The Revised 2016 Gibeault Mouse Race Program

Paul Gibeault

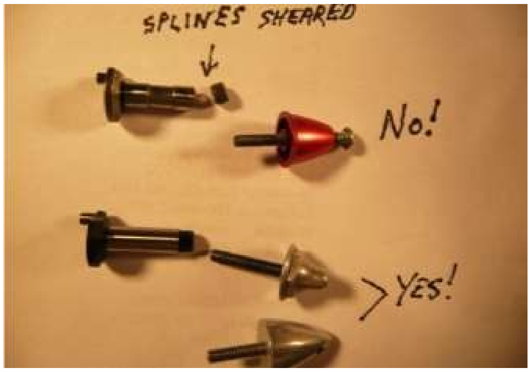
AMA Class 1 Mouse Racing objective: It is the purpose of mouse race to fly up to 3 models in direct competition in 50 lap preliminary heat races leading up to a 100 lap feature (final) race. A minimum of 1 refueling pitstop is required in the heat(s) & 2 pit stops in the final. The winners are those with the best scores (times) in the feature race. The engine requirement is any reed valve engine with an integral tank. This means 99% of racers use some form of a Cox Black Widow .049. It has always been a favorite of mine because **no machining equipment is required to be competitive.** There is no restriction on aircraft type other than it must be able to take off from the ground (ROG) with a fixed landing gear. It's cheap to fly but oddly enough, cubic dollars have little to do with how you place in competition. The deceptively simple looking Cox .049 engine has been known to stump even the most experienced modelers, causing great frustration. The following article represents much of what I have learned in my 45 years of competition in this event. It is my hope that those wanting to fly with high performance Cox reed valve engines will find it useful. This is a much updated version of my earlier article.

Engine

1. Crankshaft/Crankcase Assembly

Problem: Cox .049's (when pushed really hard) are prone to breaking the crankshaft. Usually the crank pin parts company from the crank throw web.

Solutions: The use of the Cox "race car" crankcase assembly reduces this problem as the crank throw web is noticeably thicker on these variants, but they are noticeably slower so that's not so good. Davis Diesel cranks can work BUT you really must bench run them first! REASON: Due to tolerance mis-matching many DDD cranks run very slow & give very poor starting & running characteristics. It's a real gamble. The safest bet is to use Cox "Killer Bee" cranks, for greatest longevity & speed, but with one proviso. You must use a 5-40 prop stud screwed **all the way into the crankshaft.** You will then need a Cox (or equivalent) spinner to hold the prop on. IF you use the standard 1" Cox prop screw, the crank will shear off at the spines later on down the road. The fitting of a prop stud seems to have cured the crank shearing problem. See photo.



A 5-40 TPI prop stud (screwed ALL the way in) & spinner is used to prevent the Killer Bee/Venom type crankshafts from shearing at the splines.

Using a modified crankcase with a bronze sleeve bearing in the crankcase can be useful, but it's a gamble. Unless the clearance honing is perfect, it can be noticeably slower than stock. My experience has shown that Cox's hard anodizing makes for a very good bearing surface, and so the stock Killer Bee or Venom setup is more than adequate. It's a good idea to lay some 400 wet/dry sandpaper over a piece of glass, and with the addition of some oil sand the back of the crankcase. This will remove any burrs that might otherwise prevent a perfect seal with the fuel tank. It's also useful to use a 2-56 TPI bottoming tap on the crankcase holes as extra threads in that area help.

It is very useful to disassemble the crankcase assembly. Thoroughly clean everything, and then polish up the crankshaft & crank pin with 600 fine sandpaper to remove any nicks scratches or baked-on oil that may be present. For re-assembly, use a 5-40 socket head cap screw & an old prop to draw the crank squarely into the drive plate. When re-assembled clean & dry, give it a spin. It should be really free with no binding whatsoever. On the best examples, the crank throw will even rock back to the bottom. The best engines have less than .015" end play on the drive plate.

