MOENCHELLO

LAKE MONGER
COMMUNITY SHED

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The Challenge

This is a story about the "rarest" cello in Australia. Its construction demonstrates that the Community Mens Shed and community groups have various skills to create whatever they wish. Many organisations and individuals contributed to the magnificence of this cello.

In March 2023, I finished making a **violin jewellery box.** The thought struck me that constructing a more extensive version could be challenging. Simple upsizing, just as an ornament, was the thought. I casually mentioned the idea to Richard, who suggested we use the CNC to make the tricky bits…the soundbox. I never intended to make a real cello, but Richard hit a note…making an actual instrument was far more appealing than a show object. I'm not one for making small things, and the idea appealed. What's wrong with a challenge…I can't even play the cello…

The internet is a goldmine of ideas and techniques for making fiddles. I settled on a ¾ cello. I am passionate about making stuff out of exotic timber. The back and soundboard [soundbox] are predominantly American Walnut [Juglans nigra] with a dash of Jarrah [Eucalyptus marginata]. In addition to the straight-grained pinkish karri, I purchased some American Oak [Quercus Alba] for the cello neck and peg box.

Soundboard Test Profile

Richard was already sourcing his programmes for the cello. To remove the bugs from the formulae, we decided to cut an **MDF profile.** It took several days to get it right, but that template was our guide for the rest of the project.

While at **Vincent Mens Shed,** I mentioned the cello project to Murray, who suggested I contact **Andre** for advice. Andre is a respected violin maker who makes instruments in the traditional manner. Shortly after, Richard and I met him, explained our plans, and showed him the MDF template. He was interested in our approach and offered some valuable technical advice.

