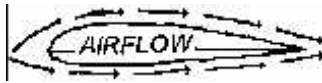


*January – February 2007*



*the official newsletter of the*

## ***Radio Control Club of Rochester***

*AMA charter 465 since 1957*

President: Matt Kirsch 585-317-3752  
Secretary: Dick Brook 585-746-5668  
Treasurer: Jim DeTar 585-637-5163  
VP Membership: Bob White 585-225-2191  
VP and Program Director: Ed Britton 585-352-6463



DEDICATED TO RESPONSIBLE R/C FUN  
SAFETY BY CHOICE NOT BY CHANCE

The purpose of the Radio Control Club of Rochester is to aid and encourage interest in the design, construction and safe operation of radio-controlled model aircraft, boats, and cars.

All visitors are always welcome at the Northampton Park Model Flying field and at regular meetings.

Note that Meetings are scheduled for the second and fourth Wednesday of every month at 7:30 PM. During the colder months they are held at the Salem Church, 60 Bittner Street, just east of the Inner Loop exit at St. Paul Street.

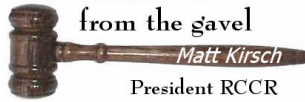
From May 23<sup>rd</sup> until September 2007, the RCCR meetings are 7:30 p.m. at Hasman Field, 1 mile west of Union Street (Hwy 259), behind Abe's restaurant, north side of Ridge Road (hwy 104), entrance is directly across from the KwikFill

**FOR THE LATEST INFO:**

RCCR WEB PAGE: [http://home.rochester.rr.com/rccr\\_](http://home.rochester.rr.com/rccr_)

Email: [airflow@rochester.rr.com](mailto:airflow@rochester.rr.com)





# Sample the Gavel

The 2007 Chilly Chili Fuhn Fly is officially on the books. It certainly wasn't chilly, but there certainly was chili, and certainly plenty of fun flying going on. With a total of 5 entries, four chili dishes and John Floyd's famous beans, the competition was a little leaner this year than usual. Apparently none of the dishes were inedible, though, as evidenced by the lack of substantial leftovers. We also had a surprise visit from Shirley Hunter and her "significant other" Ludvig Andreas Ziegelmaier, known to his friends as Andy.

Andre Blanchard's "Golisano Special" took first prize, one of my prized bottles of Colonel Cooper's Mile High Hot Sauce (with the Dick Petersen Seal of Approval). My "Afterburner MkV" chili took second. Phil Evans's famous "All Over" chili and Shirley and Andy's classic Texas Chili tied for third. Be sure to ask Phil about why I call his chili "All Over."

Other memorable moments from this year's Chilly Chili Fuhn Fly include:

- ✓ the first flight of 2007 by Bill Wegman
- ✓ the club's first prop-cut finger of 2007 courtesy Jerry Joseph
- ✓ the club's first combat kill of 2007 courtesy Jim Warner
- ✓ the first hat trick (three crashes by the same model plane) who's honor is shared by Phil Evans and Bill Wegman.

By now I'm sure you're wondering what happened to the November – December edition of the newsletter... Well, suffice it to say that due to unanticipated circumstances, Mike Mance has had to resign from the newsletter editor's position. Ed Britton and I are going to whip up a make-up edition that will include this and last edition's "Sample the Gavel" articles.

In the meantime, we once again have an opening for a newsletter editor. The job entails producing six editions of our club newsletter a year, and includes free club membership as an officer's position. Contrary to popular belief, this is not a difficult job, and a few hours of work a year can save you \$75.

This winter looks to be a busy one. Our annual February Roast is quickly approaching, and it's time to make your reservations. The dinner will be held at the Lodge on the Green, on Ridgeway avenue just East of Elmgrove. The date is Friday, February 16<sup>th</sup>, with cash bar cocktails starting at 6PM and dinner being served at 7PM. Get your \$16.00 per person reservation fee in to Ed Britton ASAP.

We've also got plenty of indoor flying opportunities at the Main Street Armory. Dates are January 7<sup>th</sup>, February 4<sup>th</sup> and March 4<sup>th</sup>, from noon until 5PM. Landing fee is \$10 per pilot.

Finally, Bill Stauber, Barb Koza, and Ed Britton are busy organizing a mid-winter swap meet on behalf of the RCCR. Show your support at the Rochester Police Locust Club on February 17<sup>th</sup> at 9:00AM.