2. Integral Fuel Tanks

Problem: The stock fuel tanks can be slow and sometimes short on range. They also may have trouble holding a consistent needle valve setting (due to leakage).

Solutions: Use one of the larger 8cc stunt tanks for the greatest range. These are commonly found on Golden Bee, Super Bee, Black Widow & Venom engines. Since the stock needle valve w/ spring arrangement is prone to leaking, modify the needle valve assembly as follows. Remove needle valve, discard the spring, install a #4 flat washer, and then add a piece of medium silicone fuel tubing. Inspect the tip of your needle valve to make sure it's not bent. Re-install the needle valve and you now have one cheap, but air tight needle valve assembly. See photos.

***Needles showing the tubing seal mods*.**

Needles showing the damaged and good needle tips.

With the tank and tank back together, check that the venturi size is .082" I.D. If not, drill out the tank and tank back inlet venturi to .082", (this is what the record holding engine used). Drilling out the venturi larger than .082", sometimes produces an rpm gain, but often your engine **<u>won't run as steady</u>** and your range will be less. To me, it's just not worth it. Next, sand the metal tank back flat over glass (again with the 400 paper), as some tank backs are warped a bit & do not sit flat when bolted to the firewall. If you wish, you can use a Dremel tool to grind away the screen holder from the venturi area of the tank back. It looks racy, but I doubt that it makes any difference. See photo.

One not fully explored area of performance is tank venturi & tank back mis-match. It is thought preferable (& sometimes works) to have the tank backplate venturi a few thou. **<u>smaller</u>** than the tank venturi. A too large tank venturi (i.e .089") can sometimes be made to work with a smaller .082" tank back.

One reliability mod all my engines have is a "clearance groove" filed on the tank. This groove provides a clearance for the bottom of the piston when the ball socket joint gets loose at BDC. If you haven't done this, you can probably see where the piston skirt bottom has been hammering a small groove already. (Dave Layman of Boss Engines cures this by machining .010" off the bottom of the piston)

The fuel pickup absolutely **__must__** be located at the outboard corner of the tank. The normal neoprene tubing arrangement is prone to moving out of place & giving an unstable engine run. I bend a piece of 3/32" O.D. soft aluminum tubing & make the pick-up one solid piece. I file a chamfer at the bottom of the pick-up tube so that it fits perfectly into the backplate. Attach it to the tank back with a short piece of **__tight fitting__** silicone tubing. The net effect will be that the pick-up stays perfectly positioned. You will notice greater range & stable running from your engine, with a properly positioned fuel pick-up tube. See photo.

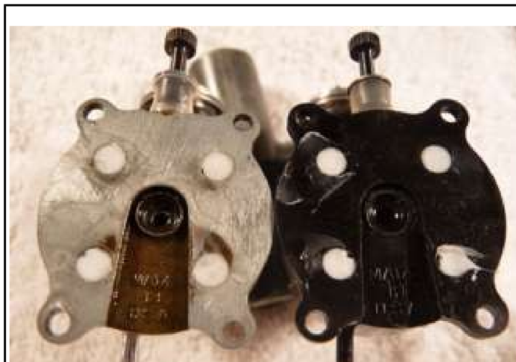
The replacement pick up tube is bent from 3/32" O.D. soft aluminum tubing & chamfered at the bottom to fit exactly. Silicone tubing attaches it to the tank back.

The next step is to prevent the integral tank from leaking. This is a **__must__** if you wish to hold a consistent needle setting, and have the engine shutdown properly. In some cases it may be necessary to wrap a piece of 1/2A dacron line or dental floss around the entire peripheral groove of the tank to help seal it. Hold the thread in place with saliva or oil for final assembly. It may help to lap the metal tank & tank back joint instead of using thread. The use of a thread gasket is not necessary if you're using one of the newer nylon tank backs.