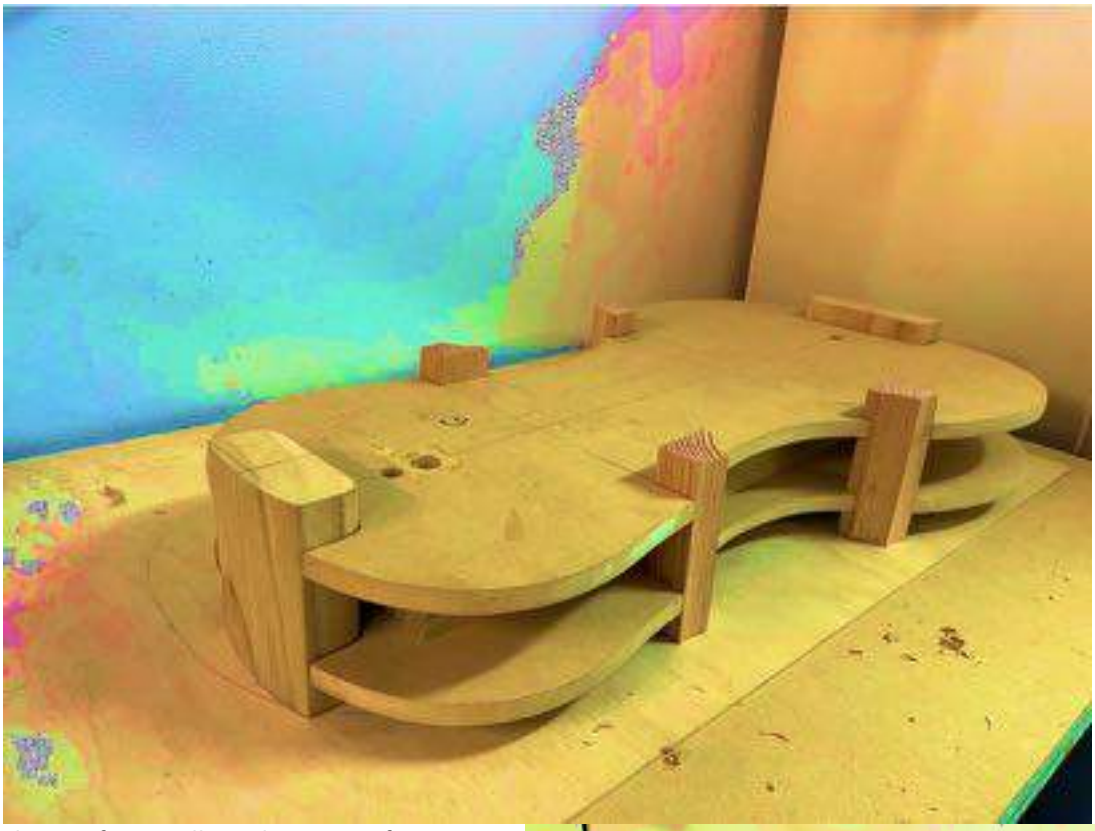
Scroll, Pegbox & Neck

The violin's sizing and making of the neck, etc., was based on internet information. I laminated a sandwich of oak, jarrah and sheoak…that required considerable hand carving, chisels, and general woodworking. Richard thought it might be a job for the CNC…but I had to do something.

Rib Construction

I constructed a jig that profiled the cello ribs. Experimenting with several types of timber was a thought, but I couldn't help myself and settled on karri…one of my favourite timbers. Frank from the **Vincent Mens Shed** helped dress the timber to about 6mm thickness. Andre suggested the ribs be 1.5mm thick, which presented the next challenge as the Lake Monger Community Shed thicknesser had a 4mm limit. We thought we could use the drum sander to achieve the thickness. However, Richard had a few tricks up his sleeve and suggested we "double-sided tape" the timber to an MDF board. This process worked well, and I was delighted with the performance of the karri… it didn't split.

The next challenge was to bend the ribs into shape. Many suggestions were offered, and I settled on a bending iron and heating the timber to 185° C. This was successful, although if there ever is a next time, I might be more patient. Once bent, I used hide glue to stick the final shape together using the profile. To release the ribs, I destroyed the template. Unfortunately, there was some spring back which I knew would be a later challenge.



The timber soundboards [see next page] were ready for shaping the real thing. It was a tense moment … the CNC Cycle Start button was pressed…and we watched the cello taking shape for endless hours. Of course, this was not without drama, as the back piece was a tad undersized, and we made some subtle [guesstimate] adjustments.

Back Piece and Soundboard

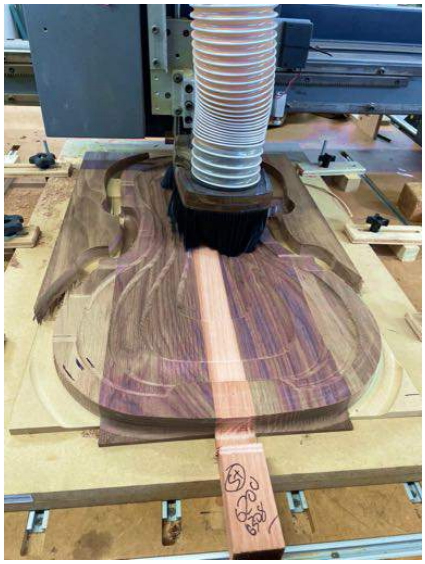
Forming the soundboard and back was a piece of engineering ingenuity. Richard was the mastermind behind its development and implementation. It isn't easy to describe the process, but here goes:

a) From details available on the net, the profile of the soundboard was divided into horizontal and vertical slices. Their meeting points created a "Space Map".
b) This detail was converted into programs such as Meshmixer or Blender.
c) This information was used to create a 3-dimensional program on "On Shape".
d) To create a .obj file.
e) To generate code.
f) To program the CNC
g) Six separate programs were used to create the soundboard and backpiece.