## **"Sample the Gavel: The Lost Edition"**

**(Originally intended to be printed in the November-December 2006 Edition of Airflow)**

Talk about unusual, this year's end-of-season picnic at the Northampton Ski Lodge certainly broke with tradition by actually occurring on a sunny day! Normally, this event is punctuated by a cold, wet rain, but this year, we were grilling in shirtsleeves, enjoying a near-perfect day. I didn't get an official count, but judging by how full the tables were, we were looking at a near-record turnout. There was certainly enough food, and plenty of people to eat it.

Apparently club members weren't the only ones that decided to take advantage of the nice weather: Later at the Northampton flying field, it was standing room only with the biggest crowd of recreational flyers I've ever seen. The parking lot was literally full; I had to double-park behind three club members until a space opened up.

Not only was it a picture-perfect day, it was a perfect picture of how things should run at Northampton. At least half of the people flying were non-members, and things were running like clockwork. People were using the frequency board, flying the pattern, calling out their takeoffs and landings, etc.. This is extremely encouraging. It means that our message is getting out there, and that people value the facility that we've established and maintained for 39 years now. Keep leading by example and educating people, and we'll be flying at Northampton for another 39 years.

2007 is our 50<sup>th</sup> year as an AMA-Chartered club, and we're definitely going to have to do something special. I've tasked our Promotions Committee (Greg Kesel, Jerry Joseph, Ed Britton and others) with heading up the effort, but we could use your help. Bring any ideas you've got for "golden anniversary" promotions to a meeting, or present them to any of the members of the committee.

Since the last edition, we've become a "big box" organization. I'm talking about the new storage container that was dropped off at Bolling field in late September. We're now the proud new owners of an 8' high, by 8' wide, by 20' long, 16 gauge corrugated steel storage container from Averdi. The container replaces the two ailing sheds that served us well for many years, but were simply beyond any hope of repair at this point.

If I may be so bold, I have to say things are wrapping up quite nicely for the year. The dining canopies are down and packed away, the road down to the runway at Hasman has been officially closed, Northampton has been cleaned up for the year, all the mowers have been serviced and stowed. That leaves three meetings before the holiday break, and our annual Chilly Chili Fuhn Fly on January 1<sup>st</sup> 2007.

Ah, but you thought you were going to get off easy with a hearty "Happy Holidays" and a pat on the back, did ya? Not quite! It's an election year, and all the club officer positions are up for election at our annual December business meeting, including Vice President, Secretary, Membership Director, and Treasurer. There are also four at-large Board of Directors positions to elect. Come for the donuts. Come for the State of the Club address. Come for the \$100 Show-n-Tell Drawing (must be present to win!).

Okay, now let me wish you and yours the best of holiday seasons! Beware the chili!

## ***Minutes of the Meetings***

### **09/13/06 RCCR Minutes from Sept 13, 2006 meeting at Salem Church**

Officers Present: Matt Kirsch – Pres, Ed Britton – VP/Prog, Rich Brook – Sec, Jim DeTar – Tres, Bob White – Memb

New Members: None

Guests: None

Membership Report: 95 Members for 2006, including officers and lifetime members. We were at 89 members last year at this time

Programs Report: Whatever

Field Report:

• All fields are in great shape • The metal storage container will be delivered and installed at Bolling Field. A gravel bed was laid as a pad for the container and the remaining gravel was placed in low spots on the entrance road • We will be putting in 4 culverts, at NH, in the ditch North of the runway

Committees:

• Field Monitoring Committee – None • Field Search Committee: Currently deactivated • Sound Committee: None • Turbine Committee: Matt Kirsch printed and distributed copies of the current draft of the NH Field Rules pertaining to the flying of Turbine powered aircraft at NH. There was some discussion. Any concerns or suggestions should be forwarded to Greg Kesel, either by email or in some written form. There was a suggestion that we issue some kind of ID indicating that a pilot has passed the review process and can fly a Turbine powered aircraft at NH. • Events: Combat Meet on Sept 30 – Pete Durante is the CD

Old Business:

• The club bylaws will be reviewed at the next scheduled club meeting • The Intracub meet was wet but flyable. The GVA club will host the meet next year

New Business: None

Announcements:

• Next meeting is on Sept 27, 2006, at Salem Church. • Combat Meet on Sept 30 at Hasman Field • Superman Jet Meet – Oct 4-8 – Cape Girardeau, Mo

Show and Tell:

• Trevor Ewell – Report on the Ithaca, NY FF • Jerry Joseph – Electric Extra

50/50 –

### **09/27/06 RCCR Minutes from Sept 27, 2006 meeting at Salem Church**

Officers Present: Matt Kirsch – Pres, Ed Britton – VP/Prog, Rich Brook – Sec, Jim DeTar – Tres, Bob White – Memb

New Members: None

Guests: None

Treasurer's Report: None

Membership Report: 95 Members for 2006, including officers and lifetime members. We were at 89 members last year at this time

Programs Report: Devon flying and videos

Field Report:

• All fields are wet • The metal storage container is in place at Bolling Field. Thanks to all who helped install it and dispose of the old sheds • Culverts purchased for NH

Committees:

• Field Monitoring Committee – None • Field Search Committee: Currently deactivated • Sound Committee: None • Turbine Committee: None • Events: o Oct 8 annual RCCR club picnic at the Ski Lodge o Combat meet on Sept 30 – Need cooks and scorers

Old Business:

• The club bylaws were reviewed and all changes were passed

New Business:

• This is an election year. All positions are available. • Mike Mance is the new RCCR newsletter editor • There has been a change at the Monroe County Parks Dept. Our new contact is Casey DiCaro • The OK was given to reserve the NHSki Lodge for Oct 9, 2007 • The June FF for 2007 is scheduled for June 23-24 • The Feb Roast is scheduled for Feb 16, 2007. We need a volunteer for the MC. Greg Kesel was unanimously voted in

Announcements:

• Next meeting is on Oct 11, 2006, at Salem Church. • Combat Meet on Sept 30 at Hasman Field • Superman Jet Meet – Oct 4-8 – Cape Girardeau, Mo

Show and Tell:

• Don Steeb – Antique Radio Museum • Jim DeTar – Flying Aces in Muncie – Jim is now Grand Master “D” • Pete Durante – Model Airplane News Cub R/C Conversion • Trevor Ewell – Mini Funtana electric and FMA Cellpro charger • Devon McGrath – Knuffel Foam Electric and JR6102 Spread Spektrum Conversion • Mike Mance – Airport Security Update • Matt Kirsch/Ed Britton – Stika Vinyl Graphics cutter  
50/50 –

## 10/11/06 RCCR Minutes from Oct 13, 2006 meeting at Salem Church

Officers Present: Matt Kirsch – Pres, Ed Britton – VP/Prog, Rich Brook – Sec, Jim DeTar – Tres

New Members: None

Guests: None

Treasurer’s Report: read & accepted. Checks still need to be written for the Lodge on the Green reservation and the Ski Lodge reservation

Membership Report: 95 Members for 2006, including officers and lifetime members.

Programs Report: Stika Vinyl Graphics Cutter

Field Report:

• John Floyd and Trevor Ewell indicated that a survey, at NH, needs to be performed in order to determine the Ditch Pitch. A suggestion was made to dig out both the N and S ditches and connect them at the E end of the runway. This must be reviewed with Russ, the NH foreman. We will probably have to wait until the spring • Trevor spoke to Russ about Turbine Jet flying at NH • The access road to the runway, at Hasman Field, is softening up and will soon need to be blocked • The road into Bolling Field is wet, but the runway is dry

Committees:

• Field Monitoring Committee – None • Field Search Committee: Currently deactivated • Sound Committee: None • Turbine Committee: Greg Kesel has received only one response to the request for any additions or deletions to the initial interim NH Turbine field rules. It was suggested that a note should be added indicating that all existing NH field rules need to be adhered to, as well • Events: None

Old Business:

• The Combat Meet, at Hasman Field, was a success. There were 7 contestants, 2 from Lockport. Bill Stauber lost 3 aircraft. Greg Kesel received a call from the Coast Guard indicating that he was observed operating an unsafe, unlicensed watercraft and posing as a Navy Seal. It appears that the named watercraft was a small, 35 year old rubber raft belonging to Trevor Ewell. Greg and Bill Stauber were involved in a midair and Greg volunteered to retrieve the plane from the island in the pond • Elections for RCCR club officers will take place in December • The annual RCCR Roast will be held on Friday, Feb 16, at the Lodge on the Green. The girls will bring the desert • The RCCR End of Season Picnic was a big success. There was a record number of flyers at NH, after the picnic

New Business:

• Dick Peterson underwent a knee replacement operation • Jerry Joseph recommended that the WNYFFS try not to schedule their events in conflict with the RCCR Great Electric FF. Jim DeTar will look into this • Next year is the 50th anniversary of the RCCR as a chartered club. Greg Kesel indicates that the RCCR may be one of the oldest AMA clubs. We should try to have a special recognition event. Ed Britton will look into the situation • A vote was taken to move our meetings to the front meeting room. It was approved. • Matt Kirsch suggested that we change the format of our two monthly meetings and reserve the first meeting for business and the second meeting to be scaled down. Jim DeTar suggested we strive for shorter meetings. Greg Kesel suggested we start meetings at 7. Don Steeb suggested we leave things as they are. • Greg Kesel reported that Ledge Dale Airport was up for sale. The asking price is \$4 million. Due to government funding, it should remain an airport for some time • There was more discussion regarding the interim Turbine Field Rules for NH

Announcements:

• Next meeting is on Oct 25, 2006, at Salem Church. • Spiderman Jet Meet – Oct 19-22 • Jamestown Auction on Oct 14 • Herkimer Auction on Nov 4 • Hobby House Swap Meet on Nov 18

Show and Tell:

• Dick Kosbab – Two wheel dolly for flight box • Joe Somers – Pop and Water was donated to the Salem Soup Kitchen • Ron McGrath – E conversion of old Taylorcraft • Devon McGrath – Jeti Spin records inflight data • Matt Kirsch – Photos of recent combat meet

50/50 – Bob Schoepke

## 10/25/06 RCCR Minutes from Oct 25, 2006 meeting at Salem Church

Officers Present: Matt Kirsch – Pres, Ed Britton – VP/Prog, Rich Brook – Sec, Jim DeTar – Tres, Bob White - Memb

New Members: None

Guests: None

Treasurer’s Report: None

Membership Report: 98 Members for 2006, including officers and lifetime members. 3 new members were voted in (Barletta – Father and 2 Sons)

Programs Report: Stika Vinyl Graphics Cutter

Field Report:

• Hasman Field road to runway is closed due to wetness. There were some ruts on the grass on the North side of the red building • The entrance road to NH park is closed for the season • The road into Bolling Field is usable and the field is dry. One more mowing will occur. A shelf was added to the Steel Storage Container • The Portapotties have not been picked up, yet, at Hasman and Bolling. Jim DeTar will inquire

Committees:

• Field Monitoring Committee – None • Field Search Committee: Currently deactivated • Sound Committee: None • Turbine Committee: The Turbine Committee needs to meet again to discuss some minor issues • Events: None

## 11/08/06 RCCR Minutes from Nov 8, 2006 meeting at Salem Church

Officers Present: Matt Kirsch – Pres, Ed Britton – VP/Prog, Rich Brook – Sec, Jim DeTar – Tres, Bob White - Memb

New Members: None

Guests: None

Treasurer’s Report:

Membership Report: 99 Members for 2006, including officers and lifetime members. Vince Mancuso voted in

Programs Report: WXXI TV warbird video

Field Report:

• Portapotty is still at Hasman • Hasman has been mowed, including the winter runways. The frequency board was moved to the hangar. The roller is still missing. The road to the runway is dry, for now • John Floyd recommends that we put up flags, instead of a wood barrier, to block the road down to the Hasman runway • Bill Wegman reports that the car lot next to the Hasman access road has cut down some trees that were blocking the access road • A rut was found at the South end of the N/S runway at Bolling Field

Committees:

• Field Monitoring Committee – None • Field Search Committee: Currently deactivated • Sound Committee: None • Turbine Committee: Ron Griswald flew his AV8R turbine powered jet at Bolling Field. • Events: None

Old Business:

• The Dec elections are coming up • The 50th anniversary of the RCCR is 2007. • The Feb Roast will be held on Feb 16 • Trevor Ewell will again arrange the picnic for the NH park employees



New Business:

• We will need a new CD for the Annual New Year's Day Chilly Chili Fun Fly • The Brighton HS Festival of Ideas is coming up on Mar 3 • The After Meeting Dinners will now be held at Perkins, West Ridge • Phil Evans had cataract surgery

Announcements:

• Next meeting is on Nov 22, 2006, at Salem Church. • Hobby House Swap Meet on Nov 18

Show and Tell:

• Rich Brook – Sears miniature short bit drivers • Bob McClure – Dick Smith thanks us for the get well card • Greg Kesel - Eflight Ultimate Biplane and a report on Mark Gillette's crash

