X-Cell News

The Official Newsletter For Miniature Aircraft

Volume 2002 Issue Number 1

Introducing: Min Air West !!!

Miniature Aircraft USA is excited to announce that in January 2002 Todd Bennett will become our West Coast Distributor!! Many of you know Todd, as he's very respected in our hobby and a great pilot. He will now focus his talents on promoting Miniatures products in California, Oregon, Washington and Nevada. Initially, Min Air West will stock Fury Kits and parts for the Fury. Later, the operation will be expanded to begin support of the entire Xcell line. This will provide faster service to our hobby dealers on the west coast. Todd will also use his vast experience to provide technical support, and will run the distributorship with his wife Baylor. We're looking forward to working with Todd and Baylor this year and beyond to continue to ensure that Miniature Aircraft's eX-Cellent line of products are easily available wherever you are, and have the best support in the industry.

Min Air West - 805 529-1136

CORRECTION:
In the cover story of the last newsletter, it was reported that the United States F3C Team won the Team competition at the FAI World Championships. In fact, the Japanese Team won the Team championship and the US team finished second. Congratulations to all the members of the Japanese team and I apologize for the error.—*ed*

Inside This Issue

EDITORIAL

Welcome to 2002! Hope you all had a safe and happy holiday season.

This new year promises to bring a lot of new things from Miniature Aircraft. If you've been following these newsletters, you've seen announcement after announcement of new team members and now a west coast distributor. All of these things are aimed at broadening the exposure of MA products, and provide more channels to get direct feedback from the field, to the factory designers so that their products can be the best in the world.

This issue has extensive coverage of revisions that have been made to the Fury model since its original release in 2001. The success of the model has been phenomenal and these changes have only made it better!

Its winter time now, and in many parts of this country and the world, it's a bit chilly now. If you're not going to fly for a while, take this opportunity to look over your model for anything damaged, broken, or worn out, and to give it a really good cleaning.

Its also a good time to check out your batteries. If they won't cycle at least at their rated capacity, and you can't revive them by repeated cycling or fast charging, then replace them. Its cheap insurance.

Finally, if your electronics have been installed for a couple of flying seasons, consider sending the servos and receiver in for a check up to make sure they'll give you another season of fun!

The radio service centers will start to get busy as Spring approaches and everybody is getting their systems serviced, but this time of year, turnaround is usually great.

Fly as often as possible and stay safe!
Carey

X-CELL News

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Complimentary

Contents:

News items, tips, articles, and reviews of Miniature Aircraft products are invited and should be addressed to the above address, ATTN: Newsletter Editor. We reserve the right to edit, rewrite, or refuse editorial material, and assume no responsibility for accuracy, errors or omissions. Graphics must be submitted in digital format. Material will be returned if specifically requested but only if accompanied by a self-addressed mailer with correct postage applied.

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Calendar of Events

Helicopter Events

Event Orlando Helicopter Classic—III
Place: TBA – Orlando Florida
Time May 3rd thru 5th, 2002

Sponsored by The Orlando Radio Control Helicopter Society, and Miniature Aircraft. Helicopter Contest for AMA Classes I, II, III, Scale and FAI F3C. For more information contact Steve Hathaway via www.torchs.org

Event Heli Heat Wave IV
Place: T-Bird Field Benbrook, TX
Time August 16th—18th, 2002

Hosted by the Ft. Worth Thunderbirds. 3D competition, Autorotation contest, heli drag racing. Top Gun Scale Helicopter Qualifier. For more information contact:

Chris Berardi CD chris.g.berardi@lmco.com 817-777-4020
Roland Estrada roland.estrada@lmco.com 972-603-0416

Event The Travelling Contest 2002
Place: Jim Fulton Field, Grand Prarie, TX
Time October 18th—20th, 2002

Hosted by the Golden Triangle Radio Control Club. AMA/FAI Helicopter Contest—Classes I, II, III and F3C Schedules A & B. For more information contact:

Mark Womell CD, mongo@planetwide.com 915-689-6092
Roland Estrada, roland.estrada@lmco.com 817-658-5245
Http://gtrc-club.tripod.com

Team Pilot Intro:

Dabling Harward

Effective in January 2002, Dabling Harward has joined the Miniature Aircraft Pilot Team! Many of you know Dabling as he has been involved in launching another manufacturers products. He took a few minutes to detail what he's been up to:

I started flying R/C helicopters in Orlando in 1995 with a shuttle ZXX and a Futaba 7UHP. Upon know-

ing that I was hooked on the hobby, I got a Futaba 9ZHP and an X-Cell 60 so I could keep up with the big boys. I would visit Miniature Aircraft everyday and watch Wayne Mann practice in the field in back of the shop. Just watching him build and fly really taught me a lot, about the hobby that I enjoyed so much.

I was so determined to learn every aspect of R/C helicopters that I swear I spent every dime I made on them. Cliff Hiatt also taught me how to be meticulous with building and setting up my machines. The knowledge that he bestowed upon me is priceless and is part of the same knowledge that I pass along to the people I help here in LA.