*NOTE: The metal tank backs are much **__more durable__** & will often survive a crash without breaking. The newer nylon backplate is much **__more fragile__**, & will often be damaged the very first time you crash. Metal backplate fitted engines finish more races whenever flying incidents/accidents are involved. In order to finish first...you must first FINISH!

High-Power: The original Cox copper/beryllium reeds tend to 'float' at ~17,000 rpm & so they are not optimal for top performance. In a reed valve engine, top performance is only attainable by using the clear mylar reed. I find the cross shape better in tanks that use a 'G-Clip reed retainer wire & the rectangular ones better in the tanks using the nylon retaining cap. This last production change allows reed engines to be on par with "TeeDee's" in performance! My test bench results indicate that 24,000+ rpm is achievable for steady-state running with such reeds.

What about 'other ' reed materials & shapes? Cox engine designer Larry Renger prefers the Cox stainless steel reed over the mylar reed. My main concern with the steel reed is that it wears the anodizing right off the mouth of the venturi tube, although the rpm seems to be the same. I've tried other reeds made of thinner steel, floppy disc material, etc. & so far haven't found anything better. One Australian made metal reed was indeed 300 rpm faster, but it broke away after only a few minutes of running. Teflon reeds may or may not work as well. I've not found them to be any faster, & sometimes worse. The final reed sealing check is done by attaching a piece of tubing to the tank venturi & sucking on it. A proper fitting reed will hold the pressure & **__not leak.__**



After final assembly, the tank screw hole areas are filled with RTV silicone sealant for leak prevention.

Final Assembly: Clean the 2-56 tank screws with thinner. Final assembly is done using blue Loctite thread locker. Every time you tear down the engine, replace both the paper tank gasket and the venturi o-ring. This may seem like a waste, but $2.00 worth of new gaskets now is $100.00 worth of reliability in the racing circle! Once assembled, apply an RTV type silicone sealant over the tank screw head area. The tank screw heads are a major source of leakage & this really seems to help. Removing the sealant is very easy if you need to remove the screws later on.

****NOTE:** Some Cox engines have been supplied with screws that are up to **<u>.115" longer than normal.</u>** Often these engines will have the tank leak & come loose during running! Bottom taping the c/case screw holes can help here OR use the proper length screws in the first place. It took me an awful lot of wasted time, lost races, & loose leaky tanks before I found out what exactly was going on here. See Photos to note the difference. ***Note**: If you really hate paying a paltry few bucks for new gaskets, they can be home made. Cut from the tank gasket from thick vellum paper & from a piece of silicone tubing, thinly slice the venturi o-ring…

This example is over .100" longer than Standard! Too long and the tank won't seal.

3. Piston/Cylinder Assembly:

Problem: Not enough power!

Solution: Any type of piston/cylinder assembly made by Cox can produce good results. However, a superior "fit" will overcome nearly any porting deficiency. This means that a well fitted "Babe Bee" piston/cylinder is better than a bad "TeeDee" piston/cylinder. I recommend a flying test for all piston/cylinder assemblies in your possession, as certain assemblies will occasionally defy all rules of performance. Having said this, I find that good fitting "TeeDee" #4 piston/cylinder assemblies to be excellent. Many of the the very fast engines use these. The Cox Venom cylinder porting seems to be consistently fastest. With just a little Dremel work, you can make your TD cylinders identical. Personally, I rarely grind in my own cylinders as I'm afraid of doing more harm than good…

Aftermarket pistons: Some enterprising individuals have offered for sale standard Cox pistons that have been lightened by grinding the piston skirt on the inside or by cutting the skirt off at the bottom causing increased Sub Piston Induction (SPI). Actually these mods can be useful, if & only if **<u>the fit to the cylinder is good.</u>** If the fit is wrong then all is for naught. So of course, a test run is always in order when going with this piston type. A note on SPI numbers: Measured with a feeler gauge, SPI should be in the range of .012" - .025". I've yet to determine exactly how much SPI is too much…

