Winter 2016

Thermal Journal

Dedicated to the never-ending battle against the law of gravity

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Submissions the Thermal Journal in the form of letters to the editor, articles or photos (please include appropriate caption information) are always welcome. Use the editor's address provided above.

The Editor's Ramble:

As we begin 2016, the indoor season is in full swing and our plans for the outdoor season are in place along with a few new activities to try out.

We are once again helping out with the Science Olympiad's aeromodelling events. The High School competition (for rubber powered propeller driven models) was held in January at Brockport State University. Still to come is the Junior High contest which will be held at Saint John Fisher College on March 12. This year the Junior High event is "Elastic Launch Glider". Anyone interested in helping out should contact Bob Clemens at rclemens2@rochester.rr.com

The current indoor flying season has been going on since November of last year. Attendance has been very good with a wide variety of models being flown. Indoor flying will continue through March. Check out the website for details.

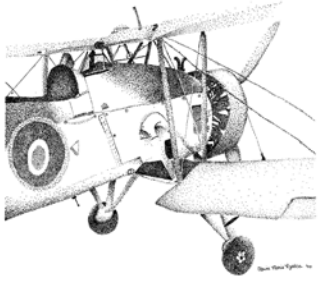
One of the newer outdoor free flight events is E-20. This is a fairly simple electric power event which should make it easier for new modelers to get started in free flight. To make it more enticing, we will build a few models will be built to have on hand for interested spectators to try out at our contests. There is a write up on an E-20 power system in this issue which includes a few links for additional information such as E-20 rules and sources.

In the "Dates to Keep in Mind" below, you will note an event for "E-20 Build Wrap Up." This session will be held to "encourage" completion of our club E-20 models. Details have not been worked out since it is not known what will be needed. Let Brad know (contact info is in the masthead on the left) if you are interested in helping out.

Continued on page 2

Dates to Keep in Mind:

E-20 Build Wrap Up	March 26
Spring Picnic & Rain Date	April 30 & May 21
Spring Opener (a.k.a., Hobo meet):	May 7 & 8
Spring Opener Rain Date:	May 14 & 15
FAC Outdoor Nationals	July 13 ~ 16
ESSFC:	August 12, 13 & 14
Pirate Challenge:	August 26, 27 & 28
GGG:	September 9, 10 & 11



Meeting Minutes from 2015 Annual Meeting

Club president Brad Bane called the meeting to order at 1:19 PM. As the first order of business, we covered the Old Business.

Old Business

Club secretary, Mark Rzadca, read the minutes from 2013 meeting. Roy Smith moved that the minutes be accepted as read, Jack Barker seconded. The movement was unanimously accepted.

Club treasurer's report was made by club treasurer, Ruth Bane. Our finances were in good order with $3044.23 on hand. Lyle Whitford moved that the minutes be accepted as read, Jim DeTar seconded. The movement was unanimously accepted.

As part of Old Business, Brad suggested that contacts for the King Orange International be included on WNYFFS email list.

New Business

Joe Mollendorf motioned that the club make a contribution of $600 to the National Warplane Museum. The motion was approved unanimously.

Mark Rzadca motioned that the club make a one-time contribution to the National Warplane Museum of $200 to partially make up for the losses incurred by the museum at their Corn Roast. The motion was approved unanimously.

Flying Dates

The following dates were announced for our 2016 outdoor contests in Geneseo:

Spring Opener:	May 7 & 8 (Rain date: May 14 & 15)
Empire State Free Flight Championships:	August 12, 13 & 14
Pirate Challenge:	August 26, 27 & 28
Great Grape Gathering:	September 9, 10 & 11

Jim DeTar made a motion to explore the idea of having E-36 models available so that visitors to our contests could try out Free Flight at our contests. The motion was approved unanimously.

Announcement of planning Meeting for 2016:

Planning meeting will be held on January 2, 2016 at the Bane's. All are welcome. Doors open at 12 noon or a bit before if you are nice to the hosts.

Motion to Adjourn:

Ruth Bane's motion to adjourn was seconded and unanimously carried.

Mark C. Rzadca, *secretary, Western New York Free Flight Society*

The Editor's Ramble:

As another new activity for the WNYFFS, we will have a club picnic at the airfield where Brad and Ruth hangar their Super Cub. Dates are provided on page 1. Let the Banes know you are coming if you can; it's not required but it sure makes it easier to plan when the number of attendees is known. We'll be eating the usual picnic foods. We sure to have a wealth of hangar talk and even a hanger or two to explore.