Shortly after coming out to LA, I really progressed as a 3D pilot and joined the Thunder Tiger team as one of their test pilots for their Raptor series of helicopters here in the US. I worked closely with Mr. Lai, the President of Thunder Tiger in making all the necessary changes to the machines to make it one that was both reliable and inexpensive. In addition, I produced a how-to video on the Raptor

(Continued on page 4)

Team Pilot Intro

(Continued from page 3)

30 which has been on the market for the past year.

The fact that I live in the vicinity of Todd Bennett, really increased my level of flying exponentially, because I would video tape his flights and come home and study the tapes for days. Just visually watching his machine and moving the sticks in my mind was my flight simulator. I knew, as long as I flew with pilots who were better than me, it could only increase my level of flying. And Todd is one of the best. I've known Todd and Jason Krause for years now as we've hit the funfly circuit every year. I truly believe helicopter pilots are all one big family regardless of the machine you fly.

I know that by flying the Fury, my level of flying is going to go through the roof. I just recently built a Fury for a club member and I was able to really wring it out. Even though the heli is just under 10 pounds, it flys like it's 8. It absolutely just scoots through the sky with no effort. Miniature has really set the new standard by which 3D will be flown with this new kit. Although I think the Fury kit is superb, my goal is to help make this kit idiot proof. My vision is to open this hobby up to the masses that don't even know that this sport exists. With that comes a lot of responsibility to make sure its done right. To the novice, a lot of the small details that are so important go unnoticed.

This is where making a kit foolproof comes in. I hope to be instrumental in making that happen so that more and more people can get to enjoy what we love so much in this crazy world of R/C helicopters. Now that these machines are getting bigger and faster, safety must be our number one concern today. We have so many new people coming into this hobby that are reaching out for leadership. We all need to set good examples so that we all can collectively enjoy and watch this hobby grow and prosper.

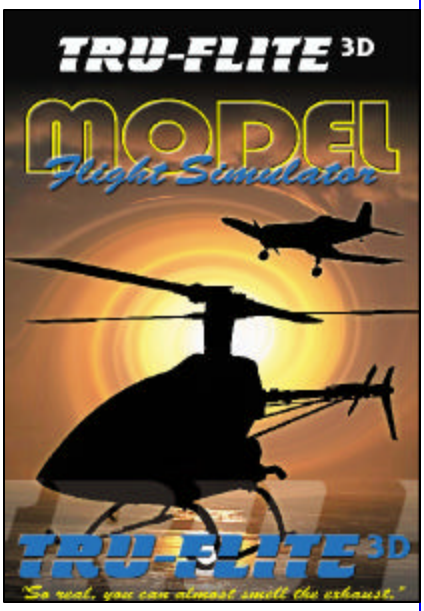
I want to thank Tim Schoonard for welcoming me into the Miniature Aircraft family of pilots. Let's have a great year and make some things happen.

Dabling

Tru Flite R4 Simulator

Part # 4575

Miniature Aircraft recommends the TruFlite simulator to assist you in learning new pilot skills.
This simulator has proven to have very accurate simulation of flying a model helicopter. Its been designed to work with your actual transmitter and to be easily configured just like your helicopter. Using easily understood setup screens, you can use predefined models or make changes to the same settings that would affect your model. Things like rotor blade size/weight, flybar length, flybar paddle weight, overall model weight, amount of fuel, and many, many more options.



You can actually make changes to your radio or the simulator to see how they would affect your model, before you actually make the changes to your model.
Allows simulation of several different helicopter models as well as airplane models.
In addition, TruFlite has a number of beginner specific features, like being able to freeze the model position, and to slow down model reaction time.
There are multiple detailed backgrounds to choose from as well.
If you're interested in owning a video game, that happens to look like r/c models, then this isn't the product for you, but if you're interested in learning to fly an R/C helicopter or airplane, this product is ready built specifically for that purpose.
Available now from Miniature Aircraft. Updates can be downloaded from ***www.tru-flite.co.uk***.

MA International Distributors

Motors & Rotors
Unit 2, 13 Smith Street
Watford, Herts UK
WD18AA
Tel. 0192 346 5712

Latest Products

Torque Drive Tubes

Now improved with longer couplers and high-strength aerospace epoxy for additional strength needed for larger motors.

