

Three Basses

Back 25 years ago, in the second half of 1988, three of us who were building guitars in Sydney, Australia; Gerard Gilet, Jim Williams and myself all received orders for acoustic bass guitars around the same time. None of us had ever built one previously, there was not much information available (none of this modern interweb stuff) so there was a bit of discussion back and forth about the best approach. American Lutherie editor Tim Olsen had written an article in AL No 9 on acoustic bass guitars and this had been followed by several more articles in AL No 12 including one from Harry Fleishman which included a picture of a delightfully assymetrical body design which I promptly appropriated. (I did retrospectively seek permission when I met Harry at a GAL convention some years later) These articles provided at least a starting point for our instruments.

As all three basses were finished about the same time, we thought it might be useful to do some comparisons. All three were about the same size, ie as big as possible and made of similar materials - Sitka spruce soundboards and Tasmanian blackwood (acacia melanoxylon) body. The main difference was the methods of soundboard bracing.

The Instruments:

Gilet: body 22"x 18.5", 5.5-6" depth, 4" soundhole, 32" scale. Bracing double X / lattice, double X reinforced with CF/ epoxy. 78 degree angle in longitudinal direction.

Williams: body 22"x19", 5.5-6.25" depth, 4.5" soundhole, 34" scale. Bracing 5x5 spruce lattice, 80 deg.

McDonald: 22"x19" 5" x 6.5" depth, 4" soundhole, 32" scale. Top .125" - .080" at edges. Bracing double X, heavily scalloped

Subjective listening:

Gilet - lots of bass, but with plenty of highs and definition

- Jazz Bass sound

- good balance

Williams - too bright, not enough fundamentals in the sound. 1st harmonic on the e strings sound much the same as the open string.

- loud

- 34" scale and standard gauge strings felt quite tight.

McDonald - lots of bass, tonally similar to upright bass

- lack of definition, uneven response, with each string having a different quality. On the A string there is a different sound to each note between b and d.

- we wondered if the semi flat wound strings might have had an effect?

Objective testing:

Gerard had a frequency generator, amp and a hand held loudspeaker. A small handful of sawdust from the bandsaw or tea-leaves gave quite accurate indications of the lower soundboard vibrational modes. A swept frequency response could probably have told us more about what the soundboards were doing, but we didn't have that kind of equipment.

Gilet:

| | | |
|-------------------|-------|----------|
| Air | 65hz | C |
| 0,0 | 155hz | D# |
| 0,1(cross dipole) | 258hz | C |
| 1,0 (long dipole) | 292hz | D (weak) |
| Tripole | 388hz | F#-G |

Williams:

| | | |
|---------|-------|------|
| Air | 80hz | D#-E |
| 0,0 | 169hz | E-F |
| 0,1 | 242hz | A#-B |
| 1,0 | 313hz | D# |
| Tripole | 426hz | G#-A |

There were also resonances at 650, 830 & 1310 hz

McDonald

| | | |
|---------|-------|-----------------------|
| Air | 75hz | D |
| 0,0 | 134hz | C# |
| 0,1 | 225hz | A-A# |
| 1,0 | 326 | E |
| Tripole | 485 | B (indistinct & weak) |

Conclusions:

- The air resonance should be as low as possible. This means a big body with a small soundhole. 4-4 1/2" seems about as small as can be made before an audible 'wooshing' sound can be heard. Graham Caldersmith has experimented with half-ports on his acoustic classical bass guitars (see references below), but a full port, as might be found in a hi-fi speaker box doesn't work. Sometime after we built these instruments I had the chance to look at a Caldersmith classical bass. It had an air resonance of 55hz and a main top mode at 123hz, significantly lower than any of ours. (Toward a Classic Guitar Family AL No 18 and The Guitar Family, Continued AL No 41)

- The soundboard resonances need to be low, but in proportion to the air resonance as they need to be on a standard guitar. Gerard thought the lack of definition on my instrument may have been a result of the very weak tripole mode. It might be better to use a floppy piece of soundboard material, rather than a stiffer one

- The bracing does not have to be massive. At a 34" scale, a setoff bass guitar strings has around 160lbs of tension, about what a medium acoustic guitar set pulls, so bracing similar to a dreadnaught should be enough. In 1988 I didn't have access to the D'Addario on-line string tension chart

(<http://www.daddario.com/DASTringTensionGuide.Page>) so I found a spring balance and made up a dummy neck with a single tuner on it. The spring balance replaced the ball end anchoring point so I was able to tune individual strings up to pitch and directly measure the tension. It worked out to around 18-19kg per string, around 40lb. D'Addario's string tension chart makes it much easier and they even give tensions for a 32" scale which works out at about 4-5lbs less per string.

- Scale length: Jim's 34" scale bass with felt much tighter and perceptibly harder to fret than the two 32" scale instruments with standard gauge (.045/.050 -.100/.105) strings on all three. What might have been preferable for the 34" scale guitar could have been a lighter set (.040 -.095") and a more lightly braced soundboard.

I built only one more acoustic bass a few years later, Jim has built a couple more within the last few years with still larger bodies and off set soundholes in the upper bout while Gerard another half a dozen or so. Both have used a lattice bracing system. My interest has gone towards smaller instruments as the years have gone on, but I came across these few pages of handwritten notes recently and thought our observations might be useful to others who might be working on similar projects.