In a change from previous years, the Spring Opener will *not* include any official events. It has been a long time since anyone seriously competed at the Spring Opener; or Hobo Meet for that matter. That event will be officially recognized as a practice session. Fortunately, given the peccadillos of Upstate weather in May, we also have a rain date. As usual, AMA or MAAC membership (insurance) is required.

Contest flyers for the Empire State Free Flight Championships and the Pirate Challenge are included for your review. Only modest changes have been made for those contests. Both the ESSFC and the GGG will include the E-20 event so you may as well get building. Your editor plans to scale down a Starduster plan for E-20.

With the quiet and the ability to control the motor run, trimming models at modest fields close to home is quite reasonable with electric power. That adds to the appeal of the event. School yards offer only a limited opportunity for trimming rubber models. Once you're past the bare minimum of turns, most schoolyards are just too small. For glo power ships, it is out of the question to fly in suburbia at all. This could be just the ticket to enjoying *flying* free flight outdoors between contests.

If you weren't at the Annual Meeting, you missed you chance to pay your dues the easy way. Send your check to Ruth at the address included on the Masthead. It's not too often that you can make a donation and know ALL the money is going to support the cause. Everything goes to supporting free flight. Makes you feel good just to think about it. You'll feel even better when you actually do it!

Till the next time, build light, build straight and fly often.

Mark C. Rzadca, editor, WNYFFS Thermal Journal.

Bench Top Dust Collector

While working wth a number of Science Olympiad competitors during the 2015 building season, our interest increased in building Catapult Launch Gliders. In anticipation of the 2015-2016 your editor started building a couple of new gliders including a Vartanian. Anyone who has built these all sheet balsa models knows that a lot of sanding is involved. Balsa must produce the most annoying dust since the particles are so light they float forever. One way of dealing with the dust was suggested years ago by Bob Clemens. He has a standard house vacuum near his work table. When doing any significant sanding, he sets up the vacuum to pull in the air in the near the sanding operation. That works very well but it is a bit of a nuiscance to set up the nozzle and hold it in place. On the bench top, the a vacuum hose gets in the way and can wreck havoc on our fragile models. In addition, the vacuum can be noisy. On the other hand, if you have a cooling fan salvaged from a computer, it is possible to make up a bench top dust collector without too much effort.

Computer cooling fans (also referred to as “Muffin Fans”) are relatively high flow devices. They are not able to turn over the volume of air in a hobby room too often but by working close to the fan, a majority the very light of dust is pulled through. These fans are typically powered by 120 volt AC or 12 volts DC. The unit pictured uses a 120 volt fan salvaged several years ago. If a 12 volt fan is used, a DC power supply is needed. That makes setup of the 120 volt fan a bit easier. Unfortunately, most desktop computers now use the DC fans.

Fabricating the enclosure is easily done using corregated cardboard from most any source. Cardboard from a shoe box was used for the collector pictured. One of the dimensions of the shoebox matched the fan size exactly. Folds had to be made for the other edges of the fan to form an enclosure about 6 inches long by 5 inches square. Woodworker’s yellow glue was used for gluing up the cardboard.

The filter is made from a material sold a the big box home improvement stores. Locally, Lowes sells a a “cut to fit” filter material product called *NaturalAire*. A sheet 24” X 36” X 1” costs about $7 and will provide enough filter material for many bench top collectors. Three filters were cut to the size of the enclosure. That number was arrived at by trying 1 to 5 filters and choosing the max number of filters which still drew in most of the dust. By the way, according to the packaging, *NaturalAire* filters are washable so one filter set should provide several years of service.

To keep the filter material from getting too close to the fan, a cardboard panel was cut from a scrap of photographich matt board. Any thin cardboard or corregated should work. Cutting a round hole was a bit tricky but a perfect circle is not really needed. Corregated stops are located on the fan side of the panel to keep the fan from sliding agains the panel. A stop is all the more important if your fan does not have a grill as shown here.

The fan is held in place by friction so make sure your enclosure provides a tight fit. With a loose fit, the fan can slide towards the open end. When that happens, the whole assembly can tip back too easily. Place the fan about an inch in from the ouput end of the enclosure to avoid tipsy behavior. (If the enclosure is made from wood, the fan can probably be located right at the end which would allow for a smaller assembly.) If desired corregated could be used to make some stops on the output end of the fan to really lock it in. Gluing in the back stops will make the fan installation pretty much permanent.

Adding a frame to the front is not essential but helps to hold the filters in place. The simple frame shown was made from the bottom of a box which happened to be just the right size. Reinforcing strips (once again made from corregated) are needed to hold the corners together. Keep the reinforcements away from the side surfaces so the frame can slip completely onto the enclosure. A rear frame will add a finishing touch if desired.