Ball-Socket Resetting: It is worth noting that new Cox pistons often come with the connecting rod ball-socket joint set too loose. Therefore it's a good idea to re-set the fit with a Cox factory tool to .002" slop, or less. Using the wrong piston holding fixture can result in a mushroomed head piston (totally ruined), so I don't use one. Clean the socket area with acetone or brake cleaner first to remove the oil. Then lay the piston on a heavy piece of ½" plate glass or flat thick piece of steel (something quite dense like a vice). With the tool in place, tap with an 6-8 oz. hammer, rotate a bit, tap again and continue, checking often until all excess play is removed. Use lots of small taps & check the play often. It is necessary to check this joint after every contest. At normally low rpm's this isn't critical. However, at racing rpm's (20,000+) a loose ball-socket joint reduces piston life to a few minutes.

Piston Fit: Optimum piston to cylinder fit needs to be checked with parts being absolutely clean and dry. To check the fit, slide the piston up the cylinder bore (with no finger prints!) until it sticks. Ideally, it should stick flush with the glow plug land or even slightly higher. Now with a slight tap of the finger, the piston should fall right out of the cylinder. If the fit is slightly looser this may be OK, unless starting consistency deteriorates. In this case, the piston is worn too far for that particular cylinder. Keep it to try in other slightly smaller cylinders in your collection later on.

Please note that some new TeeDee piston/cylinder assemblies are fit just a bit too tight. Those of you with an excellent feel can go ahead and lap the piston to fit. However, Dale Kirn's easier way to do this is by just running in the engine. Start by cutting down a 5x3 prop until it turns up to 24,000 rpm rich. Run up to 2 dozen tanks of fuel through the engine, but for no more than 2 minutes at a time, to allow for cooling in between runs. It is better to use a TeeDee crankcase for this purpose, and transfer the piston/cylinder assembly to the reed valve crankcase when it is run in. The reason being that at 24,000+ rpm some reed valve crankcases will wear out quickly, notably the non anodized cast R/C Bee type. Lastly, it is **very important** to keep carbon varnish off the piston and especially the cylinder walls. #000 steel wool or medium grade Scotchbrite wrapped around a small dowel wet with solvent easily removes all the carbon. This procedure takes only a minute, but really should be done before every contest to ensure peak performance. **Note: the Davis de-varnishing brush can also be used, but be careful not to get carried away. Bob Davis recommends **only a few strokes** as his brush actually hones the cylinder. Used vigorously & too much can cause 'over-honing' making the piston fit too loose. Do be aware of this possibility.

Cylinder orientation: This is something very mistakenly taken for granted. I don't know why exactly, but I've had certain engines lose massive rpm or just ***'run funny'*** by mounting the cylinder sideways. That's expressly why my engine cylinders are all mounted upright. Mounting the cylinder sideways also exposes the needle valve to damage in case of a flip over. I will allow that the odd racer seems to be able to get it to work OK for them. All I will say is, try a back to back flight test & note how stable your engine runs **before** going this route.

4. Glow Plug

I use Cox TD high compression glow heads for maximum reliability & stable running on a new (or newly rebuilt) engine. My engines also start out with 4 new head gaskets. A good rule of thumb is one head gasket for every 10% of nitro. (hence 35% nitro = 4 shims)

After removing a new Cox plug from it's package, carefully sand the seal band on a plate of glass with 400 paper and oil. This will ensure the plug seal area is flat, and will seal properly when tightened. Now examine the plug element, and with a T-pin, make sure the coil is centered. Finally with a T-pin, very gently pry at the element where it is welded to the plug. It should be a firm weld. If it breaks loose (which won't happen often) you'll unfortunately need a new plug!