Part #	Description
0867	For use with 31.5" boom
0867-12	For use with 32.5" boom
0867-14	For use with 33" boom

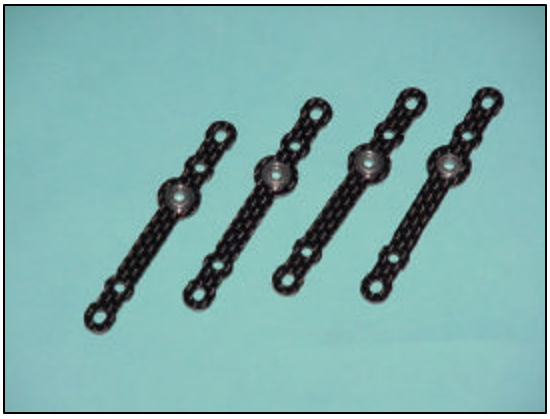
X-Cell Tail Rotor Blades -

New extra stiff carbon t/r blades provide excellent t/r control. Proven to work great with all gyro systems

Symmetrical air foil

Part #	Construction/Color	Dimensions (mm) Root	Chord	Length
3699-40	Carbon - black	8	24	92
3699-44	Carbon - black	5	30	105
3699-46	carbon - black	8	30	105
3699-48	carbon - black	5	30	110
3699-50	carbon - black	8	30	110

Fury Servo Support Components



Now available in graphite, the support plate itself is compatible with either JR or Futaba, but still requires an adapter for the particular brand of servo.

Part #	Description
119-86	Fury Graphite JR/Futaba Servo Support with Bearing
119-87	Fury Graphite M2.6 Servo Doubler kit (Futaba)
119-88	Fury Graphite M3.0 Servo Doubler kit (JR)

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Information About Recent Kit Updates

As you are no doubt aware, the Fury helicopter is incredibly popular. Since its entry to production, sales have been excellent. In our continuing effort to make sure our products continue to be the best of class worldwide, Miniature Aircraft has introduced a number of important design changes to the Fury since the first kit was sold. Many of these changes have not only increased the strength and rigidity of the model, but lowered the overall parts count as well!

The following narrative will help you explain these changes to your customers who already have a Fury, or to potential customers who are ready to move up to the Fury. These changes will be effective with Fury kit s/n 1018-0467 and later.

Frame Finish

- ✓ The most immediate difference in appearance, is the use of a new matte finish on the G10 side frames. The strength of the material is unchanged, however this finish is less prone to show surface imperfections on the material.

Frame Rigidity

- ✓ The lower frame rails, originally parts #115-54 & #115-56 have been replaced with a single G10 plate part #115-57.
- ✓ In addition, the two engine mount supports, part #'s 106-78 have been replaced with a single engine support block machined from aluminum, part #115-53.

#115-57

#115-53

These two changes, have SIGNIFICANTLY enhanced the rigid nature of the frame, which now are virtually impossible to flex in any way!

(Continued on page 8)

Technical Focus

Ball Bearings

All those turning parts! And what makes them turn smoothly? In Miniature Aircraft's helicopters, its bearings, as virtually every part that turns rides in a bearing.

Some turn almost imperceptibly slowly (like bellcranks) and others are spinning at nearly 20,000RPM! Some carry very little loading, and others (like those in the rotor head) carry the equivalent force of many hundreds of pounds.

While they appear incredibly simple, in fact the details of their design are very complicated. Their apparent simplicity, often results in mishandling which can result in bearing failures, far sooner than the service life they were designed for.

The intent of this article is simply to provide you more information about these vital components of model helicopters, to ensure that you get the longest possible service life from them.

Ever look inside a bearing to see what's there? In VERY simple terms, a typical radial bearing consists of an inner ring and an outer ring, each with a small channel called a raceway. The only thing that connects these two rings together, are the tiny balls that fit into the raceways, captured in a ball separator assembly.

This assembly allows one or both of the rings to turn. In order to make this work, the clearances between the balls, rings, and separators are very small. In fact, they can be as little as *one millionth of an inch*! That's pretty small! Now turn them at high speed and you can see why smooth operation of the bearings internal components is critical.

Miniature Aircraft uses only precision, quality miniature bearings in its products. Typically the kits contain bearings that have clearances measured in ten thousandths of an inch. This is still very small, and as will be discussed, a critical factor in bearing operation.

Properly handled, these bearings will provide hundreds of hours of correct operation, however when damaged, they will fail. When bearings fail, they become stiff, "notchy", frozen, or sometimes totally disintegrate. Bearings that don't turn smoothly, result in friction/heat and small vibrations. Should a bearing freeze or disintegrate, obviously something bad is going to happen.

