JUNE 2009 ISSUE 275

RC REPORT

SERVING RADIO CONTROL MODEL AIRCRAFT ENTHUSIASTS EVERYWHERE

R/C REPORT ONLINE

JUNE 2009

SPECIAL FEATURE

TOP GUN 2009

page 32

lines from the editor

MODELING MATH

Solve the following for X.

$$2 + 3 \times 4 = X$$

Is it first 2+3 = 5, and then 5x4=20, or is it 3x4=12, plus 2 =14? At first the answer may seem to depend on how you look at it. We can't allow math to work that way, though. There has to be only one correct answer, and the same answer every time, so we need rules to guide the way *everyone* looks at it.

The PE-MiDAS Rule

To refresh my memory and double-check my accuracy, I researched this on the internet and at the city library, where I found absolutely nothing referring to old King Midas. I guess now that this was just a personal teaching aid that my teacher used at the time. He called it the "Purple Envy MiDAS" rule. You do know the story of ol' King Midas, don't you? Man, he was one greedy dude. And we're not talking about greedy like airplane kit hoarders or fliers who hog the frequency pin all day. We're talking *super* greedy... like politicians! See, as rich as he was, old King Midas was said to turn "Purple with Envy" every time he met anyone richer than he. So when he was somehow granted a magic wish to have anything he could imagine, King Midas didn't ask for something really meaningful like world peace, the end of hunger and disease, or truly unbreakable propellers. No, he selfishly asked to have everything he touched turn to gold. And when he got his wish he was so excited he ran all over the already lavish White House... I mean castle, exercising his new power. And sure enough, everything he touched turned to solid gold. He was thrilled about it until... until he touched his one and only child, his much beloved, beautiful daughter. As per his wish, of course, the young girl was instantly transformed into a solid gold statue. Dead as yesterday's highway possum, mind you, but solid gold nonetheless.

So, someone must have decided to punish that greedy old king's place in mythology by using his name (well, sort of) as an acronym reminder that complex math operations have to follow certain priorities. And sure enough, how many people today enjoy complex math? Now, had Midas touched his *wife* first, historians may have remembered him in an entirely different light!

Anyway, just remember the sequence of letters in the learning aid "PE-MDAS" when reading and performing complex math operations. In order of rank, the different operations have these priorities:

1. P: Parentheses

This includes stacked parentheses too, so operations in double-parentheses are done before those in single parentheses, those in triple-parentheses are done before double-parentheses, and so on.

2. E: Exponents

This includes numbers that are squared (x^2), cubed (x^3), etc.

3. MD: Multiplication and division. These two operations share an equal priority, so they are performed left to right.

4. AS: Addition and subtraction.

These two operations also share the same priority, and they too are performed left to right.

The "I" in Midas? Now look, fella... did I ever say I have the answer to everything? No! Only Presidential candidates make *that* claim!

Example: Solve for A.

$A=9^2 \times (5+9) \times 6 - 14/2 + 16$

First comes "P" for parentheses, so I'll replace the (5+9) with 14, so it then reads...

$A=9^2x14x6-14/2+16$

Next comes E for Exponents, so I'll replace the 9^2 with (9x9=) 81. Now it reads...

$A=81x14x6-14/2+16$

Next comes multiplication and division, working from left to right, so I'll replace 81x14x6 with 6804, and I'll replace the 14/2 with 7. Now it's...

$A=6804-7+16$

Finally comes addition and subtraction, working from left to right, so the answer for A becomes 6813.

Easy, right? Hello?

Hello? Is anyone still here?

Now let's do some fun and exciting math! (I can already hear the clicks of many mouse buttons stabbing at some other article... *any* other article!)

I receive what I consider to be a surprising number of requests for help in computing wing areas. Of course, I think once a month would be surprising, but it's a lot more often than that. Nearly everyone knows how to calculate the area of a simple rectangle, but throw in a pair of oddly shaped wing tips or a tapered leading or trailing edge, and many modelers become as uncomfortable as I am in the men's department of a lingerie store. (The only reason I even *know* of the men's department is because it's often right next to the livestock section.)

Wing Area is simply the average wing span multiplied by the average wing chord. Well, maybe not so "simply" all the time, because sometimes determining those "averages" can get a wee bit tricky.

Personally, I categorize all the many different wing plan forms (a wing's shape as viewed from above) as Constant Chord (Figure 1), Single Tapered Edge (Figure 2), Double-Tapered Edge (Figure 3), Swept (Figure 4), Plug-in Panels (Figure 5), Elliptical (Figure 6), and Weird (Figure 7, to handle anything that isn't covered in the first six categories).

I also generally omit any irregular wing tips and fuselage wing area (see Plug-in Panels) from the *basic* calculation. I compute them separately and then later add their area to the results of the main wing area calculations.

My Conventions

The conventions I use for wing area calculations include: A=Area, C=Average Chord, R=Root Chord, S=Span, and T=Tip Chord, with all of those measurements being in inches. W=Weight in ounces, and WL= Wing Loading in ounces per square foot (oz./sq.ft.).

I don't use an "Average Span" convention because I calculate irregular wing tip areas separately.

My Wing Area Formulas

Basic: $A = (R+T) \times S \div 2$

(Works with all straight-edge wing shapes, tapered or cons-

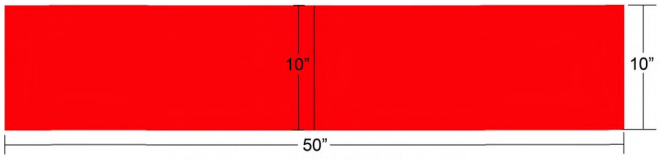


FIGURE 1: CONSTANT CHORD (10")

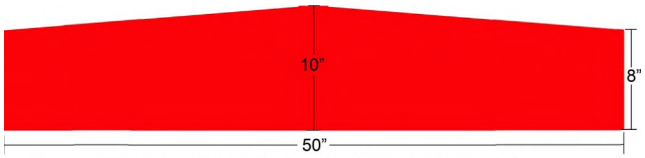


FIGURE 2: TAPERED EDGE (LEADING OR TRAILING)

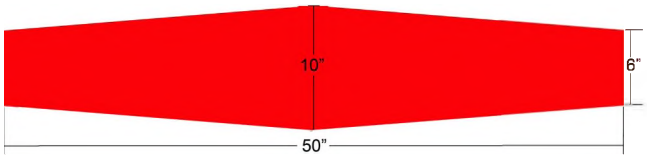


FIGURE 3: DOUBLE TAPERED EDGE (LEADING AND TRAILING)

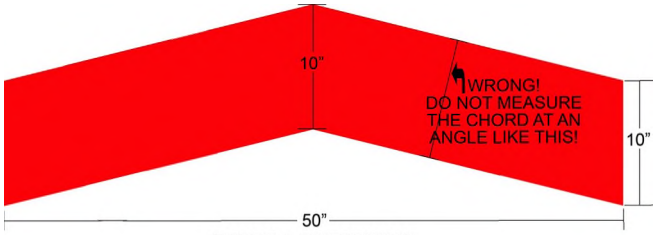


FIGURE 4: SWEPT WING

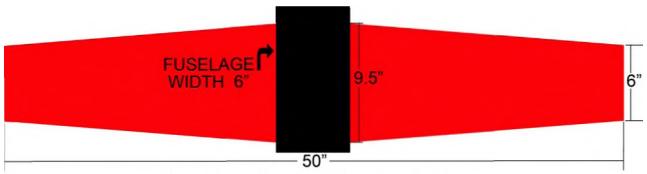


FIGURE 5: PLUG-IN WING PANELS

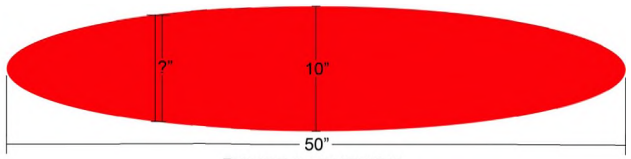


FIGURE 6: ELLIPTICAL

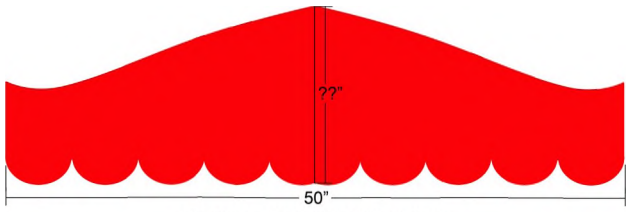


FIGURE 7: DOWNRIGHT WEIRD!

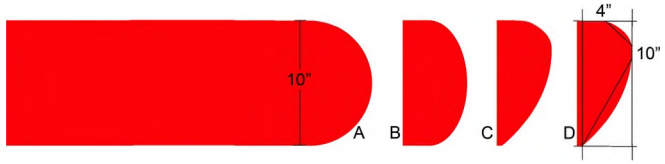


FIGURE 8: IRREGULAR WING TIPS

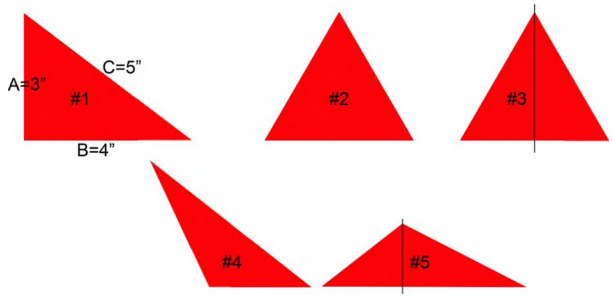


FIGURE 9: TRIANGLES

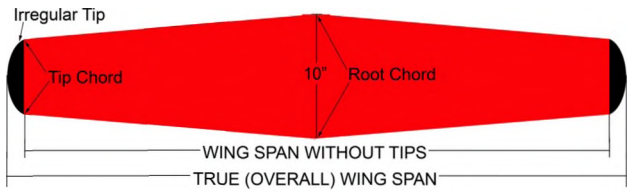


FIGURE 10: CONVENTIONS

tant chord, except Plug-in.) (See Figures 1-4.)

Constant Chord Only: A=S x T (or A=S x R since R and T are equal) (see Fig. 1).

Plug-in Panels: Use the Basic formula above for each wing panel, and then add the area of the fuselage between the two wing panels, using straight lines across the fuselage between the wing panels' trailing and leading edges (see Figure 5).

Elliptical or Elliptic: See Figure 6 and "Weird" below.

Weird (aka, What the hell was s/he thinking? See Fig. 7).

There may be some proper formulas for determining the areas of elliptical and weird wing shapes, but we encounter them so seldom, who can remember them? I'm trying to ramimbur where the "e" key is on my keyboard, and you want me to calculate the wing area of a 77.5" span model built to look like a bald eagle? I don't think so, Tim! I use cardboard! And although not necessary with ordinary wing shapes, the cardboard method works with *any* shape.

Cardboard Calculation

Onto a single piece of cardboard big enough to do the job (and it's very important for accuracy that you use the *same* piece of cardboard throughout, to avoid variances, I first trace the outline of the entire wing (or one panel). Then cut just inside that line to yield a cardboard pattern of the exact same shape (and thus the same surface area) as the wing or wing

panel. Then weigh that piece of cardboard on a scale capable of very small increments, and write down the weight as WW (wing weight). I use a gram scale, but one that measures ounces in tenths or hundredths will do just as well.

At this point we still don't know the exact surface area of that piece of cardboard, but we do know its weight (WW). We wrote in down, remember?

Then cut from that *same piece* of cardboard any size rectangle(s) you want that will yield an exact and known number of square inches. Since a higher number increases our accuracy, I like to use exactly 144 sq. in., cutting a rectangle of 12x12" or 6x24" (or two pieces of 6x12", etc.). The more precise we are with our cuts, the more accurate our final figure(s) will be.

Then weigh the second piece(s), and record that weight as CW (cardboard weight). Let's say you too chose to use 144 sq.in. So now that we know the weight of exactly 144 sq.in., we can divide CW by 144 to determine W1 (weight of 1 sq.in. of that particular cardboard). And then, knowing the weight of 1 sq.in. of that cardboard, we can determine the number of sq. in. it took to make the wing pattern weigh WW oz. Divide WW by W1 (WW/W1). The answer is the figure we've been seeking, the surface area in sq.in. of the wing or wing panel from which we made the cardboard pattern.

Hungry? Let's have Pi.

Pi (the symbol π) is just one of many scientific "constants" made popular by mathematicians working with circles and spheres (aka, balls). The scientific notation for Pi is 355/113, and the precise calculation extends out to many, many decimal places. I once read that a super computer had calculated Pi out to 10,000 decimal places, but I've not yet personally verified that (cough cough). That's too long a number for this article, though, so I accept the common value of Pi as being 3.1416 for non-scientific work. Some people even accept 3.14 as being "close enough." (Now now, don't worry. Whenever I'm playing around with sub-atomic particles in my secret workshop, I use a far more accurate number. Mistakes there could lead to headline news some evening, *"New crater formed in North Alabama"*. No, I never make eras in my secrit werk shop!)

When my friend Bubba first heard about "Pi R Square", he laughed. *"You city boys may know a lot,"*, he grinned, *"but even I know that ain't so. Pie are round! Cornbread are square!"*

Common Formulas Using Pi ($\pi = 3.1416$)

Circles (using R for Radius, and D for Diameter)

Area = πR^2

Circumference = πD

Spheres (or balls)

Surface Area = $4\pi R^2$

Circumference = πD

Irregular Wing Tips: (See Figure 8.) Again, I compute these separately and later add their area to that of the wing.

Look at Figure 8-A. This tip is one half of a full circle, making it easy to calculate. The formula for calculating the area of a circle is $A=\pi R^2$ (Pi times radius squared, or 3.1416 x Radius x Radius). Since the radius of a circle is one half its diameter, a 10" circle has a radius of 5". I use 3.1416 as the value of Pi, and since our two half-circle wing tips make one whole circle, I calculate them both at once as totaling 78.54 sq.in. (3.1416 x 5 x 5 = 78.54).

Okay, that's fine for circles and half-circles, but what about those truly irregular wing tip shapes like those in Figure 8's B & C? Then what?

Here I resort to that time honored calculation tool known as a "guestimate". We make the best calculations we can, and then guess at the rest.

I first separate the wing tip area from the main wing area by determining where along the leading and trailing edges the curvature of the wing tip begins. I can then measure the length of both sides (and thus the surface area) of the imaginary rectangle in which the wing tip resides (see Figure 8-D). I then pencil in some right triangles to "guestimate" the missing areas at the corners, and subtract the triangle areas from the imaginary rectangle's surface area.

"Triangles? We gotta learn triangles too??" Oh stop your whining, you pansy! A triangle is nothing more than a rectangle after a bad crash. It's area is *precisely half* that of a simple rectangle having the same height and width. Determining its height is the only thing that throws many people into a tizzy, but I'm going to make even that easy for you.

Triangles

Right Triangles (see Figure 9 #1) are those with one right angle (the 90° corner at lower left, of course). Right Triangles very easy to work with, since it even *looks* like half-a-rectangle. The adjoining sides at the 90° corner are Sides A and B, and the other side is Side C. In Figure 9's triangle #1, Side A is 3" long and Side B is 4" long, which pretty much forces Side C, like it or not, to be 5" long (even triangles have rules, y'know). Since a triangle's surface area is one half that of a rectangle having the same height and width, simply multiply the Right Triangle's height by its width and then divide by 2. In this triangle's case, that's:

Area=A x B/2 (or AxBx0.5)

Sadly, not all triangles are Right Triangles (see Figure 9's #2). Now hold on! Don't run off just yet! Look at Figure 9's triangle #3 and see how easily we can talk such triangles into becoming friendlier Right Triangles. We simply draw a line perpendicular to the triangle's longest side, to pass through the peak (the highest point) of the triangle. See what happened? Now we have two of those nice and easy Right Triangles. Compute away!

Some triangles are drawn at a different angle, though, just to frighten and confuse us, as seen in Figure 9 #4. But don't give in, fight back! Just turn that puppy a little to put its longest side on the bottom, as seen in Figure 9 #5. Then draw in the perpendicular line described above, and again we have two nice and friendly Right Triangles.

Now was that so hard? Of course not. Triangles are our friends! Without Triangles, we'd have no GPS (Global Positioning System) navigation systems. And men in particular know the value of GPS navigation systems, because now we *never* have to stop and ask for directions!

But before you run off thinking triangles are as easy as that one particular blonde we all knew in college (well, maybe not *you*, Bob), there are darker aspects to triangles, with formulas that involve the widely feared "Square Root" operation. There are many aspects of higher math that send me into hiding, but I'll bet that the most common one for most people is "Square Roots".

Remember all those attractive young ladies we used on the printed magazine covers, especially between September 2007 and Jan 2009? All but Lisa (age 37, on the Feb 09 cover) were between 18 and 27 years old, and when I asked some of them if they were familiar with square roots, only Courtney, the 18 year old college student (Oct and Nov 2007 issues), even knew what they were. Some of the "blondes" (using the word very loosely) grabbed a mirror and began examining their hair close to their scalp!

The square root of any number is a smaller number which, when multiplied by itself (i.e., squared), yields the first number. I suppose the easiest example is four (4), the square root of which is two (2). Using the square root sign, this can be shown as $\sqrt{4}=2$. More examples are $\sqrt{9}=3$, $\sqrt{16}=4$, $\sqrt{25}=5$, and $\sqrt{100}=10$.

When do we need to use square roots in modeling? Not very often, thank you very much, but when I know the lengths of any two sides of a Right Triangle, and need to know the length of the third side, it's sometimes easier to calculate it than it is to measure it. And if it's not a Right Triangle, then I use the method already described to turn it into Right Triangles.

To determine the length of one unknown side of a Right Triangle having Sides A & B forming the 90° corner, and Side C being the longest side (see Figure 9's triangle #1 again), all we need to know is where to find the piece of paper onto which we wrote the formula $A^2 + B^2 = C^2$. From that we can figure out almost anything we want about a Right Triangle.

Using Figure 9's triangle #1, where we already know the length of all three sides (A=3, B=4, and C=5), let's see if we can prove the formula.

A^2=9 (3x3=9), and B^2=16 (4x4=16), so C^2 would have be (9+16=25), and sure enough, it is (5x5=25). Neat, huh? Can you imagine how exciting it must have been for the guy who discovered all this Pi and Square Root stuff?

From that one formula we can extract cooperating formulas to determine an unknown A from a known B and C ($A^2=C^2-B^2$), or an unknown B from a known A and C ($B^2=C^2-A^2$). Then determine the square root of the answer to get the length of the unknown side. Yes, you can use a calculator!

SCALE FACTORS

I find Scale Factors so simple and easy to understand, it always strikes me as odd when some people just don't get it. On the other hand, living in Madison, AL (near NASA's George C. Marshall Space Flight Center on Redstone Arsenal), where rocket scientists and aeronautical engineers seem to live on every other corner, I have friends who think I'm an idiot for not understanding quasars, black holes, and dark matter. I always thought "dark matter" was any part of the turkey other than the breast... and I still do!

Scale factors are used to enhance realism, and it doesn't even have to be a scale model. You simply don't put a tiny, 1" tall pilot bust in the cockpit of an 80" span Piper Cub. It looks dumb! That's even worse than having no pilot figure at all! In a non-scale sport model, I don't care if you stick in a figure of Mickey Mouse, Snoopy, or even Big Bird. It's often cute and amusing. But it still needs to be approximately the right size to represent a human figure of the appropriate size. Why? Because the gods of model airplanes say so, and we *never* argue with *them*!

"My model has a wing span of 72", so what size pilot figure should I use in it?"

Okay, if we know the wing span of our model, how do we use that it to determine the Scale Factor for that model?

Let's look at the already overused (because it's so widely understood) example of a Piper Cub. I mean, let's face it, every R/C modeler who's been stirring sticks a month or more knows what a Piper Cub looks like, right?

A genuine, full scale J-3 Piper Cub has a wing span of 36', which is also 432". Now here comes the math part. Divide 432 (the full size airplane's wing span) by 72 (our model's wing span. The answer is six (6), so that, my friends, is the Scale Factor for this particular model, sweet and simple, period. It's six. It's not five or seven, it's six, and it means that our model is 1/6 scale (one divided by six).

Since today's question is about selecting a pilot figure's height, all we need to know now is *"How tall a pilot do you want to represent?"* If you have a particular person in mind, how tall is that person? Otherwise, you can choose the height of an average man, which is around 70-72" (5'10" to 6'), or the average woman which is around 64-68" (5'4" to 5'8").

Our Scale Factor also works with wheels, propellers, windows, lettering and graphics, and just about anything you want to represent with realism. How tall is the real thing?

Once you know the height (or other size factor) of the real thing, simply divide that number (N) by the model's Scale Factor (6), giving us N/6. If you've decided to represent a 6' (72") man (boy am I lazy!), then N represents 72, so divide 72 by 6 and you get 12 (at least you *better* get 12. Otherwise I'm moving you up to the front row where I can make sure you're not sleeping in class!).

So now we have the number 12, which represents... what? It's the proper height for a full pilot figure to represent a 6' tall man in a 1/6 scale model. (You really haven't been paying attention, have you?)

"But I'm not using a full pilot figure, I'm only using a pilot bust. Now what do I do?"

With patience and a lot of practice, I'll bet you'd make a great fence post! Look, it doesn't matter *what* you're trying to represent, you still use the same Scale Factor! So help me, if you ask that again, you're getting a *ton* of homework!

This is sooooo wrong! I mean, *everyone* knows Snoopy didn't fly a Tiger Moth!

Determine (in inches) the size of *whatever* you're trying to represent with realism, and then divide that number by the Scale Factor. Measure *yourself* if need be! If you measure 30" from your waist to the top of your head, then that's your "N" number, so divide N by your scale factor (6 in this case). Your "from the waist" pilot bust should be close to (30/6=) 5" tall.

With a non-scale model we usually don't have a full-size airplane for reference, but we can choose something similar. My Carl Goldberg Models "Tiger 120" has overall lines somewhat similar to a Piper Cherokee, which has a wing span of 30' (360"). Since the Tiger 120 has a span of 80", the Scale Factor is (360/80=) 4.5, so a full pilot figure of a 71" tall *me* would measure (71/4.5=) 15.78" tall, and an extra large 16" pepperoni pizza would scale down to a disgustingly small 3.55".

Divide the wing span of the full scale aircraft by the wing span of your model, and the answer is your Scale Factor. Then divide the Scale Factor into the measurement of anything you want to represent in a realistic size, and that's the approximate size the item should be on your model.

OTHER USEFUL STUFF

Metric/SAE Conversions

From	*to*	*multiply by*
mm	in.	0.0394
in.	mm	25.4
meters	ft.	3.28
ft.	meters	0.3048
dm^2	in^2	15.5
in^2	dm^2	0.0645
cm^2	in^2	0.155
in^2	cm^2	6.45
grams	oz.	0.035
oz.	grams	28.35
kg	lbs.	2.205
lbs.	kg	0.4536
cc	c.i.	0.061
c.i.	cc	16.387
fl. cc	fl. oz.	0.0338
fl.oz.	fl cc	29.579
km	mile	0.622
mile	km	1.609
kph	mph	0.622
mph	kph	1.609
liters	gal (US)	0.2642
gal (US)	liters	3.785
liters	gal (UK)	0.22
gal (UK)	liters	4.546

Temperature Conversions

(C=Celsius, F=Fahrenheit)

F = C x 1.8 + 32

C = (F-32) x 0.56

Horsepower & Watts

From	To	Multiply by
HP	Watts	745.7
Watts	HP	0.001341

Horsepower & Torque
HP = Torque x RPM/5252
Torque = (HP/RPM)x5252

Engine Capacity
C=Capacity (cc or c.i.)
B=Bore (mm or in.)
S=Stroke (mm or in.)
N=Number of cylinders
So, $C=B^2 \times S \times N \times 0.7867$

The CASIO fx-115ES
Hand-held Calculator

If your work shop and/or office is in need of an easy to use, yet extremely powerful hand-held calculator that's literally overflowing with features, built-in conversion tables, multiple memories for numbers or formulas, and all for less than 20 bucks (mine was $19.95 at a Staples Office Supply store), I highly recommend the Casio fx-115ES. I have never seen so many useful features included in one, low-price, hand-held calculator. It even allows textbook entries, stacked priorities (i.e., formulas with multiple layers of parentheses and exponents), and mixed fractions (i.e., use 1/4 or .25) in the same calculation. It even has a "Solve" feature (Solve for X, 25=5xX). It's as easy to use as a $1.95 calculator in its basic math mode (except it's even more forgiving in how you can enter values and variables), but when you need more complex calculations, and you're prepared to study the instructions, it has capabilities that I'll probably never use!