After awhile, you may notice that your glow head keeps coming loose in flight. This is due to the copper head gaskets becoming old and hardened due to the constant heat cycling. Since the Cox engines use an annealed copper gasket, replacing the head gaskets with new ones will solve the problem. *Note: I've heard that annealing the gaskets with a torch can work, but have no experience doing that. I find removing gaskets from a cylinder is easier when carefully using a very thin surgical blade or a Davis brush. A micrometer or calipers is really useful here as the odd head shim is thinner than the standard (.005") giving a less than desired head clearance. Head gaskets can also 'fuse' together & the calipers can easily show this.

A Cox replacement head manufactured by Doug Galbreath that uses the Nelson HD plug can offer better performance at less than half the cost (per plug). These are certainly worth using once you have a **stable** running engine set up. On the odd engine they run **slower** than normal, which is why you need to use the TD plug as your performance reference. The Galbreath/Nelson head often gives harsher running until your engine warms up, so go easy on the needle adjustment until the engine gets hot. (note: Some Nelson HD **plugs** have been found that don't fit the Galbreath head properly & this has been found to cause the performance decrease).

There are other glow head alternatives in the form of the Norvel 'Speed Plug' & the Merlin plugs. I do not have enough experience to know if they work well or not. They are certainly worth exploring though. Melvin Schuette has certainly shown the Merlin plug to work well in mouse.

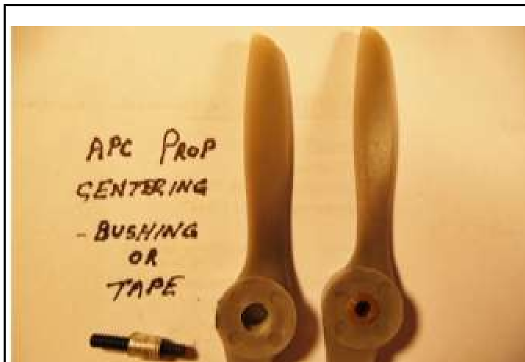
RPM Performance numbers: Ah...it's pretty easy to banter about high performance rpm numbers, but really they aren't meaningful unless one compares apples to apples & under the exact same conditions of prop, fuel, & weather. And YES, I can get some very impressive rpm numbers with 70% nitro, high compression & a large venturi size at sea level. BUT, such an engine will rarely finish a mouse race...so, let's get real. To that extent using Sig 35% nitro fuel, an **APC 4.75D X 4P prop** & Galbreath head, (w/ my 'local Leduc weather'): 19,000 rpm is my minimum standard. 20,000 is quite a "good engine" & 21,000+ is superior. Increasing nitro content can easily give a boost of 1000+ rpm over these figures, BUT the engine/glow plug **reliability goes down proportionally.**

5. Miscellaneous Problems
Problem: Engine comes loose in flight, prop falls off, glow plug comes loose in flight.
Solutions: 1. Use the right length tank screws with silicone sealant on top. 2. Check tighten the glow plug, prop spinner, & mounting bolts before every race. 3. If field disassembly can't be avoided, use Loc-Quik super primer T accelerator, with blue Loctite thread locker upon re-assembly. The tank back can be sealed on the field using a single piece of sticky Fascal tape over the entire backplate with only the venturi area cut away.

Airframe & Race Equipment

Airplane: In my opinion, there is no better design **to start with** than the rugged record holding Streaker Mk V.

Prop: You must use 4" of pitch to get rolling! Any 1/2A prop made by Cox, Tornado, Top Flite or APC is OK. However, cut down props (less than 5" diameter) go faster than stock. Only test flying will determine which prop(s) ultimately work best for a given combination. The tough & forgiving Tornado Black 5DX4P cut to 4.75" diameter has won the Nat's final, so you could start there. The APC 4.75D X 4P is my personal **reference standard** & and was used to set my last (2:14) heat record. The Trimming the diameter to 4.5" is also a reasonable choice, if you want a lighter prop to use in poor weather or if your engine is down in RPM a bit.



Centering APC props w/ a big prop hole: Use of a bushing,aluminum tape or thin fuel tubing can all be used here.

