Build Along

Glass Recurve 52"

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Intro

In this build along I'm going to build a short and compact glass recurve. The finished bow should have the following caracteristics

bowtype:	glass recurve with static recurves
lenght:	52" NTN
width:	3.2cm (parallel up to 3/4-limb, then narrow down to 1.5cm at the tips)
riser:	actionwood Green Mountain Camo with phenol overlays
limbs:	1.5/1.0mm red elm-lams, 2 x 1.2mm glass, width 3.4cm
tips:	phenol black-white-black, tip wedges 1mm x 12cm
weight:	35-45# @ 28"

Target

The goal of this build along is to build a short recurve, that is very nice to shoot und that has a good shooting performance (arrow speed). The grip will be fitted to the hand, so that the wrist is supported and can not be twisted.

The design is inspired by the zebra camo of Ted Nugent. The black and white phenol applications on the riser and the tips fit perfect into that design.

Findings/Conclusions

Since this is my first recurve, I wasn't sure if the stack was correct for the desired draw weight. I made my estimation based on information I found on the internet (thanks a lot Brad... ☺) and measurements I did myself on a few bows.

My worries finally proved as unbased. With a brace heigh of 8" the draw weight ended up at 48@28. I guess the tip wedges added a lot to the draw weight since they made sure the recurves stayed static. They also allowed to shape the tips very thin, and therefore added to the good performance.

At the moment I'm using a dacron string and the performance is already good. I wonder how much the arrow speed will improve with the fast flight string that I ordered.

I can say that there are a few points that could have been done better, but over all the goals have been reached.

Tools I used

The use of the different tools is explained as I go along with building the bow.

- belt sander
- drum sander
- hand saw
- electric jig saw
- c clamps
- various rasps
- chain saw file
- sanding paper (a lot...)
- flexible metal ruler
- R&G epoxy standard type L
- dust mask
- rubber cloves
- bike tubes or rubber bands
- finish

On top fo that I used a lot of nerves (when something didn't work the way I wanted... ☹) and a few cans of beer (when it worked exactly the way I hoped... ☺).

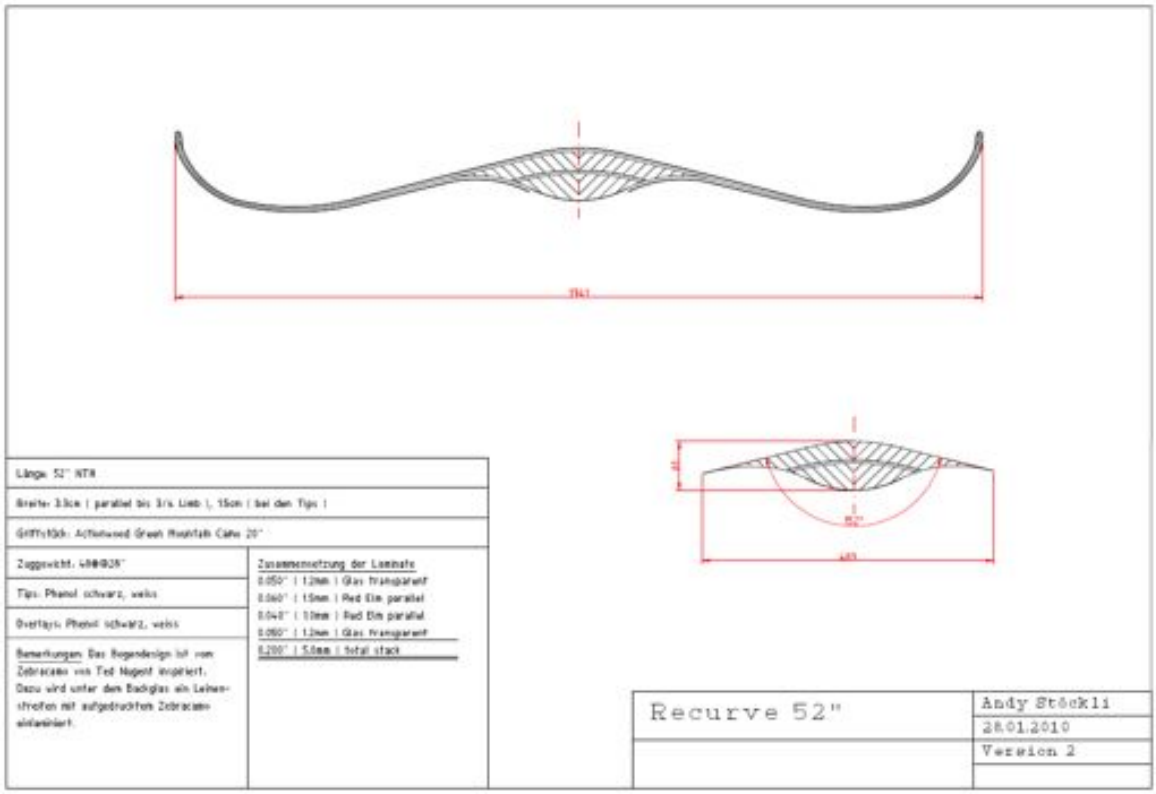
IMPORTANT NOTE !!!