For an AC powered fan, a simple rocker switch is put in line with a lamp cord. Once again using a DC supply is a bit more complicated since a connector matching the fan is required. Of course the connector could be used as the switch.

Although the fan does not suck in all the sanding dust, the really light particles (the ones can float forever) are pulled right in. Heavier dust settles down on the bench like always; ready for the big vacuum when the pile gets too annoying. So far, the filters have collected a good amount of dust from sanding formers and sticks as needed for typical stick and tissue assembly. It doesn’t address really heavy sanding jobs like shaping the leading edge of a 30 inch model but it helps control the light dust from smaller sanding tasks. If you have any questions send a note to the editor using the contact inforomation on the front page.

Coming soon to a contest Near You!

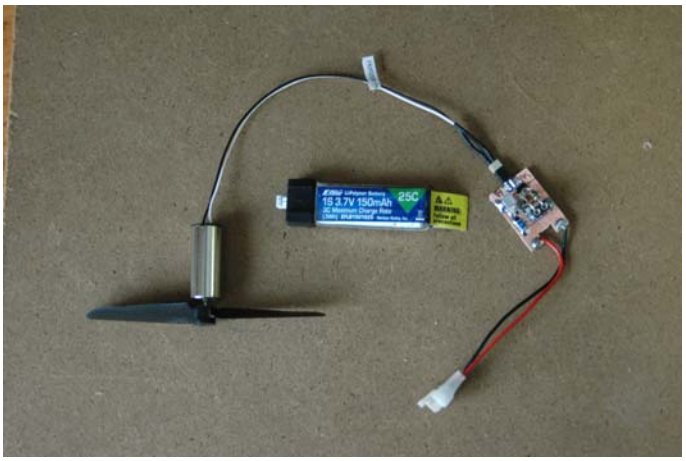
Thoughts on E-20 Power

E-20 at the ESFFC and the GGG

For those interested in E-20, here are some pictures and data for your consideration. As is often the case, Jim DeTar has jumped out in front. He has already turned out two models. One will be available to the club to use as a "loaner" for interested parties to try out free flight at our contests.

The data included here is provided for reference. Other systems will behave differently.

Timers from the Willamette Modelers are available for a modest cost. They do not include a low voltage cut off so essential to the wellbeing of LIPO batteries. Instead it will be the modeler's responsibility to monitor the battery's voltage or keep track of the amount of current used. Here is a simple example of how to calculate the amount of "juice" used or the number of flights available with a given system.



Motor, propeller and motor run timer as provided by Willamette Modelers along with 150 mAh LIPO battery from Horizon Hobby. These are the components used for the measurements described in this article. Note, this is a sample of one and a sample of one is next to none.

For starters, rules for E-20 stipulate a single LIPO cell not exceeding 160 mAh (milliamp hour) capacity. That means the cell will put out (under some specific test conditions) a current of 160 mA for one hour. Alternately, a current of 80 mA would be provided for 2 hours. In other words, the product of the current (in mA) and the time (in hours) will always be 160. Of course battery technology being what it is, higher currents than those used for measuring the battery's capacity will result in a lower capacity than specified. We can be confident that the test current used to measure the capacity of a 160 mAh battery is significantly lower than the current used for flying an E-20 model. Rest assured the capacity will be less than the advertised value when used to power a free flight model.

A simple measurement of the current drawn with the system as sold by Willamette Modelers shows that during the majority of a 10 second motor run, the current draw is about 2,100 mA (that is 2,100 milliamps or 2.1 Amps). Note that a 150 mAh battery was used for the measurements because that is what was on hand. The difference in capacity does not make any significant material difference in this discussion.

To use of this measured value, we must convert to a current capacity with equivalent units as provided for the source battery. This is done by recognizing we expect to draw the average current for 10 seconds or 2,100 mA times 10 s for a total of 21,000 mAs (that is, milliamp seconds). By converting the 10 seconds to the equivalent portion of an hour we can calculate the portion of current capacity utilized. As with any physical calculation, always be mindful of the units.

21,000 mAs X 1 min/60 s X 1 h/60 min = 5.8 mAh

If on the other hand, the motor had been run for 20 seconds, the result would be twice the above quantity, or 11.6 mAh. Additional results for other run times or current draw can be easily calculated as needed. In words, multiply the run current (in mA) by the run time (in seconds) and divide by 3600 to determine the milliamp hours consumed in a run.