Fuel: A minimum of 25% nitro is required to get with the program. A 60%+ mixture, yields faster times, but only if everything else is correct. i.e. You have fabulous reliability on lower (35%) nitro, are practiced and know what you are doing! Be prepared to buy lots of expensive glow plugs as well!

A most important note about Cox .049 fuel: A minimum of 5%, & preferably 10% of the oil mix must be castor oil. Should you decide to race your Cox .049 on a castor oil deficient fuel, your engine will commence a course of self destruction, and you will find out first hand why some have sworn off flying with Cox engines for good! **YOU HAVE BEEN WARNED!**

A truly good performance mix for Class 1 Mouse racing is Sig Champion 35% nitro fuel. I have found it to be the only fuel I need to consistently make the finals at the U.S. Nats, and win anywhere else.

Pre-Race Start & Warm-Up

1. Before the first run, always prime the crankshaft with oil or raw fuel for additional lubrication at this critical time.

2. Fill tank, prime exhaust, and wind up the spring starter 1 ¼ turns to start. Anything less than 1 ¼ turns will allow your engine to start backwards. 1 ¼ turns ensures a correct start **first time every time.**

3. Most Cox .049 engines do not take a really good needle setting until warmed up (especially with the Galbreath/Nelson head combo). Therefore don't be surprised if the ground and air settings differ, sometimes as much as ½ a turn! The best time to fine tune the needle valve is immediately after a flight. Important note: If your needle valve setting changes by more than a ½ turn, you have a fault! Clean or flush out the dirt, but stop perpetually messing with the needle valve. A non-responsive needle valve most often means **<u>you have a tank leak !</u>**

4. To stop a running engine on the ground, squeeze your thumb and index finger over the tank vents. This will verify your tank seal. If the engine doesn't stop, but continues running, then you have a sizable leak somewhere that needs to be fixed as soon as possible! Pressurizing a full tank with a fuel bulb can often pinpoint where your leak is. is.

5. I have mentioned earlier that Cox crankshafts may have a fatigue problem when run really hard on high nitro fuel. You can accelerate all kinds of shaft and crankcase wear problems by stopping a running engine by it's prop nut. **<u>Do not do</u> <u>this.</u>** Stop the engine by blocking the vents & pointing the model's nose down. You will increase the life of these parts considerably, as well as save yourself some grief.

6. Always monitor the color of the engine exhaust oil. Usually a good running engine will alert you in advance of an impending failure by "making metal". This usually means tiny aluminum particles are being rubbed off and are visible in the exhaust oil, if you look closely. This is usually accompanied by frequent plug failures. At this point, it's best to find the trouble spot and fix it. When this happens, I

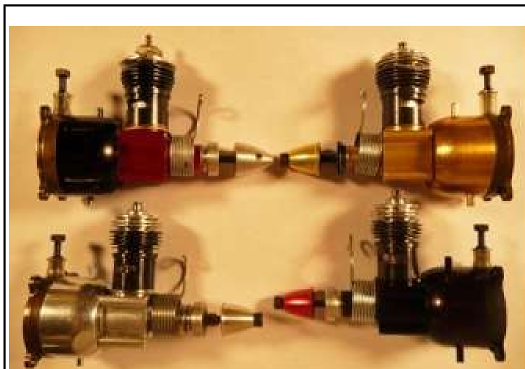
Black Widow tanks: note severe wear around reed flange holes on reed retainer(Left) excessive wear on top of reed retainer (Right) cracked retaining "G-Clip area and reed seal venturi hole area.

replace the whole crankcase assembly, because the crank pin has worn (tapered) causing the rod to slide off the crank pin and rub away at the tank. Examine your tank regularly. If you notice excessive rubbing, (see photos) you'll need to replace your c/case ass'y or crankshaft at minimum. If you are able, use the newer type tank that incorporates the nylon reed retainer. A steel crank pin rubbing on nylon is much preferable to one rubbing on aluminum. Again, watch for excessive rubbing on the nylon reed retainer & replace the offending worn parts as necessary. See photos. (Note: if your crankcase ever makes a squeaking noise on startup, or shutdown, it's caused by that particular reed. Change it only if performance is down).