How bearings fail

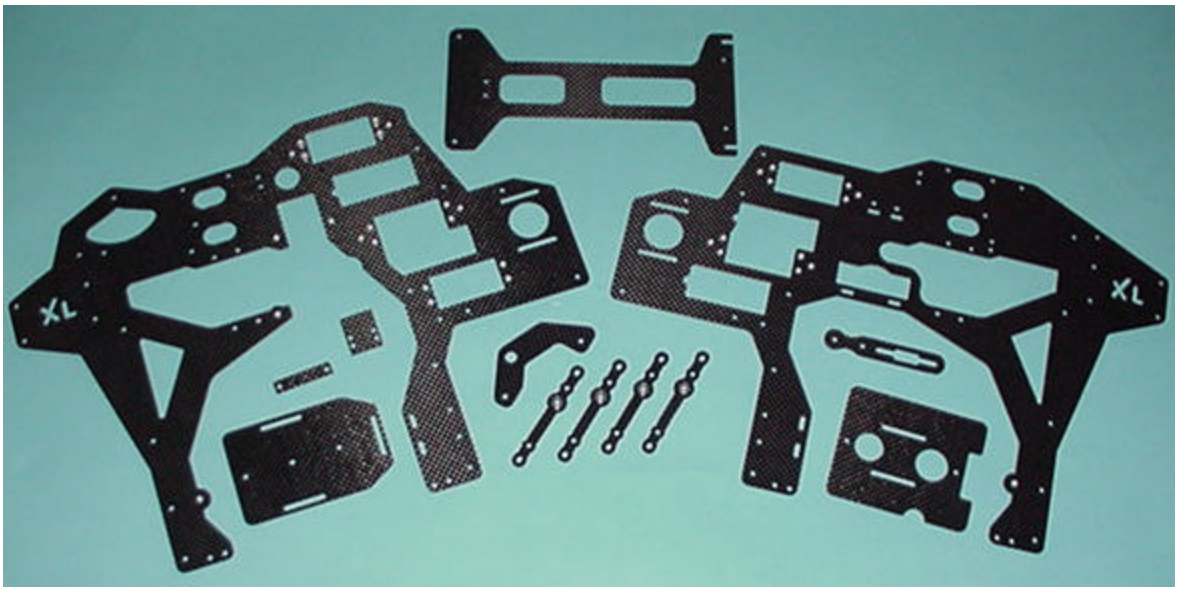
Balls/Raceways/Separators become damaged - small dents, called Brinell Marks, can be formed on the balls or in the raceways due to shock loading or contaminants. In a precision bearing, a Brinell Mark in the raceway, of only *TEN MILLIONTHS OF AN INCH*, will cause a bearing noise tester to go off scale when that bearing is tested.

(Continued on page 10)

Fury Updates *(Continued from page 6)*

- ✓ The left and right frame sides, include mount holes for a soon to be introduced lower main shaft support block. This will result in the main gear being supported both above and below by bearings.

- ✓ For the ULTIMATE in rigid frames, Graphite frame conversion kits are available for those that want it. Part #119-110 is a complete graphite conversion kit. This kit does not include clutch doubler plates or fins, but they are available separately.



Part #119-110

Gear Alignment

This is the most exciting area of improvement! The Fury will be the first model helicopter available with easily changeable gear ratios, with automatic and precise gear mesh and alignment guaranteed!!!

- ✓ The starter block now includes a third support bearing. This better supports the start shaft and prevents any bearing movement from causing binding with the shaft. In addition, the block will now mount with 4 bolts threaded into the block. This prevents any bearing binding from overtightening of the mount bolts.

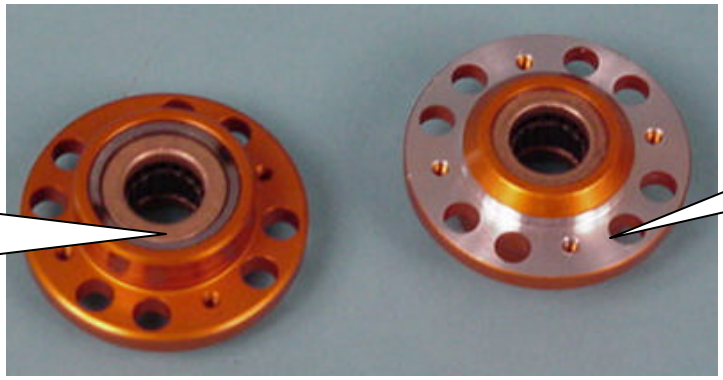
- ✓ The autorotation clutch is now a one piece aluminum assembly (part #0866-4). The mount face for the main gear has been machined perfectly flat, which minimizes main gear run out! This replaces part #'s 0866-8 and 0866-9.

The original Fury left frame included a graphite or metal clutch doubler plate part #115-46a. This doubler was precisely drilled which ensured a proper and fixed gear mesh, however since it was permanently attached, it required multiple mount holes for various gear ratios.

(Continued on page 9)

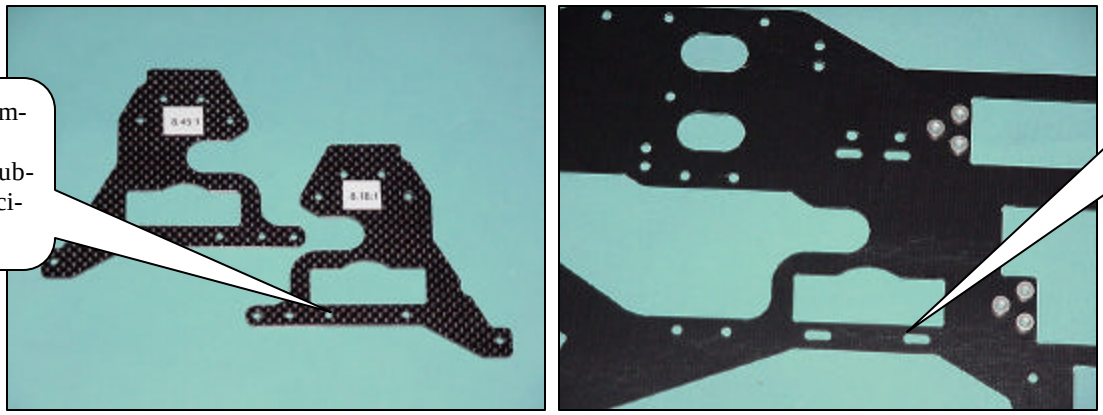
Fury Updates *(Continued from page 8)*

✓ A new design for this assembly has been created, in which both doubler plates are now made of .100" thick Graphite in the Expert kits.