These values can now be directly compared with the test battery's stated capacity of 150 mAh. For example, motor run duration in E-20 starts out at 20 seconds. So for each flight approximately 11.6 mAh will be consumed. Our 150 mAh battery will allow (theoretically at least) 150/ 11.6 = 13 such flights. (Using the maximum battery capacity allowed in the rules of 160 mAh would yield 160/11.6 or 13.8 flights.) However, one must be careful to NOT over discharge a LIPO battery. Doing so will absolutely destroy the battery. To be safe, consider 7 or 8 flights of 20 seconds motor run as a reasonably number. (Alternately, the number of seconds available at a representative current draw could be calculated for the stated amp hour capacity. With an appropriate safety factor, the cumulative time could be calculated following each flight to determine when to recharge.) Batteries being what they are, the voltage will drop after each flight. Thus, less power will be available for latter flights and the climb will be less with each subsequent flight. For competition, we will probably not take more than 2 to 4 flights from a battery before recharging. That provides a much better safety margin for the battery.

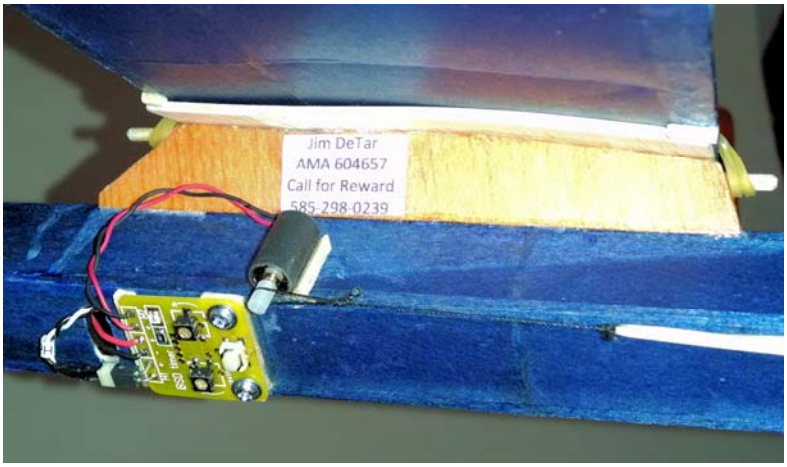
Fortunately, the batteries used in E-20 are not too expensive; the battery used for this test was purchased at Performance Hobbies in Webster for about $5. The connector included was the correct one to use with the system as purchased from the Willamette Modelers.

A few additional measurements and notes:

- Max RPM measured using the provided propeller was 16,200 RPM.
- At a speed of about 15,500RPM, the current draw was 2,100 mA.
- Average RPM was about 15,000 RPM.
- Peak current draw (at motor start) is something *over* 2,300 mA. (Technique used to determine peak was to watch multi-meter at motor start for several starts and note the highest current observed. Multi-meters have a significant delay and take time to "read" the current as well so this is only a rough approximation, and likely low.)
- After 10 runs (of 10 seconds duration) the highest current observed was 2,000 mA or less.
- RPM drops noticeably after about 7.5 seconds. This is likely a characteristic of the timer design.
- Motor, propeller and motor run timer collectively weigh 6.5 grams
- LIPO cell of 150 mAh capacity weights 4.4 grams
- All representative current draws stated here are based on use of the components as provided. Changing any component (such as the propeller, for example) will change the current consumed.

One of Jim DeTar's E-20 models. This one was built from Bob Stalik's "EAP II" plan. This will likely be one of the models made available as a loaner for visitors to our contests.

Another of Jim's models. This one is Bruce Hannah's "Mini E" design. It is equipped with Bob Selman's timer with pager motor DT system.



Closeup showing Jim's installation of the Bob Selman motor run timer and DT mechanism. This is an alternate to the Willamette Modeler's system.

E-20 Links

- Official NFFS rules for E-20: https://www.freeflight.org/competition/E-20ProvisionalRules.pdf
- Willamette Modelers, source for turn-key power systems and plans: http://willamettemodelersclub.weebly.com/
- BMJR, source for laser cut E-20 kits: http://www.bmjrmodels.com/free-flight/e-20
- BSD (Bob Selman Designs) source for E-20 timer: http://bsdmicrorc.com/index.php