50/50 –

## 11/22/06 RCCR Minutes from Nov 22, 2006 meeting at Salem Church

Officers Present: Matt Kirsch – Pres, Ed Britton – VP/Prog, Rich Brook – Sec, Bob White - Memb

New Members: None

Guests: None

Treasurer's Report: None

Membership Report: 101 Members for 2006, including officers and lifetime members. Jack and Arron Bearce voted in

Programs Report: Aerofly Pro Deluxe

Field Report:

• Portapotty is still at Hasman • Hasman is wet. Some ruts. Equipment put away. Flags in place on entrance road for snow plowing • Bolling Field is dry • John Floyd, Dick Casbah, and company completed a survey of the NH runway and found the west end was 10ft higher. For now, the ditch needs to be kept clean • Bill Wegman reports that BC park is quite a mess with all the excavation. There was a \$50 to Forest Skelton. There was some discussion about the proposed enhancements to BC park and capabilities for electric R/C aircraft as well as gliders. The discussion was tabled

Committees:

• Field Monitoring Committee – None • Field Search Committee: Currently deactivated • Sound Committee: None • Turbine Committee: None • Events: None

Old Business:

• Next meeting is Dec 13 – Annual elections and Show/Tell drawing • The 50th anniversary of the RCCR is 2007. • The Feb Roast will be held on Feb 16 – Matt estimates \$16/person – The RCCR dollies will provide the desert

New Business: None

Announcements:

• Next meeting is on Dec 13, 2006, at Salem Church. • 1st Fall Armory electric event will be on Dec 10 • BHS Festival of Ideas on Mar 3, 2006 • Chilly Chili FF – Hasman Field – Jan 1, 2006 – Need heater and tables • There was discussion about a Swap Meet at the Armory

Show and Tell:

• Dick Peterson – Greg Kesel's haircut • Phil Evans – Reported on Pete F's wallet incident • Greg Kesel - Riot 3D • Devin McGrath – Eflight Extra260, Manta electric, and Spektrum receiver • Matt Kirsch – H9 Twist

50/50 – Mike Hatch

## Pictures From Around the Club



**Chilly Chili Fuhn Fly  
January 1, 2007 at Hasman**



**2007 Chilly Chili Fuhn Fly**

# Matching Propeller to Mission

By: Don Brooks  
(Re-Printed from the AMA online E-Zine, Sport Aviator)



My all-time favorite aircraft to fly is a .40-powered semi-scale P-51D Mustang. However, landing this model used to be another story entirely; it was too fast on final to make a three-point landing. Every good landing had to be a “wheels” landing with touchdown on the mains. Landed in this manner, the model often flipped over and struck the fin ignominiously on the pavement as it skidded to a stop.

My trips out on the runway to retrieve my upside-down aircraft were a source of shame. I almost decided to go back to my high-wing trainer and forget the Mustang. Then, during one particular flight, the most amazing thing happened: the engine flamed out. I had to shoot a dead-stick landing. It was the best approach and touchdown I had ever flown with the model; I even three-pointed the landing.

With the 10 x 6 propeller I was using and with the engine at idle, the model’s airspeed was too high for an easy approach and landing. To reduce the airspeed on final, I switched to a 10 x 5 propeller. What a difference! The P-51 was still a pleasure to fly, and landings no longer ended with a flip and skid on the fin. Sometimes, when not limited by the pilot’s skill, the landings were even graceful. Bring out the observers! I was ready to show them a thing or two.

Whether you are flying a hot warbird or a slow-flying Piper Cub, the propeller you select makes a great difference in how a model performs. With the right propeller for the model’s mission, each flight is a delight.

“So, what is the model’s mission?” you may ask. I judge the model’s mission to be adequate performance in each of three phases of flight: takeoff and maneuvering, cruise level flight, and landing.

The takeoff-and-maneuvering phase tends to require a larger-diameter but shallower-pitch propeller for maximum thrust. Wing lift increases in step with the airspeed squared. To generate sufficient lift to maintain level flight with an aircraft having a high wing loading, we must fly at higher cruise airspeed. So for cruise we may need a more steeply pitched propeller to get the higher speed.

If we increase the propeller pitch, we may also have to decrease the propeller diameter to maintain the engine rpm in the best operating range. If we don’t have flaps on the aircraft, we may be back to needing a lower-pitched propeller for the landing phase.