Now let's see, what else? Oh yeah, sines and cosine... (Well, I did warn you that some aspects of math send me into hiding.) *-Gordon Banks*
glbanks@knology.net

As I just now typed the word "Knology" above, it reminded me of something I should pass on to anyone living in an area served by Knology, a non-wireless telephone, internet, and cable TV company.

When *"R/C REPORT"* went out of business after just one year into a three-year contract with Knology for our business telephone and internet service, I was afraid that they would demand the "early cancellation fee" that most of the biggies (like AT&T) impose. When I called to inform them that we were going out of business, I asked about their early cancellation fee. The Knology representative said that there *would* be a penalty (approx. $3200 in this case) if we were simply switching to another service provider, but that it was not Knology's policy to add to the problems of a failed business, so there would be no penalty. I also called AT&T, who I had fired a year earlier for double-invoicing, and asked about their policy. There would indeed have been a stiff penalty for early cancellation, and that whoever signed the contract would be held responsible.

But wait.... because Knology wasn't quite finished with us after all. After calculating the diminished use of our toll free and long distance telephone service during our final month, they sent us an overpayment refund check for $92.30!

Yes, there really is a telephone, internet, and cable TV provider with integrity and a heart. It's *not* just a dream.

Accepting our dinner invitation, our new neighbors came over one evening and brought their blonde, 12 year old daughter. When asked what she wanted to be when she grows up, she promptly replied, "The President of the United States."

"That's wonderful," I replied. "And if you do become President, what's the first thing you'll do."

"I'll give food and clothing to all the poor and homeless people," she replied. Her parents, both liberal Democrats, literally beamed with pride.

"Wow," said I. "That's a very worthwhile goal. But you don't have to wait until you're the President to do that. You can come over here this weekend and mow my lawn, pull weeds from my garden, and sweep the driveway and sidewalk. When you're finished I'll give you $50 and take you downtown where the homeless people are. Then you can give them your $50 so they can buy food and clothes."

She looked me in the eye for a moment, and then smiled. "You're just teasing me. That doesn't even make sense. Why don't the homeless people come over and do the work and you could just give them the $50?"

Then I smiled back at her. "You're going to make a fine Republican," I said.

Her parents haven't spoken to me since.

THE BIG PICTURE

by Dick Pettit

Spring has arrived in my home area with a bang. It's only April, yet the temperatures are supposed to be in the 90's this coming weekend. The winds we had last week have hopefully blown away the spring onslaught of yellow pollen, which covers everything and makes the entire area appear as if the cleaning lady took a month off! Nevertheless, it's shaping up to be a great weekend to head for one of the local flying events in this area.

I think I'll take my Concept Fleet biplane. After checking and cycling the battery, filling the tires with air, and going over the covering to remove any wrinkles and loose edges, it should be ready to fly. Then a good wiping with a clean cloth and some airplane cleaner will make the Fleet look clean and shiny again. If you've not already done this with your models, you should get to it soon, just to be sure. Don't wait until the very last minute, or even worse, try to fly *without* a new season inspection.

This month I'll be showing you some photos from a local flier, and a not-so-local modeler. I'll tell you about a new fueling valve and an interesting little power socket that can be used on electric and wet fuel models. So, let's get started.

Photo 1: John Mynster, of Tampa, FL, sent this photo of his Great Planes P6E Hawk, seen here with his son Kurt. Powered by a Magnum 120R 4C, it uses a Futaba FASST radio system for guidance.

THE FLORIDA BOYS

John Mynster, of Tampa, FL, sent an email with a few photos of his latest creations. First is his Great Planes P6E Hawk, seen in **Photo 1** with his son Kurt. It's an ARF powered by a Magnum 120R 4C, and uses a Futaba FASST radio system with Futaba servos. There's an "Aces of Iron" pilot figure in the cockpit, and John says the plane is a dream to fly in low wind conditions.

Next is John's Top Flite Stinson Reliant SR-9 built from a BIY (Build It Yourself) kit. This one, uses a Quadra 42 gas engine, and another Futaba FASST radio system and Futaba servos. John reports that it took about two years of off-and

Photo 2: Here's John's Top Flite Stinson Reliant SR-9 built from a BIY kit. This one uses a Quadra 42 gas engine and a Futaba FASST radio system.

-on building to complete. Seen in **Photo 2**, the model required 250 grams (8.75 oz.) of weight in the tail to balance it properly. According to John, it was an enjoyable and complicated building project that was very satisfying to complete, and it flies like a big, beautiful trainer. Thanks for the photos, John.

NOW HERE'S A SWITCH

I was visiting Dave, at Radical RC, when he showed me the little laser-cut wood project (see **Photo 3**) that builds up into a switch box kit to make your own custom mounting box for Anderson Power Pole Connectors, which connect to each other in a gang-type set up. This box allows us to mount the 2-pole gang into a sturdy box so we can easily plug our mating plugs into it. It can mount in two different ways, as a firewall mount or a through the fuselage bulkhead.

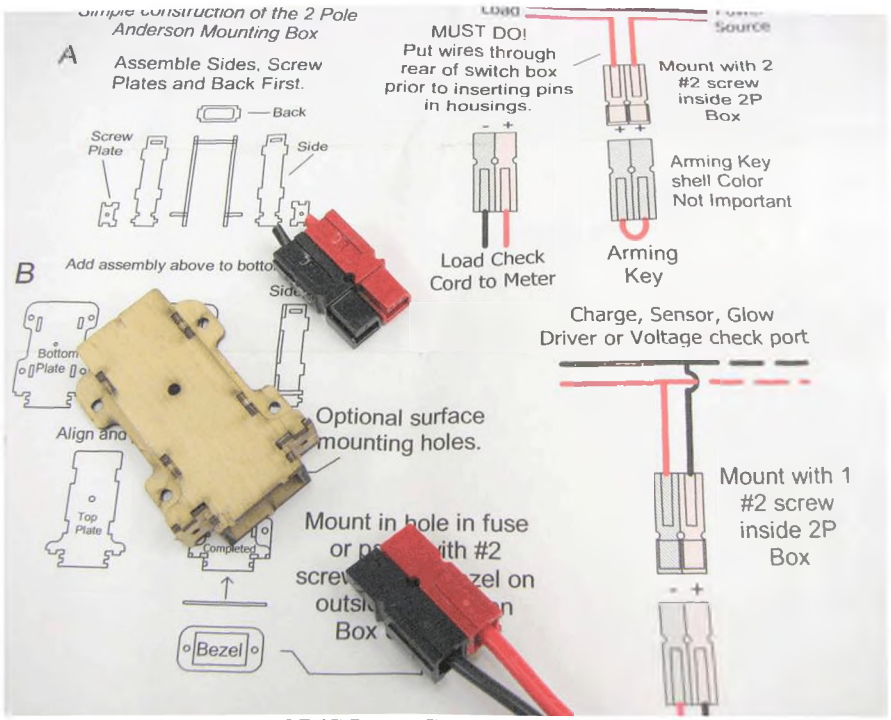


Photo 3 shows the Radical R/C Laser Cut Switch Box Kits (see text).

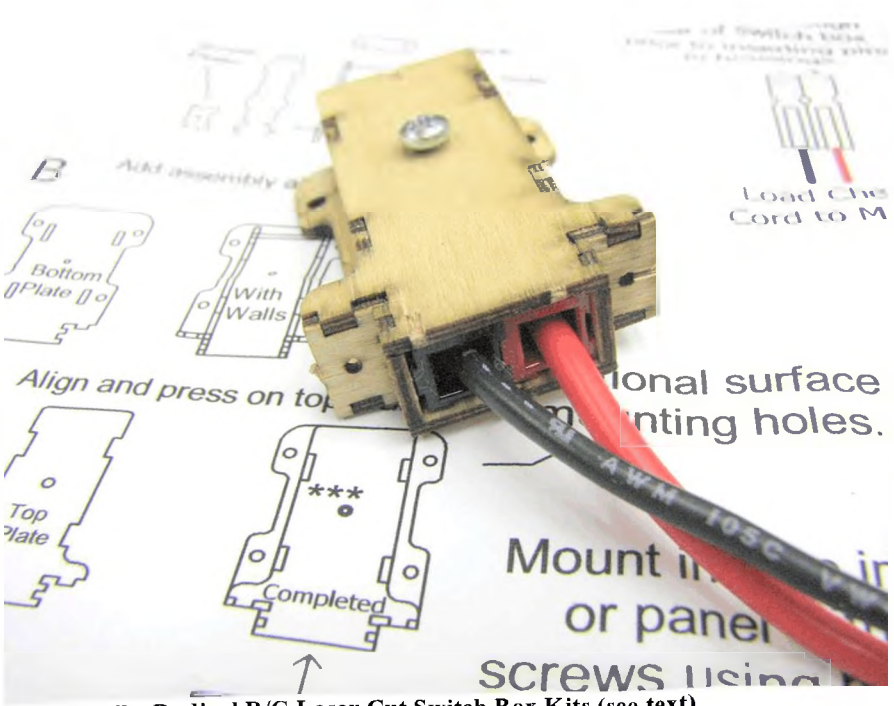


Photo 4: The Radical R/C Laser Cut Switch Box Kits (see text).

It will also flush or cheek mount onto any flat surface.

It can be used to house Power Pole connectors for charging batteries, checking battery voltage, as an input for a glow driver, or if wired in series with the battery, can be used to check current draw from the battery, or even as an on-off motor arming switch.

The laser-cut parts assemble easily and the Anderson Power Pole connectors slide into the box where they are held securely by a single #2 wood screw. Be sure to push the wires through the box before inserting the connector pins into the plastic housing. The laser-cut plywood parts are a tight fit to one another, making it perfect for thin ZAP adhesive to hold everything together.

Photo 4 shows the outside of the Radical RC Switch Box with a Power Pole connector pair plugged in.

The Radical RC Laser-Cut Switch Box Kit sells for $5.00 for the 2-pole version, while the 3-pole version, used for a

Photo 5: Gotz Vogelsang sent this photo of his beautiful World Models 1/3 scale Clipped Wing Cub.

Photo 6: Gotz Vogelsang's 1/3 scale Clipped Wing Cub has a 120" span, weighs about 28 lbs. with its DA-85 gas engine and Menz 26x10 prop, and uses a Spektrum radio with Hitec digital servos and dual 5-cell batteries.

combination charge and on-off switch, sells for $5.50. You can order them from Radical RC at www.radicalrc.com.

IT'S A REALLY BIG CUB

Goetz Vogelsang, of Apex, NC, is a new member of one of the clubs I'm in. He recently showed up at the field with this beautiful World Models 1/3 scale Clipped Wing Cub. It has a 120" wing span, and weighs about 28 lbs. powered by a DA-85 gas engine with a KS header and canister muffler swinging a 26x10 prop. Goetz uses a JR 12X transmitter with a Spektrum 9100 receiver and Hitec digital servos connected to dual 5-cell batteries to control the big Cub.

Photo 7: Gotz Vogelsang's 1/3 scale Clipped Wing Cub on approach.

A FUEL FILLER VALVE THAT REALLY WORKS!

While I was at the 2009 Toledo Show, I stopped at the DuBro booth and started snooping around for anything new and/or different for 2009.

Photo 8: The DuBro #996 E/Z Fill Fueling Valve is said to be leak free.

One item that caught my eye was the neat little fuel filler valve that's a bit different than others we may have seen or used in the past (see **Photo 8**). I've used many different kinds over the years, but many leak right away, while others begin leaking after several uses. This one is said to be leak free.

Their model 996 E/Z Fill Fueling Valve is a very simple device made of black plastic, which is mounted in the fuel line between the tank and the carburetor. The valve even has embossed letters (C and T) to remind us of which lines go where (Carb and Tank). The fuel *fitting* slides in and out, depending on what you want to do. Push it in for flying, and pull it out for fueling.

I mounted one on a recent project that used a Zenoah G-26 gas engine. Yes, this valve can be used for glow fuel and gasoline, but due to the small inner diameter of the fittings, it's somewhat flow limited, and should not be used on glow engines of 1.2 c.i. or larger. Since gas engines require less fuel flow, I'm guessing that it will work fine on gas engines up to about 40 cc.

To fill the tank, pull the cover off the fill fitting and push your fueling hose over the fitting. You will probably feel the fitting push down into the body of the valve, so pull the fitting out to connect the fuel pump to the tank. Then you can fuel or de-fuel the tank. Once that's done, pull the fuel hose off the fitting, and push the cover back in place, which pushes the fitting back into the valve, thereby reconnecting the tank line to the carburetor.

Another neat feature of this item is that it can be used to run the fuel out of the carburetor at the end of the flying session. Pull the cover off the fuel fitting, which closes the line between the tank and the carb. Then start the engine and let it run to use up all the fuel in the carb and in the fuel line. Then you can drain the tank. The DuBro E/Z Fill Fueling Valve costs about $9.00 at your local hobby dealer, or order direct from... www.dubro.com.

Well, that's all I have this time. Please send us photos (digital if possible, either by email or on a photo CD) of your latest and/or favorite giant models, and include some information on the model and its equipment. We'll try to use the good photos right here online. I'm also open to suggestions for subjects you'd like to read about, to include product review project suggestions. I'll try building just about anything... once.

Until next time, see y'all at the field.

-Dick Pettit
5704 Dedmon Ct.
Durham, NC 27713
pettit@ti.com

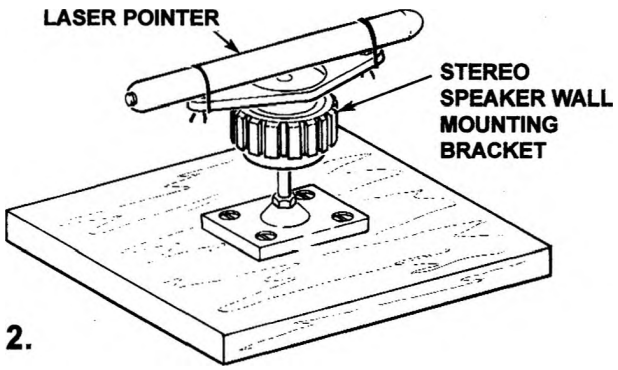
HERE'S HOW...

by Walt Wilson

Share your best ideas and building tips with others. Send your "Here's How..." ideas to...
Walt Wilson, 3000 Persimmon,
St. Charles, MO 63301
or by e-mail to... rallyo@charter.net
Please include your full name and mailing address. The first submitter of any idea used here will win a one year subscription or renewal to RC REPORT ONLINE. If the subscription or renewal is to be a gift to someone else, please state this when submitting the idea.

1.

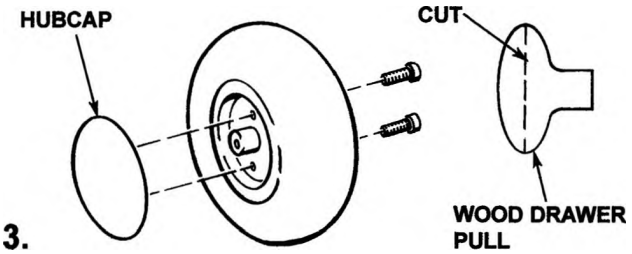
1. Clint Worley, of Cayuga, IN, keeps a drill-bit type welding torch tip cleaner in his toolbox for various applications where small drills may come in handy. It's a small aluminum pin vise, with a steel pocket clip and an inner chamber to hold a number of small drill bits. Its overall length is approximately 4" and drill bit sizes ranging from #54 to #72 were included with the one purchased from Amazon for $10.61, at www.amazon.com/gp/product/B0017Z1SXA. They are also available from several other sources (try www.widgetsupply.com), including local welding-supply and tool stores.



2.

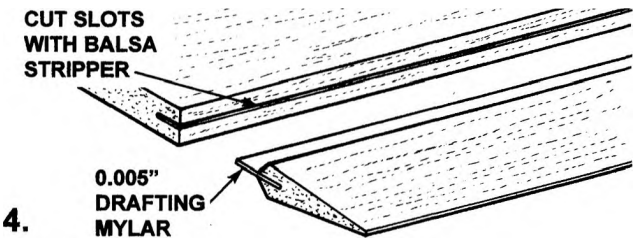
2. Blair Johnson, of Shawano, WI, uses a pocket-type laser pointer for aligning control surfaces, screw holes, etc. To hold it solidly in

place on a highly adjustable mount, he used a wall-mount stereo speaker bracket which tilts and can be rotated 360 degrees. He mounted the bracket on a 6" square piece of 1/2" plywood, and attached the pointer using zip ties. It works nicely and he's used it for several applications, including locating holes to be cut in cowls.

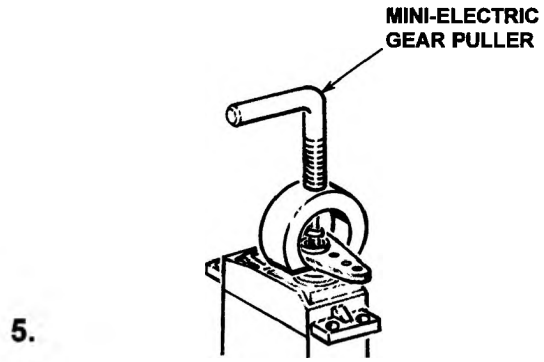


3.

3. Don Hoelting, of Florissant, MO, suggest using wooden drawer pulls and doorknobs to make great hubcaps for models like Piper Cubs. Select the proper diameter pull (they're available in a variety of sizes and shapes) and then use a band saw (or other appropriate tool) to cut the front off as shown in the illustration. Drill out the center of the backside to clear any part of the axle and/or wheel collar that may extend beyond the wheel rim. Then drill two holes through the wheel and into the hubcap for a pair of small wood screws. It can then be painted or covered in the desired color.

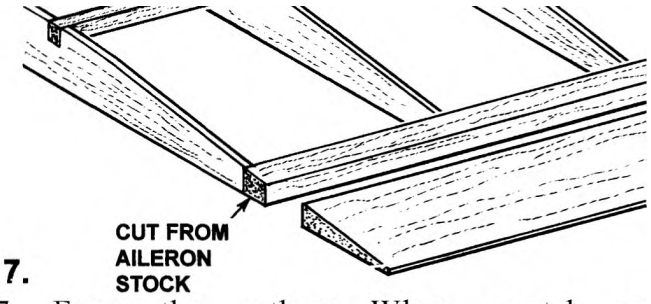


4. Paul Geders, of Florissant, MO, has his own way to create gap-free hinges. He uses a Master Airscrew Balsa Stripper to cut a slot in the center for the full length of the mating surfaces. He then cuts a strip of .005" drafting Mylar to the desired length and width, and glues it in place using RC 56 Canopy glue. When it's dry, it's a very tough hinge, is gap-free, and almost impossible to pull apart.



5. From Brian Goldammer, of Menahga, MN. When assembling large gas engine airplanes, aluminum servo arms are frequently used. If you want to move the servos to another airplane, or change the arm length, aluminum arms can be very difficult to remove. When the servo arms have been pulled down tight with the servo arm screw, you could damage the servo by prying the arm off, which sometimes seems to be the only way to remove it. Brian, however, uses a small, electric motor gear puller, with the bottom jaws ground away so it will slide under or around the servo arm. Loosen, but don't remove, the screw holding the servo arm. Put the puller on the servo arm and center over the screw. Tighten the puller and start pulling the servo arm off. If necessary, unscrew the servo arm screw a little further and repeat until the servo arm comes off without damage to the arm or the servo. Neat!

6. (No illustration) Jack DeLisle, of Saint Clair, MI, was building a model, and when it came time to do some filling, using Red Devil Onetime Light Weight Spackling, he needed a tool for applying and leveling the filler. He squared off the ends of a popsicle stick, beveled one end, and sanded it smooth. He likes it so much, he also cut one in half lengthwise to make a narrower applicator for smaller defects.



7. From the author: When scratch or plan-building a wing, it's often necessary to install a trailing edge to mate with tapered aileron stock. The trailing edge stock must then be sanded to a taper to match the contour of the wing and the mating aileron stock. The next time you encounter this, try using a length of aileron stock a little wider than required. Then use a Master Airscrew Balsa Stripper to cut about 1/4" to 3/8" from the leading edge of the aileron stock, and use that for the wing's trailing edge. You'll have the correct taper with minimal or no shaping required!

8. From the author: This isn't really a new idea, but more like a reminder. As R/C flyers get older, some have trouble kneeling down to work on their models. For some, this problem could put an end to their participation in the hobby. A few years ago I suffered a knee injury that made kneeling very difficult, so a fellow member of the Spirits of St. Louis R/C Flying Club, Don Fitch, designed and built two tables to be left at the field for that purpose. The tables are 5' long, 30" wide, and 30" high, but could be built to suit other modelers' needs. Most were assembled using 2x4 legs and frame, and plywood tops covered with Masonite. They have a row of holes in the top to place a Midwest Aero-Mate Starting Stand (or a Y-shaped yoke) to restrain planes while starting and tuning them.

Another 2x4 under the top is used for additional support of the yoke. Some add a strip on top of the table for even more support. The parts are both screwed and glued together, and several coats of paint are applied for weather protection. Most planes can be assembled and fueled, and those up to about .40-45 size can be started, and tuned, all while the flyer is comfortably standing. The weather gets to them over time, but they're inexpensive and can be replaced periodically. After their introduction at the field, the club provided the materials for various members to build several more such tables, and their use is now widespread. The design has evolved over time and they now have axles with lawn mower size wheels on one end for ease in moving them around. Now we have people waiting for *tables* instead of frequencies! For us old codgers (ah, the joys of aging!), the tables are a valuable part of our flying equipment now, and they allow us to continue enjoying the hobby.

Speaking of aging, there are *some* perks to passing 50, surviving the 60's, and making it into the 70's. For example, no one ever expects us to run any more. Friends who call at 9:00 o'clock (a.m. or p.m.!) usually ask, *"Did I wake you?"* People no longer view us as hypochondriacs, things we buy now won't wear out, and we no longer think of speed limits as a personal challenge. We quit trying to hold our stomach in no matter who walks into the room., we know our eyes won't get much worse than they already are, and our joints are more accurate meteorologists than the national weather service. Our secrets are safe with our friends because they can't remember them either, and there's little left to be learned "the hard way"! We can live without sex (but not without our glasses), and our investment in health insurance is finally beginning to pay off. We can eat supper at 4:00 p.m. and go to bed at 6:00 p.m. We may get into heated arguments about pension plans, but our supply of brain cells is down to a manageable size, and we find there are fewer things we have to remember, such as where we read this list!

-Walt Wilson
(see my addresses at top...
unless I forgot to put 'em there)

RADIO RAMBLINGS

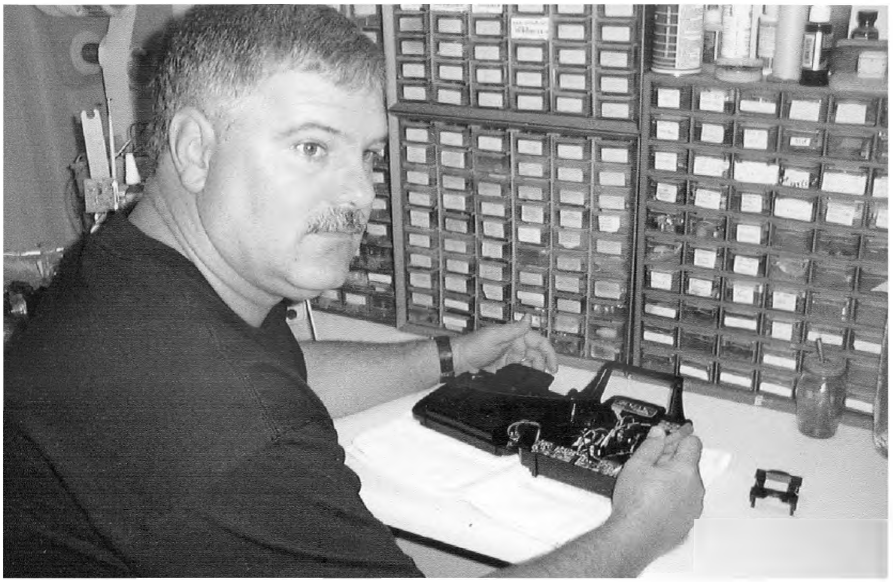
by Tony Stillman

As spring brings warmer weather to the Southeastern U.S., we get very busy with flying events. I hope you're bringing out your winter projects now, and enjoying the new flying season. This is always an exciting time of the year to see what new and cool stuff others bring out.