The Western New York Free Flight Society

Presents the 47th Annual

Empire State Free Flight Championships

2016

Part of the
National Warplane Museum Series
of
Outdoor Free Flight Contests

In cooperation with

SAM 86 Ottawa Canada

Friday Aug 12 9AM to 5PM	**Saturday Aug 13** 9AM to 5PM	**Sunday Aug 14** 9AM to 4PM
A-B Classic Gas	¼ A Nostalgia Gas	½ A Nostalgia Gas
B-C Nostalgia Gas	½ A Classic Gas (J)(S/O)	½ A AMA Power (J)
020 Replica	A Nostalgia Gas	½ A – D Gas (S/O)
Moffett	Hand Launch Glider (J)(S/O)	C-D Classic Gas
Nostalgia Rubber/Wakefield	Old Time Rubber Stick	Old Time Gas
Old Time Rubber Fuselage	E- 36 (NFFS event)	Catapult Glider (J)(S/O)
Classic Towline (J)(S/O)	E- 20 (NFFS provisional event)	36" Bungee Launch Glider
Early 1/2A Nostalgia	Cloud Tramp	P-30 (J)(S/O)
1/2A Old Favorites (see below)	Diesel Qualify	Diesel Fly Off
Diesel Qualify	FAC 2 Bit + 1 Rubber	FAC Embryo Endurance
FAC No Cal Scale	FAC Half Wakefield	FAC Old Time Rubber Fuselage
FAC Jet Catapult Glider Scale	FAC Dime Scale	FAC Golden Age Military & Civil
FAC Simplified Scale	FAC Jimmie Allen	FAC Race Planes Mass Launch,
FAC WW I Mass Launch	FAC WW II Mass Launch	Bendix, Thompson & Greve comb.

Rules for Empire State Free Flight Championships, a category III meet except:

- Old Time Gas
  16-second engine run for ignition (no glo)
  12-second engine run for old time diesel
- 020 Replica, 12 second engine run
- Moffett & Old Time Rubber:
  First three flights, 2 minute max,
  Each additional flight, max increments by 1 minute
- 1/2A Old Favorites: Any power model using a nostalgia legal 1/2A engine or the Cox TD 049/051. All fixed surfaces, no composite structures except for the motor mount. NFFS nostalgia rules for engine runs and maxes. Diesel engines will be allowed 2 seconds additional engine run.
- Junior National Cup events
  Classic Towline, ½ A AMA Power, P-30, Catapult Glider.
- Classic Towline: Straight Tow - no bunt NFFS Rules as of 2005. Alternate Bungee Launch per Great Grape Gathering specifics. Consult Great Grape Gathering rules or see CD at the contest. Contestants must use Bungee provided by CD for contest flights.
- Bungee glider: 36" or less wingspan, to be launched from a bungee consisting of 75 feet of line and no more than 25 ft. of 1/8" rubber (single strand), attached to a pole or stake fixed to the ground. Three qualifying flights of 60 seconds, flyoffs in increments of 60 seconds. Contestants must use Bungee provided by CD for contest flights.

Version 1 January 7, 2015

- Diesel Unofficial Fun Fly
  Three flights Friday and /or Saturday, 12 second run, 120 second max. Total of 250 seconds or more qualifies for Sunday 8 – 10 AM fly off, 12 second run.
- National Cup – all events will be offered
- CD for FAC events is Jim DeTar, email: jrdetar@yahoo.com
- FAC events will be flown to *current* rule book unless otherwise noted.
- Max times are subject to CD's discretion based on field conditions
- Check in at CD's table for latest in field rules.
- AMA or MAAC Proof of membership required for all contestants and casual flyers.

Date: August 12, 13 & 14 2016

Location: Geneseo, NY at the *National Warplane Museum*

Entry Fees: $25 for all events includes registration & field use fee. Juniors, $5 covers all events. Casual flyers *must* register with CD and pay $5 field use fee.

Contest Director: Ruth Bane

Contact Ruth at 585-765-9363 or windwhip47@aol.com

Dinner: At the Yard of Ale on Saturday, August 13.

Western New York Free Flight Society

and the

YANKEE AIR PIRATES

are pleased to announce the

PIRATE CHALLENGE 2016

Part of the
National Warplane Museum Series
of
Outdoor Free Flight Contests

In cooperation with SAM 86 Ottawa Canada

Awards to Third Place for events listed here

Friday, August 26
Flying 9:30 AM to 4 PM

- FAC Golden Age Combined (TOTF – Scale)
- FAC Combined Race Planes (ML)
- FAC Two Bit Plus One (TOTF – NS)
- FAC Old Time Rubber Cabin (TOTF – NS)
- FAC Simplified Scale (Misc. timed event)
- FAC Jimmy Allen (TOTF – NS)