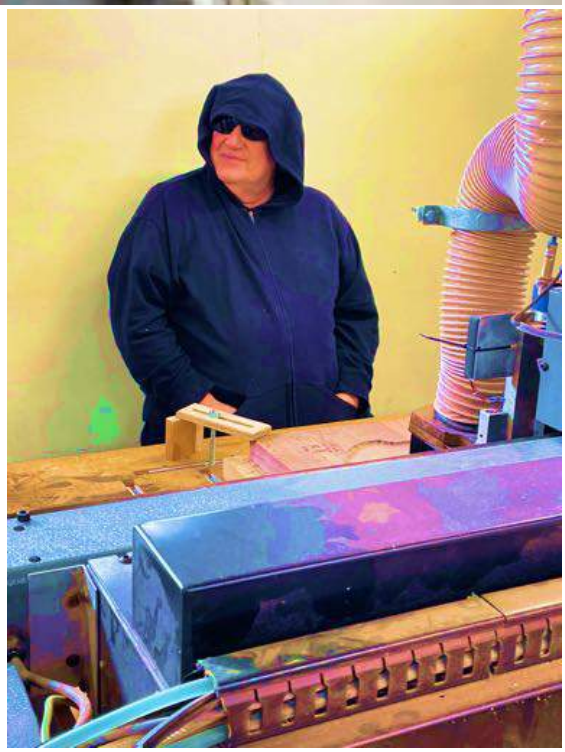
By this time, our project had a significant amount of interest. Some well-informed people thought it might be a guitar; others just looked in disbelief at this bizarre endeavour. I had an offer from one of

the member's daughters to play, others said the cello had been chosen as the most popular string instrument, a violin instructor was super impressed, and so the pressure mounted to make this project a success.

Richard is an absolute genius, especially deploying the CNC…he never failed to impress with his superior grasp of complex technical concepts. Without his input, ownership, and project engagement, this fine cello would have been a simple display, not a working instrument. Richard says that he produced the cello profiles by taking "cross-sections" of the cello and putting that into the formulae. To avoid mistakes, we conducted a trial run using MDF. This approach was fortuitous as it corrected excursions and served as a template for the rest of the project. I used this to determine the location and shape of the ribs.



We also used a machine levelled MDF board accurately located and pinned on the working area of the CNC. This project platform was for cutting the boards back and front and matching profiles. To avoid cracking during the convex operation, special strengthening was added to the concave finish. It took six separate operations to machine the soundboard and back section. Richard



Richard "The Hood" overseeing the CNC process. The day was cold.

designed a program for the "ff holes" based on my recommended measurements and as suggested by Andre.

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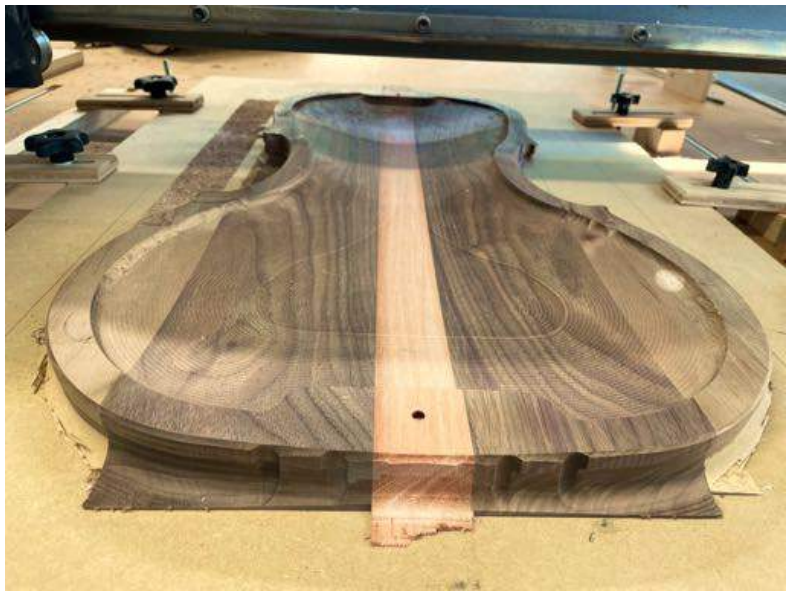
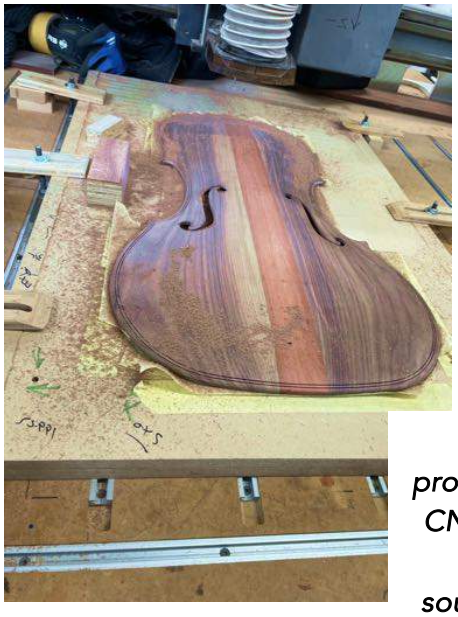
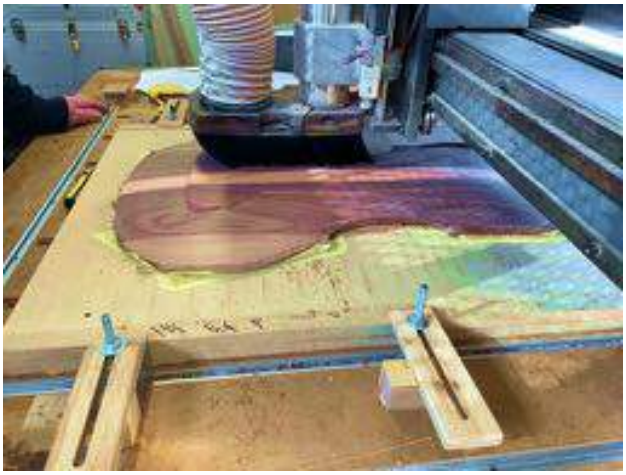
Machining the back piece convex and concave finished using this round nose bit.