I also want to remind readers that I rely on email from you to help with the content of this column. I want to cover whatever is of interest to you, so please email me at...

tony@radiosouthrc.com

Note that I have a SPAM blocker, so you'll be sent to a page where you can verify the email so that I'll get it. Please, don't forget this important step or I won't get your email!



More on PCM vs PPM

I received an email to let me know that I'd left something out of my May column:

"I just read your explanation of PPM vs. PCM in the May issue of RCR. I think you left out a very important point. The PPM signal, when it gets into the noise level, gets dithered by noise spikes. The servo then begins to get antsy. Some like this as they can tell when they are getting close to the end.

"PCM, on the other hand, is transmitted via a digital 'word'. In the transmitter each pulse is sent to an a/d converter that converts its width to a digital word that's transmitted to the receiver. The receiver looks at the word and decides if it is authentic, and converts it back to a pulse width if it passes tests. If the receiver decides the word has been corrupted it sends the last good word to the servo. If the receiver has received several corrupted words it goes into fail safe. You could have some servos getting good words and others not for some period of time.

"When the PCM receiver looks for a word in the noise, it can recognize the word at a level far below where dithering would take place in a PPM system. It can read down in the noise.

"Back when interpulse coding was introduced to radars, it permitted a 3db increase in the sensitivity of the receiver. A 3bd increase in the receiver sensitivity is the same as doubling the transmitter power.

"Several years ago I had a severe problem with ignition noise from a ZDZ80 (ignition engine). I could not get control 10' from it with the engine running. I replaced the PPM receiver with a PCM receiver, and could then get twice as far from the model with the engine running than I could with the PPM receiver and the engine not running. I then flew the A/C several times. There are those that say the sensitivity of the two receivers is the same since they both use the same FM transmission, but that is simply not true."

Richard H. Kelly

Thanks, Richard. The ability of the PCM receiver to operate better in poor environments is definitely a plus, and the reasoning is important to understand, so thanks for the reminder!

Batteries

For many years now, I have been purchasing my batteries from a reputable Sanyo distributor. Lately, however, I've seen some problems with large capacity NiCd and NiMH batteries not cycling to their labeled rating. After some discussions and testing by the distributor, they've concluded that they do indeed have a problem with this latest batch of Sanyo cells.

While I am not trying to alarm anyone, I do feel that you should be aware of this. Take the time to cycle your batteries, especially when new, to see if you're getting the rated capacity from them. In the meantime, I'm working on this issue and hopefully will have it resolved soon.

I'm also looking more at the Sanyo "eneloop" NiMH cells out now. I'm planning on doing some testing on these myself, to see how they compare to some others. In the meantime, see Gordon's *"From the Editor"* in the printed version of the January 2009 issue of *"R/C REPORT"*. He's already tested and compared these and several other brands of new NiMH cells.

Top Gun and Joe Nall 2009

I've just returned from the Top Gun scale event in Lakeland, FL, and the Joe Nall Fly In in South Carolina. Both events were great, and both enjoyed wonderful weather! I mostly helped out in the AMA booth at both events, but I did manage to visit the flight line now and then.

One thing that really impressed me at Top Gun was the quality of the aircraft, *and* the quality of their pilots! It's been about three years since I last attended this event, and I can honestly say that the demonstrated flying skills have greatly improved! Several models being flown were not the typical scale models we often see, and some would appear to be a real handful for even a very good pilot. The Top Gun pilots, however, did a great job all week! One flew a P-51 which had a right main gear hang in the wheel well almost every flight, yet he made three great landings in the grass with the left gear down and somehow didn't even leave a scratch on the model! Very impressive!

There were a couple of engine flame-outs that were handled by cool, quick thinking pilots. There was no damage, and just a long walk to retrieve the still pristine model.

One thing I will comment on here is that most all of these pilots are using new radio equipment in the 2.4 GHz band. I heard no one complain of radio problems all weekend, either. I spent some time at AMA Technical Director Greg Hahn's tent, who was using the Futaba 14MZ with a newly installed 2.4 GHz system. It worked perfectly, and Greg even commented on how much better "connected" he felt to the model. It would seem that Spread Spectrum is working very well indeed. There were other brands flying equally well at the event, so it all speaks well for each of the manufacturers.

As usual, Frank Tiano did a great job with this event, especially ordering the great weather! Our congratulations to all the winners (including Greg

Hahn!) and to *everyone* who participated. They all have a lot to be proud of!

What can you say about the Joe Nall Fly In? This year I arrived "early" on Thursday afternoon, and the word I got was that over 700 pilots had already registered! Wow! I believe that makes this event the largest model airplane event in the world by attendance! It was a great setup with five flight lines including electric, helicopter, 3D, Amphibian, and what they called the "center-stage".

Pat Hartness continues to improve an already fabulous flying site every year. The 3D site is world class with its own bath house and pavilion area. On Thursday evening we had our annual AMA membership meeting and hot dog dinner. Our new FAA liaison, Rich Hanson, gave an overview of what's happening with the SUAS program, and how that might impact model airplane flying in the USA. This is a *very* important issue, and it's vital that the AMA works in this area, making it our #1 project. We'll have to live with the rules that come from this for many years to come. I recommend that you visit the AMA website at...

www.modelaircraft.org

and read up on what's going on. Also, make sure you read *"MODEL AVIATION"* when it arrives at your door to stay up to date on this issue.

REVERSING SERVOS

I've received a lot of email and phone calls lately on this subject. I wrote a column about it a few years ago, but I guess it's time to cover it again.

Reversing a servo's normal rotation is not as simple as swapping the black and red (positive and negative) wires at the connector. All that will do is release all the locked-in smoke (i.e., it will burn up the servo)! That would be kind of like saying you could switch the positive and negative wires on the battery in your family car, and that would make it go backwards when the car was in drive! It just doesn't work that way!

Reversing servos used to be something that every modeler had to know how to do. Until about 20 years ago, only high-dollar transmitters had servo reversing switches. Remember the old Futaba 6FN series? They were brown, vinyl-clad aluminum case transmitters that were among the most reliable RC systems ever made. Thousands upon thousands were sold, and they were popular at nearly every flying site. They were simple but rugged transmitters. As was common in their day, however, they had no servo reversing capability. Back then, nearly all radio manufacturers included three standard-rotation servos and one reverse-rotation servo with their complete RC systems. The reversed servos usually had a special notation on the label. The idea was that if you needed a reverse-rotation servo, you had one. If you didn't need one, you could usually use it in an application where it was easy to use either type.

Those older servos usually had square output shafts, by the way, which are very different from today's round and splined output shafts. Back then, when you set up your model you had to pre-plan the installation so that you had the pushrods lined up with the correct side of each servo. If a particular installation required an opposite rotation servo, you pulled out your handy-dandy reversed servo and installed it! It was sometimes easy and sometimes not, but transmitters with servo reversing switches changed all that, and the feature became so popular that the capability, via switches or programming, has become pretty much standard equipment on all the top-brand radios today.

How did they produce a reverse-rotation servo? All that's required is to reverse the rotation direction on the motor, *and* reverse the polarity on the feedback potentiometer (aka, pot). It may sound difficult, but it was usually pretty easy, and many modelers were so used to doing it they could probably reverse a servo in their sleep! *(Editor's Note: Yeah, I remember waking up one morning with curiously sore and greasy fingers, and found that I'd reversed <u>all</u> my servos in my sleep... Not! Actually, I started*

out with a Hobby Lobby radio system that used $14.00 five-wire servos that allowed swapping two wires to reverse their rotation.)

The process required removing the bottom case of the servo, and then swapping the wires on the motor poles, and the outside wires on the feedback pot. With the old, square output servos, you also had to re-center the servo pot, as the neutral point would change somewhat when you reversed the servo's rotation.

As servos improved, one of the problems the manufacturers wanted to solve was the internal wiring. Wires inside the servo had a tendency to break over time, causing lots of crashes. Many companies battled this by supporting the wires inside with glue or foam rubber to keep their movement to a minimum. This helped a lot, but it wasn't the ultimate answer.

Now servo manufacturing has progressed to the point that SMT (Surface Mount Technology) components are used. This allows for smaller and more reliable circuit boards, as well as a redesign of the servo's electronics to the point where the servo pot and motor are now soldered directly to the amplifier board without any internal wires at all! This makes servo manufacturing a completely robotic process, which not only reduces their cost but makes a more reliable product.

The downside to this SMT construction is that the consumer can no longer easily reverse such a servo. Doing so now requires the motor to be rotated 180° so the poles of the motor are swapped. Some motors are not symmetrical, however, so that won't work on all servos. Also, we still have to reverse the polarity of the feedback pot, and many of those are not symmetrical either, but are keyed into the servo housing which makes it impossible to rotate. What this all means is that more extensive modifications are now required, like adding wiring to the pot leads so they can be inserted into the proper soldering points. Compared to the cost of a reversed servo, it usually just isn't worth the time and trouble.

We still encounter situations where reversed servos are required, however, so one easy solution is to use an electronic servo reverser, a device that connects between the servo and receiver, looking something like a servo extension lead. There are several on the market, but some are good and some are not. The good ones do *not* have a pot to adjust the servo's center, and are electronically centered using a circuit that will give exact reversing while making sure that the servo has the same amount of throw each way from center. One of the best out there is the FMA Servo Reverser, a very small and lightweight item that sells for $16.95 directly from FMA Direct. *(Editor's Note: One of my favorite tricks is to use a different brand servo. If, for example, you plug a Futaba servo into a JR receiver, it will turn in the opposite direction from the JR servos, and the same goes when plugging a JR servo into a Futaba receiver.)*

Now let's discuss how servos work. The output shaft accepts a wide variety of disks and levers called servo output wheels and arms. The shaft itself is driven by a geared--down motor, and can rotate up to 180° total. Most servos can rotate 90° in less than 1/4 second, with some moving even faster. Torque, a measure of the servo's ability to overcome mechanical resistance (i.e., lift weight, pull springs, push levers, etc.), ranges from less than 10 to more than 300 inch/ounces.

To make the servo move, voltage is applied to the positive and negative wires, and a signal pulse of 1-2 milliseconds (ms) in duration is applied to the third wire and repeated about 50 times a second. The width of the pulse determines the position the servo motor will seek. Since servo travel can vary, there isn't a definite correspondence between a given pulse width and a particular servo output arm angle, but most servos will move to the center of their travel when receiving a 1.5 ms pulse. Servos are closed-loop devices, meaning they are constantly

comparing their command position (proportional to the signal pulse width) to their actual position (proportional to the resistance of the potentiometer called the "feedback pot", which is mechanically linked to the output shaft). If there's more than a small difference between the two, the servo's electronics tries to turn the motor to eliminate the error, which causes the servo output shaft to turn. In addition to moving in response to changing input signals, this active error correction means that servos will resist any mechanical forces that try to move them *away* from their present command position. When the servo is not under power, or not receiving positioning pulses, you can usually turn the output shaft by hand. When the servo is powered and receiving signals, however, then it's difficult to move it.

Trouble spots for servo failures include dead spots in the motor and in the feedback pot. Repairing servos these days consists of little more than replacing broken gears, feedback pots, and/or the servo connector. Other repairs usually aren't cost effective compared to the cost of a new servo, and especially with inexpensive "standard" servos. With their low cost, who's going to spend an hour or more repairing a $10.00 servo?

Many of the high quality digital and coreless motor servos, however, can be revitalized to a like-new condition just by replacing the pot and gear set. This is a major advantage to the high-cost servos, in that they can be repaired for less than one fourth the cost of new ones, to extend their usable life considerably.

Someone is surely wondering by now, that since today's modern transmitters almost always have the servo reversing capability, why would we ever need a reversed servo. Actually, there are a number of examples, but here's just one: many models today use two servos on a single function, like ailerons and split elevators. Others use one servo for rudder, and one for ground steering. When two normal-rotation servos are connected via a Y-harness, both servos will turn the same direction. Even then, some models allow two such servos to work just fine, but this is not always the case, and sometimes nothing will do but a reversed servo.

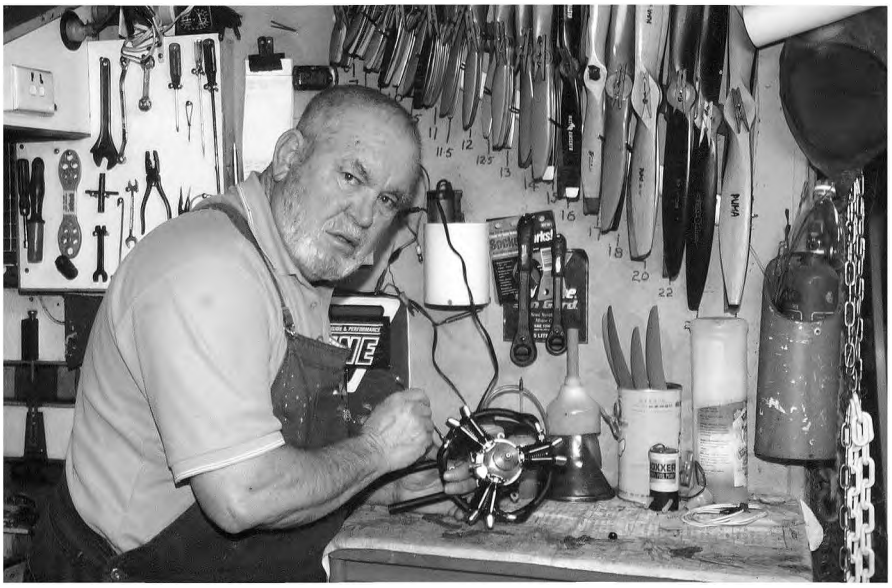
-Tony Stillman
139 Altima Connector, Box 322
Brunswick, GA 31525
tony@radiosouthrc.com

The Oily Hand

by Brian Winch

FOREWORD

Well, it has to be said, "If it ain't broke, why fix it?" That was my first reaction when I received an information release to announce the new .54 and .91 Thunder Tiger 4C engines. These two engines have been providing sterling service for many years, with warranty claims almost non-existent. I see many at the fields, and I hear praise from the modelers who use them. In particular, as this is the engine being tested



ENGINE REVIEW	THUNDER TIGER F-54S
CONFIGURATION	Single cylinder OHV 4C, ringed
DISPLACEMENT	8.86cc (0.540 c.i.)
BORE x STROKE	24 x 19.6mm (0.946 x 0.772")
WEIGHT	419.6 g (14.8 oz.) complete
ADVERTISED POWER	0.8 HP @ 12,000 RPM
RECOMMENDED RPM RANGE	2,200 TO 13,000
RECOMMENDED PROPELLERS	10x9 - 12x4
RECOMMENDED FUEL	20% synth. oil, 10% nitro, 70% methanol
SHAFT THREAD	UNF 1/4x28
SUPPLIED WITH	Muffler, glow plug, tool kit, instructions, and decals

here, the .54 has a great reputation for being very reliable, with good overall performance and quiet operation... a good, no nonsense engine. So why change it? One reasonably simple answer is the modern day outlook on most consumable items: Remain static and you'll drift into history. Perhaps a bit extreme, but take the horse for example. They were once great for riding and pulling wagons. They haven't changed, and you can still ride them and use them for pulling wagons. But where's the automatic transmission, power steering, dual climate controls, and adjustable power seats? The horse is almost history in the workplace today. Consumers want modern automobiles with chrome plating and tinted windows. As I said, perhaps an extreme example, but the fact remains that quite a lot of well founded technology is being pushed into history by the development of new processes, new methods, and new technological advances that were not even contemplated just a few years back. A more realistic example close at hand is the cylinder liner in this new engine. Under the heading of Japanese nanotechnology, the new XC2 cylinder with Extreme Composite Coating is one of the latest advances in producing a wear resistant, low friction surface

The new Thunder Tiger F54S

that's far advanced beyond that which we've been using. It sort of puts a whole new meaning to the old phrases, "heat treated" or "plated" cylinder liner. Add this to the corrosion-resistant coating on the crankshaft, the new, one-piece style muffler, and several other subtle internal changes, and we need a nice new exterior for all these new and improved pieces.

This new design first appeared with their .75, and coupled with the performance of the engine and its small size, it proved to be a winner. The innovations included in the .75 were then redesigned into the next generation .91 and .54, so we now have a very nice trio catering to a broad range of model power requirements.

Thunder Tiger claims these engines to be more powerful, more stable, and more quiet than their predecessors, but are these claims supported by the facts? At this point I can verify only the .54, as this is the first of the redesigned series I've tested. But if the .91 follows suit, I will certainly agree with their claims. Looking back to my test of the previous .54, I recorded very similar RPM figures with most props used, but any variances were on the high side for the new engine. I also noted increases when I tested some quite large propellers to see how far I could go without the engine bogging down. The new engine is certainly stable while running, as the tachometer hardly moved off the peak RPM readings after a full 400 cc of fuel (13.5 oz.) had been burned. At least part of this stability can be attributed to the increased fin area providing better heat transfer, a large factor in the even running of any engine.

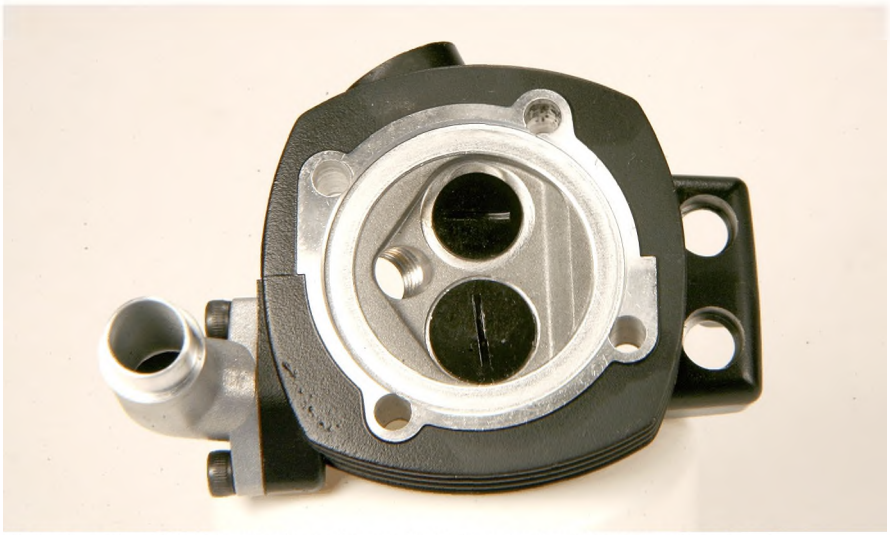
I don't have a reference for the sound level of the previous engine(s). They were pretty quiet, but so is this one.

Another subtle change is the rear main bearing, now rubber sealed and lubricated for life. I favor this design, where it can be used, for two reasons. First, rear bearings are very prone to corrosion in most 4C's when modelers overlook even

The new Thunder Tiger F54S

The crankcase is a fine example of being light without sacrificing strength.

simple after-run care. The same modelers will still see corrosion (if they don't change their wicked ways.), but now it will be confined to the rim faces of the inner and outer races, which is not a problem other than aesthetically displeasing. Secondly, ball bearings occasionally fail, it's just the nature of the beast. Although very rare, that won't matter much to you if it's your engine. When using an open bearing, the usual result of such a failure is pieces of bearing cage and/or bits of broken balls taking a tour through the engine, and like so many tourists, they leave a lot of damage behind. The chances of this happening when a sealed bearing is used are almost reduced to zero. For reasons that will be brought to light further on, the front bearing is shielded, using metal covers on both sides, to reduce the chance of foreign objects (nasty things) entering, but allowing air to pass both ways.



Note the nice thick (and strong) manifold flange for the induction intake.

We have virtually two lower sections in this engine as far as lubrication is concerned. The area most dependent on adequate lubrication is the main sump wherein the crank pin and conrod big end do their job, an area very demanding as far as lubrication is concerned, and an area where failure is common when adequate lubrication is not forthcoming. In this engine, even if it's run lean, there's a reasonable chance that the big end will still be adequately lubricated - at least for a while - due to, shall we say, the first reservoir which is maintained by the high mounted breather nipple. Note thee well, however, that even though there is a reasonable safety envelope in this engine, lean running is certainly not advised, and is a sure-fire way of setting up for a problem sooner than you might expect. The rest of the internal sections are adequately lubricated during the running as evidenced by the presence of oil when I disassembled the engine.

Still, one point disturbs me a little, and I made a note of this in the first .54 review I carried out in March, 1999. When you refer to the instructions, as one should always do, to learn the recommended fuel, the reference is for the use of 30% oil for general running, but at least 20% for break-in. I still don't know what they *really* recommend for general running, but I certainly don't recommend using 30% oil! I'll try again to have *that* information amended.

The short side of the square-length is to maintain a timing reference.

Okay, back to the good stuff. Looking at my notes from the performance tests, I gave the engine a good run-in on the previous day, and the testing was carried out in the afternoon at a temperature of 30˚C (86˚F) and 56% humidity.

My first item of note was the glow plug, their latest in the new Redline series designed specifically for 4C use. I've been testing these plugs for some time in a range of engines, and I can recommend them highly for steady running, faultless idle, and long life. I've seen no sign of deterioration in the test plugs. They are certainly a perfect match for this engine, as my test is to switch off the glow plug power while the engine is idling at normal operating temperature, and note any RPM change. For this test there was none. My next test is to have the engine running at full speed, and then switch the plug power *on*. If this makes the plug too hot, the engine will detonate and drop RPM, which is exactly what happened. This shows that the plug *is* the right heat range for this engine.

Starting was by hand with the throttle at 1/3 open, hot or cold, and usually required only one flick of the prop... two at

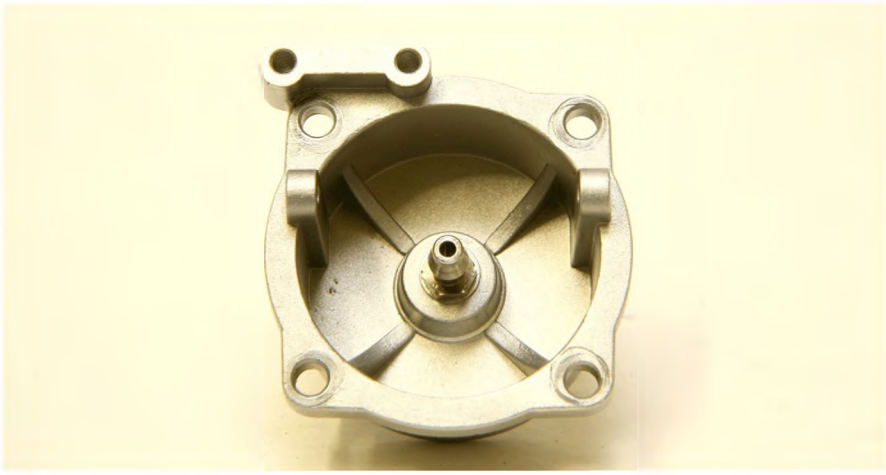
Muffler assembly construction is light weight and effectively quiet.

most. The idle setting was just a smidgen rich right from the box for my fuel, requiring only a minor adjustment, and the main needle tuning is not overly sensitive, which you can check reliably with a good tachometer. The engine cools off rapidly when stopped, vibration was never a concern, and the engine was still quite clean after all the testing. Muffler pressure was not used during testing.

Overall, this was a very happy little engine that was always willing to start easily with no spluttering, coughing, or kick-back, and its good running characteristics were enhanced by its overall nice appearance.

Now let's tear it apart and see what makes it tick

The main crankcase is of the common style incorporating the sump, finned barrel, mounting lugs, front housing, cam case, and cam follower pillar block. The casting is of very high quality using a tough aluminum alloy that machines bright and clean. The mounting pattern is well spaced with 3mm clearance holes on 20mm centers through lugs that are 5mm thick and 29mm long, providing good contact area for the size of the engine. The generously finned cylinder is a radiused-side square shape with the top four fins edge machined to a pleasant shine. These top fins are marginally thicker than the lower fins, presumably to handle the hotter upper section adjacent to the combustion chamber.



With the breather nipple in the center of the rear cover, there's a safety margin area underneath for extra low end lubrication.