Since most of us don’t have a variable-pitch propeller on our models, we must select a propeller that best matches at least the minimum requirement for each phase of flight. Therefore, selecting the propeller to match the mission requirements will be a compromise. To do this job properly, we need guidelines for making informed judgements.

I’ll show you three tools you can use to make objective judgements on adjustments to match the propeller to your model aircraft’s mission: graphs for calculating stall and minimum cruise speeds, graphs for calculating pitch speed, and equations and a graph for calculating the static thrust produced by a propeller.

To use these tools, you will need a tachometer. You will also need a way to calculate or measure static thrust. I’ll show you how to do that. I’ll make the judgements based on two rpm measurements: one at full throttle and one at idle.

Does that sound simple? It is. I wish I had these tools when I was trying to solve the problem with the P-51. I would have been much more confident in the outcome of the propeller change and its effect on the Mustang’s flying performance.

**Stall and Cruise Airspeeds for Models:** An estimated stall speed can be calculated using the equation in the sidebar. The calculation is even easier if one only has to look up a number on a graph, so in Figure 1 I’ve plotted graphs of model stall speed as a function of wing loading for four elevations: sea level, 2,000 feet, 4,000 feet, and 6,000 feet.

In the calculations for these graphs, I assumed a value of 1.3 for the lift coefficient, a temperature of 70 degrees Fahrenheit, and an appropriate barometric pressure for each elevation. A lift coefficient of 1.3 is the approximate value for several common airfoils when operated near the stall condition.

Please examine Figure 1. Airspeed is shown along the vertical axis. Wing loading is shown along the horizontal axis. To use the graph, calculate the wing loading; i.e., model ready to fly weight in ounces divided by the wing area in square feet. Locate the value of the wing loading along the horizontal axis. Slide a pencil point upward until you reach your flying-field elevation. Estimate a point for elevations not represented on a graph. Read the stall speed off the y-axis for your field elevation.

I'll use my P-51 as an example. Ready-to-fly, it weighed 88 ounces and the wing area was 490 square inches (3.4 square feet). The calculated wing loading was 26 ounces per square foot. At my flying field elevation of 4,740 feet, the stall speed for my P-51 is 24 mph.

In the Model Airplane News article "Electric Power for Scale Models," Bob Benjamin recommended at least two times the stall speed as a minimum level-flight cruise speed. Applying these criteria to the P-51, the minimum cruise speed should be 48 mph. Keep these two values in mind as we look at the second tool: the pitch speed graph.

### **Pitch Speed at High and Low Throttle**

Figure 2 shows lines of constant pitch speed for various combinations of propeller pitch and propeller rpm. The pitch speed is the maximum level-flight airspeed that would be achieved for a particular propeller rpm if the propeller did not slip in the air and the model had no drag.

However, we would never expect the model to fly at 100% of the pitch speed; real propellers do slip in air, and real models do have drag. But there is a compensating mechanism. Note that the propeller unloads when in level flight, which would make the in-flight rpm greater than what we measure during a static run-up on the ground. This propeller unloading compensates for some of the effects of slippage and drag.

For our purposes I will assume that the high-throttle pitch speed is the same as the high-throttle airspeed in level flight. The relationship is not exact, but it gives us a useful gauging tool.

Let's continue to use my P-51 with the 10 x 6 propeller to illustrate how this information can be used. With the 10 x 6, the high- and low-throttle rpm values were 11,000 and 3,000 respectively.

Looking at Figure 2, find the pitch of 6 and slide a pencil point upward along that line until you reach the rpm value of 11,000. Estimate the high-throttle pitch speed by the relationship of this point to the two closest pitch speed lines. Note that this point is approximately one-third of the way between the 60- and 70-mph lines. I read this pitch speed as 63 mph. This is well above the minimum cruise speed of 48 mph.

At low throttle, the pitch speed of 17 mph is not far below the stall speed of 24 mph. If the model were maintaining level flight at 24 mph, it could be just above the stall speed and fly on and on. This relatively high pitch speed with the engine at idle explains a lot about why my P-51 did not want to settle in during the final approach and landing.

When I changed the propeller pitch to 5 inches, I didn't want to lose takeoff and maneuvering thrust. So instead of changing to a 10 x 5, I selected an 11 x 5. The 11 x 5 loaded the engine more than the 10-inch propeller, so the engine only turned it at 10,200 and 2,500 rpm at full and low throttle respectively.