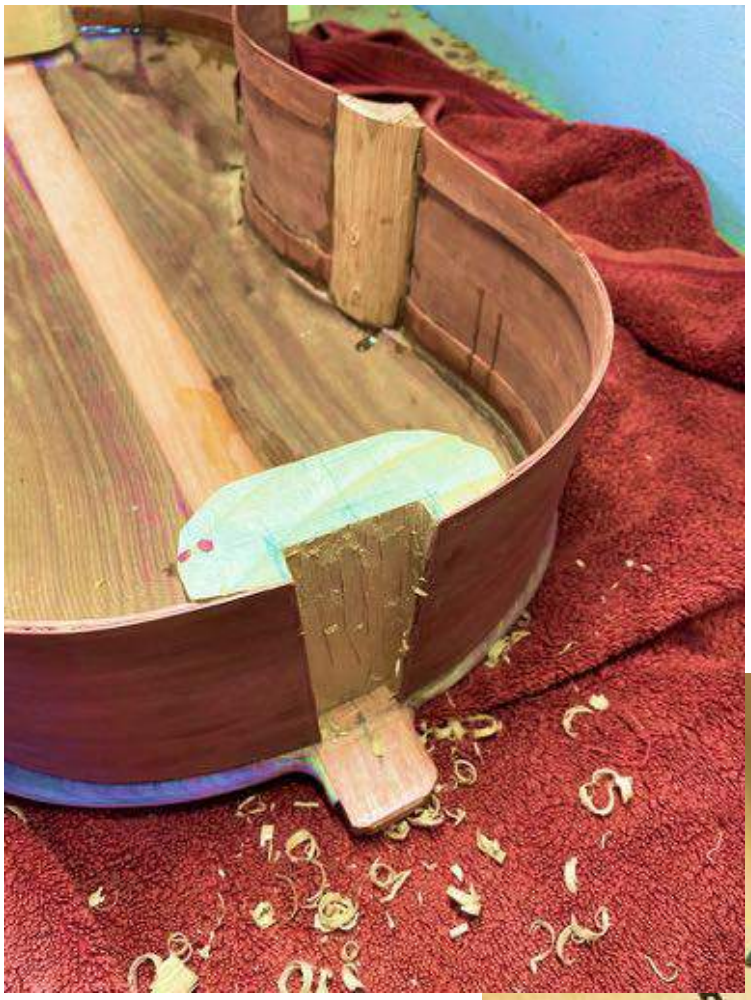


Final products after CNC….back and soundboard.



Assembly & Finishing

I was anxious when it came to carving out the slot for the Neck. This is important as the angles affect the geometrics around the bridge and the locations of the strings. I drew up a scale version and matched my construction accordingly.