The front housing is quite sturdy with three gussets on each side and a thicker one underneath. It appears that there might have been thoughts of placing a breather nipple in this area, as there is an unused pillar cast in with the underside gusset. Rather than fit an unsightly nipple there, a shielded but breathing front bearing is used to provide the necessary engine breather, in my opinion. On top of the front housing section is the cam case and cam follower pillar block. As is commonly used in this arrangement, transverse helical gearing is used to transfer the motion of the crankshaft to the camshaft, whose one piece design includes the cam gear and both cams. The ends of the shaft are housed in bronze bushings, with one fixed in the blind end of the case, and the other in the cam case cover.

The rear cover uses the common four bolt pattern, and incorporates a mounting base for the carburetor, brackets for a choke rod, and a *center* mounted nipple, the height of which ensures that there is always some oil left in the rear case section.

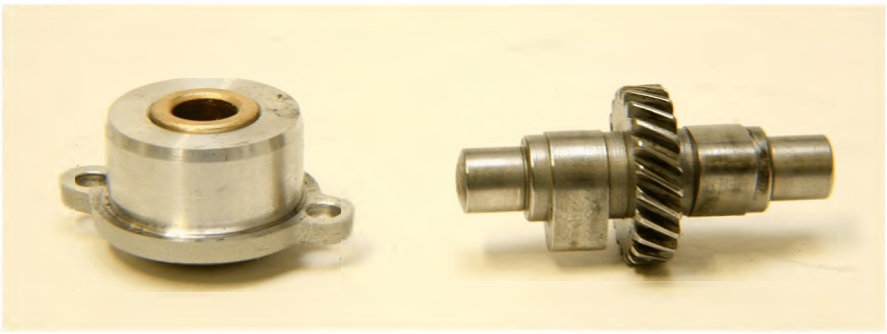
Even though the instructions explain how the choke is to be used... *no choke is supplied with the engine!* In my opinion, this is likely due to the manufacturer's recommendation that all engine starting be done with an electric starter, for which no choke is required. This is likely due to the con-

What color is that? Special treatment for the liner makes it a tough customer.

stant threat of litigation if some careless modeler has a finger or two belted by the prop while attempting to hand start the engine if this was suggested in instructions. Rather than showing a few scars with pride (*"Look at my great collection of engine starting scars. This one here came from..."*), some total wuss would likely go whining to a legal eagle, wanting to sue. Anyway, since there is no choke included, Thunder Tiger might want to delete this reference when they're attending to that "30% oil" reference.

The cylinder head is a nice piece of work in matte black livery, and includes several design features that appeal to me, engineering-wise. The first point is the inlet manifold, an area that can be a problem if not adequate in proportion. The induction tube, from the carb to the head, attaches with two screws securing a sturdy flange to the manifold on the head. If this flange is too thin it will bow when removed, and then you have a sealing problem. Another problem area is the too frequent use of short screws with a small diameter, leading to stripped threads. Well, I'm pleased to report that the flange is a good 3mm thick, and the screws are a solid 7mm long, an excellent combination.

Another area with a high potential for problems is in exhaust manifold. Here too, if the thread depth is on the shallow side, you can expect a stripped thread if you're inclined to remove the header pipe every so often for whatever reasons. The best method of avoiding this problem, of course, is to leave the header pipe alone, but this is not always possible, so the next best method is to choose an engine with adequate thread depth. Once again, this engine scores well, with a 10x0.75mm thread header in a tunnel-like 10mm hole. Only the most determined thread-stripper would damage *that* much thread!

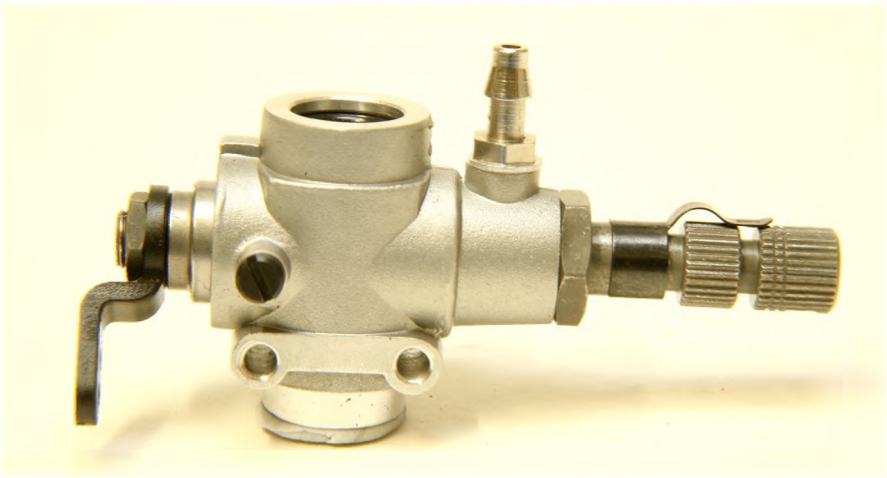


Bronze bushings for the camshaft are quite effective for this size engine.

The combustion chamber is what I call "bath tub and side spa" shape. The two valves are in the bath area, while the glow plug resides in the spa, a little higher than the bottom of the tub which will be appreciated when you run the engine inverted. The neat cast steel rockers come as an assembly that locates on the rocker pillar and is retained by a cap head screw. A gasket seals the chromed rocker cover for a neat finish, and all you need do is install it the correct way (the raised sections go to the front).

The piston is machined from bar stock material, has generous wrist pin support while still having enough space between the support faces to move the conrod side to side, to allow easy removal.

Disassembly is quite easy. One piston ring is used, the wrist pin is retained by a stepped hole on one side, and a wire circlip on the other (but why not a Teflon pad?). The liner is the secret deal, being steel with a surface treatment listed as "XC2". It sounds impressive,



Throttle arms can be a mean arrangement. This one is sturdy and accessible.

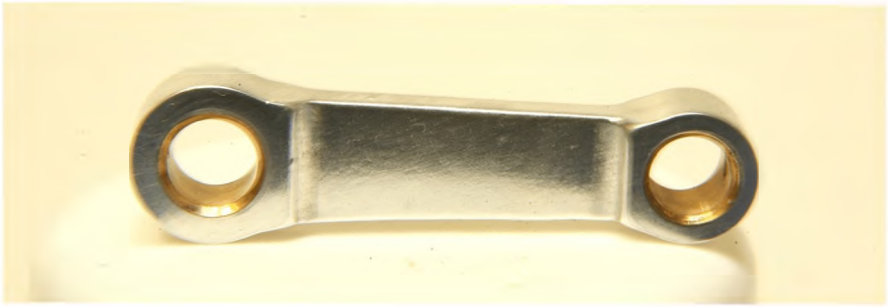
but its real meaning is kept secret by the company. One thing is for sure, though, under observation it's very hard and super slick, even to the point where the piston and ring slide easily and freely through without the benefit of oil (not recommended, of course, but an interesting test nonetheless). My guess is that it will last at least until you get tired of using the engine, or crash it beyond repair. (The latter of which appears to be Gordon's adopted method of avoiding engine rebuilds!)

The connecting rod is a bit of a curiosity, and it would be nothing more than my guess as to how it was made. Maybe it was finely cast, maybe forged, maybe machined from stock, and tumbled. Whatever process was used, it produces a neat unit with a very fine finish, and from my experience in warranty repair for Thunder Tiger here in Oz, it is very tough. I have *never* needed to replace one. Bushed at both ends with bronze, and drilled at both ends for oil, it's a forgotten piece that quietly just does its job nicely.

Looking now at the crankshaft, we see a fine piece of engineering machined from stock chrome molybdenum steel alloy, with a super fine finish on all surfaces, and a surface coating on the exposed sections to deter corrosion. To me, the true mark of quality in any engine is the crankshaft. You could knock out a working crankshaft using mild steel and rough machining that would work, but maybe not for long. But when I see a high quality crankshaft, I can rely on the rest of the engine being commensurate in quality. Here we see a fine example of the art, so to speak.

An interesting feature that first caught my eye on the .75 engine is the propeller drive hub. Being a 4C, it helps to have a timing reference on the shaft or prop drive hub. If it's on the hub then that item needs to be keyed in place by some means to ensure that it always fits back in that same position. Here we have a cast hub with a square hole drive and an appropriate square section on the shaft that, normally, would not provide a reference as it could be fitted in any of four positions. But if they machine one flat shorter than the rest, and one flat longer than the others, then only those two flats will align, producing a timing reference that's marked as a neat slit on the rim of the hub, all very neat. The prop washer is tapered-face steel (the best), and the prop is held firmly in place (always a good idea) with a collet lock nut assembly on the UNF 1/4x28 thread. This is good stuff.

Latest in the range of Redline plugs, this one is for 4C engines.

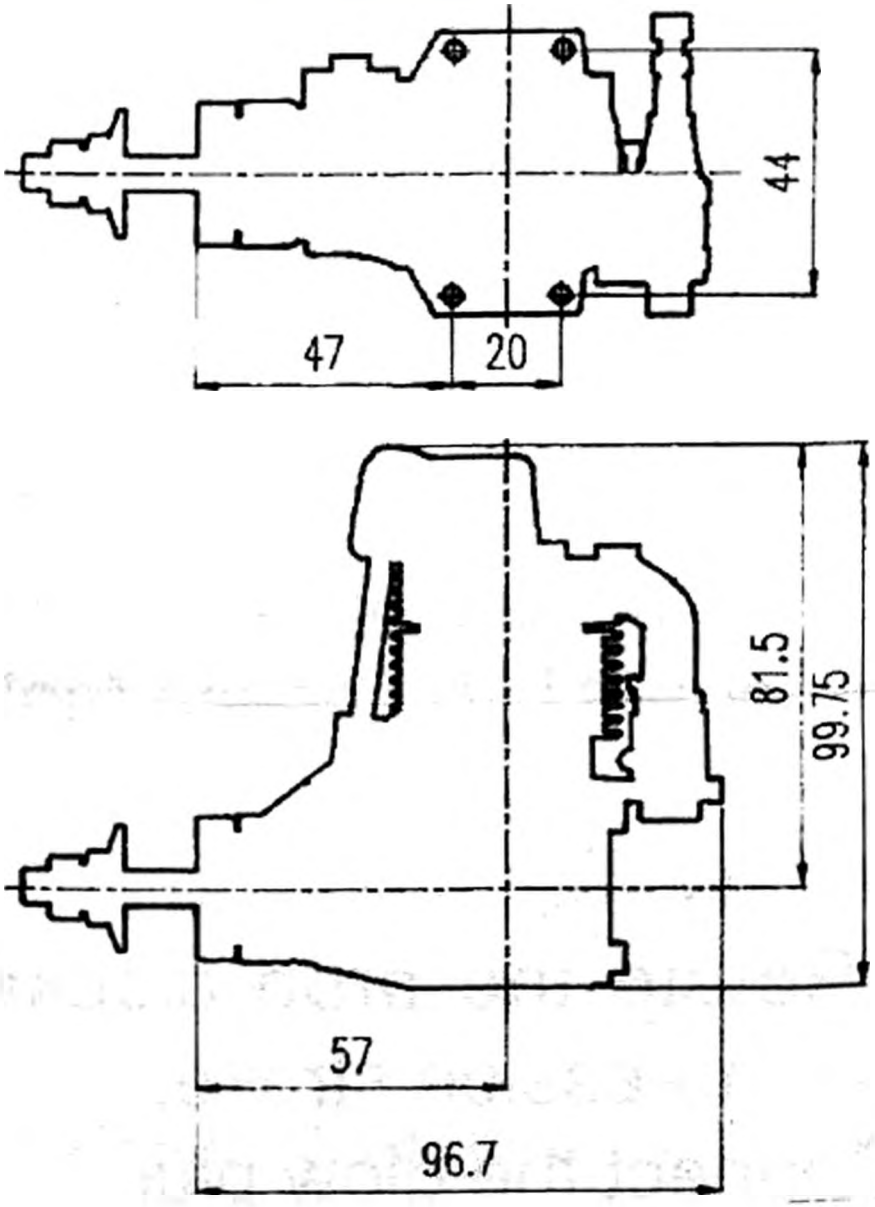


It's a bit of a puzzle as to how this connecting rod is produced, but worry not, for it's well made.

The exhaust system consists of a curved steel header with an approximately 25° bend, two lock nuts, and a one-piece (well, two pieces fused together) aluminum expansion chamber providing considerable muffling that exits a 6mm bore stinger (the outlet) pointing straight to the rear. A fuel tank pressure nipple is fitted, the chamber body is matte black with a cosmetically pleasing machined end section in bright aluminum. All in all, it's a nice unit with good muffling and no leaks.

The new carburetor replaces the original which was an air bleed type. This one offers full fuel metering with two adjustable needles. The throttle rotor movement is smooth, the throttle arm is easily accessible with its connection well out from the carb, and the main needle tuning is quite broad. This too is a neat unit that will give good service if you don't interfere with it too much.

F-54S Outside Dimensions



PROPELLER TESTS

Prop	Peak RPM
APC 10x9	10,989
APC11x5	11,971
APC 11x6	11,538
APC 11x7	11,144
	(2,500 idle)
APC 11x8	10,691
BOLLY 11.5x6	11,441
	(2,200 idle)
APC 12x4	12,135

And with that I leave you for another month while I dig up some new Oz words to confuse the editor (as if he needed any help in that area) and his spell-checker. I *love* my job!

-Brian Winch
33 Hillview Parade
Lurnea, NSW
Australia 2170
oilyhand@bigpond.net.au

(Editor's Note: No wonder they keep you in a "bigpond.net!)

So here I am, sitting at the Tampa International Airport, waiting to board my flight home to North Carolina. I'm staring at the screen on my laptop, trying to figure out how I'm going to describe all I've seen and what I've been doing for the past five days. I've mostly been wandering around in the hot sun, admiring some of the most incredibly beautiful model airplanes in the world, most of which were flown by some of the best pilots our sport has. And just in case you've been hiding under a rock for the past 21 years, I'm referring to the world famous "Top Gun Scale Invitational",

Photo 1: Top Gun Guru, Frank Tiano, who has truly elevated scale aeromodeling in this country to all new heights.

Photo 2: Craftsmanship judge, Rich Uravitch, getting up close and personal

held again this year at Lakeland Linder Airport, just a few miles from Tampa, FL.

Frank Tiano, seen in **Photo 1**, is the founder and annual organizer of this invitation-only scale competition event, where the participants must have demonstrated their ability to build a world-class model, and then fly it in a manner that demonstrates the performance characteristics of the full scale airplane represented.

There were five different classes at Top Gun 2009:

Masters, the premier and most demanding class, is where the model must be built from plans drawn by the builder, using parts and accessories manufactured by the builder.

Photo 3: Flight Judges conferring over a flight score

Documentation requirements include three-view drawings, proof of color and markings accuracy, and photographs of the full scale model.

Expert, where the model can be built from an available kit, scratch-built from available plans, or a combination of both. The documentation requirements are the same as those in the Masters class.

Team, which consists of two people. The builder of the model can use any available kit, commercially available or self-drawn plans. Documentation must be provided as described in the Masters class. The pilot of the model is responsible only for the judged flight performance.

Pro-Am Pro is a class for experienced modelers who regularly compete in other forms of local and/or national level flying competition. It's also for scale modelers whose aircraft have exceeded the "time limit' rule for the number of years a particular model can participate at Top Gun without undergoing a major change. Their models can be scratch-built, built from a kit, or a combination of both. Documentation requirements include only a photograph showing that the full size aircraft modeled actually existed.

Pro-Am Sport is similar to Pro-Am Pro, except for modelers who have never before competed at Top Gun in any other class. The model and documentation requirements are the same as in Pro-Am Pro.

Photo 4: Dropping fuel tanks is but one of the popular mechanical options

Only entrants in the Masters and Expert classes are eligible for the highly coveted "Mr. Top Gun" award.

Static judging for the Masters, Expert, and Team classes take place before any flights are made. The models are closely and critically judged for scale outline, finish, color and markings, overall realism, and craftsmanship. **Photo 2** shows how closely the craftsmanship judge, in this case Rich Uravitch, examines each aircraft. Each model goes in with a perfect 100 points, and then *loses* points for every deviation found by the judges.

Judged flights are flown in front of a panel of judges, as seen in **Photo 3**, who grade the flights based on the maneuvers flown. (The fellow in the middle is Chris Allen, who was invited by Frank Tiano to come

Photo 5: Electric ducted fan F4 Phantom flown by Bob Violett

Photo 6: Typical pilot and caller positions in front of judges

over from the United Kingdom to be a flight judge.) Each pilot can choose from a number of mechanical options depending on the model, such as retractable landing gear, bomb drops, tank drops (as seen in **Photo 4** being performed by Jack Diaz and his F-86F), and others. Mandatory flight maneuvers include Take-off, Slow Speed Fly Past, High Speed Fly Past, Landing, and Flight Realism. Power choices are pretty much unlimited, as evidenced by the beautiful F4 Phantom seen in **Photo 5**, flown by Bob Violett and powered by a pair of high-power *electric* ducted fans!

Photo 7: Stearman biplane and P-51 Mustang can compete side by side

Photo 6 shows a typical flight line arrangement with the pilot standing in front of his or her caller, who reminds the pilot which maneuver to perform next, and also helps keep an eye out for other airplanes in the vicinity

To score well at Top Gun, each maneuver must be completed in a manner that's prototypical to the full scale aircraft. For example, while a P-51 Mustang and a Stearman biplane (see **Photo 7**) can both perform a loop, they should be flown in a manner consistent with each real airplane's performance capabilities.

When all four rounds of judged flights are completed,

Photo 8: New to Top Gun last year, John Boyko won Pro-Am Pro this year

the scores are tabulated and the top five scores receive trophies and sometimes cash prizes. Also the top scores from the Masters and Expert Classes are compared, and the highest scoring modeler there is awarded the very prestigious title of "Mr. Top Gun".

Now that I've bored you with all this background data, let's take a look at some of the planes and pilots that participated this year. I'll show you

Photo 9: Brian O'Meara's P-47 on a low and slow fly-past

Photo 10: Billy Thompson's DVII didn't win its class, but it flew great!

some photos and describe the model, its pilot, and the awards it won at the event. They'll be presented in no particular order, but all the trophy winners will be included, and more.

John Boyko came to Top Gun last year with his Pitts S1-S and won the Pro-Am Sport class. At that awards ceremony, when John received his trophy, someone in the crown called out, *"Now you'll have to compete in the Pro Class next year!"* And so he did, and sure enough, this year he won the Pro-Am class! John's fine Pitts, seen in **Photo 8**, is modeled in 1:2.2 scale with a wing span of 96", and weighs 38 lbs. powered by a DA-150 engine. He uses a Futaba 9Z radio system to guide his Pitts, and I can attest to the fact that he does a

Photo 11: Jason Shulman won 2nd place in Pro-Am Pro with this super-sharp F-4U Corsair.

Photo 12: Here's Jason's F-4U on a landing approach.

fine job in the process. The judges thought so too. Good job, John!

Brian O'Meara, from Denver CO, is a perennial participant at Top Gun, and his 1/5 scale P-47, seen in **Photo 9**, has been seen there a number of times. This year Brian flew his "Jug" to a 5th place finish in Pro-Am Pro. It's powered by a BME 110 engine, and the 92" span model weighs 38 lbs. Brian uses a Futaba 14MZ 2.4 GHz radio.

The beautiful Fokker DVII seen in **Photo 10** was entered and flown by Billy Thompson. It didn't trophy in its class, but it certainly flew great. Billy uses a Husky 81cc engine in the 1/3 scale model built from a Balsa USA kit, and he relies on a Futaba 9C radio system on 2.4 GHz for control.

Jason Shulman decided to try his hand at scale competition this year, and got to fly one of Graeme Mears' models, the Competition ARF F-4U Corsair seen in **Photo 11**. The big Corsair is powered by a Moki 250cc radial engine, which pulls the 50 lb. model just fine. The plane also features hydraulically folding wings just like

Photo 13: Scott Prossen's T-28 cruising past the camera

Photo 14: F-9 Cougar (or is it a Panther) flown by Jorge Escalona

the full scale aircraft. Just after **Photo 12** was taken, Jason folded up the wings to complete his flight, using the Futaba 14MZ 2.4 GHz radio employed for guidance. Jason took 2nd place in Pro-Am Pro.

I met Scott Prossen last year at Monster Planes, another one of Frank Tiano's Florida events. I was very impressed with his T-28 Trojan, as seen in **Photo 13**. Scott told me then that he'd only been building and flying R/C models for three years, which totally amazed me. Scott and his beautiful model took 4th in Pro-Am Sport. The 97" span model was born from a Byron Originals kit, and includes a 3W 106 engine, a Futaba 14MZ 2.4 GHz radio, and Robart retracts.

There were a pair of Grumman F9F models entered this year, and it was very difficult to tell one from the other, even though one was a Cougar and the other a Panther. Jorge' Escalona's swept-wing Cougar is seen in **Photo 14**, and placed 5th in Pro-Am Sport. It's powered by a Jet Cat P160 turbine, and uses a Futaba 14MZ radio system. Jorge's Cougar has a large "D" on the vertical fin that differs from the other, almost identically finished F9.

Photo 15: Homemade pilot figure in a big Stearman

Every model entered in Top Gun must have a visible pilot figure, so some modelers get quite creative in this matter. **Photo 15** shows a hand-made pilot figure that looks just like its owner and pilot, Mitch Epstein, seen in **Photo 16**. I think the miniature version is a bit better looking, don't you?

Turbine-powered models emit a lot of heat from their tail pipe, so the field crew at Top Gun insists that they be started over a concrete surface. There's also a blast shield behind the model, this one belonging to Dustin Buescher (see **Photo 17**), to direct that

Photo 16: Full scale Stearman pilot used to make that figure

heat upwards, away from the grass. Dustin's F-4 Phantom also performed well enough to win 3rd Place in Pro-Am Pro. His BVM Phantom is powered by a Jet Cat P-120 turbine, and features BVM retracts and a JR 12X radio. **Photo 18** shows the excellent F4 model in flight.

Last year there were a number of BAE Hawk models, and this year there were four. That seen in **Photo 19** was flown by Axel Hache, who performed well enough to earn 2nd place in Pro-Am Sport. Axel's Hawk is powered by a Jet Cat Titan turbine, and uses a JR 12X radio. Axel won another award this year, the hard-earned (or should that be "firmly earned"?) "Best Buns" trophy. Awarded by the Top Gun Hussies, this award has absolutely nothing to do with flying, but it is just as prestigious as any other trophy given at Top Gun, not to mention being a lot of fun.

For the past three years, the team of Ray Johns (pilot, and an active-duty two-star general in the USAF!) and Mike Selby (an extraordinary model builder) brought a model all the way from *Thailand* to compete! Last year, their unbelievably exquisite A-10 Wart Hog won several trophies, and this year they brought a smaller but equally impressive F-111 Aardvark, complete with swinging wings! Seen in **Photo 20**, the model is being prepared for its first competition flight by the team of assistants who accompanied it from Thailand. This gorgeous model is powered by a pair of PST 1300R turbines, and uses

Photo 17: Starting a turbine on dry grass can cause problems

Photo 18: Dustin Buescher's F4 Phantom gliding past in a low speed run

a JR 12X control system. Although the plane did not complete the four required flying rounds, it was extremely impressive, winning Runner-Up awards in both "Critics Choice" and "Best Military Aircraft", Ray and Mike told me that the F-111 is one year into a two year development program, so I hope that means we'll be seeing it again next year.

The beautiful F-16 Fighting Falcon seen in a high speed flyby in **Photo 21** first appeared at Top Gun last year after winning "Best of Show" at the 2008 Toledo Expo.. Built by Graeme Meares and piloted by David Shulman, this already famous model is powered by an AMT Olympus turbine, and uses a Futaba 14MZ 2.4 GHz radio system. One of the details added this year is the simulated afterburner effect using very

Photo 19: BAE Hawk (one of 4 in attendance) by Axel Hache, "Mr. Best Buns"

Photo 20: F-111 Aardvark, entered by Ray Johns and Mike Selby in Team Scale

bright Light Emitting Diodes (LED's) as seen in **Photo 22**. David and Graeme took first place in Team scale, in no small part because of their incredible perfect 100 point score in static judging! They also won awards for "Team High Static" (obviously!), and "Best Jet".

I like biplanes. Anything with two wings is my kind of airplane. And when you add a third wing, it gets even better! The beautiful Sopwith Triplane

Photo 21: Graeme Mears' F-16 Fighting Falcon entered in Team Scale got a perfect 100 score in static judging, the first "100" in Top Gun history!