Saturday, August 27
Flying 9:30 AM to 4 PM

- FAC WW I Mass Launch (ML)
- FAC Rubber Scale (Scale – Judged)
- FAC Power Scale (Scale – Judged)
- FAC No-Cal Profile (Misc. timed event)
- FAC Embryo Misc. (Misc. timed event)
- FAC Phantom Flash (TOTF – Scale)
- FAC Half Size Wakefield (TOTF – NS)

Sunday, August 28
Flying 9:30 AM to 4 PM

- FAC WW II (ML)
- FAC O.T. Gas Replica (TOTF – NS)
- FAC Modern Civil (TOTF – Scale)
- FAC Dime Scale (Misc. timed event)
- FAC Old Time Rubber Stick (TOTF – NS)

NOW HEAR THIS:

Flying times posted for the events are subject to change based on weather conditions. If the weather is good we can extend the flying (on either end) or if weather is bad, flying time may be shortened. Stay in touch with the official AMA CD of record, Jim DeTar (jrdetar@yahoo.com) or Mark Rzadca (wnyffs@rochester.rr.com) In addition to flexibility regarding flying time, the events flown are flexible as well. If sufficient flyers make official flights (per the current FAC rule book) to warrant a Kanone, the event will be included in the report.

Entrance & Registration Fee: $10 for contest & casual flyers. ALL contest & casual flyers must register

Proof of AMA or MAAC membership required. National Warplane Museum membership encouraged.

Version 1 January 7, 2016

Location: National Warplane Museum

Home of *The Greatest Show on Turf*

Geneseo, NY

The

Western New York Free Flight Society

presents the

2016 Spring Opener

for the

National Warplane Museum Series

of

Outdoor Free Flight Contests

May 7 & 8, 2016

Rain Date: May 14 & 15, 2016

Version 0 January 1, 2016

Event Particulars

Saturday, flying from 9:30 AM to 4 PM

- Practice Flying

Sunday, flying from 9:30 to 4 PM

- More Practice Flying

Location is the National Warplane Museum in Geneseo, NY.

As the first flying event of the National Warplane Museum Series, the Spring Opener provides an opportunity to clear the cobwebs off your existing fleet and work the kinks out of any new models. The event list is non-existent as are the prizes. FAC events may be flown on an ad hoc basis. Those with the required minimum number of flyers will be reported to the Keeper of the Kanones. FAC events will be flown per the current Rulebook.

Keep in mind that weather and field conditions can be difficult in May. It is not unusual to find conditions are not suitable for even the most gung ho competitor. Send an email to wnyffs@rochester.rr.com if you would like a status report just prior to the meet.

Once again we are fortunate to have a rain date. Even if we fly on the original date, the rain date will be available for flying.

As always, AMA or MAAC proof of membership is **required** for all flyers, contest or casual. Field use and registration fee of $10 covers both days and helps support the National Warplane Museum.

WNYFFS

In cooperation with

SAM 86 Ottawa Canada

LOW WINGERS AND THE DEADLY RIGHT HAND TURN

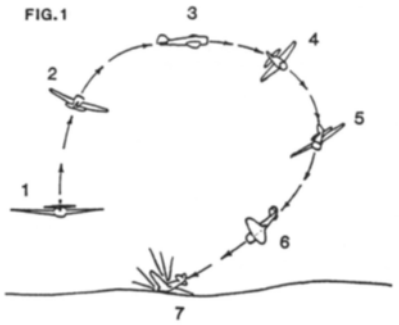
An epic fragment form the Flying Aces Newsletter

by Dave Stott.

The phenomenon we will consider in this article is familiar to many flyers of low wing rubber powered scale models. It manifests itself in that initial turn down-wind. Once a low winger successfully negotiates that turn the flyer rests easy, for if a low winger is in for trouble, it usually starts right there.

Let us review some typical flight patterns of low wing models by starting with a model that makes it's initial turn down-wind to the left. The model climbs out against the wind after launch. After gaining some altitude it begins to turn to the left. When about 100 degrees into the turn the nose begins to drop. As the model turns further down-wind it picks up speed, zooming down a bit, then up, all the while turning left. And so it goes, into a repeat of the cycle that becomes a pattern of undulating circles usually gaining a few feet of altitude with each cycle.

FIG.1



How does the flyer feel about this type of flight? "Well, not bad for a low winger, but it took a long time to gain a little altitude. And those undulating circles don't strike me as being very scale-like. Maybe if I try a tad more of right thrust, or some right rudder to open the turn up," thinks he.

Our flyer makes his trim change and tries another flight. This time the model climbs straight out into the wind. The nose gets high, the model slowing down. The nose drops to the left and the ship roars back straight at the flyer! But look what is happening to the model as this occurs…the nose plug has pulled out of the zooming ship! How in Hung could that have happened? That plug had a 5/16 long shank that was keyed to a slot in the nose block! How could it have pulled straight out against the tension of an almost fully wound motor?!? There are very powerful forces at work here, clubsters.