✓ The left and right main frames are now slotted where the upper and lower clutch block will mount, which will allow the block to be repositioned for various gear ratios. However there are now specific doubler plates available for each gear ratio.

These plates have been very precisely drilled for a particular ratio, and simply bolt on. No adjustment is required to result in a perfect mesh for every available gear ratio. Once



you've seen this work, you won't believe how simple it is to install change gear ratios, and how smooth the gears will turn!!
So changing ratios involves replacing the main and/or pinion gear, adding shims to the engine mount (or replacing the mounts), and replacing the clutch doubler plates. Its simple, only takes a few minutes, and will yield a perfect gear mesh every time!! (NOTE - it is recommended for best results, that clutch pinion gear changes be done at our factory by returning the assembly to Miniature Aircraft)

✓ The front tail rotor drive transmission is unchanged, so assembly results in perfect alignment with no adjustments necessary.

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Bearings *(Continued from page 7)*

Internal Friction - there are many parts, with very tight clearances, that are rotating. If any of them are damaged or improperly aligned this produces vibration and heat. Changes in temperature, (as little as 20^0 F) can significantly reduce the effectiveness of the lubricant.

Overheating - Balls expand or deform (not usually uniformly) and can stall in the separators. In the worst of cases, this can cause the separator to disintegrate releasing the balls and obviously destroying the bearing.

What causes them to fail?

Miniature Aircraft's kits are provided with both loose bearings and those that have been pressed into a fixture. There are many ways that these bearings can be damaged, here are a few:

Improper installation/handling - physical damage

This is the most likely reason for the bearings in your helicopter to fail quickly.

- In cases where bearings are installed in fixtures that are clamped in place by bolts, (such as clutch blocks, t/r transmissions, etc), if these bolts are overtightened, it can easily distort the bearing rings. It doesn't have to be by much to cause binding (remember the tiny clearances). This causes friction and will result in overheating.
- Alignment - imagine what happens to the inner ring for example of the lower clutch block bearing, when the clutch alignment is done improperly, and it visibly wobbles every time the engine turns over…….and this happens 16000 times a minute! This will cause the bearing to get hot and the internal components to expand (remember the clearances?) resulting in even more friction! Obviously this can cause the clutch block bearing to fail in only a few hours of use.
- Installing them with a hammer - this can dent the balls or the raceways – (remember the tiny clearances?). This results in brinell marks and noise/vibration.
- Stressing the bearing structure - putting heavy pressure on an unsupported bearing ring. A typical example of this would be found when removing a clutch shaft installed with Loctite, by simply hammering it out of the bearing block! This side loads and damages the balls and raceways.
- Greasing the bearing with the wrong lubricant. Thick lubricants can cause friction and heat buildup.
- Damaging the bearing shields - perhaps pushing them into the bearing separators or balls
- Simply dropping them onto a hard surface

Unless the damage is so severe that the bearing is binding outright, most of this is only detectable with highly sophisticated equipment. The bearing may seem fine, and indeed may operate normally, but will fail sooner than its design life because very minor damage starts a chain of events that will eventually destroy the bearing.

One of the ways manufacturers test bearings is by using incredibly sensitive sound testers. By operating the bearing under typical conditions, they can listen to the bearing, and detect problems. In fact, when testing multiple lubricants the sound the bearing makes is compared between the products.

Some suggestions for handling bearings to prevent damaging them:

- ✓ Don't excessively tighten bolts that clamp fixtures that contain bearings. All this accomplishes is damaging the bearings. For a std 3mm bolt 10-11 in/lbs is tight.
- ✓ Make sure turning parts that ride in bearings are aligned properly.
- ✓ Treat bearings as you would any other precision assembly. Don't drop them or hit them.
- ✓ Don't install new bearings with a hammer, or re-install bearings that were hammered out of a fixture.
- ✓ If a bearing is attached to a fixture only by the outer ring (typically a bearing block), only push against the outer ring to install/remove it.
- ✓ If a bearing is attached to a fixture only by the inner ring (typically with loctite on a shaft),

(Continued on page 15)

Latest Products *(Continued from page 5)*

New MAH/X-Cell Rotor Blades

These new rotor blades are available in various lengths for .30-.91 size helicopters. Like most high quality composite rotor blades, these are manufactured in machined aluminum molds. This ensures that blades are as close to identical as possible and are extremely straight with a high quality finish. These blades are constructed using high quality carbon with exceptional torsional strength characteristics. This results in excellent, consistent control at the blade tips. Color choices will be clear black carbon with white roots and tips or white with black roots and tips.