Photo 22: Here's the Falcon's LED simulated afterburner.

seen in **Photo 24** was designed and built by a long-time Top Gun competitor, Bud Roane. Bud's 1/4 scale, 80" span Triplane uses a Saito 1.80 engine, and weighs 16 lbs. using JR radio gear. I was very happy to see this model do well enough to earn 4th place in the tough, Masters class.

Another Top Gun perennial is the team of builder Octavio DePaula and pilot Eduardo Esteves, who entered the beautiful 1/4 scale Fairchild PT-19 seen in **Photo 25**. This 117" span model uses a ZDZ 60 gas engine and JR radio equipment. But wait! Who's that pilot *in* the PT-19? It sure looks a lot like someone we've seen before. Take a close look at **Photo 26** and see if you can identify him. Whoever it is, together they took 5th place in Team Scale.

One observation I made this year was the number of pilots using 2.4 GHz radio systems. Sure, some folks still relied on their proven 72 MHz radios, and some used six-meter radios. But of the 104 entries listed on the program, over 75% were using the new 2.4 GHz systems.

During the pilots briefing, Frank Tiano told the participants that next year he would allow *only* 2.4 GHz radios at Top Gun. He even promised that if any Top Gun participant felt they couldn't afford a new radio, he'd buy one for them! Personally, if I were flying a Top Gun quality airplane in a contest as big and important as this one, I'd sure want a radio that's proven to be as reliable and interference-free as the 2.4 GHz systems.

Now back to the contest.

Photo 24: No, it's not a flying venetian blind. It's Bud Roane's Sopwith Triplane

Photo 25: Beautiful PT-19 in Team scale, Esteves and DePaula

Photo 26: Who's the handsome devil flying the PT-19?

Photo 27: Mike Barbee's beautiful Waco YMF-5 in Expert.

Mike Barbee brought the beautiful Waco YMF-5 seen in **Photo 27**, which was built from a Genesis kit. Mike uses a Moki 215cc radial engine to power the 120" span 1/3 scale model, using the popular Futaba 14MZ 2.4 GHz radio for guidance. Mike and his Waco took 5th place in Expert class.

One of my long time friends, Rich Feroldi, always seems to bring something new and different to fly at Top Gun. He really went the extra mile this year, with the 1/3 scale Ansaldo SVA-5 seen in **Photo 28**. This 121" span model weighs 50 lbs. powered by a Quadra 100 gas engine. The fuselage is constructed from formed 1/64" plywood sheets stained and finished to look like fine dining room furniture! That look must have impressed the judges too, because Rich took home 3rd place in the Masters class, and earned a

Photo 28: Rich Feroldi's Ansaldo SVA-5

beautiful trophy for "Best Pre-WWII Aircraft".

Another good friend, Jack Buckley, flew the de Havilland DH-82 Tiger Moth seen in **Photo 29**, perhaps for the last time at Top Gun. Jack has flown this model for the past few years, and it "timed out" this year. To prevent even a truly extraordinary model from winning more than three years in a row, there's a Top Gun rule that limits the number of years a model can be flown in the Masters, Expert, or Team classes, without a significant change to its finishing scheme. Jack's beautiful 1:4.5 scale 21 lb. Moth is powered by a Laser 150 4C engine, and uses Futaba radio gear for guidance. He did well enough this year to take home 2nd place in the Ex-

Photo 29: de Havilland Tiger Moth flown by Jack Buckley

Photo 30: David Ribbe flies his MIG-15 past the crowd in Expert class.

pert class. Now I wonder what he'll bring next year? It's going to be interesting to find out!

A former Top Gun winner, Dave Ribbe, flew the 1/6 scale MIG 15 jet seen in **Photo 30** in Expert class. This 22 lb. model is powered by a JetCal P70 turbine, and uses a JR 12X radio system on 2.4 GHz for control. This year Dave won 3rd place in his class, and earned the "High Static Expert" as well. Great model!

One of the more unique models at Top Gun this year was the 1/5 scale Westland Wyvern seen taxiing into position in **Photo 31**. The full scale Wyvern uses a turboshaft engine turning a set of counter-rotating propellers, but David's Wigley's model uses a BME 100 gas engine turning the inner prop only. The outer prop is allowed to free-wheel, so it spins up from the air being pulled by the driven prop, giving a great visual effect. The Wyvern, with its interest-

Photo 31: Twin props and turbo powered Westland Wyvern by David Wigley

Photo 32: David Johnson's Albatross D5a heading out on another mission

ing sounds as it flies by, won Dave 5th place in the highly competitive Masters class.

One of the more interesting modelers I know is Dave Johnson, who has entered the Albatros D5A seen in **Photo 32** for several years now. Dave's 118" span 33 lb. model is powered by a Fuji 64cc engine, and uses a Futaba 14MZ radio on 2.4 GHz. Dave somehow finds a way to *just barely* miss the top spot in Masters class, and only by a fraction of a point. This year Dave and his model performed flew well enough to take 2nd place in Masters. We'll keep an eye on Dave to see if he continues to move up in the final rankings.

The team of builder and designer George Maiorana, and pilot David Pinegar, have been bringing some of the most technically challenging models seen at Top Gun for the past few years, and this time was no different. Their fantastic Tupolev TU-95 Bear, as seen in **Photo 33**, features counter-rotating propellers, just like those found on the full scale Bear. But instead of being driven by turbo-shaft engines, their model is totally electric, using gear drives to spin the dual props. The 1/18 scale model has a 108" wing span, and weighs 32 lbs.. The motors are Maxx-Cim 13V units spinning custom 12x10 props.

As you can se in **Photo 34**, the Bear looks very intimidating as it flies over the field, and

Photo 33: Impressive TU-95 Bear by George Maiorana and Dave Pinegar

Photo 34: Underside of the electric powered Bear with counter rotating props

it was impressive enough to win 2nd place in Team Scale, as well as earning the trophy for "Best Military Aircraft", *and* the highly prestigious "Charlie Chambers Craftsmanship Award". His is truly one of those models you simply have to see in person to fully appreciate.

I first met Tom Smith at the Monster Planes event last year, where he brought the beautiful A1-H Skyraider seen in . He flew it well then, and again at Top Gun, where he entered it in the Expert class. The 1/6 scale, 100" span model is powered by a DA-85 engine, and uses a Futaba 9C radio system for control. As an interesting

Photo 35: A1-D Skyraider by Tom Smith back at the field after a flight.

Photo 36: F-86 Sabre entered by Ian Richardson and Steven Elias in Team

side note, the full scale Skyraider modeled by Tom was flown in Viet Nam, and its pilot visited Tom after the model was completed! One comment the pilot made was, *"The model looks too clean."* Well, clean or not, it was good enough to take 4th Place in Expert.

One of the six turbine powered trophy winners at Top Gun this year was a beautiful F-86 entered in Team by builder Ian Richardson and pilot Steven Elias. Seen in **Photo 36** as it cruises by the camera, it flies straight as an arrow. This was a last-minute replacement for the team's original entry (an F-100 Super Sabre), so I have no other information about it. But it flew well enough to earn the team 4th place in their class. Some last-minute replacement, huh?

Photo 37: F-4U from Marco Benincasa, 4th place Pro-Am Pro

Photo 38: Laser 200 from Danny Corozza, placed 4th in Pro-Am-Sport

Marco Benincasa entered Pro-Am Pro with the beautiful F4G Corsair seen in **Photo 37**, and it performed beautifully! The 1:4.5 scale model is powered by a Moki 250cc radial engine, and uses a Futaba 14MZ radio system. You may be able to see some minor damage in this photo, where the cowl slipped forward and got chewed up by the propeller. In any event, Marco and his Corsair won a well deserved 4th place in Pro-Am Pro.

You don't see many scale models of aerobatic aircraft at Top Gun, but here's a fine one. The Laser 200 built by Danny Corozza is seen in **Photo 38** approaching "the box" just before the first maneuver was flown. The model 200 uses a 3W 140 engine and Futaba 9Z radio. Danny did a great job with this entry, earning 4th place in Pro-Am Sport.

Photo 39: Greg Hahn's B-25 Mitchell on one of his flights

Photo 40: Grumman F9F Panther by Ryan Haldenwanger in Pro-Am Sport

Another good friend, and a truly gifted pilot, Greg Hahn brought his 1:6.5 scale B-25 again this year. Entered in the Expert class, Greg's model, seen in **Photo 39**, is powered by a pair of Fuji 43 gas engines. The 120" span, 50 lb. plane features Robart landing gear and a Futaba 14MZ radio. I guess you could say it performed well, since he took first place in Expert, while also makes his eligible for the coveted title of "Mr. Top Gun".

Remember my earlier comment about there being two Grumman F9 models this year?

Photo 41: AC-47 Spooky gun ship in Team scale, Dino DeGeorgio and Bill Fuori

Photo 42: Mister Top Gun (again!) David Hayes and his Rockwell Thrush

Well, here's the second one, this one a Panther version with straight wings and fixed wing-tip fuel tanks, as seen in **Photo 40**. Built from an AirWorld kit, and flown by Ryan Haldenwanger, it's powered by a Jet Central Rhino turbine, and uses a Futaba 12Z radio. Ryan and his Panther performed beautifully, and well enough to eaqrnt he #1 spot in Pro-Am Sport.

I once saw a real AC-47 "Spooky" gun ship, much like the model entered this year by builder Bill Fuori, and pilot Dino De Georgio in Team scale, as seen in **Photo 41**. During my first week in Viet Nam, I had to go out on a night mission to see for myself how the war was being fought. A Spooky gun ship was circling over a nearby hill, emitting a solid stream of fire from its side-mounted mini-guns. It was all very impressive, to say the least, but my *greatest* impression was that I was very, vert glad that it was on our side! Dino's AC-47 looked so much like the one I'd seen, it really brought back some memories.

Dino's immaculate 1/8 scale model is powered by a pair of Zenoah G-38 engines, which propel the model very well. There were even little lamps in the mini-gun barrels, simulating the firing flashes. Were the judges threatened by the Spooky's awesome capability to destroy gound targets? Maybe so, but it wouldn't have been necessary to award this outstanding model a well deserved 3rd place in Team Scale.

Now we come to what many people consider the greatest moment Top Gun, the grand finale'. As you may recall, I earlier mentioned that the top and utmost honor at this event is always the awarding of the highly coveted "Mr. Top Gun" title. This title and award honors the single pilot who earns the highest overall point tally from the combined flight scores and static judging score, from either the Masters or Ex-

Photo 43: David's Thrush on a spray run but those love-bugs were still alive

pert classes. This year, as is often the case among such great models and talented pilots, the top scores were extremely close. There must be just one winner, however, and this year was a repeat from Top Gun 2008. Earning multiple awards for first place in the Masters class and "High Static Score" in class, the title of "Mr., Top Gun 2009" again

Photo 44: Sonex Waiex all metal model by Carlos Rangel, Pro-Am Sport

Photo 45: Republic F-84 Thunder Streak, Barry Rayborn, Pro-Am Sport

went to David Hayes and his truly remarkable Rockwell Thrush, as seen with David in **Photo 42**. David's Thrush is powered by a Saito 180. One of his mechanical options is the crop dusting feature, using baby powder expelled under pressure to give the spectators (and judges) the very realistic impression that the Thrush is actually spraying a field. In **Photo 43** the Thrush is beginning a spray run, after which David pulls up into a wing-over, and then heads back down the field in the opposite direction, exactly as a full scale Thrush would do while dusting someone's crop. Well, maybe not with baby powder, but you know what I mean. Besides, the baby powder sure does smell better!

So, our congratulations to David Hayes, from Roanoke Rapids, NC, a neighbor and friend of another multiple "Mr. Top Gun" title winner, and former scale columnist for

Photo 46: Lavochkin LA-7, Greg Foushi, Pro-Am Sport

Photo 47: Feisler Storch, Eddie Newman and Nick Ziroli, Team Scale

"R/C REPORT", Jeff Foley. David and his Thrush are on a wining streak now, but I believe his model has "timed out" now, so we've anxiously waiting to see what he'll bring to defend his "Mr. Top Gun" title next year. It's going to be interesting!

There were more than 100 aircraft entered this year, so not all won awards. Top Gun traditionally brings out the very best models, built and flown by the very best modelers, however, so there were many outstanding entries, that for one reason or another, didn't make it into that elusive group of award winners. Here are just a few that caught my attention.

Photo 48: AVRO B-2 Vulcan, Sam Snyder and Steven Ellzey, Team Scale

TOP GUN 2009 STATIC & FLIGHT AWARDS

SPECIAL AWARD	AWARD SPONSOR	WINNER
Masters High Static Score	Fly RC Magazine	David Hayes, Thrush (97.75)
Expert High Static Score	Sport Flyer Magazine	David Ribbe, Mig-15 (96.75)
Team High Static Score	Model Airplane News	Graeme Mears, F-16C (100)
Best Pro-Am Entry	JR Radios	Greg Tracey, Hurricane
Best Civilian Aircraft	Red Bull	Bob Patton, Scottish Bulldog
Best Civilian Runner-up	PST Engines	Peter Conquergood, Super Cub
Best Military Aircraft	Ziroli Plans	George Maiorana, TU-95 Bear
Best Military Runner-up	SOS International	Mike Selby, F-111 Aardvark
Best Biplane	Kempinski Hotels	Gerardo Galvez, PT-17
Best Pre WW2 Aircraft	ZAP Glue	Rich Feroldi, Ansaldo SVA-5
Best Jet Aircraft	RC Jets Int. Magazine	Graeme Mears, F-16C
Engineering Excellence	Sierra Giant Scale	Carlos Rangel, Somex
Charlie Chambers Craftsmanship Award	Bob Violett Models	George Maiorana, TU-95 Bear
Grey Eagle Award	FTE Inc.	Herschel Worthy
Grey Eagle Award II	Futaba Radios	Sam Wright
Top Buns Award	Top Gun Hussies	Axel Hache
Best 4C Performance	Saito Engines	Kevin Knebel, PT-17
Best Gas Performance	Fuji Engines	Mike Barbee, Waco
Best Multi Performance	JR Radios	Chip Greene, Tiger Cat
Best Jet Performance	Futaba Radios	Thomas Singer, Mig-29
Critics Choice Runner-up	Fly RC Magazine	Mike Selby, F-111
Critics Choice Award	ZAP Glue	Sam Snyder, Avro Vulcan

Photo 49: 14 year old Ricardo Mirandez and caller/father Frankie, entered in Pro-Am Sport.

Photo 44 shows an all-metal model of a popular home-built aircraft, as entered in Pro-Am Sport by Carlos Rangel. The Sonex Waiex (pronounced "Y-X") model was built in 1/3 scale with a 92" wing span. Carlos uses a ZDZ 50 engine and a JR 9303 radio system. Actually this model *did* win an award, that for Engineering Excellence, and it was certainly well deserved.

MASTERS TOP TEN

Modeler	Model	Final Score
1. HAYES, DAVID	ROCKWELL THRUSH	194.710
2. JOHNSON, DAVID	ALBATROS D5A	193.337
3. FEROLDI, RICH	ANSALDO SVA-5	187.295
4. ROANE, BUD	SOPWITH TRIPLANE	185.331
5. WIGLEY, DAVE	WYVERN	185.205
6. PATTON, BOB	SCOTTISH AV.BULLDOG	182.292
7. GALVEZ, GERARDO	STEARMAN PT-17	175.947
9. GROSS, KARL	STEARMAN PT-17	150.787
10. PLATT, DAVID	SCOTTISH AV.BULLDOG	150.292

EXPERT TOP TEN

Modeler	Model	Final Score
1. HAHN, GREG	B-25D MITCHELL	192.667
2. BUCKLEY, JACK	TIGERMOTH DH-82	189.553
3. RIBBE, DAVID	MIG-15BIS	189.356
4. SMITH, TOM	SKYRAIDER AI-H	189.010
5. BARBEE, MIKE	WACO YMF-5	187.352
6. FOLK, LARRY	SUPER CUB PA-18	187.258
7. CONQUERGOOD, PETER	SUPER CUB PA-18	185.806
8. SNYDER, ROD	L-39 ALBATROSS	185.776
9. SINGER, THOMAS	MIG 29	185.735
10. CAMPANA, GUSTAVO	MIRAGE 2000	185.203

TEAM TOP TEN

Builder/Pilot	Model	Final Score
1. MEARS, GRAEME SHULMAN, DAVID	F-16C	196.690
2. MAJORANA, GEORGE VINEGAR, DAVID	TU-95 BEAR	191.875
3. FUORI, BILL GIORGIO, DINO	AC-47 SPOOKY GUN SHIP	190.773
4. RICHARDSON, IAN ELIAS, STEVEN	F-86	188.223
5. DEPAULA, OCTAVIO ESTEVES, EDUARDO	PT-19	187.721
6. RUTHERFORD, OLEN DAVIDSON, HOWARD	BEECH D-18S	187.383
7. ERBESFELD, MARVIN FAIRCHILD, RANSOMS	SOPWITH CAMEL	185.995
8. NEWMAN, EDDIE ZIROLI, NICK	FEISLER STORCH	185.567
9. SPOOR, ROGER PECKHAM, STEVEN	FW-190A8	185.172
10. VALDEZ, DAVE MIRANDES, FRANKIE	LOCKHEED TV-1	181.327

Photo 45 shows one of my favorites, the Republic F-85 Thunder Streak. This 1/5 scale model was entered in Pro-Am Sport by Barry Rayburn, and uses a Jet Cat Titan Turbine and a JR

One of the larger planes in attendance was the 1/3 scale Lavochkin LS-7 seen in , and flown by Greg Foushi. The model has a 100" span and weighs 50 lbs. powered by a DA-150 twin engine.

Photo 47 shows the Feisler Storch entered in Team Scale by builder Eddie Newman and pilot Nick Ziroli. This 1.4 scale model was built from Eddie's own plans, and uses a DA-85 engine and a Futaba 12Z radio.

PRO-AM PRO TOP TEN

Modeler	Model	Final Score
1. BOYKO, JOHN	PITTS SPECIAL S1-S	121.539
2. SHULMAN, JASON	CORSAIR	121.019
3. BUESCHER, DUSTIN	F-4	120.700
4. BENINCASA, MARCO	CORSAIR F-1G	120.601
5. O'MEARA, BRIAN	P-47	120.056
6. DIAZ, JACK	F-86F	119.793
7. PAYNE, DAVID	ME-109 G6	119.721
8. GOLDSMITH, PETER	MB-339	119.545
9. MCQUEENEY, DAVE	BEARCAT F8F-2	119.302
10. HESS, JIM	EXTRA 260	119.183

PRO-AM SPORT TOP TEN

Modeler	Model	Final Score
1. HALDENWANGER, RYAN	F9F PANTHER	120.164
2. HACHE, AXEL	BAE HAWK	118.349
3. CAROZZA, DANNY	LASER 200	118.173
4. PROSSEN, SCOTT	T-28	118.083
5. ESCALONA, JORGE'	COUGAR F9F	117.689
6. MIRANDES, RICARDO	T-34B MENTOR	117.292
7. PIERCE, DOUG	SOPWITH PUP	117.205
8. BACON, MICHAEL	PIPER L-21A CUB	116.447
9. THOMPSON, BILLY	FOKKER Dr-VII	116.363
10. FOUSHI, GREG	LA-7	115.952

An impressive model long on detail was the huge Avro Vulcan B-2, entered in Team scale by builder Sam Snyder and pilot Steven Ellzey. Seen in **Photo 48**, the 1/12 scale model has a 109" span, using a pair of Jet Cat 120 turbines for power, and a Futaba 9C radio.

Photo 49 should provide an insight to the future of scale model competition. On the right, the pilot is 14 year old Ricardo Mirandez, with his father Frankie serving as caller. Although Ricardo and his T-34B Mentor didn't win an award this year, I'm confident that he'll be back next year, and who knows how much he'll learn and improve by then. We'll be looking for you, my young friend.

Me, I'm still at the Tampa airport about to board my flight home. I still don't know why we get "on" an airplane, but "in" a car, but in the last five days I've seen more than 100 incredibly beautiful models, most of which are likewise headed for home with their owners. There were over 400 competition flights during the event, and many more for practice and demonstration purposes. It was hot this year, hot and dry, yet it was one of the best and most enjoyable Top Gun events ever. The level of competition seems to continue growing year after year, both in flying skills and the quality of craftsmanship in the models. Through personal experience if nothing else, I'm confident that this trend will continue, even though I can't understand how it's even possible. I recall the feeling I had several years ago, that the models and pilots have surely peaked. I mean, they were so close to perfection even then, how could they get any better? Yet they do get better, year after year. I don't understand it, but I sure do enjoy it! And perhaps best of all, it makes me want to improve as well. Seeing our sport's finest examples of scale modeling and realistic piloting skills, tend to make any modeler want to improve. And if *these* guys can find ways to improve, so can we all. If I had to describe the Top Gun Scale Invitational in just one word, it would have to be "inspiring".

I hope to see many of you at Top Gun 2010. *-Dick Pettit*

pettit@ti.com

The Webb Scale

by Gary Webb

Well, Mother Nature has done it to us again here in Ohio. We had a few days of warm, sunny weather, but then we were plunged back into cold and gloomy weather for a while. I was able to get out and fly once, but it's been raining and blowing ever since. It's only two weeks until Top Gun as I write this in mid-April, so I thought I'd play "Myth Busters" with you regarding scale contests.

I've heard some of the naysayers' comments to new modelers wanting to get into scale competition. "Why even try? The big names with the 'halo effect' always win. You'll have to pay 'your dues' for years before the judges will take you seriously." We hear this being said about all types of competition. Where oh where do these myths get started? I've even heard it said that the judges are intimidated by the stars in the sport, and are afraid to give them bad scores. As a newbie, I'd sure find these comments discouraging. Who wouldn't?

Well, as the TV show would say, that's "Busted" on all accounts! For example, I'm sure the name Mark Lanterman rings a bell with many long-time modelers. He provides a lot of photos for "Model Aviation", the AMA magazine, other magazines as well, and he owns his own business called Airborne Media. He creates all kinds of multimedia illustrations, and he's a great guy to sit and talk with... very friendly.

Well, a few years ago Mark competed for the first time at the AMA NATS instead of just photographing it. He flew in Fun Scale with a small, .40 size ARF "Shoestring" racing plane. Now, most people would say that a small racing plane would be a difficult model to use in scale competition. Mark, however, much to the amazement of all, flew the plane like it was on rails, and won his class on his very first try! But wait, I'm not done. One of the most coveted scale awards at the NATS is the NASA (National Association of Scale aeromodeling) flight award which is given to the pilot who, throughout the course of the event, flies his or her aircraft in the most prototypical scale manner consistent with the full scale aircraft's capabilities. The winner of this award is determined by the judges in a blind vote. Trust me here, some of the sport's biggest names have tried for years to win this award, yet Mark won it on his first scale contest outing. Not just in Fun Scale, mind you, but for the entire contest which included all contestants. After the contest, Mark told me he had practiced his routine many times per week, every week for two months prior to the contest. He was prepared, and he knew his aircraft.

Another good example is Bob Bush, an old friend of mine, who's been building and flying scale models for years, just for the fun of it. But he finally decided to enter a Corsair at the NATS, after a little prodding from me and some of the local gang with whom he flies. Bob didn't score well in static judging because his doc-

umentation wasn't up to snuff, but he went ahead and flew the judged flight rounds anyway. Well, he too won the NASA flight award on his first try, and only a few of the judges that day even knew him.

Guys, if your model is well documented, and you've practiced well enough, you too can do well on your first outing.

As far as the infamous "halo effect" goes, keep in mind that every one of those "big names" started out as a "no name', just like everyone else. They didn't get into scale competition with their names already on the trophies. In fact, the very reason why the big names do so well and place high so consistently, is because they've learned what's needed, they worked hard at documenting their models and building them accurately, and then they practiced flying them until they were better than anyone else that day. Period. Actually, a lot of the better scale pilots flew in pattern completion for some years before they became involved in scale. They got used to flying specific maneuvers in front of judges, they learned the importance of "placement" (a big part of getting a good score), and they learned how and when to use their rudder.

It's been said that turbine pilots get better scores. One possible reason for that is that so many turbine pilots have competed in pattern, they are generally excellent pilots. It's not easy getting a turbine waiver (a special license for turbine pilots), so their group tends to have very good pilots. But this in no way says you can't be competitive with a prop-driven aircraft. Just like a turbine powered model, you have to fly it in a prototypical manner, and hit your marks consistently. Frank Tiano has always strived to create a level playing field with the rules at Top Gun. This allows all types of aircraft to compete with one another, and does not allow one type of aircraft to have an unfair advantage over another. He wants everyone with the talent and dedication to build and fly at this level, to be able to choose any aircraft they want, and compete on a fair and level playing field. I personally think Frank has done just that, and much the same thing applies to the Scale NATS and Scale Masters as well.