Looking at the graph for a pitch of 5 inches and rpm values of 10,200 and 2,500, I read pitch speeds of 48 and 12 mph. I'm right at the recommended minimum for cruise speed. But now the combined effect of lower idle rpm and lower pitch have reduced the low-throttle pitch speed to roughly half the stall speed.

With the model on final and flying faster than the stall speed of 24 mph and with the propeller trying to move forward at 12 mph, the propeller acts as a brake to help slow the model. This combination of factors produces an easy, steady descent for landing. I have not only solved the problem, but now I have some numbers that we can tag to the aircraft performance if we want to try a different propeller.

### **Takeoff and Maneuvering Thrust**

Now you might be thinking, "He changed the prop from a 10 x 6 to an 11 x 5. That took care of the high approach speed on final. But what did he do to the takeoff and maneuvering thrust for the model at full power?" One could calculate or measure the static thrust to ensure enough thrust for takeoff and maneuvering.

Using the thrust and air-density equations (see the equation sidebar), a modeler could simply calculate the maximum static thrust for the two propellers. For this calculation we need to know the propeller thrust coefficient and the air density.

The thrust coefficients for the Master Airscrew 11 x 5 and 10 x 6 propellers are 0.079 and 0.099 respectively. I obtained these values from Appendix C of my book *Prop Talk, Understanding and Optimizing Propeller Performance for Model Electric Aircraft*.

To calculate the air density, we need the local barometric pressure and air temperature. The average local barometric pressure for my flying field at 4,740 feet is 25.30 inches of mercury. I assumed an air temperature of 70 degrees Fahrenheit. The air density under these conditions is 1.014 grams per liter. I calculated the thrust of the 10 x 6 propeller at 11,000 rpm and at this air density to be 50.6 ounces. The thrust calculated for the 11 x 5 propeller at 10,200 rpm was 50.8 ounces. Even though the 11-inch propeller had a lower thrust coefficient and operated at a lower maximum rpm with my K&B .40 engine, it produced equivalent thrust because thrust increases with the fourth power of the propeller diameter.

If math is not your favorite thing, the thrust measurements for this third step could be made directly. A rough measurement could be made using a fishing scale attached to the tail of the aircraft during a run-up with each of the propellers to be compared. More accurate bench measurements could be obtained using an engine test device such as the American Hobby Products Thrust-Finder.

This bench test could be done even before you have the aircraft built. I plotted the thrust curves for the Master Airscrew 11 x 5 and 10 x 6 propellers, ending at the maximum rpm for each with the K&B .40 in Figure 3. These graphs show how the propeller thrust changes with rpm.

If the thrust coefficient, air temperature, and barometric pressure are known, plots such as those in Figure 3 can be made for any propeller for various values of operating rpm using the thrust and air-density equations. Here is some work for your calculator. These graphs may be useful on those days when the engine rpm is lower than previously measured for some reason. You could use the graphs to verify that you still have sufficient takeoff thrust.

So for the Mustang and the change to the 11 x 5 propeller, I've verified the match of the propeller to the model mission. I've reduced the model's approach speed while preserving thrust for takeoff and maneuvering and ensuring sufficient pitch speed for cruising flight. When I made the adjustment a long time ago, it was by trial and error. I've verified my expectations from the long-ago adjustment using graphical estimating tools.

### Matching the J-3 Mission

My friend Ken Marler had an engine I wanted to bench-test for possible use in a 1/4-scale Piper J-3 Cub. The engine was a Fox .74 two-stroke, and Ken's suggested propeller was a Zinger 12 x 5. We set up to test this combination on my new Thrust-Finder.

At high and low throttle, the rpm readings were 10,800 and 4,800 rpm. The Cub was projected to weigh 15 pounds (240 ounces) and would have a wing area of 1,600 square inches (11.1 square feet). The wing loading was calculated at 22 ounces per square foot.

From Figure 1, the stall speed for the J-3 would be 22 mph, and the minimum cruise speed would be 44 mph. From Figure 2, for a propeller pitch of five inches operating at the low- and high-throttle rpm we measured, the pitch speeds would be 23 and 51 mph. The measured full-power thrust was 93 ounces, which more than meets my minimum guideline of one-third the model's weight (80 ounces) for takeoff thrust.