Symmetrical Profile - perfect for 3D flying styles

#3699-10

30 Series

Part #	Construction/Color	Root	Chord	Length(mm)
3699-2	carbon - black	9	48	555
3699-4	carbon - white	9	48	555

40-50 Series

Part #	Construction/Color	Root	Chord	Length (mm)
3699-10	carbon - black	14	49	605
3699-12	carbon - white	14	49	605

60 Series

#3699-22

#3699-20

Part #	Construction/Color	Root	Chord	Length Dimensions (mm)
3699-20	carbon - white/black tips	14	60	685
3699-22	carbon - black/white tips	14	60	685
				700—Coming Soon!

"S" Profile - for FAI flying styles

Part #	Construction/Color	Root	Chord	Length Dimensions (mm)
3699-18	carbon - black	14	62	680

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Fury Updates *(Continued from page 9)*

Fury kits will be offered with the following base gear ratios:

Ratio	Engine	Flying Style	Pinion	Main Gear	Kit Style
9.0:1	.60 size	3D	10 tooth	90 tooth	Standard
9.3:1	.60 size	FAI	10 tooth	93 tooth	Expert

In order to create additional gear ratio combinations, Miniature Aircraft is offering gear ratio change kits which include everything necessary to set an available gear ratio.

Fury Gear Ratio Kits/Components

Complete kits to allow the Fury gear ratio to be changed. Contain everything needed. Clutch doubler plates are precision drilled for perfect gear alignment every time. Available with or without a complete clutch bell. Miniature Aircraft recommends that pinion gears be installed at our factory to ensure proper alignment. For a $15 service fee, Miniature Aircraft will install a new pinion gear/bearing and alter your existing engine mounts if necessary.

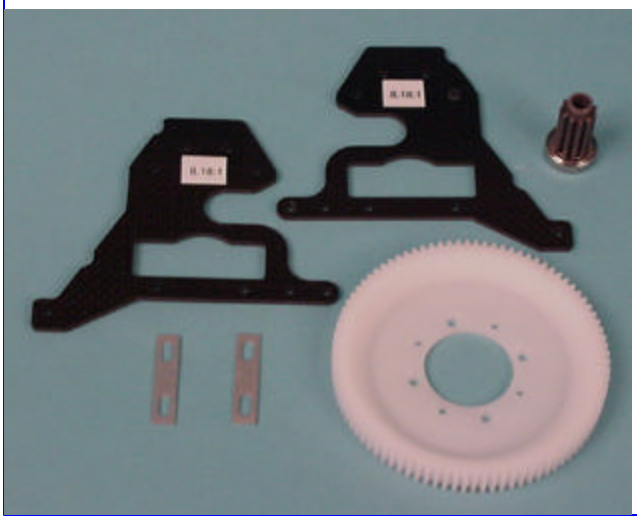
Gear ratios changes are recommended for 80/90 engines as follows:

YS80
8.18:1 FAI Style Flying/Mild 3D Flying
8.45:1 3D Mild/Hard

OS91
8.18:1 All Uses
8.45:1 Not Recommended with this motor

The 8.18 conversion uses your existing engine mounts without alteration. The 8.45 conversion either requires that the mounts be replaced, or returned to Miniature Aircraft to be altered.

Fury 8.18 to 1 Ratio Kit



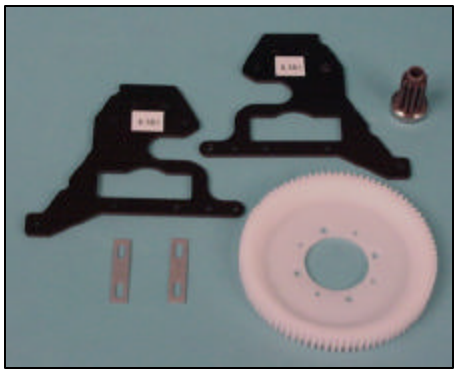
Part #	Description
119-130	Includes

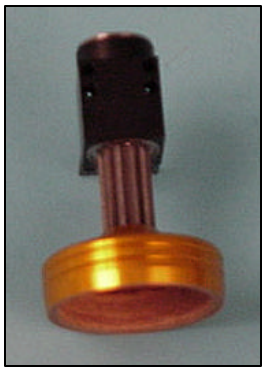
- 90 tooth main gear
- 11 tooth pinion gear
- upper gear bearing
- graphite doubler plates (set)
- upper plate spacer (G-10)
- lower plate spacer (G-10)
- motor mount shims (2)
- Clutch o-ring

(Continued on page 13)