Let us say our flyer put in a very little bit more trim adjustment than in the previous paragraph. The model is launched and climbs straight into the wind. It begins a wide right turn still climbing nicely. It continues the wide, right turn down-wind and still climbs. Crossing behind the flyer, it comes into the wind again gaining even more altitude, and so on for a beautiful high scale-like flight of good duration. Our flyer is elated. "Boy is this crate ready! I'll be promoted in no time with the batch of kanones this bus will win for me! Why, here comes Capt. Downthrust driving onto the field. Wait 'til he sees this ship perform"!

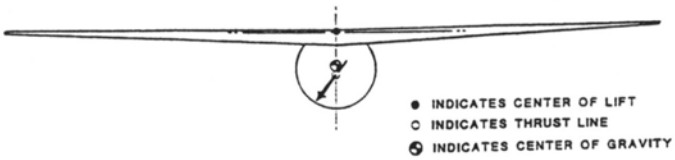
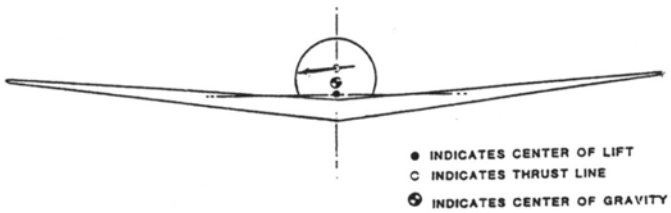


FIG.2



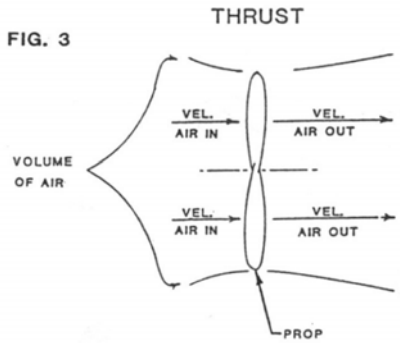
"G'mornin' Cap'n, sir, pipes our happy hero, saluting smartly. He describes his previous flight to the officer as he winds for a demo. He launches as before, but lo ... the model flys as depicted in figure 1.

"Cripes, Cap'n, I didn't change a thing on it since the last flight. I gave it a few extra turns wuz all. Geez, it come whistlin'-in like a bat outa hell"!

“Um”, says the captain. “Ya oughta make some high wing crates. They never do any of that nasty stuff”, says he as his Monocoupe screws up into the ozone like a home sick angel.

NOW, the author knows that not all low wingers fly as described above. Some sit right up there turning either right or left. But we all must admit the band between being in trim, and out of trim is pretty narrow for the low wingers. You can never really count on them flying a groove the way a high winger does. Why is it so? Much has been written on dihedral and vertical fin sizing and their effect. In this study we will add another important consideration. Thrust.

FIG. 3



THRUST=VELOCITY OF AIR OUT MINUS VELOCITY OF AIR IN TIMES THE-VOLUME OF AIR MOVED

Before going on we should look at the forces, and their location, that are acting on the models considered. Figure 2 illustrates both high wing and low wing configurations. The center of lift is determined by drawing a horizontal line from the mean chord on one half of the wing, to the like place on the other half. Where this line crosses the vertical center line is the center of lift.

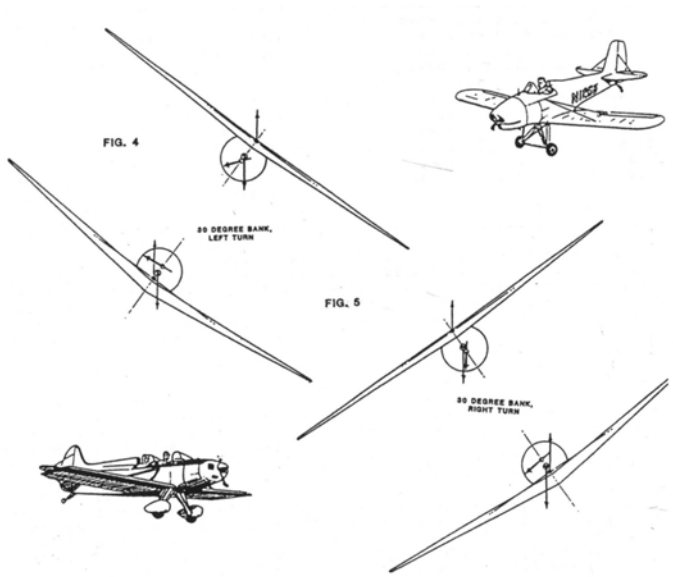
The center of gravity is well known to all. Just remember that all three axis pass thru this point. Horizontal (roll), vertical (yaw), and lateral (pitch). Think of the CG as a ball joint around which the plane moves in any and all attitudes. Notice that the CG is below the center of lift on the high wing configuration, and above it on the low winger.