I am personally offended by the claims that judges are intimidated by the big names, and that judges won't give certain people poor scores even if their model has obvious flaws or their flight performance is poor. Like all the judges with whom I've worked, I don't even consider who the builder or pilot is. We care only about how well the plane compares to the documentation given for static judging, and how well the flight maneuvers are performed. When sitting in that judge's seat, we have no friends or enemies. Believe me, I know what it costs in time and money to build and prepare a model for a contest, not to mention the travel, lodging, and food expenses involved in each and every contest. But every contestant, big name or newcomer, has to face the same thing, so the people behind the models make no difference to us.

The most difficult part of being a judge is being consistent from the first flight to the last flight each day. Each judge knows this, so we work hard to ensure that each contestant gets an equal shot at winning, based solely on their building and flying abilities. Each contestant flies in front of all the judges, to help ensure a balanced score at the end. In most cases you can throw out your worst flight score, so one bad flight won't totally eliminate you from competition.

The reason I'm covering theses long-standing myths about competition is to encourage scale newcomers to compete, and to let them know they're welcome. When equally prepared, newcomers have just as much chance of winning as guys who have been competing for years. You'll be welcomed into the fold with open arms, and there will be plenty of help and advice if you ask for it.

Want another example of new talent taking home the gold? My good friend, Jim Martin, has been giving advice to a new scale modeler who already likes to design and

Charles Brooks with his L-4 at the Toledo Show

Front view showing details of landing gear, engine, and prop

build his own models. Charles Brooks, an avid J-3 Cub fan, entered his brand new L-4A Grasshopper in designer scale at the 2009 Toledo Show. This was his first time to enter this highly competitive static contest, which really brings out the best of the best. Well, he won first prize, out-scoring even the likes of Dave Platt, no less! Every model in this class are winners, of course, and Dave Platt always brings a fabulous model. So as you can see, there are no halo effects there. Myth busted!

I asked Jim Martin to contact Charles to get some photos and details on the award winning L-4. Charles has been building and flying R/C models for about 15 years now, and like a lot of us scale guys, he loves to hang out at full scale air shows. It turns out that he'd come across a video from a full scale Cub fly in, which included a restored L-4 that looked like it had just rolled off the assembly line. Charles was so impressed and taken with the airplane, he tracked down its

Left to right: Dan Hall and girlfriend Janet Brooks, Charles's mother, and Dutch and Dick Hall, owners of the full scale L-4.

owner and asked if he could model it. It turned out that the full scale L-4 plane was hangared only six hours from where Charles lived, so he made arrangements to meet the owner and thoroughly photograph the aircraft. Charles says it was the great detailing effort that the owner had put into restoring the plane that made him want to reproduce it in miniature.

Charles had also read some articles in *"R/C REPORT"* on scale contests (See, someone *is* reading this stuff!), so he knew to get his documentation in order well before building the model. He acquired full scale drawings of the aircraft, and already being familiar with AutoCad, he was able to draw his own plans for the model by scaling them down to the size he wanted. Charles said he put a lot of time into the plans, to make them as true to scale as he could, and his work shows that his efforts were rewarded. Charles said he enjoyed the three years it took to complete the project, and he also made some new life-long friends, the owner of the full sale L-4 and his family. This is just one more of the many rewards found in scale modeling.

Charles also shared that he had tried producing some of the airplane's details in several different ways to see what worked best. I think the photos tell the rest, except maybe for one tiny little detail that you may find interesting... this was the very first time Charles had designed and scratch-built his own model. Forget "Myth Busters", this one is an entry for the TV show, "Believe It Or Not"!

A truly fantastic job, Charles, so thanks for sharing the background and details.

Here are some of the specs of this award-winning model:
Scale: 1:4 (1/4 scale)
Wing span: 106"
Weight: 17.5 pounds
Radio: Spektrum DX7 transmitter, AR7000 receiver, and analog Hitec servos.
Engine: Evolution G26

Interior detail of the L-4

Covering: Super Shrink Coverite covered with latex paint

By the way, the control stick and rudder pedals move with the control surfaces!

Charles says he's now looking forward to entering his first contest at the Mint Julep Scale meet later this year. Maybe someday he'll make it to Top Gun!

He also told me that he's called the "Cub Man" at his local club, the Lexington Model airplane Club in Lexington, KY.

Was the full scale L-4's owner interested and/or flattered to have his airplane modeled? Apparently enough for him and his family to personally accompany Charles to Toledo to see the results of Charles' first competition! See the photo showing Dan Hall (son of the L-4's owner) and his wife; Charles' mother, Janet Brooks; and Dutch and Dick Hall, owners of the full scale L-4. I'll bet Dick Hall's buttons were bursting with pride to see the model of his aircraft take first prize at this very illustrious event.

Charles, thank you for sharing your model with us here at RC Report Online.

To bring this month's column to a close, a long time friend and scale warbird flier, Doug Miller, sent us some photos of the latest addition to his hanger. Doug is into P-47's like I'm into P-51's. He's flown a Top Flite Gold Series P-47 for a number of years, and when he saw Robart's new 98" P-47 at Toledo 2008, he just had to have it. Doug was putting in a lot of overtime at his day job at the time, so he asked me to help in the building process. I was equally eager to get my hands on this new model, to see how it was built. Although advertised as an ARF, it's actually more like what Gordon affectionately calls a BARF, a "Builder's ARF". In other words, while much of the work has been done for the buyer, there is still a great deal left to do, and such kits are *not* (here's yet another myth busted!) among those that *"Anyone can assemble an ARF."*

The kit came with a CD containing some construction photos and some written instructions. I installed the control surface hinges, and mount-

Doug Miller after his first flight of his newly finished Robart P-47

ed the engine with Doug's help, a Husky 4.4, (78cc). The cowl came with metal brackets to hold it in place using external screws. Neither of us liked that idea, so we mounted the cowl using *hidden* brackets glassed to the inside of the cowl. We also drilled holes in the mounting plates and the firewall, and installed dowel rods so that the cowl would stay in place while the bolts were tightened.

This plane also comes with inner gear doors, strut covers, tail wheel gear doors, and features droppable stores, a real plus in flight competition. The builder, of course, has to install the air cylinders and control mechanisms.

Doug finished the cockpit and radio installation,, the latter being a Futaba 2.4 GHz system with Hitec digital servos. Robart retracts and wheels were used.

The completed model, by the way, weighs 32.5 lbs., which is *less* that its advertised weight!

Doug only recently made the maiden flight, and he says he was amazed at how well it flew (not unusual for Robart products, of course). He said it was much like flying a larger version of the Top Flite P-47 he'd built from a kit.

He determined the need for a little more down thrust, and a little right thrust. The plane comes with a zero offset, so Doug made an aluminum

Doug Miller's Robart P-47

wedge to install behind the engine to provide the necessary offset. He also said the plane needed very little in the way of trim, and the only difference in flying it and the Top Flite model was that he could feel the extra weight on final.

The first landing was truly one to write home about, a real greaser (i.e., a smooth and soft touchdown)! He completed several more flights that first day, despite a strong cross wind which the model handled very well.

Doug and his Robart P-47 will probably be seen at numerous local contests this year, competing in Fun Scale. He also likes to fly at the Mint Julep and the NATS. Doug has excellent competitive skills, so I doubt he'll need this, but good luck anyway, my friend.

Well, that wraps it up for me this issue. I have to turn this in a little early this month because I'll be in Florida next week, being one of those "intimidated by the big names" judges (not!) at Top Gun. Meanwhile, please send us some photos of your new and favorite scale models, as well as your questions concerning scale, be they about building, competing, or even how to avoid a "Gordon-Style Landing".

Fair winds and blue skies to you all! *-Gary Webb*
gcwent@woh.rr.com

(Editor's Note: You're all just jealous that my landings provide more justification to build new models than do your landings! So there!)

2009 War Bird Event

Rocket City Radio Controllers

Huntsville, AL

CD- Alan Berard 256-417-5499

Visit **RocketCityRC**.com for information

Door Prizes to be awarded
Food and Refreshments available
Landing Fee $25
SORRY, NO VENDERS ALLOWED

GPS Info:
34 41.192 N
86 35.725 W

July 17th and 18, 2009
Friday at 1200, and Saturday 0800 till 1700
Spectators Welcomed
Pilots Meeting at 0800 Saturday
Overnight Camping Available, no hook-ups

Come by the Home field or RCReport Online for our War bird event in July!

Keep an eye at RocketcityRC.Com all year to see what events are coming up! We would love to see you there!

Two Old Scale Guys

by Dick Watz & Bill Hurt

Dick Watz:

When *"R/C REPORT"* magazine went out of business, I felt an immediate and great sense of loss, but quite frankly I secretly enjoyed not having deadlines to meet! But in a very short time I began to miss hearing from many of the great people I'd come to call friends. I've always said that modelers are some of the greatest people in the world, and it was proven again by the many cards, emails, and phone calls I received from friends (many of whom I've yet to meet) concerned about my health. You people are truly something else! *(Bill says: Good Lord, Dick, I've been called "something else" for years, and quite often worse!)* My "Watz Scale" column almost ended before I even had a chance to thank you all for your concern. So now, thank you from the bottom of my now repaired and finely tuned heart. You are all *such* good people.

Now, I promise that my health will not become a "theme" in this column, but I am soooo grateful for the opportunity to thank all you amazing people one more time. I considered continuing this column for RC REPORT ONLINE long and hard before accepting. The two main factors behind my decision to continue are, as you may well imagine, my lovely wife of 45 years, and a gentleman I met through the magazine column, Mr. Bill Hurt. Most of you will recall that Bill handled the magazine column-writing

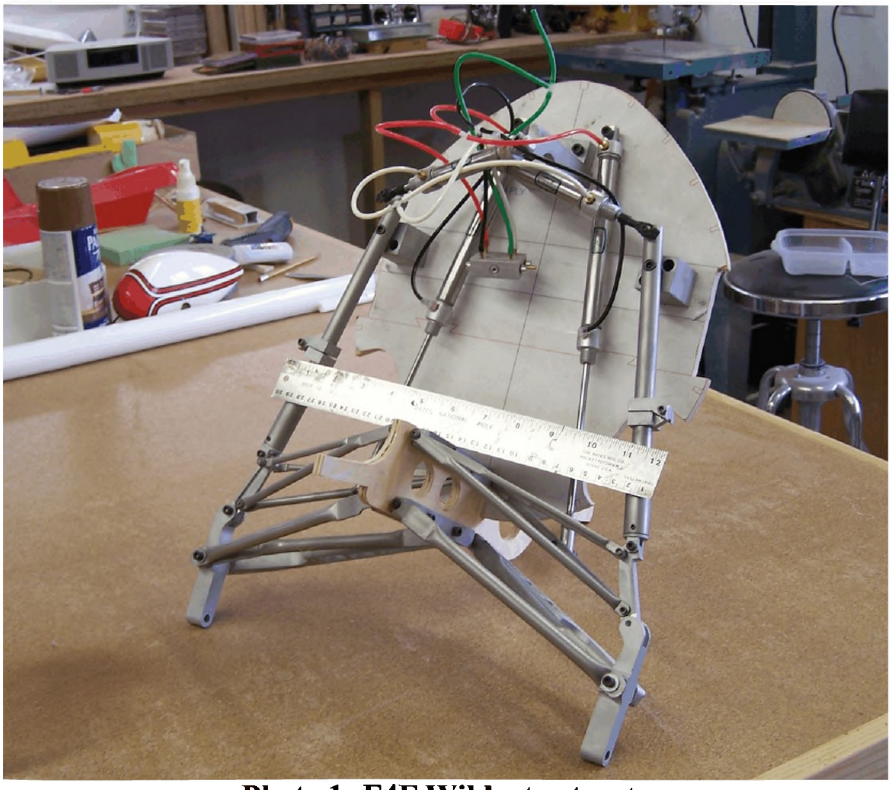


Photo 1: F4F Wildcat retracts

F7F Tigercat retracts

The wings of my new Waco YMF

chores for me while I took a break to have bypass surgery. And you'll also know that he did a great job. *(Bill says: I am good, ain't I?)* I heard comments ranging from *"Where have you been hiding this guy?"* to *"Why don't you two write the column together?"* So it was actually Bill and Sue's encouragement that prompted me to write again, and I'll try hard not let them or you down. Bill, you are my friend and brother. You have enriched my life in ways you may never know. *(Editor's Note: I hope Dick and Bill won't mind me adding this, but it's something I'd like the readers to know. Dick's wife, Sue, tirelessly kept us informed about Dick's progress before, during, and after his surgery. The news was sometimes good, and sometimes not, but we could always tell that her strength and devotion were steadfast and unfaltering. Bill Hurt, meanwhile, took over the column, but insisted that all author payment checks be sent to Dick. Dick opposed this idea, of course, but it was my decision that the checks belonged to Bill, so I was going to follow his instructions, and send the checks to Dick, "as ordered. I don't know how it worked out between them, but since neither one has killed the other yet, I assume they reached a mutually satisfactory agreement. Both of them are great guys, and even though Dick has one strike against him (he is, after all, from Michigan), the truly wonderful Sue more than makes up for it.)*

We plan on combining our writings to produce the one scale column. We want to carry on the old tradition of your participation as well. In other words, "We'll show you ours if you show us yours", so keep sending us photos and info about your models. *(Bill says: Send us your questions and info on your projects. That will enhance the column for everyone. Your participation will be very much appreciated.)*

I'm short on start-up ideas, so a lack of words will keep my participation short this month. Yeah, I can already see the smiles on your faces, *"When was Dick Watz ever at a loss for words?"* I need a little time to regroup, but maybe Bill will fill-in for me again. Anyway, thanks for joining us here online. I'll be back in full swing soon.

I do have several photos this month, showing the retracts for some projects Eric and I are working on (we'll keep you updated as we progress). One is an F4F Wildcat, another is a F7F Tiger Cat, and of course you'll recognize the wings of my Waco YMF5, a model I hope to take to Top Gun some day.

Bill and I intend to make this a very special column, and we look forward to your comments and contributions every month.

Bill, I'm sorry about the brevity, but I'm sure you can bring this column up to the old *"R/C REPORT"* standards. So until next month, take it away, Bill.

Bill Hurt

Okay, Dick, and thanks for all the kind words.

I've been pretty busy with my own Waco YMF project, and with that Florida event called "Top Gun 2009" (see our full coverage beginning on

Mike Barbee had his gorgeous 33% Waco

page 32 in this issue). As you all know, Frank Tiano puts on this great event every spring down in Lakeland, FL, inviting many of the best scale modelers from around the world. This annual and very prestigious event runs from Wednesday through Sunday, with a posh banquet held Saturday evening.

My personal preparation for this event is no small task. I have to bring someone up to speed at the office, and find someone to puppy-sit with Luk--Luk. Finding someone who's willing to take care of a 100+ lb. Husky is no easy task, but Janelle's sister was willing to do so this year, so off we went to Florida. Normally we'd commute back and forth daily, since the drive normally takes only about an hour, This year, however, we decided to take advantage of the nearby Hilton, and man was the pool a great bonus after the event wound down each day! When you consider that the air temperature was at least 96˚F every single day, the pool was a very welcome relief! On the other hand, seeing Mitch Epstein in a swimsuit did take a little off the edge of nice (just kidding, Mitch). *(Editor's Note: No he's not, Mitch.)*

Day one was for getting acclimated at the field, and the entrants began to arrive. The place soon became like old home week, including meetings and greetings from friends we get to see only once a year. All too soon we were involved in judges meetings to discuss rules changes. Before long the sound of reciprocating engines and turbines alike shattered the previous quiet of the field.

The list of entrants at any Top Gun contest truly reads like a, "Who's Who" of our sport. Frank went ahead and allowed the early arrivals in the Masters and Expert classes, to be static judged early if they wished to do so. This turned out to be a great idea, spreading out the massive workload to two days instead of one.

Mitch Epstein had his new Waco at Top Gun this year... but that ain't Mitch!

While this was going on, the Pro-Am classes were making their first scored flights, so the field was soon a very busy place!

Come Thursday morning the static judging continued for the Masters and Expert classes, while those judged on Wednesday began their scored flights. In the hotly contested Pro-Am Pro class, John Boyko was flying the stink out of his S-1 Pitts. John won the Pro-Am Sport class last year, so he had to move up to the Pro class this year, where he was doing very well again. Mike Barbee had his gorgeous 33% Waco again, and was all ready to fire up his big Moki radial. Mitch Epstein had his new Waco (from an AMR kit) ready, and was setting up to make his first flight. Sadly, however, a dead stick landing cut his efforts short this year, but I'm sure he'll be back next year, with renewed fire in his eyes.

On Friday morning the Team scale judging began, and was I ever busy! We began judging at 8:30 a.m., and other than a quick break to wolf down a slider for lunch, we didn't get up again until the last plane came across the table later that afternoon. You simply would not believe the quality of models brought to Top Gun. Mike Selby brought a brand new F-111 swing-wing Aardvark all the way from Thailand, and in addition to being huge, it was quite simply outstanding!

There was also an unbelievable, electric powered TU-95 Bear with counter rotating props. The model was covered in aluminum tape with over 250,000 simulated rivets! The model was done in a seemingly small scale, but since the real airplane is huge, so was the model!

Ed Newman brought in his Feissler Storch again. It had undergone some serious rebuilding since last year, and it was an outstanding effort. Good job, Ed!

Then along came Graeme Mears with his breath-taking F-16 in USAF Thunderbird livery. This model, however, created quite a problem for the judges. You see, never before in the history of Top Gun has any model ever received a perfect, 100 point score in static. But what else could we do? We looked and looked, comparing the model and his documentation over and over, and despite

trying the best we could, we were unable to find any deviation whatsoever, not even the tiniest detail that might have earned him a 99.999 score. Graeme thus made Top Gun history by scoring the first ever perfect score in static judging. It was simply unbelievable, but then... so is his model.

(Editor's Note: Now folks, don't get me wrong, because I'm not trying to take anything away from Graeme as a great scale modeler. But I saw this F-16 myself at the 2008 Toledo Show, and I still have doubts that he actually built it. Personally, I think he stole an F-16 from the Thunderbirds, and then somehow shrunk it! It's the only explanation I can offer (or accept) for the vast amount of incredible, mind-blowing fine detail. I mean, it's either that or he went to the F-16 farm and got a newborn puppy! I'll bet he uses magic!)

There have been cases, of course, where modelers have come very, very close. Graeme himself scored extremely well just last year with this same model, going on to win the Team Scale class.

I won't go on and on about each and every entry, but believe me when I say that they were *all* extraordinary!

Saturday was all about flight scores. John Boyko flew his Pitts to an amazing 98.3 point score on his third flight.

Come Saturday evening we joined the festivities at the much anticipated banquet. Greg Hahn was there in his authentic, WWII pink and green uniform of the U.S. Army Air Corps! A great touch there, Greg! We were then practically *forced* to eat too much (that's my story and I'm sticking to it!), after which Frank held his now world famous auction. Lots of items were donated, and all were sold to the highest bidders.

Sunday morning saw the scored flights flying continue, going on until late afternoon when the shadows grew long across the busy field. Once the last flights were scored and tabulated, the highly anticipated trophy presentations began. I won't step on Dick Pettit's Top Gun coverage elsewhere in this issue by revealing the results, but I will say that it was spectacular!

I wish I had room to include all the pictures we took, but that would take more space than we're allowed. Besides, Dick Pettit seemed to be everywhere all the time, working his fingers (and his camera) to the bone to bring you the great coverage he always provides. It was great to see you again too, Dick, and we enjoyed the time we spent together.

So now I'll wind it down for this month, but Dick Watz and I will be back next month with more coverage of scale aeromodeling. Even though *"R/C REPORT"* magazine brought you coverage of the top events a month or two sooner than any other publication, this online format allows us to bring you the news even sooner than before.

Fly often, fly safe, have fun, and keep it scale!

-Dick Watz
8400 Swan Creek Rd.
Saginaw, MI 48609
watz7@aol.com
(989)781-2692

-Bill Hurt
1212 Oak Drive
Leesburg, FL 34749
williamhurt@comcast.net
(352)978-1708

COMING SOON!
FROM HORIZON HOBBY

The "BEAST"

Horizon Hobby Inc. is proud to announce that they will soon releasing their new Model 12R "The Beast"™ in the near future. This model, along with the full-size "Beast", was a crowd favorite at the Joe Nall Fly In this year at Triple Tree Aerodrome in Woodruff, SC.

The airplane design has been a collaboration between the full scale builder and designer Mr. Kevin Kimball, and our very own Quique Somenzini. Kevin Kimball has secured copyrights on the outline of the airplane and the color scheme, and has trademarked the name "Beast". Quique has the exclusive rights to use these three items in model aircraft. This project has evolved over the past 24 months, and the Joe Nall Fly In turned out to be the perfect place to unveil the duo together.

The full scale "Beast" is owned and piloted by Bryan Jensen, who intends to make limited appearances in 2009, and to begin a full slate of air shows beginning with the 2010 air show season.

Steven W. Goodreau
Sr. Publicity & Media Mgr.
Horizon Hobby Inc.
4105 Fieldstone Rd.
Champaign, IL 61822
Phone 217.403.3279
www.horizonhobby.com

NEW GIANT SCALE ARF!
from TOP FLITE

TOP FLITE GOLD EDITION CESSNA 182 ARF

One of today's most popular light civilian aircraft is now available as a fine scale ARF R/C model. The Top Flite Gold Edition Cessna 182 ARF is based on the ever popular and time-tested kit offered in the Top Flite line, but with many new options and upgrades. The 81" span model features a modern, easy-to-see color and trim scheme inspired by the current full scale 182's. The Top Flite model is IMAA legal, easy to see in the air, and flies well in most wind conditions. With a .75 2C or .91 4C engine, the Cessna 182 flies much like a sport plane. Lower the flaps and throttle setting, and it settles in for a slow and solid landing. Constructed from select wood and fiberglass, the Top Flite Cessna 182 is covered in MonoKote and boasts an assembly time of just 18-25 hours. The kit includes navigation and landing lights, as well as a fully detailed cockpit.

Other features include:

Uses economical engines or may be built as an electric.

Time-saving and scale accurate fiberglass corrugated control surfaces and landing gear.

Scale IMAA legal model of a popular civilian aircraft.

Includes navigation and landing lights, plus a detailed cabin interior

Lightweight built-up wood airframe

Includes aluminum spinner

Highly visible color/trim scheme, covered in MonoKote

Specifications:
Wingspan: 81"
Wing Area: 898 sq.in.
Weight: 11.5 to 12.5 lbs.
Wing Loading: 30-32 oz./sq.ft.
Length: 64"
Radio: Requires 5-ch minimum with seven standard servos.
Power: .60-.91 2C, .91-1.20 4C, or a suitable electric power system.

Now available.
Retail:$549.99
Street:$399.99

For more information visit
www.top-flite.com

Bird on a Wire

by Terry Dunn

The weather here on the Texas Gulf Coast has been pretty bad this spring. It seems that almost every day has been tainted with rain, double-digit winds, or both. Because of that, I haven't done much flying lately. I usually like to poke fun at you guys up north because I get to fly all winter while you fellas are stuck in your igloos, so I guess karma has caught up with me and y'all are having the last laugh. Frankly, this lack of flying weather is starting to have a negative impact on my sanity. All work and no play makes Terry a dull boy! *(Editor's Note: "Dull" isn't the word I would have used, but at least you're half right.)*

On top of all that misery, I wasn't able to attend the Southeast Electric Flight Festival (SEFF) this year on April 30-May 3. This is the granddaddy of electric flight events in the U.S., and probably the whole world. Several of my friends were able to go, however, so I'll have to settle for living vicariously through them while planning to attend SEFF next year.

The Long Wire Limbo

Whenever we need to install a servo in a remote location, we just slap on the appropriate length wire extension and press onward. But what about when we need to locate the motor and battery of an electric plane farther apart than the wires of our Electronic Speed Control (ESC) can reach? That could become an ugly situation. For several years I was blissfully ignorant of the potential problems associated with lengthening ESC wires, but I never had any problems. In retrospect, I was blindly doing things the correct way... well, mostly. Now I'll share what I've learned to help *you* stay out of trouble. *(Editor's Note: Said Bill Clinton to President Obama.)*

Some ESC manufacturers will provide suggestions for lengthening the wires on their controllers, but most do not. Considering all the technical variables involved, as well as the dubious soldering skills of us in the general modeling public, I can't say that I blame anyone for being tight-lipped on the subject. But it's worth a shot, so contact your ESC's manufacturer and see what they say about your particular situation.