7. Always keep your engine clean and always protected from corrosion with a plastic bag or rag. Always filter your fuel, especially when changing containers. Ensure your fuel bulb is in good shape and not cracked, or flaking rubber. Better yet, **replace it yearly** for a paltry $4.00 and don’t worry about it. When everything checks out OK, and your engine still hics and coughs, it’s very possible that dirt in the fuel system somewhere (or bad fuel) is causing the problem. It doesn’t take much dirt at all to raise havoc with a Cox reed engine which is why it's just so important to keep your motors **scrupulously clean.**

Tips and Suggestions
"The Engine"

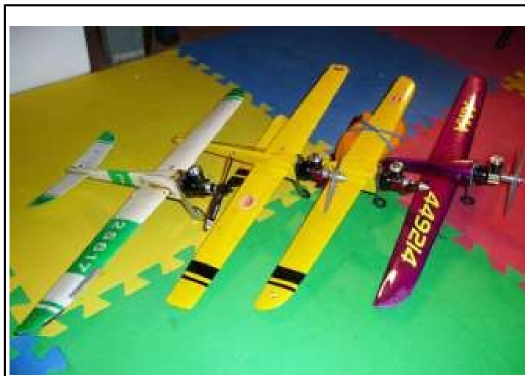
I assume that if you followed my engine set-up tips, you should have a very decent running engine. The later Cox “Venom” engine can make you competitive quicker (due to the slightly better cylinder porting & better crank balance), but I strongly recommend one change. In the original production batch of engines, they varied from designer Larry Rengers’ original drawing & made the piston too thin at the top. This caused the piston top to separate in as little as a half dozen runs. My cure has been to fit up a TeeDee piston to the Venom liner (as described earlier). Now you have one great running set up with no more piston failures. Using a “Venom” will not necessarily make you an instant winner. You still need to keep in mind all of the maintenance tips mentioned earlier. Besides, both previous AMA records (2:18:6 & 4:34:0) were held with a much older engine, (a Golden Bee w/ TD cylinder) so don’t go throwing out “ole reliable” just yet.



Cox .049 mouse racing engine variants: Top L-R: Venomw/ Galbreath head & Golden Bee. Bottom L-R: Silver Bee & Black Widow.

“The Model”
I assume that you have built the all basswood Streaker Mk V with 2 ounce fiberglass cloth on the wing, stab & motor mount. Plus 1/4 -1/3oz. tip weight, for a total model weight of about 6 ¾ oz. **In this event only, heavier is better** at least to start off with.

You will notice this advantage in windy conditions (and when isn’t it windy when flying Mouse!). Unlike many designs, the heavily tip weighted Streaker can darn near fly in a storm if need be. After all, anybody can fly in the calm…..but successfully flying in wind separates the men from the boys!



Paul Gibeault's all Cox .049 powered Streaker mouse racing fleet ready to race.

However, if you have ignored the instructions and built your Streaker out of balsa instead, and without enough tip weight, then you will find out two things. 1) That it doesn't whip well flying high and falls out of the sky downwind, cart wheeling upon landing. 2) It builds momentum slowly and won't keep its speed up with a dead engine, and you end up crashing in a line tangle anyway.

When flying in rainy conditions it's the **pilots job** to wipe the lines with a soft cloth moistened with acetone. Do this prior to every race. Much of the sticky film buildup is caused by the oily exhaust residue produced during flight. If not cleaned often, the solid lines can stick together causing a loss of control, almost always with disastrous results. I have lost races neglecting this! I suggest a cleaning just before rolling your lines up for the day.