During all the sawing and sanding work always wear a good dust mask and use a shop vac system or work outdoor.

Also during the glue up of the bow make sure to have good air circulation. I always wear rubber gloves to avoid skin contact with the glue. Epoxy can cause itching and other alergic reaction. The overlaying glue after the glue up is sharp like a rasor knive and can cause very bad cuts that heal only very slow (guess how I know that one...).

Bow design

On the computer I draw the form and I also define the dimensions and the caracteristics of the bow.



Picture 1: First drawing of the bow

For that I rely on information I found on the internet and on measurements I took myself on several bows.

Acquisition of material

The lams, the actionwood and the phenol for the tips and the overlays I got from Kenny M.

http://www.kennyscustomarchery.com/index.html

The glass I order through our local archery shop. They offer me a very reasonable price.

On top of that I need a plywood board like it's used in construction, for building the bow form. A few other stuff (masking tape, piece of foam) I buy in a homeworking shop.

All in all the material fort he bow costs me about 90 – 100 US$. For the bow form I have to pay another 40 US$.

Building the form

Bevor I can glue up the bow I have to build a form for that. In the homeworker market I buy a plywood board like it's used for construction. I cut the board in half lenghtwise and screw/glue em together. This way I get the desired width. After that I draw the form of the bow on the plywood and cut it out with the jigsaw. While sawing it's important to make sure, that the blade is cutting straight and not bent to the side. The better I saw the less I have to work with the rasp afterwards. With a good bandsaw or a router this work would probabely much easier, but with some patience and a bit of elbow grease it can be done very good as well.

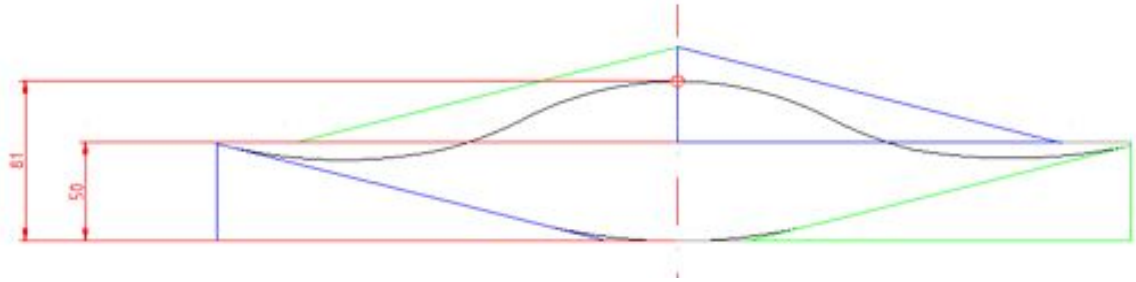
The surface of the form has to be absolutely flat and exactly at a right angle.

Picture 2: The finished form

On top of the form I glue a glass strip and a rubber strip. This way I'm sure that the surface is flat and even and the rubber helps to distribute the pressure. Approximately 8cm from the contour of the form I drill wholes in the form. In these wholes I stick pegs that stand out two inches on each side of the form. On these pegs I will attach the rubber bands during the glue up of the bow.

Construction of the riser piece

For the riser I'm using a block of Actionwood (Green Mountain Camo) the size of 1.75 x 2 x 18 inch (4.5 x 5.0 x 48 cm). Since I want a riser bigger than that I take the pieces that I cut on one side and glue them back on on the other side.



Picture 3: Construction of the riser

Now I can start to sand the shape of the riser until it fits perfectly into the bow form. After that I sand the fades of the riser on my custom made drum sander. With a piece of wood I back the paperthin fades, so they wont brake off.

Picture 4: Sanding of the fades on the drum sander

Preparing the lams

Before I can laminate the bow I have to prepare the lams. First I mask the blank side of the glass strips with masking tape to protect them from scratching. Then I cut the glass and wood lams to the desired lenght.

To make sure the recurves stay static I will add tip wedges at the end of the limbs. The wedges are 12cm long and are tapered from 1mm to 0. The advantage of this construction ist hat the tips can be very narrow and therefore have less mass witch will add to a better shooting performance.