The best way to stay out of trouble is to just leave your ESC alone! As you'll soon see, extending the wires between the ESC and motor is some-

Photo 1: Sometimes you just have to extend the leads on your ESC. Al Hall's scratch-built concept plane (modeled by Don White) required over 2' of extra wire to connect the motor to the ESC. With the appropriate precautions (see text), the system worked fine.

thing of a black art, so the only way to be truly safe is to modify nothing. What's that you say... the battery plug won't reach the ESC *unless* you lengthen the wires? Like I just said, leave it alone and your ESC (and airplane) will be just fine when you check on it in a year or so.

What? You want to actually fly your airplane? Oh well, in that case educate yourself, do what you have to do, and assume the associated risk. Then if you somehow release all the magic smoke from the ESC, motor, or your ears, at least it won't be my fault!

Before I get started on the techno mumbo-jumbo, allow me to disclose that I have only a layman's understanding of how ESC's work, so I have no business trying to explain *that* topic to any of you in any sort of respectable level of detail. I won't even try. I'm not real clear how a gas pump works either, yet I still know that it's not a good idea to juggle flaming bowling pins while filling up my mini-van at the local Esso station. By the same token I've somehow developed a few good habits about lengthening ESC wires that remain valid despite my lack of an electrical engineering pedigree. And that brings me to the first tidbit of advice this month: It's not a good idea to juggle flaming bowling pins while lengthening ESC wires, either.

So what's the problem with long ESC wires? The answer to that question depends on which wires you're talking about. All modern ESC's (ignoring the now-obscure *sensored* brushless controllers) have three sets of wires. First, there's the pair of wires that make up the leads for the battery. Then we have the two wires (for brushed-motor ESC's) or three wires (for brushless ESC's) that connect to the motor. Lastly, we have the three-conductor wire that connects the ESC to the receiver. This one, of course, is not much of a threat. Treat it as you would a servo and add the appropriate length extension as necessary, but no *more* than necessary. When I'm using the

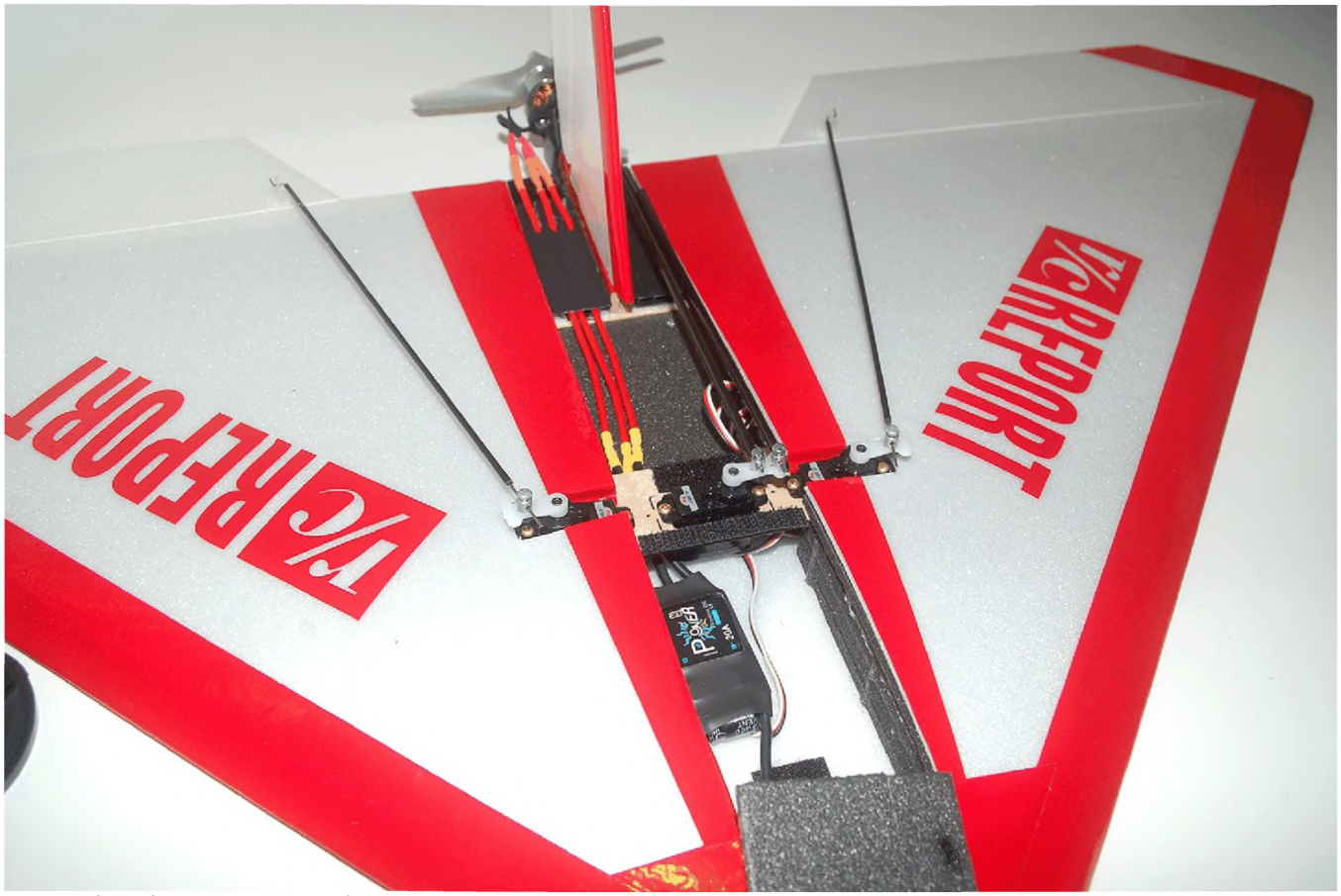


Photo 2: It's usually considered safe to add moderate extensions to the motor leads of a brushed or brushless ESC, as displayed by the 6" red wire segments added to this little delta-wing park flyer.

Battery Eliminator Circuit (BEC) of an ESC to power the receiver, I always make sure to use a heavy gauge extension. The sum total of the amperage pulled by the rest of the radio gear all flows through this wire, so it should be beefy. It's also a good idea to keep this wire clear of the motor or battery leads as much as possible.

When it comes to extending the motor and/or battery wires of an ESC, however, things start to get a little fuzzy. Even experts in the field openly disagree on the root causes of problems that can pop up, and on the appropriate ways to overcome them. The result is that there's no comprehensive set of hard and fast ground rules for extending ESC wires. The good news is, despite the disagreements among ESC experts, there is some common ground here, so let's focus our discussion on these points.

For the sake this discussion, think of an ESC as having two circuits. There's the input circuit which includes the battery and all the wire leading to the little bumpy things on the ESC's circuit board (mostly made of licorice jelly bean stuffing, I believe). We can also think of the output circuit as the wiring from the jelly beans to the motor. When you lengthen either the motor or battery leads of an ESC, you increase both the electrical resistance and inductance of the relevant circuit. An obvious negative side-effect of increased resistance is that less voltage gets to its desired location. Now, resistance is a necessary evil that best be combated with high-quality wire that is at least the same gauge as the stock wire that you're extending. However, voltage drop is *not* our main concern with resistance here. We'll come back to that in a minute.

Inductance is a far more obscure property. I find it easier to think of inductance as the

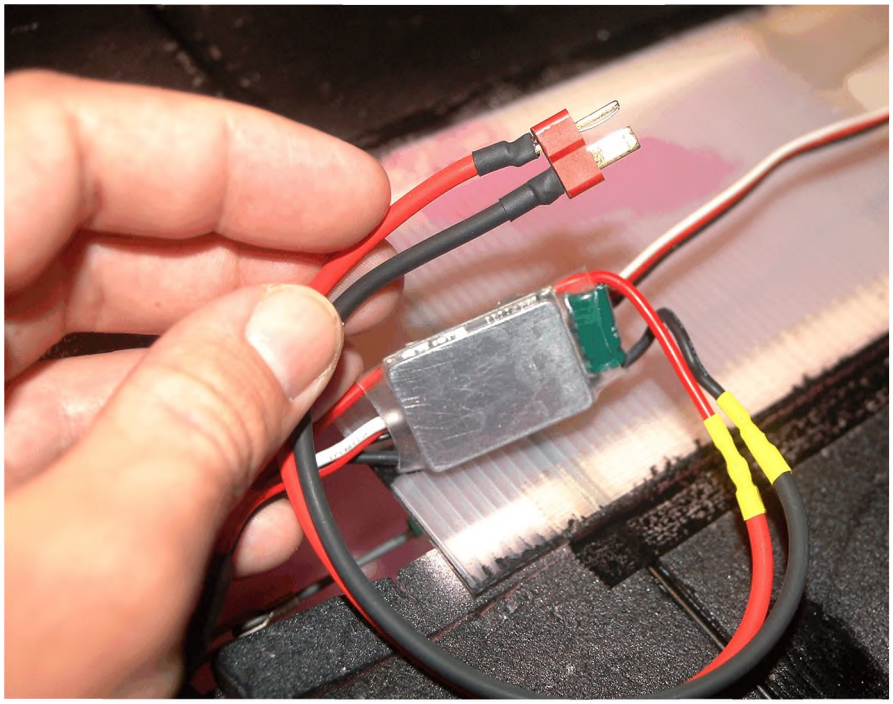


Photo 3: I was feeling lazy and a little bit lucky when I wired up this ESC. Lengthening the battery leads is generally ill-advised, but it can sometimes be done without experiencing nasty side effects. Note the larger wire used as the extension.

electrical equivalent of inertia (objects at rest want to stay at rest, while objects in motion want to stay in motion). So, for the purposes of this conversation, inductance is the circuit's reluctance to alter the direction of current flow. When I tell you that one of the operating principles of ESC's is to alternate the direction of current really, really fast, you can begin to see how added inductance is something to be avoided.

In our ESC's, inductance and resistance work together like a set of mischievous evil twins to cause problems. I'll bet their mother even dresses them alike! Their dirty work manifests itself as voltage spikes that can quickly degrade an ESC's capacitors, FET's, and... uh... other jelly beans. The spikes may even be severe enough to cause instantly fatal (and smelly) electronic injury to an ESC.

With regard to the wires between the ESC and motor, the added resistance and inductance that results from extending their length is probably negligible. The output circuit already has significant resistance and inductance due to the coils of wire in the motor itself (FYI, licorice jelly beans have almost zero inductance compared to those pesky red ones). This is why most experts agree that it's better (or at least less risky) to extend the motor leads rather than the battery leads.

Now, already over 1,000 words into this column, we come to my second bit of sage advice: If you must extend the motor or battery wires of an ESC, extend only the motor wires. As stated before, use high-quality stranded wire that is at least as large as the original wire. Make the extensions no longer than necessary, and avoid adding connectors that add even more resistance. It may also be advantageous to twist the wires to reduce electrical noise.

How long can we extend the motor leads without suffering ill effects? From what I've read, the general consensus is that a foot or so of extra distance should be no problem with most setups. Beyond that, who knows? There are many examples of folks who have added much more than that without problems, so maybe our setup will work just fine too. Or maybe we'll get just a little noise that confuses the controller and decreases its efficiency a little. Or, maybe the whole setup will unravel itself into a molten mound of pretty wires and smoke that resembles a Jackson Pollock painting. Hopefully not, but the message here is that we need to do our homework and proceed with caution.

Now let's talk about the imposing input circuit of the ESC. It doesn't have the pre-existing condition of high inductance like the output circuit. Here the added resistance and inductance of longer wires is more likely to be significant, and in a bad way. In fact, the

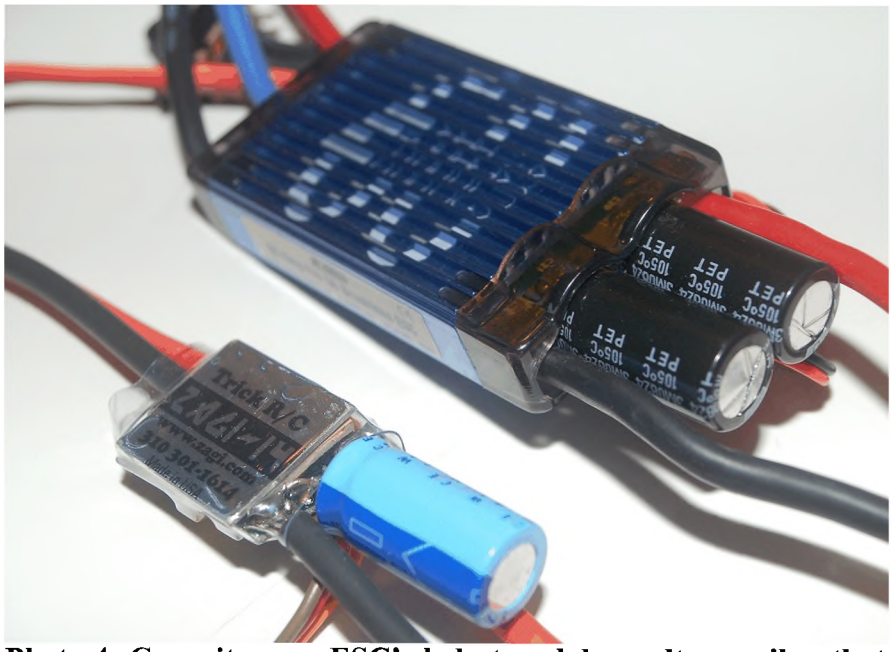


Photo 4: Capacitors on ESC's help to subdue voltage spikes that can be exacerbated with longer battery leads. The E-flite 60 Amp ESC on top comes with two capacitors to handle the strains of the stock wires. The Trick R/C 14 Amp ESC on the bottom required adding the blue capacitor when the battery leads were lengthened.

input circuit is susceptible to voltage spikes even with the *stock* wires! This is why ESC's have capacitors on the input side, which serve to dampen the peaks and valleys of voltage spikes coming from the battery, to shelter those fragile jelly beans on the circuit board. These capacitors are sized to handle the *expected* voltage spikes when using the *stock* wiring. With the increased resistance and inductance of longer battery leads, however, the spikes grow larger, and the capacitors may become overwhelmed. If you find that the capacitor gets warm during use, that could well be a sign of impending doom. Perhaps the capacitor(s) will fail with a "pop" during its first use with long battery wires. Or perhaps it may just go to an earlier grave from being worked so hard all the time. It's hard to say if or when a capacitor will die, but when it does, it becomes 'open season' on the circuit board, and I think you'll find the aroma (and economic results) of roasted jelly beans to be most unpleasant.

I'm sure that some of you out there are saying, *"The uber-scale P-51 I'm building for Top Gun must have longer battery leads. It simply must!"* Okay, okay, I hear you! I'm not saying you *can't* extend the battery leads (I've done it). I'm just saying that you have to accept a bigger risk when doing so!

Now, with that said, there *are* a few things we can do to help minimize that risk. Once again, use the largest gauge of good quality wire that's practical (even if it's larger than the wire you're extending), and add only the length you absolutely need.

The amplitude of those potentially harmful voltage spikes is directly related to the voltage and current being pushed though the circuit. So the closer we get to our ESC's absolute voltage and amperage limits, the more likely we are to see destructive effects from the extended leads. If we need to extend the battery leads on a power system that pulls 30 Amps at full throttle, try using a 50 Amp (or larger) ESC. The larger controller will likely be better equipped with larger capacitors, wire, etc., to handle the increased spikes of the long-wire setup.

Alternatively, we can add more capacitors to the ESC's input circuit. There's really no upper limit from an electrical standpoint, but you may have trouble fitting a huge 1-farad capacitor into the fuselage of your uber-scale Mustang! Maybe you should build a Super Guppy instead. But if you feel comfortable adding capacitors to your ESC, then go for it. I'm sure doing so would void any warranty you may have, though. The actual soldering task isn't very hard. The tough part is knowing what capacitors to use, where to get them, how many to add, etc. I can't even *begin* to offer ad-

vice in that area. Google "long ESC leads", sift through the results, and make your own judgment.

Well, there you have it. Perhaps this is more than you ever wanted to know about ESC wires. There may be some of you out there who have extended your ESC wires without knowing the risks or best practices. You know who you are. If so, go back and look at your setup to make sure you comply before something sizzles. Or perhaps you already smoked the ESC (but like Clinton, I hope you didn't inhale) and didn't understand why. In either case you can now consider yourself officially informed and out of excuses.

If I've done enough damage this month, I'll say... 'Til next time.

-Terry Dunn
15510 Penn Hills Lane
Houston, TX 77062
boaw@comcast.net

(Editor's Note: I want to repeat Terry's earlier note that experts in this field do not always agree on this subject. Some feel that it's better to lengthen the wires between the battery and ESC, while others prefer extending the wires between the ESC and motor. But all *agree with this much: When lengthening* either *set of wires, use the largest gauge of good quality wire practical for the situation at hand, even if it's larger than the wire being extended. Also, never* ever *add more wire than is absolutely necessary! Well, so much for my plan to fly all day using a 500' extension cord connected to all the car batteries in the parking lot!)*

SPARKY'S REVOLT

by Tony Coberly

Well, I missed attending the great SEFF event again! Man I really need to talk to my boss and make him understand that I need a flexible work schedule! The only problem with that is that my boss is very abrupt, unsympathetic, and very "to the point". But that's a common problem when you're self-employed! No work, no eat! Now back to the real world.

This month I'm going to talk a bit more on a subject I mentioned about a year ago, soldering. We'll go deeper into it this time, though, in response to several reader requests and a recent incident at our home field, the Rocket City Radio Controllers flying site in Huntsville, AL. We were having a nice time on a nice day in late April, enjoying light winds from the North under a clear, sunny sky. I'd brought out my E-flite "Deuces Wild", and was stretching its legs a little with a

My daughter, Cassie, and my E-flite "Deuces Wild" electric twin.

fresh set of 5-cell LiPo's. The twin-motor Deuces Wild has become one of my favorite planes to fly fast and furious, sometimes only 2' off the deck. The new batteries were topped off and ready to go, so I pointed her into the wind and off we went, with very good authority I must add! The two E-flite Power 32 motors were singing strong, pulling about 58 Amps each, with their 10x10 APC props clawing for air and shredding it behind. I climbed out at a 45° angle, pulled up the gear, banked sharply into a path parallel to the runway, and we were off to the races! I made several low passes before climbing high for a big Cuban-eight.

Well, this is where it suddenly got so weird, it surprised me even more than seeing Gordon make a decent landing. I pulled around the back side of the Cuban-eight just fine. But after I rolled on center and pushed to hold the nose up for the second half of the eight, the plane began to yaw hard to the right! I immediately rolled back to level and tried to bank the wings around, but it simply would not respond. I had lost one motor! When I applied full rudder that corrected some of the yaw, but maneuvering was still an issue. By this time the plane was still climbing and heading away toward the horizon! With full rudder and full power on one motor, I simply could not get the plane to bank around and head back to the runway. I finally cut the power and pointed the nose down. Then I waited... and waited... and waited, until I was sure I had enough airspeed, finally pulling up to level again about 20' off the ground. I then had enough speed to bank hard back toward the runway, where I made a surprisingly decent (and lucky) dead-stick landing.

Back in the pits I discovered that a factory-made EC3 connector had failed on the ESC, with the black wire hanging loose. The connector *appeared* to have been soldered correctly, so why did it fail? A closer inspection was further revealing. An EC3 connector is basically just a 3mm bullet connector mounted in a blue plastic housing. This bullet has a 2mm deep hole for the wire to be inserted for soldering. The wire that had come loose, however, was stripped and tinned only about 1mm, providing only half the contact area it should have had. This small contact area offers more resistance than a correctly prepared and soldering wire, which caused heat to build up at that point. Then, with the powerful new batteries installed, enough heat was generated to soften and weaken the solder joint, causing it to fail! Since its outward appearance showed no sign of weakness, there's really nothing we could have done to prevent this. But we can "learn a lesson" here and do our best not to produce our own bad solder joints.

Now let's get into more detail on some of soldering's "do's and don'ts".

Probably the first subject to discuss about soldering is safety. Remember, all soldering irons are *hot*! To melt solder and heat the wiring sufficiently to accept the solder, soldering irons and guns *have* to be hot, and when they contact human flesh, they have a tendency to cause very colorful language. Handle them with care, and keep the painful end in some kind of holder during rest, and make sure the cord is not where it may be pulled off your work area by a child or pet.

Another safety issue is protecting our eyes and lungs. The smoke and fumes generated by soldering is in no way beneficial to the human species! If you inhale enough of it, I'm told, your children may be born naked and screaming! Wear safety glasses to protect your eyes, and solder only in a well-ventilated area. I like to keep a fan running nearby, that blows gently right across my face, which blows the fumes away before they reach my eyes and nose. I work in my garage, so I open the big door when I'm soldering. I generally do a lot at one time, so I may be at it for an hour or more. So keep your personal safety in mind when soldering.

Now let's move on to some of the tools we should have when soldering.

I think everyone should have a "spider" caddy of some

Photo 1: Here's my Spider helper holding pieces for soldering.

Photo 3: A quick wipe on the sponge cleaned the iron.

kind to assist with soldering. The one I use has a heavy base for stability, and alligator clips on arms that can be positioned as needed to hold the work in place while soldering (see **Photo 1**). Mine also has a few additional items. The spring-type holder is where I rest the soldering iron while not in use. This holder is usually a universal size that will hold nearly any size iron. There's also a magnifying glass to help see small items when necessary. Finally, there's a small sponge in the base tray that I keep moist. This sponge, or an alternative, is probably the most underused item while soldering, yet may be one of the most important. We need to make sure the iron and the items being joined are as clean as possible to promote the flow of solder throughout the connection. When I melt solder for electrical connections, I use solder

Photo 2: This very, *very* dirty soldering iron tip is not good!

with a rosin core. This core contains a chemical flux which, when melted, promotes cleaning, adhesion, and the flow of solder throughout the connection. The rosin does blacken the soldering iron tip when it burns, which is bad for good heat conduction into the wires and connector (see **Photo 2**). A dirty soldering tip like this is basically useless, and if used to solder something together, it introduces dirty contaminates into the joint. This contamination produces a weak and high-resistance connection, usually leading to an early failure. So, I use the sponge frequently to clean the soldering tip, by simply wiping the tip across the sponge (see **Photo 3**). This also helps remove excess solder from the iron, so you don't drip molten solder onto any of your favorite body parts.

Once I have a clean and hot soldering iron, it's ready to go

Photo 4: A nice, a clean iron.

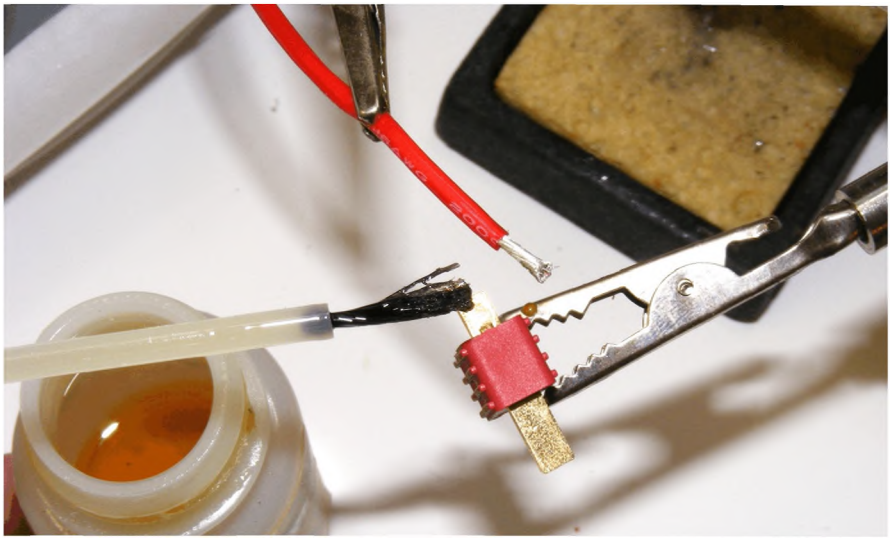


Photo 5: I add small drop of liquid flux to the wire and connector.

Photo 6: The clean iron with a small drop of solder on the tip for tinning the connector.