With a stall speed of 22 mph and a low-throttle pitch speed of 23 mph, this model would be worse than the Mustang. It would never land until it was out of fuel. Obviously, we did not have the idle adjusted properly. This engine should easily idle at 3,000 rpm or less. From Figure 2, for a propeller with five-inch pitch and with it spinning 3,000 rpm, the pitch speed would be approximately 15 mph. This compared to a stall speed of 22 mph is barely low enough to land. A 12 x 4 might work better.

Let's see how the numbers work out for the 12 x 4 propeller. At 3,000 and 10,800 rpm, it would give pitch speeds of 12 and 41 mph respectively. The 12 x 4 would work better in the landing pattern but would provide a full-throttle pitch speed less than the minimum cruise speed of 44 mph. At 10,800 rpm and an air density of 1.014 grams per liter, a Zinger 12 x 4 with a thrust coefficient of 0.075 (reference Bob Benjamin's article) would produce 76 ounces of thrust, which is a bit less than we think we need.

Let's hope that the decrease in pitch results in an increase in the high-throttle rpm. If so, this could fix the thrust and cruise-speed problems. We could try this propeller knowing that the takeoff run would probably be a bit longer than with the 12 x 5.

What have we done? We defined the model mission as adequate flight performance in all three phases of model flight. We examined three tools that use rpm readings for input to help us match the propeller to the model mission.

Figure 1 can be used throughout a wide range of flying-field elevations, and Figure 2 is universally usable, regardless of location or air-density considerations. Preserve them for future reference; you could laminate Figures 1 and 2, and keep them in a handy place. Figure 3 is only good for the specified propellers, air temperature, and air pressure. If you want to use graphs such as these, you must construct your own Figure 3 for your particular propeller(s) and flying location using the thrust and air-density equations.

Have you matched the propeller of your favorite model to its mission? Try it; a successful match makes the flying much more fun. Good flying! MA

Don Brooks

900 Bower Dr.

Idaho Falls ID 83404

References and Source:

Model Aircraft Aerodynamics (ISBN 1-85486-121-2): page 21 Martin Simons, Argus Books, Argus House, Boundary Way, Hemel Hempstead Herts HP2 7ST, England (1994)

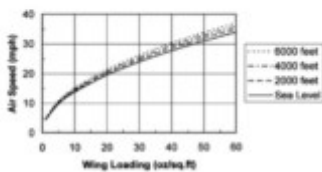
"Electric Power for Scale Models" Bob Benjamin January 2001 Model Airplane News, page 82

Prop Talk, Understanding and Optimizing Propeller Performance for Model Electric Aircraft (ISBN 0-9657014-0-9): pages 77 and 80 Donald W. Brooks

**NOTE: Please forgive the blurrines of the figures and graphs. They were not readable even in the original article E.B.**

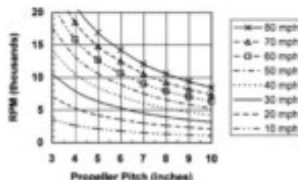
Sea Level	2000 feet	4000 feet	6000 feet
1	4.4	4.5	4.6
5	8.8	10	10.7
10	13.2	14.2	14.6
20	18.5	20.1	20.7
30	23.9	24.6	25.1
40	27.6	28.4	28.7
60	33.8	34.8	35.7

Figure 1: Stall Speed as a Function of Wing Loading and Elevation



80 mph	70 mph	60 mph	50 mph	40 mph	30 mph	20 mph	10 mph
3	28.16	24.84	21.12	17.6	14.08	10.56	7.04
4	21.12	18.48	15.84	13.2	10.56	7.92	5.28
5	16.80	14.76	12.672	10.56	8.448	6.336	4.224
6	14.24	12.48	10.68	8.8	7.12	5.34	3.58
7	12.072	10.56	9.024	7.545	6.036	4.527	3.018
8	10.56	9.24	7.82	6.4	5.28	3.96	2.64
9	9.364	8.211	7.036	5.665	4.662	3.516	2.345
10	8.448	7.362	6.336	5.28	4.224	3.168	2.112

Figure 2: Pitch Speed as a Function of RPM and Propeller Pitch



	MA 11x5	MA 10x6
0.001	0.001	0.001
2	2	1.7
4	7.8	6.7
6	17.6	15
8	31.2	26.7
10	48.8	41.8
11		50.8
10.2	50.8	

Figure 3: Thrust Graphs for Two Master Aircrow Props at 4740 Feet and Air Temperature 70 Degrees F