Gluing the soundboard and backboard to the ribs required perseverance and planning to ensure all surfaces were parallel and precisely finished. In practice, this is challenging to achieve and requires much patience.

I had to apply some pressure and a slight filling during the gluing process.

Tight bond Hide Glue offers the opportunity to open the cello if that's required in the future.

My clamping arrangement for the first side was clumsy and untidy but worked and was different from the professional luthiers.

"MoenCelloMarkOne"... assembled and ready for finishing.

*"**MoenCelloMarkOne**"… finished with many coats of "Birchwood Tru Oil Gun Stock Finish" ready for tuning.*

Tuning

I consulted Andre several times and was at the stage when stringing, bridge adjustment, and other procedures were ready for completion. On 8 August 2023, I proudly presented the almost complete cello to Andre. I planned to make sure that I could progress to the tuning stage. My dreams were shattered when Andre pointed out some issues:

- "Gluing in" the endpin was a "no-no"…as it prevents the tail end from being properly installed and, therefore, prevents successful tuning.
- The **base-bar** was installed on the wrong side of the soundboard's vertical axis. This is the reinforcing bar inside the cello. It's easy to make this mistake as it's counter-intuitive in placement during forming and gluing. However, this was an annoying setback and set the stage for my future options.

Options/Risks/Solutions

My technical mistakes led to some agonising moments. Should I:

a) **Do nothing and use it for display only**…this option was not considered appropriate, as the "crowd" and Richard wanted to hear the sound the cello made.

b) **Cut out the endpin and replace it with a new endpin**…this attracted a cost and the probability of damaging the cello. However, I found it was loose enough to be taken out….so that was no longer an issue.

c) **Remove the soundboard and reposition the base-bar**… I felt this solution had a high probability of wrecking the soundboard and the cello. The option was to do nothing and accept that this instrument would be a left-handed cello. [BTW…I am also a left-hander.] In practice, this option doesn't work as there are no left-handed cello players to be found…all left-handers play like a right-hander….seems like musical discrimination to me.

d) **"String the cello for a left-handed player**, and once the sound is heard, display it as an object to demonstrate what community sheds can make.

While I was frustrated about my errors, Andre quickly pointed out that the cello was beautiful and display-worthy. I don't believe any of my mistakes detract from demonstrating what can be made within the community shed movement.

I had to make tough decisions after Andre's discoveries and the options available. I consulted my mate, Jamie, at Zeniths and asked if he could finish the cello. We decided to string the cello for a **right-**

hander and ***"to hell"*** with the consequences. A brave decision but a successful outcome when on 16 August, a young cellist at Zeniths played a few bars…and my heart sang to the emotional magnificence of this instrument.

Acknowledgements

An enterprise of this complexity is only possible through the support and advice of many players:

- I am grateful to Richard for his friendship and encouragement during the construction of this project. This project was possible through his endless time and support.
- My thanks go to Andre, who, without hesitation, offered significant technical advice.
- I thank The Lake Monger Community Shed and Max, whose leadership in establishing this Shed has been first class.
- My thanks are extended to Zenith Music and James, who was instrumental in making the cello work.
- I acknowledge the support provided by Frank of Vincent Mens Shed.
- I remember my skilful grandfather **Levi Deen**, who trained at the Amsterdam School of Architecture early in the twentieth century. He was a respected Amsterdamer, Dutch Architect and prolific furniture maker…thanks, Opa!