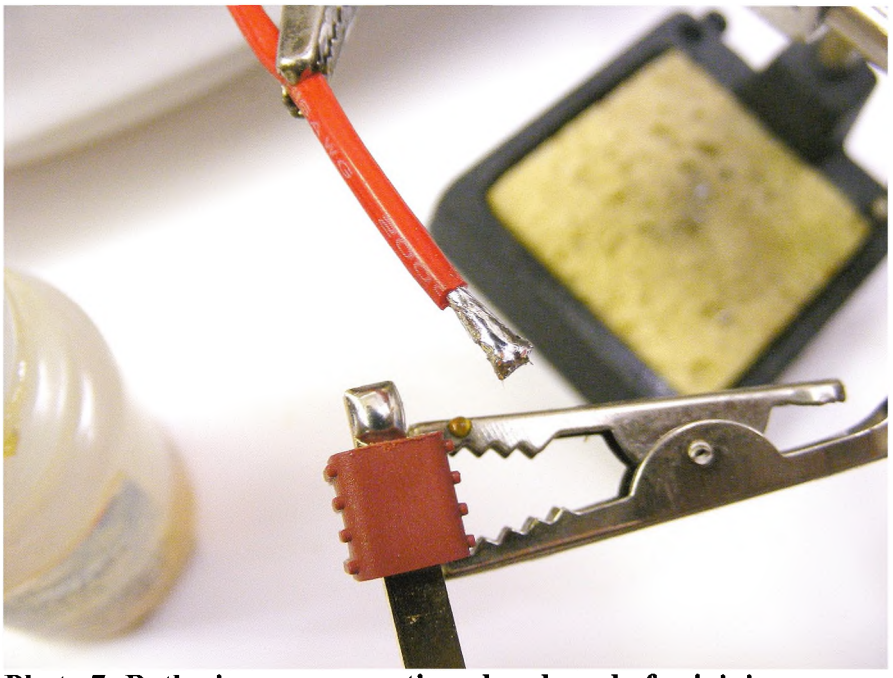


Photo 7: Both pieces are now tinned and ready for joining.

to work (see **Photo 4**).

Next I need to position the connector and wires, or whatever it is I'm soldering. I insert the wire and connector into the clips of the spider caddy, and position them fairly close together, as seen in **Photo 5**. I also like to apply a little liquid flux to the connector and wire. This is not absolutely necessary, but it usually makes the job easier.

Next I prepare the iron, wire, and connector by "tinning" the pieces before attempting to join them. "Tinning" is the act of pre-coating with solder, the areas to be soldered, to ensure that the surfaces are thoroughly covered, which aids in adhesion and heat transfer, both of which lead to a stronger joint. To do this I touch a bit of solder to the tip of the clean iron, leaving only leave a small drop on the tip. We don't want a large glob of solder that will fall off, but a small drop will seemingly defy gravity if you turn the iron over (see **Photo 6**). Why do I need this drop of solder? It's a heat conduction thing. If I take a hot iron and touch it to a wire or connector, the actual contact area of the iron tip to the work

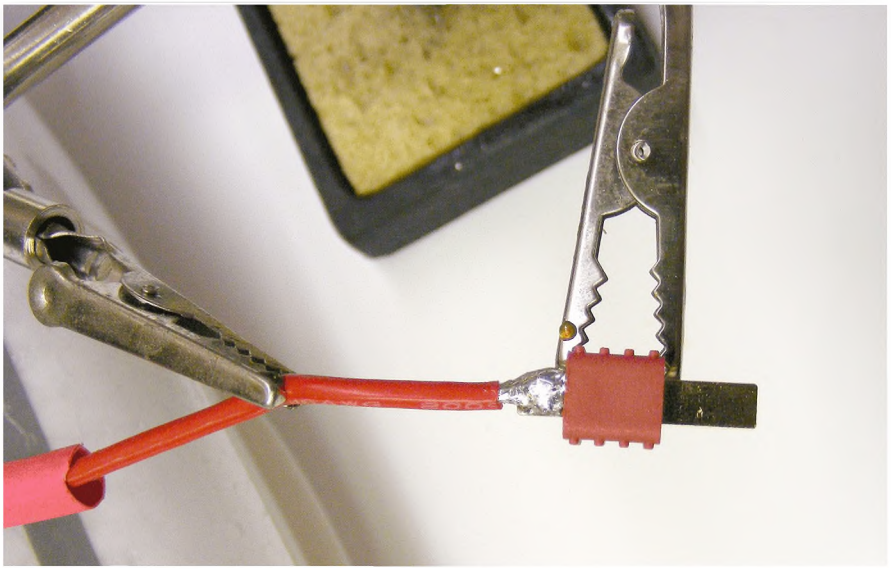


Photo 8: Solder joint complete and ready for the shrink tubing.

piece is very small, sort of like touching two ball bearings together. That small drop of solder, however, will spread and increase the contact area many times over. The larger contact area greatly improves the heat transfer speed and evenness. I'll continue adding a little more solder as the piece heats up, until I have a uniform coating on the surface to be soldered. Once again, no big globs are necessary, just an even coverage like paint, over the surface area to be soldered. In **Photo 7** we see the connector and wire tinned and ready to be joined. Note how the wires are silver and shiny. You don't want "cloudy grey" solder. That color is a sure sign that the solder did not flow throughout or all across the connector. Cloudy is bad, shiny is good!

Now I can actually make the solder connection between the wire and the connector. Once again, I place a small drop of solder on the iron, and then bring the wire and connector together. Now I hold the iron on the connection until the solder melts and spreads, and the joint looks semi-smooth and shiny. Now I have a completed solder connection that's ready for the heat shrink tubing already slipped onto the wire, but far enough back not to feel the heat (see **Photo 8**).

Finally, remember that liquid flux is your friend. I use it on every connection I make, not some or most, but every connection I make. I want those smooth and shiny connections that indicate strength, with no big globs of solder.

I hope this information will prove useful to you, and that all of *your* solder connections will last as long as you need them. Let's send all the battery's voltage to the motor, and not drop any at soldered connections.

-Tony Coberly
10017 Strong Drive SE
Huntsville, AL 35803
tony@rcreport.net

(Editor's Note: Does a "spider caddy" have eight wheels?)


RC REPORT
ONLINE!
Subscribe Now to RCReport Online!
1 Year Standard subscription
$24.95
Access to archive and current magazines
1 Year Premium subscription
$29.95
Access to archive and current magazines PLUS downloadable and printable PDF files!
WWW.RCREPORT.NET/LOGIN.PHP

FUN AEROBATICS

by Ed Moorman

MANEUVER OF THE MONTH
THE OUTSIDE LOOP

Last month we covered the reverse outside loop, which is a fairly easy maneuver. Well, okay, maybe it's not that easy, but at least it doesn't go down, down, down toward the ground like this month's *regular* Outside Loop. When I did my first Outside Loop, I didn't even know about the reverse outside loop. I just flew my Kaos way up there in the stratosphere before giving it full down. How high was I? The nearby Air Force Base air traffic control was calling me an unidentified bogie! *(Editor's Note: That's not true! He just made that up! It's his wife who calls him an unidentified bogie.)*

How many of you have done a downward Outside Loop? Sure, you've done inside loops, snaps, spins, and you name it, but how about giving your plane a lot of down elevator, watching it dive toward the ground, all the while hoping that the nose will rise and make it all the way around? Last month we covered the reverse outside loop where we roll inverted first and do an outside loop going *upward*. If you followed that procedure, then it shouldn't have been very hard. Once you can do the reverse outside, it's time to get over the fear of going downward, and learn the real Outside Loop.

No, I'm not going to tell you to climb up high, punch in full down elevator, and then just pray for a recovery. What I *am* going to do is to give you a step by step procedure so you can be sure that you and your plane will make it through that dive toward (but not to) the ground. Once you've mastered the round Outside Loops, then you'll be ready for the *ultimate* outside loop, the diving outside *square* loop! *(Editor's Note: I'll bet you were one of those mean, neighborhood bullies as a kid, weren't you?)*

DESCRIPTION

The Outside Loop is a looping maneuver that starts from level flight and flies through the loop using only down elevator. The Outside Loop travels downward at first, passes through inverted level flight at the bottom, and then climbs back up to the entry point, mostly right side up.

KEYS TO THE
OUTSIDE LOOP

Learn the reverse outside loop first (see last month's May column). Overall, your plane must have good down elevator authority, and... blah, blah, blah. Look, just learn the reverse outside first, so you'll know how your plane *does* outside loops, and get used to using (and surviving) down elevator.

AIRPLANE SETUP

Take a good long look at your plane. *(Editor's Note: Why? Are you about to tell us that we may never see it again?)* If you're flying a trainer with a flat-bottom airfoil, there's a high probability that it won't even *do* an Outside Loop. That type of airfoil often

simply won't generate enough lift while inverted to make it around an outside loop. A few such trainers will do it, but the maneuver is usually difficult even for an expert pilot. Also, the high wing location with generous dihedral makes the model want to roll off to one side or the other, forcing the pilot to worry about *two* things, getting around the loop and keeping the wings level. While flying a Sky Raider Mach I, a high wing plane with a semi-symmetrical airfoil, I was able to fly nice outside loops, but I had to work the ailerons to keep the wing level. If you're flying a trainer-type model with a high, flat-bottom wing, I suggest saving the Outside Loop for an airplane with a symmetrical or at least a semi-symmetrical airfoil, and one with a lower wing, or little to no dihedral. Good models for the Outside Loop are the typical Stick or one of the fun fly models, but any semi-symmetrical airfoil plane with moderate or no dihedral should be fine.

Next, look at your control surfaces. Make sure the model has enough down elevator movement. A lot of guys make sure they have enough *up*, but they pay little attention to the down movement because they use it so seldom. You should do an airborne check of this by doing a reverse outside loop. Try doing a reverse outside loop using full down elevator. If the plane won't make it around, you need more down elevator. If it does an inverted snap out of the loop at some point, usually near the top, then reduce the down movement a little.

Another thing to check is the location of the elevator control horn. If it's on top of the elevator, then the servo *pulls* on it for up control, and pushes it for down control. But regardless of where the control horn is (and this is true for all control surfaces), make sure your pushrod doesn't flex when it's pushing the control horn. Hold the control surface firmly, and use the radio to drive the servo back and forth. If you notice the pushrod flexing, which reduces the amount of control surface movement in that direction, then you may need a stiffer pushrod assembly, or at least some additional

RC REPORT MAGAZINE

TEACH YOURSELF AEROBATICS CARD

OUTSIDE LOOPS

By Ed Moorman

DESCRIPTION OF THE OUTSIDE LOOP: The outside loop starts from level flight and travels downward around the loop using down elevator.

KEYS TO THE OUTSIDE LOOP: A plane with good down elevator authority that can withstand several negative g's.

AIRPLANE SET-UP FOR THE OUTSIDE LOOP

TYPE OF PLANE:
-Most trainers will not do an outside loop.
-A few trainers will do an outside loop, but the high wing location with dihedral makes the maneuver difficult.
-The best planes are Sticks, sport planes and fun fly/3D planes with a symmetrical or semi-symmetrical airfoils.

CONTROLS:
-Make sure you have the same amount of up and down elevator movement.

LOCATION OF THE ELEVATOR CONTROL HORN:
-If your elevator control horn is on the top of the elevator, the servo pushes for down control. Make sure your pushrod doesn't flex when it is pushing.

DOING THE OUTSIDE LOOP

Step I: LEARN THE REVERSE OUTSIDE LOOP FIRST.
-Check the May 2009 issue for this maneuver.

Step II: Let's get to the real outside loop!

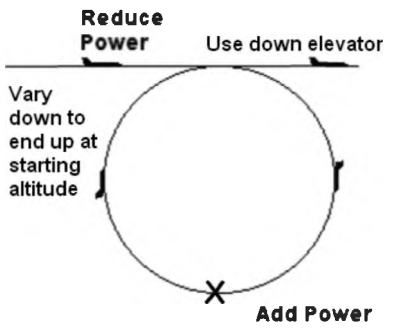
START WITH THE STANDARD SET-UP

1. Full power, 2. Parallel to the runway,
3. Two mistakes high. Get higher for this one at first.

DIRECTION:
The outside loop should be started flying into the wind.

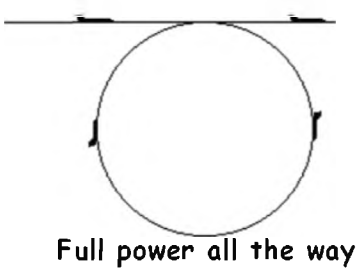
OUTSIDE LOOP WITH REDUCING POWER

1. From level flight, reduce power to just below midway.
2. Use half down elevator or a little more to start the downward, outside loop.
3. At the bottom when you are inverted, add power back to full power.
4. Level off when you are back on top.



Full Power Outside Loop

1. From level flight, put in half or slightly more down elevator and hold. A good amount is what you used for the reverse outside loop.
2. Modulate down control as you climb back up to starting altitude.
3. Level off when you are back on top.



ERRORS:
-Plane snaps out of loop: Too much down elevator used.
-Plane spirals out: You are holding aileron in the loop.

CLIP OUT-TAKE TO THE FIELD
COLLECT THE WHOLE RC REPORT SERIES

For reprints of Fun Aerobatics or back issues call R/C Report (256) 503-8436

Ed Moorman E-mail: moorman1@cox.net

bracing somewhere along the pushrod to inhibit the bowing. Try bracing the pushrod near the center of its length if you can reach it, and check both ends for any signs of loose connections. If you can't add bracing, maybe you can remove the pushrod, add material along its length to make it stiffer, or replace it altogether with a stronger and stiffer pushrod. Any slop and/or flex in a control surface linkage is an invitation for Mr. Disaster to visit.

DOING OUTSIDE LOOPS

For easier and quicker learning, always start using the Standard Setup.

1. Full power
2. Fly parallel to the runway
3. Start out at least two mistakes high.

The Outside Loop should be started flying into the wind.

What To Do

Step 1: I keep repeating this because it's very important: *Learn the reverse outside loop first!* Aerobatics beginners find the regular Outside Loop harder to do because you start high and dive toward terra firma (which I may be Latin for "terribly firm"!). Most fliers have a natural aversion to pushing in a lot of down elevator and holding it while hoping and praying that it goes around and comes back up. This is why you should start with the *reverse* outside loop, which starts inverted, but goes *upward* at first. We covered the reverse outside loop last month, so if you missed it, please go back and read it and learn that first. In doing so you learn to do an outside maneuver without diving at the beginning, which really helps to overcome the natural fear of using a lot of down elevator. Becoming familiar with the reverse outside loop also helps you develop a feel for the size of outside loop your plane will do. Once you learn and see for yourself that you *can* push in down elevator, and that your plane *will* make it all the way around, then going downward from the very start isn't so hard. So one more time, learn to do the reverse outside loop first.

Have I made my point yet? Here, I'll say it again... learn the reverse outside loop first.

Step 2: Now for the main event... the genuine... the original... the one and only... the

Outside Loop! Well, wait. Actually there are *two* ways to do the Outside Loop. One is to begin at idle power, and the other is to begin with full power. If you don't know the model well, or if you're worried about control surface flutter, then reduce power to idle before you shove on the elevator stick. The bad part about this is that we'll need to add power back at the bottom of the loop, and many people, when learning a new maneuver, have trouble thinking about using both hands, so adding power in the middle of a maneuver is hard. If you do forget to add power, trust me, you'll notice it when the plane is partway up the back side, and you start running out of airspeed.

Anyway, here's what to do:

Low Power Outside Loop

1. Start parallel to the runway, about two mistakes high, at full power.

2. Then reduce power to less than half, or if you're *really* worried, then reduce throttle to a high idle.

3. Use at least half or more down elevator to begin the downward loop. At first use just your thumb to push down, to help prevent accidentally moving the ailerons at the same time. If you squeeze the stick while pushing it, you may apply some aileron that will cause a spiral off to one side.

4. Once you pass through the bottom of the loop and start back up, smoothly add the power back in.

5. Once back at the top, level off and fly straight ahead.

Full Power Outside Loop

Since you have already practiced the reverse outside loop many times now (Don't make me say "you know what" again, or I *will* come and stomp on your airplane!), and you know your plane's flight characteristics in an outside loop, you should be able to start one at full power. Just keep in mind that your plane will be gaining speed during the dive, so now the loop *may* be larger in diameter than the reverse outside loop. I said "*may* be" because with many fun fly planes, it doesn't seem to make a bit of difference.

Using low or full power, always start while flying parallel to the runway, about two mistakes high. Use at least half the down elevator, and hold it through the loop. I suggest using the same amount of down elevator you used for the reverse outside loop. And then, once you're back at the top, level off and fly straight ahead.

Your airplane should have gone around the Outside Loop very nicely if you... you know... if you learned the reverse outside loop first, and had everything adjusted properly. You'll soon find that every time you complete an Outside Loop, your experience and confidence makes it easier and easier. Keep on practicing until you are completely comfortable with diving into the loop.

What May Go Wrong

1. Once you start downward, don't chicken out! Complete the maneuver!

2. Be very careful about adding any aileron or rudder. If you do, the plane may roll off to one side and spiral out of the loop. Use just your thumb to push in the down elevator.

3. If your plane snaps out of the loop, you're using too much elevator. There's a natural tendency to cram in full down (and try for even more!) when you first do Outside Loops. You shouldn't have to use full down elevator. Go back to doing the reverse outside loop, and adjust your down elevator movement so you *can* use full down without snapping out.

4. If the plane loops very tightly, you're using too much down. As you get used to doing outside loops, you'll be able to modulate the down control as you go around. I like to start downward, see the ground in my peripheral vision, and modulate the down elevator to position the bottom of the loop somewhere around 20-30' above ground. You can use a higher figure at first, but you too will go lower as you gain confidence in your abilities and those of your model.

Now, was that really so hard to do? Of course not. You just have to take it in steps

Photo 1: Jeremy Washburn's Stick originally suffered with aileron flutter...

Photo 2: ...but not with the new, shorter and narrower ailerons.

and... did I mention the importance of learning the reverse outside loop first?

The Outside Loop is an important maneuver because so many other maneuvers consist of inside and outside loops. A couple that come to mind are the Figure-8 and Vertical-8. Some that use a *lot* of down elevator are the square outside loops and square eights. We'll be covering these in future columns.

Back in April I got an email from Jeremy Washburn. He'd been given a Stick of some kind, and was experiencing a problem. It seems that every time he dived or used more than half power, he suffered aileron flutter. Looking at **Photo 1**, the first thing I noticed is how wide the ailerons are, plus they extend all the way out to the wing tip. These are two features that rapidly promote flutter, which can be made even worse if the controls are loose or flexy. Jeremy is using a powerful GMS .47 engine, so I know it scoots along pretty well. He also said that he was more interested in going a little faster, since he wasn't a 3D type pilot.

Photo 3: John McGowan with his Saito .56 powered Wild Stik 40.

Those huge ailerons are a sure sign that this model was designed for extreme aerobatics at relatively low air speed. Since Jeremy cares less about wild maneuvers than high speed, I recommended that he do *two* things. First was to remove the original ailerons and replace them with 2" wide aileron stock. I also suggested that he shorten the ailerons' length by 2-3", and add the same amount of same size trailing edge out near the wing tip. I sent him some photos of some .40-size Sticks that have ailerons like this. Jeremy was quick to make the suggested mods, and sent **Photo 2** to show how it now looks with its 2" ailerons.

Photo 4 shows Daniel DeMaria with his father's GMS .47 powered scratch-built Stick.

Photo 3 shows John McGowan with his Saito .56 powered Wild Stik 40. Note that the wing controls are in the "crow" position. John says it's an excellent flier, to which I can personally attest, since I have both a Wild Stik 40 *and* a Wild Stik 120. It's really too bad that they aren't made any more. The Wild Stik, with its flat wing and extra large control surfaces, is a very different animal from the Great Planes "Big Stick." It even has wider control surfaces than the Hangar 9 "Ultra Stick." I'd call it more of a 3D trainer or an extreme fun fly plane. Naturally, we need some good strong servos to take full advantage of those big controls.

Photo 4 shows Daniel De-

Photo 5 shows Ugo Ferrari holding his GMS .40 powered Tower Trainer.

Photo 6: This is Richard Deese, Ugo's son-in-law, with his Sonic 25, a high wing model with a GMS .32 in the nose. It scoots!

Maria with daddy Frank's GMS .47 powered scratch-built Stick. Daniel often sees himself in this column because of two things. First, his father, Frank, takes a lot of good pictures and shares them with me. And second, Frank builds a lot during the winter. I'll bet he has a ball test flying and trimming all those new models come when the new flying season arrives. Thanks, Frank and Daniel.

In **Photo 5** we see my flying buddy, Ugo Ferrari, holding his GMS .40 powered Tower Trainer. Ugo's Stick and World Models Super Stunts were crashed, but he didn't do it. He often lets other people fly his planes, and sometimes they crash them. *(Editor's Note: Hmm. Ed offered no names in there, but we already know that he often flies*

Ugo's planes, so... Well, it's just a thought.) I don't think Ugo realizes what a good pilot he really is.

Why the Tower Trainer? Ugo logged onto the Tower Hobbies website one day to place an order, when he noticed the model on sale. This was in addition to the already active discount that gives you so much off, depending on the dollar amount of your order. Ugo and several friends compile their orders to earn a bigger discount, which led to a very attractive price for the Trainer. Anyway, it does nice touch and goes, and with the GMS .40 for power, which really turns up a 10x6, this is *not* a pokey airplane like those powered with weak engines. Despite its limited aerobatics, it's still fun to fly.

Photo 6 shows Richard Deese, Ugo's son-in-law. The model is a Sonic 25 high wing with a GMS .32 planted in the nose. This thing really scoots! Poor Richard works the night shift, and instead of going home to sleep when he gets off, Ugo picks him up and takes him to the flying site!

Photo 7 earns my official "crying towel." This, ladies and gentlemen, was once a very nice engine belonging to Bill Hogue, of Gulf Breeze, FL. You'll fine many modelers who'll swear that the O.S. 1.08 FSR was the best engine O.S. ever made, and some of them even call it the best model airplane engine ever made by any-

Photo 7 earns the official "Ed's Crying Towel" this month.

one! This one, however, no longer falls into that group. See that curved piece just to he left of the now exposed piston? What now looks like aluminum foil was once a beautiful (and expensive) Tru-Turn spinner. I was standing next to Bill at the time of the accident, and it hit hard... very hard.

I'm already working on what I believe will be an interesting column for next month. Flaps takes a twin engine kit, and bashes it into a *single* engine flying wing!

See, he's already scratch-built three scale models in a row, his latest being a 74" span, radial-engine version of the Fairchild 24. So I decided that it was time for him to build another one of those odd-ball, non-conventional airplanes for which he's locally famous. Well, he argued that a flying wing wasn't odd enough, because he'd already done plenty of wings and deltas. But I kept after him until he finally gave in and agreed to start on it... but only because he was bored, he said!

This is not an ARF, by the way, but a very nice, laser-cut kit with excellent wood. The general idea of the project is to delete the nose block, add a firewall, delete the twin nacelles, cut the fuselage off about half way back, and move the fin and rudder forward. Sounds simple to me!

I'll reveal all next month, in a mini-review of the... no, you'll just have to wait and see.

Until then, once you're comfortable and familiar with the Reverse Outside Loop, then practice the regular Outside Loop. You'll love it!

-Ed Moorman
85 12th Street
Shalimar, FL 32579
moorman1@cox.net

TOP GUN 2009 Sponsors

Primary Sponsors:

ZAP	www.franktiano.com
Fly RC Magazine	www.flyrc.com/

Major Sponsors:

Futaba	www.futaba-rc.com
FTE	www.franktiano.com
Kempinski Hotels and Motels	www.kempinski.com
JR	www.jrradios.com
Red Bull	www.redbull.com
SOS	www.internationalsos.com
PST Jets	www.pstjets.com

Associate Sponsors:

Nick Ziroli Plans	www.ziroliplans.com
BVM Jets	www.bvmjets.com
Warbirds over the Rockies	www.warbirdsovertherockies.com

Supporting Sponsors:

Saito	http://saito-engines.info/
Top Gun Hussies	
Traplet Publications	www.traplet.com
Sierra Giant Scale	www.sierragiant.com
Fuji-Imvac	www.fuji-imvac.com
RC Sport Flyer magazine	www.rc-sf.com
Model Airplane News	www.modelairplanenews.com