You need to use a good quality nose wheel, and solder it on with **Sta-Brite** silver bearing solder. Many racers have lost races when their wheel fell off during a race. **Regular solder just doesn't cut it here.**

"Piloting"

An otherwise great airplane/engine combination is obviously disadvantaged by poor piloting. Here are a few suggestions you might find advantageous. Since mouse races often involve line tangles, (surprise!) choose a pilot with combat experience. This type of individual often has a "never say die" attitude when lines from other (often crashed) models have him wrapped up. He just keeps on flying, no matter what. The lesson here is that not all line tangles will bring you down if you keep a cool head about you. A great pilot must train himself to not look at his own model, but watch his opponents models and his own pitman for signals. This allows him the important split second to see and avoid accidents just as they happen and fly accordingly.

Cox .049 reed valve engines unfortunately do not have shutoffs. This lack of a shutoff, often causes a fatal mistake as seen in the following scenario: You are flying along, just overtaking a slower model and your engine quits! You quickly lose airspeed and sink into the model you just overtook, bringing both models down in a line tangle. Happens frequently it seems, but consider this:

A great mouse pilot must:

Count and be aware of his laps at all times, i.e. Know what lap his model is on, and how many laps his model is capable of flying in traffic. (for this example, let's say 35 laps per tank) At maximum laps, less five (per example, 30 laps), **assume** that your engine will quit if you overtake. If you are approaching a passing situation at this critical stage; as you approach to overtake, quickly **whip hard** with just enough height to get by safely. Do not climb any higher during passing than absolutely necessary or your engine surely will quit! As soon as you have completed the pass, stop whipping. You shouldn't have to whip for more than a few seconds to accomplish this correctly. You may well be called for whipping, but better a penalty than a crash. Should your engine quit while passing, the whip momentum will allow you to complete the pass even with a dead engine! Such is the beauty of a properly weighted Streaker Mk V.

"Pitting"

An otherwise good pitman can cost you the race by launching your model **without first looking for traffic!** Sometimes you will be taking off just as another pilot is landing. A launch at this critical time involves you in an instant line tangle/crash, and disqualification from that race. The solution is “heads up” pitting. A great pitman must simply **'relax'** and hang on a second or two until it’s safe and clear to release. You must remember to **always yield to the landing model.** Seldom is a mouse race lost by 2 or 3 seconds, but it’s always lost on a pitting accident that results in disqualification. The pitman is also responsible for signaling when his pilot is being called for whipping and when he's due to run out of fuel. In very close races (or record setting), this becomes very important.

“Conclusion”

A winning Mouse Race effort can basically be put down to the right amount of **teamwork.** That is to say the ability of a good team working together in a nice flowing manner, **carefully avoiding accidents,** yields better results than a team with a killer fast model, but lack of team work and practice. I have been most fortunate to fly with my buddies, Roy Andrassy, Les Akre and Todd Ryan. Their superior piloting and pitting abilities have guided us to many victories. Thanks for all the great work guys, I enjoyed every minute of it! Thanks also to John McCollum, Dale Kirn, Joe Klause, & Larry Renger whose knowledge and expertise has helped me on many occasions & increased my knowledge base a great deal.

I wish to thank the rest of you fellow Cox Mouse Racers out there for coming out to race with us. If it wasn’t for all of you, Mouse Race wouldn’t be the one of the more popular racing events that it is today. I wish you all great success with your Cox .049's. Good Luck!

Source appendix for equipment:

1. Cox International: All the Cox parts you need + SUPER service. ***cox****engines.ca*
2. Ebay stores: Even more sources of Cox parts Ebay.com
3. Doug Galbreath: High performance Cox heads/plugs (F1Cdoug@aol.com)
4. Streaker plans available from: pgibeault@shaw.ca .
5. MBS Model Supply: Solid lines & racing supplies
   PO Box 282
   Auburn KS 66402
   Contact Melvin Schuette
   1-785-256-2583