Fury Updates *(Continued from page 12)*

Fury 8.18 to 1 Ratio Kit - With Complete Clutch Bell

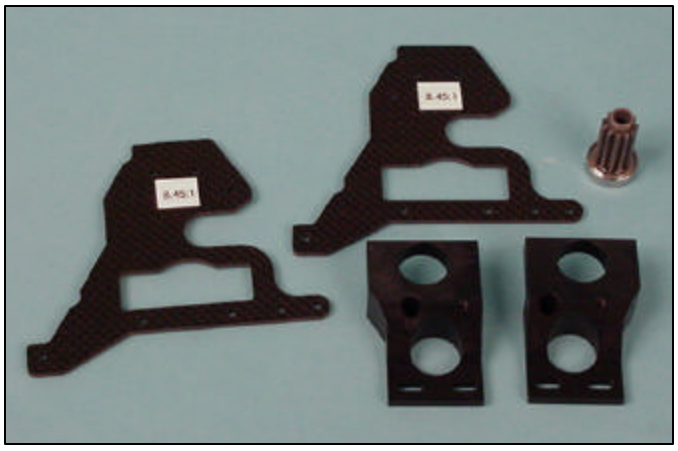




Part #	Description
119-131	Includes

- 90 tooth main gear
- Complete Clutch bell with 11 tooth pinion gear installed
- graphite doubler plates (set)
- upper plate spacer (G-10)
- lower plate spacer (G-10)
- motor mount shims (2)
- Clutch o-ring

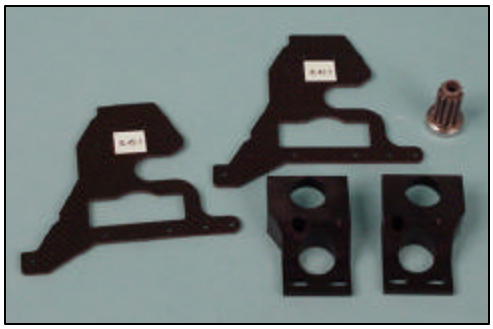
Fury 8.45 to 1 Ratio Kit -

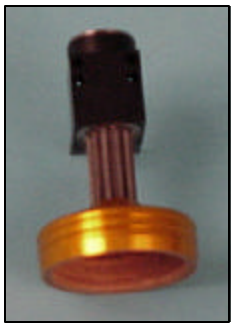


Part #	Description
119-134	Includes

- 11 tooth pinion gear
- upper gear bearing
- graphite doubler plates (set)
- upper plate spacer (G-10)
- lower plate spacer (G-10)
- Left Motor Mount
- Right Motor Mount
- Clutch o-ring

Fury 8.45 to 1 Ratio Kit - With Complete Clutch Bell





Part #	Description
119-135	Includes

- Complete Clutch bell with 11 tooth pinion gear installed
- graphite doubler plates (set)
- upper plate spacer (G-10)
- lower plate spacer (G-10)
- Left Motor Mount
- Right Motor Mount
- Clutch o-ring

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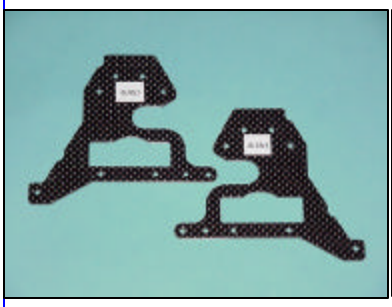
Fury Updates *(Continued from page 13)*

Fury Gear Change Ratio Components -

Available separately



#119-118/119-120

#119-50/119-51

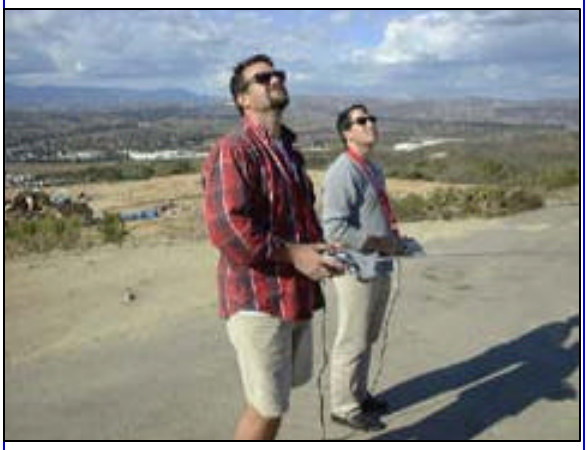
#0864-13

#0864-10

Part #	Description
115-96	Uppper clutch plate spacer - G10
115-98	Lower clutch plate spacer - G10
119-118	8.18:1 Gear Ratio Graphite Clutch Doubler Plates (set)
119-120	8.45:1 Gear Ratio Graphite Clutch Doubler Plates (set)
119-50	8.45:1 Gear Ratio Left Motor Mount
119-51	8.45:1 Gear Ratio Right Motor Mount
0864-10	11 tooth pinion with complete clutch bell unit
0864-12	11 tooth pinion gear
0864-13	11 tooth pinion gear with 0183 bearing factory installed

Todd Bennett's R/C Helicopter Flying School

Instruction is provided at an hourly rate of $50 per hour including all necessary equipment.
Instruction is tailored to individual student's needs including helicopter setup, buddy boxing, and safety training.



New for the school in 2002: Todd will be offering traveling schools at various locations not only in the United States but internationally as well.