About Martin Moen – Cello Project Manager

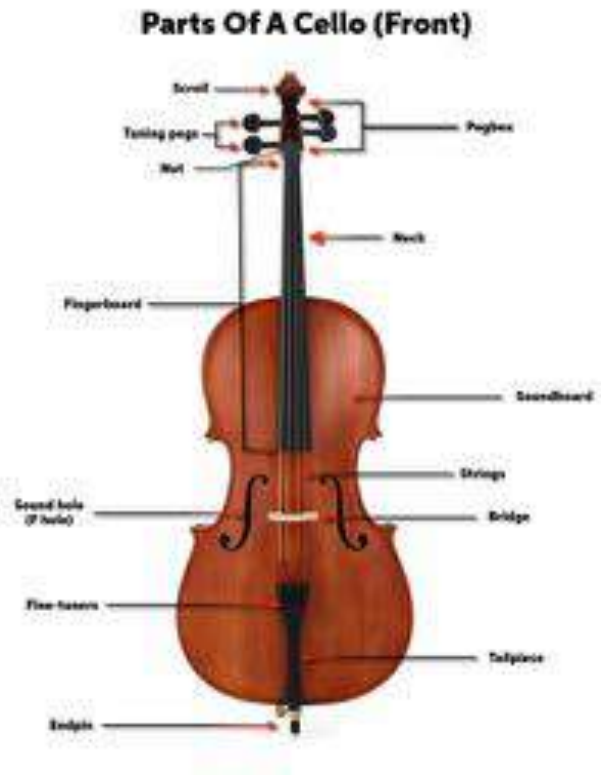
I immigrated to Australia in 1949 and am a retired Civil Engineer and Project Manager. My passion is working with timbers making all sorts of Objet d'art, wood turning and furniture. Past hobbies are kiln-fired glass art and charcoal portraiture. I am also a writer of historical non-fiction stories and memoirs. I am married and have six grandchildren.

I may be contacted at Email: mam970426@gmail.com

What Next

There is a lot to learn about these types of projects. I am making another 4/4 cello using timbers known for their sound qualities.

Technical Details



Comparison to Specifications for ¾ Cello. Reference Alan Goldblatt – Luthier

Technical	Goldblatt Specification	MoenChello Specification	Comments
Body Length	690	680	
Width: Upper	315	290	
Middle	219	210	
Lower	400	400	
Ribs: Height	90-105	113	
Thickness	1.4	1.5	
Arching Height: Back	25	27	
Top	26	27	
Back Thickness: Edge	4.8	4.5	Constant thickness
Corners	5.5	4.5	
ff area	5	4.5	
Top Thickness: Edge	5	4.75	Constant thickness
Corners	5.8	4.75	
Ff area	5	4.75	
Ff Holes: Length	125	125	
Distance to edge	24	30	
Between upper Eyes	88	95	
Bass Bar: Thickness	10	10	On the wrong side
Distance to Edges	80-85	60	
Height	23.5	25	

Scroll: Width at Ears	80	80	
Peg Box Width	45	45	
Neck Length	259	280	
Fingerboard	550	530	Internet purchase
Tailpiece Length	215	215	Internet purchase
String Length	637	750	Purchased from Zenith
Bridge Width	80-85	90	Internet purchase
Main Timbers: American Walnut & Oak, Australian Karri & Sheoak, Black Ebony	I chose karri for its colour and structural qualities. The walnut is a soft timber, and its fragrance takes me back to my childhood and our own walnut tree on the farm.		

Project Costs: This is a costly exercise, and a budget of A$1500+ should be allocated. This includes timber and all the other bits, including glue, augers, sandpaper, taper, finger board, pegs, string, callipers, tape, etc. This does not include the time Richard and I put in.

Project Duration: A crude estimate of the time translates into about four-six weeks full-time. It took about five months part-time. Approximate 6-month project period part-time.

Does it play: The ultimate test was its sound qualities. In the words of ….Rays daughter ….

What I Learnt the project:

- It is impossible to do without someone who is a master CNC operator.
- It's not a one-man project.
- Let your gut be your guide.
- The impossible is possible.
- Don't be afraid to get advice.
- Timber is expensive.
- Be bold and take risks.
- Leverage the skills and resources that community sheds have.
- Have a passion for timber and be prepared to experiment with its properties.
- Be thankful that the community shed movement exists to keep us men amused and sane.
- Think about all the things that could go wrong and mitigate them.
- Measure three times and cut once.
- Emotion is a strong driver…harness the feeling

Where was the Cello Made?

Most machining was performed at the Lake Monger Community Shed, Western Australia.

Assembly was at home. The Lake Monger Community Shed is one of the finest sheds in the State.

I thank them, especially Max, for providing such outstanding facilities and genuine friendships.

References

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