The thrust line position varies according to configuration. Figure 2 shows typical thrust line locations. The arrow passing thru the thrust line location shows typical offset to compensate for torque and drag differential. More down than right for a high wing, more right than down for a low wing. The high wing has more drag above the lateral axis, while the low wing has more drag below it, hence the difference. The side thrust does not cancel torque, it only compensates for it.

Side thrust induces a yaw force around the vertical axis by thrusting the nose to the right. It is aided by the slipstream blowing along the right side of the fuselage and fin. All this to try to compensate for torque, which is a rotary force around a different axis… the horizontal axis.

Thrust is a force often misunderstood. It is easily confused with power available. Figure 3 is a simplified explanation of thrust. An airplane sitting on the ground with its brakes on and throttle wide open is developing maximum thrust. The same plane with throttle wide open and in level flight is developing little thrust. The reason is that in level flight there is but little difference between the velocity of the air coming into the prop, and the air going out behind it. When the reduced value of this figure is multiplied by the volume of air moved (which is about the same in both cases), you can see how thrust varies.

Now, where in the flight of a hand launched model does it develop he most thrust? It develops the most thrust in the second half of its initial turn down wind, about at position 4 in figure 1. This is because the velocity of air entering the prop has been reduced by its turning away from the wind. It is developing more thrust to "catch up" to the speed the power available (which is still very high) can provide. Remember where the model was in its flight path when the nose plug unseated?



Now let's look at the forces, their magnitude and direction, as models go through that crucial down-wind turn.

Figure 4 shows both a high wing and low wing model in a left turn with a 30 degree bank. The arrows emanating from their respective symbols represent the direction of the forces of lift, weight, and thrust. On the 'low winger it will be seen that 'the lift component is tending to roll the ship into a steeper bank but thrust, which has a slightly longer moment arm, is exerting a corrective force and now points slightly upward, the vertical axis being no longer vertical. With the increase in thrust due to the turn down wind, the magnitude of this new found up thrust is even greater. Also, the increase of airflow along the right side of the fuselage and fin is producing the effect of "top rudder"! These two forces bring the ship into a power stall. While it continues the left turn it may side slip toward the inside of the turn until it heads back into the wind where thrust is reduced and the bank less steep, the model recovering. The 'cycle is repeated, and the, undulating circular flight pattern is established.
The high wing model in a left turn with a 30 degree bank suffers no upsetting forces, as can be seen in figure 4.

Figure 5 shows us that the high wing model in a 30 degree banking turn to the right suffers no upsetting fortes either. But Great Hung! Just look at the forces acting on the low wing model in figure 5! The lift component tends to increase the bank, and the side thrust is now directed downward a good deal due to the tilt of the vertical axis. The flow of air along the right side of the fin and fuselage, as well as the magnitude of the side thrust that is now directed downward will be even greater with the increase in thrust during the down-wind turn. Here then, are the powerful forces at work that we witnessed in the flight path shown in figure 1, which is actually a terminal velocity dive!

From all this we see that our torque compensator, side thrust, in concert with a high thrust magnitude during that initial down-wind turn is the cause of the phenomenon suffered by many a low wing model.

It seems little can be done to alleviate this condition, so we must try to work around it. The best approach seems to be to just let the ship turn to the left, it is safer that way. I have rarely seen any low wings spiral into the ground from a left turn. Ah, but that open right hand turn sure has a great rate of climb built into it! A shame to pass that up.

One thing you might notice is that those low wingers that do negotiate that deadly turn do so with a very flat turn. A slow flying speed (light wing loading) can help produce a shallow bank during the turn. Perhaps a washed in left wing tip for left turning models, and a washed out left tip for models which tend to turn right.

On a model with a large fin, perhaps a judicious reduction to a size less than scale will do the trick as long as it does not offend the eye. One trick tried at Pinkham Field was clear plastic spoilers on the fin to reduce its efficiency. They did reduce the model's sensitivity to trim changes, but in spite of being clear plastic, they were rather obvious. In truth I can find no wonder drug to cure this malady, just keep giving it aspirins.

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