Many of you have seen Jason Krause demonstrate his flying at fun-flys around the country. Jason has joined the school and along with Todd will be conducting classes for groups of 6 - 8 students.

In addition, Todd and Jason are working on a coordinated demo program for future opportunities when they are both attending the same fun flys.

They are also pushing to release an extreme 3d instructional video, expected to be available in early 2002.

For more information, visit the school's website at http://www.freestyle3d.com or e-mail Todd at freestyle3D@yahoo.com.

Bearings *(Continued from page 10)*

only push against the inner ring to install/ remove it.

- ✓ Never push against the shield - its thinner than you can imagine and bends easily
- ✓ Don't lubricate them! The bearing manufacturer has included the correct lubricant and in the correct quantity.
- ✓ If you cannot properly install a bearing in a fixture, return the part to Miniature Aircraft, where they have purpose designed equipment to install them.

Contamination

This is a more subtle way for failure to occur, because the damage happens over time. Internal contamination can occur in ways you don't expect.

- Bearings are assembled in very clean rooms. Anything you do to them inside will introduce dirt. (Remember the clearances?). Dirt particles are pretty big relatively.
- Forcing lubricant into the bearing, especially with tools designed to push lubricant past bearing shields. These can easily contaminate the bearing with dirt or other particles that will eventually damage the internal components.
- Using the wrong type lubricant. This can cause friction/heat which can cause distortion of the balls or ball separators (remember the clearances?). Also, a lubricant containing particles such as Teflon or just dirt particles may cause the balls to get stuck in the separator assembly and momentarily skid in the raceways. This removes the film strength of the lubricant allowing metal-to-metal contact. This can cause microscopic pieces of metal to attach to one or more balls. As this happens again and again, the pieces get larger, and eventually break off into the lubricant. The lubricant becomes an abrasive slurry, which will eventually wear out the bearing.
- Careless cleaning, can push dirt into the bearing around the shield
- Cleaning with pressurized solvents can push dirt into the bearing, as well as push solvent into the bearing, which breaks down the lubricant.
- Using too much Loctite can allow the adhesive to penetrate around the bearing shields, which can result in sticking the balls/cages. Once this happens, the bearing will never run smooth.

Some suggestions to prevent bearing contamination:

- ✓ Don't lubricate them. The bearings provided with the kit contain the proper type and amount of lubricant.
- ✓ Don't disassemble them. You'll only get them dirty (remember the clearances).
- ✓ Don't spray solvents on them. This will dilute the lubricant.
- ✓ Be careful not to let loctite get into the bearing.

Improper bearing specs or type of lubrication

Every bearing in every Miniature Aircraft product has been specifically selected to correspond to the amount of load and turning speed required by each component that they support.

When a model is designed, exacting requirements are provided for every bearing to the bearing manufacturer. They use these specs to ensure that each bearing supplied has the proper rating and contains the correct type and amount of lubrication for its intended purpose.

Of course, if you choose to use bearings from another source, or load them with grease or other lubricants, Miniature Aircraft cannot guarantee their performance, since they may not meet the original design specs. As you can see, there are many more things to consider than just the diameter of the outside and inside rings and how many shields a bearing has!

Summary

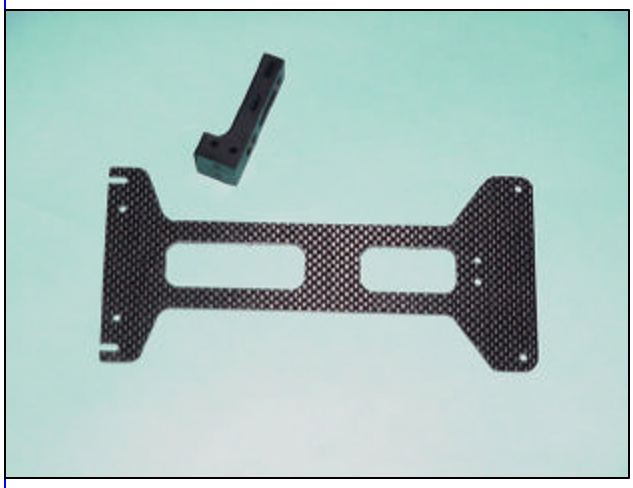
If the bearings are treated with care as you assemble or maintain your Miniature Aircraft product, you will be rewarded with a very smooth running helicopter. The bearings will continue to run smooth for a very long time.

Wes Howe provided the technical details presented in this article. Wes is the Chief Engineer for AST Bearings in New Jersey. Many thanks to him for contributing his time and engineering documents. For more detailed information, visit www.e-bearings.cc

Latest Products *(Continued from page 11)*

Fury Graphite Lower Frame Support -

Significantly enhance the rigid nature of either the G10 or Graphite frame. With these installed, the frames are virtually impossible to flex in any way.



#119-112

Part #	Description
115-53	Fury Aluminum one piece Inner Motor Mount Block
119-57	Fury Graphite Lower Support Plate only
119-112	Fury Graphite Lower Support Plate with Inner Motor Mount Block

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Orlando, FL 32808

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