Picture 5: The lams, the glass and the camo strip ready for glue up

Before the glue up I do a dry run and check if all the parts fit together like planed. If they don't I rework 'em until I'm satisfied. Especially at the fades of the riser it is very important that there are no gaps left.

After that I clean all the lams and glass strips with acetone and cover the form with a food wrap foil so that the bow can not be glued to the form.

Glue up

To get a good glueing result the temperature should not be below 20 degrees Celsius. This way the epoxy can cure correctly. With baking or tempering of the bow during several hours the curing of the epoxy can be improved. But in my opinion this is not an absolut must, if an epoxy that cures well at room temperature is used. I have glued up many bows without a failure so far.
It's important to mix the two components of the epoxy exactly the way it's specified. With a kitchen scale the parts ca be measured very accurate. For a bow of this size and type I need about 150 grams of epoxy.

I glue up all the glas and lams and put them in to the form one after another. It is important that both sides of the lams that are glued together are soaked with epoxy. While putting on the rubber bands I take care that the lams are well alined and not mooved out of the center.

Pictere 6: The glued up bow

Now I let the bow cure during 24 hours.

Sanding limbs and tips

After the bow has cured completely I take it carefully out of the form and sand off the excess glue.

Picture 7: The cured and cleaned bow

Then I take off the masking tape and check visually if the glue up has been a success. I check the glue lines and if there are some irregularities visible under the glas.

With a string I draw the centerline and check if the string goes through the center. The limbs stay parallel on ¾ of the length and the the narrow down to ca.15mm. After I have cutt he lenght of the limbs I sand the form of the limbs roughly. I don't go exactly to the drawn line yet, so in case the recurves will twist I still have some security margin to correct that.

Picture 8: Sanding of the limbs on the belt sander

With a chain saw file I file the string grooves in the limbs.

Picture 9: Filing of the string grooves

Now ist time to string her up for the first time and pull her carefully. The string is a tad longer than the final one will be.

Picture 10: Drawing the bow carefully fort he first time

The bow pulls very smooth troughout the whole range and the tips don't twist at all. Now the accurate work during the building of the bow form pays back. The draw weight is 45@28. Actually the brace height is still to low and I will increase it to 8 inches. So on the finished bow I guess the draw weight will be close to 50@28.

The next step consists of glueing on the tips and the overlay that are made of black and white phenol. First I cut the phenol strips and rough em up with sanding paper. Next i rough up the glass where I will glue up the phenol. Bevor the glue up i wipe all the pieces with acetone to make sure all the glueing surfaces are clean.

Because the glueing surfaces at the tips and the riser are not completely flat, I use c clamps to make sure that there are no gaps between the phenol strips and the glass on the back. The food wrap foil prevents the excess epoxy from dripping on the work bench.

Picture 11: Glue up of the phenol tips

With a rasp and some sanding paper I shape the form of the tips. It's important that the string grooves are smooth and well rounded, so that the string don't get damaged while shooting the bow. While filing the string grooves on the belly of the bow I check from time to time that the string stays well centered. If the grooves are not symmetrical the string will pull to one side while drawing the bow.

Picture 12: The tips with the string groove

Grip and overlay

I like actionwood because it can be worked very well with a rasp and sanding paper. And with the coloured layers you can see very well where you have to take off some more material.

The grip should support the wrist and prevent it from twisting due to fatigue or wrong hand position. For this the grip has to be cut out very deep into the riser piece.

With the jigsaw i cut out the rough form of the grip and the shooting window. With a rasp and sanding paper I work the grip until it fits my hand like a glove. The grip is assymetrical, so that the pressure point in the palm is shifted slightly to the left side of the grip. This helps to prevent that the string hits the forearm, even when the arm is completely streched into the bow. With a pencil I mark the place where the fingers reach around the grip. Then I file them with a rasp until the grip feels comfortable and the position of the hand is natural. On the right side of the riser i add a thumb rest. Now I have an ergonomical grip that fits the hand perfectly and supports the hand position.

Picture 13: The finished grip with the thumb rest

Finish

After the bow is shoot in it's time for another round of sanding and applying the finish. I sand the bow until no more tool marks or other scratches are visible. First I use 120 sanding paper, then 240 and for the final round I use 360. After the first coat of finish is on, I use a Scotch Brite flies to rough up the surface. This helps that the next coat of finish will stick well and it also give a mat and silky surface that brings out the colours nicely. I put on 6 coats this ways until I have a nice and stable finish on the bow. Now the bow is well protected and can be used in bad weather without any worries.

Picture 14: After the first two coats of finish applied

Picture 15: Riser with shooting window and shelf

Picture 16: Thumb rest

Picture 17: Strung and ready to shoot