Ran an extensive comparison of the sound qualities of the three Masters Guitars and two Carbons, 3-3 and 11-2. All guitars with the exception of 3-3 were strung with the Ovation package strings.

E String 013
B String 017

Core Gauge,	String Gauge	Item #	Ovation #
.013 Hex	.026	3AD3	601226B
.015 Hex	.035	3AD4	601235B
.016 Hex	.047	3AD5	601247B
.018 Hex	.056	3AD6	601256B

Discussion of Wood Guitars:

Master #1 (#49 Guitar)

Has the best sound in the overall. The triad is the brightest and the clearest. The mid-range, i.e., D, C. B. and A chords are very clear. The low E string is exceptionally bright and responsive. However, the guitar does exhibit on single notes some tin pan on F and B on the E string. However, when played together in chords, this is not apparent. I think it can be reduced by going up .001" to a .014 string. It must be noted that these Hex strings have less output in mid-range and bass than the previous Ovation production strings thereby permitting the treble to stand out more than previously. The balance here is very nice.

Master #2 (#50-2)

This guitar is second by reason that it is a trifle feeble compared to the triad of #1. The triad is thinner. The mid-range D, C, B and A chords are beautiful, same as #1. The open E string bass is a shade muddy, not as clear and brilliant as #1. Played individually there is a barely discernible tin pan on the B note but the tin pan is noticably less than on #1. However, the whole go together of the guitar is not quite as loud, not quite as clear and not quite as bright.

Master #3 (#52-1 thru 14)

Master #3 guitar is quite thin on the high triads. It is pretty good at the B top G triad. The mid-range sequence from C, D, B and A are exceptionally clear, but not pronounced and loud. The low E string is definitely muddy as if it were muted. There is a little tin pan at E flat E and B, but really not bad on tin pan, not sufficient to be faulted. The overall output of the guitar, however, while clear is not pronounced. It has less output in total.

Carbon 11-2

Triad on this guitar is clear, but not bright like Master #1 and the E string is definitely weak. There is definite tin pan on B and A flat when played individually. The mid-range series D, C, B and A are quite clear and extremely nice. The low E string is quite muddy and muted; the overall sound of the guitar is sort of flatish and is not acceptable for a carbon guitar. It rates in sound output between #2 and #3 masters.

Carbon 3-3

This guitar was checked mainly for triad which remains clear and brighter particularly in the upper region over #1. It therefore substantiates the original preference of Glen Campbell on treble brightness. The mid-range series D, C, B and A while clear are not as clear as #1 and #2. However, the bass response is very large and the total output of the guitar is great with emphasis on little tubbiness in the bass and high cut of the treble. Some modulation and equalization of the tonal properties of this guitar are essential.

SUMMARY

My conclusion at this writing is that my preference in overall integrated sound is Master #1 with Carbon 3-3 following closely.

Discussion

Checking these guitars over, #1 has tapered fans longitudinally with the maximum height at 3/8 " in the vicinity of the bridge in front of the bridge. The fans are in a fairly spread out pattern associated with previous fan design and tapered height down to 1/16 to 1/4" on the outer perimeter of the five fans. This then obviously leads to increased longitudinal stiffness at minimum weight with minimum bulk and supports the theory that this does give bright response in the treble.

Carbon guitar #3-3 has a fairly wide displayof fans. They are both 1/8" and 1/4" in staggered pattern. All are about 1/4" high.

It is noted that in the evolution of sound on contoured spruce guitar 51-2 the outer fans were ground to 1/8" in height leaving the center fans at 1/4" in height. There was previously quite a lot of tin pan in this guitar alleviated with relief on the outer perimeter.

It is also noted that Carbon 11-2 began life with the wide footprint tapered fans of the CMD design #2 and initially displayed very restrictive sound as did Master #3, originally equipped in the same pattern.

Conclusion from these look sees would lead us to going back to the narrow fan 1/8" wide and tapered so that there areapproximately 3/8 in the vicinity of the bridge and forward tapering to a 1/4" at the neck block and tapering to nothing as customary at the bottom of the bowl. There should be five fans and the outer perimeter fans should be approximately 1/8" high. The inbetween fans can be 1/4". A tabulation of the best available data is attached on these guitars showing relative values of K's as tested.

TEST REPORT

Guitars	Carbon 3-4	Carbon 11 -2	Master #2
	Bright but thin	Lively D chord	By comparison a little muddy
	Bassey Brassey	Clear Thin E string	Muddy

Configuration:

Carbon 3-4

Small holes, large cross brace up high, narrow fans 3/16" high action is terrible and detracts from sound.

✘ This is the guitar Glenn played and preferred. Very big on bass and loud clear highs but thin some of which is due to the poor action. PLAYED 2-1

Carbon 11-2

Contoured with original #2 fans configuration with the wide 1/4" footprint. Ground this down to 1/8" to 3/16".
On 11/1 the tin pan was bad on the E string until changed. Gauge from .0135 to .0150. However, the guitar was considerably below concert pitch at the time. Later at concert, the bass and mid was lacking compared to 3-4. After grinding down the fans as described above to become 11-2, the K changed from K-.081 to K-.107 and the bass and mid-range picked up. But the Estring lost sustain. My notes on carbon #4 reveal it was very tin panny without and until fans were added. So 11-2 got worse on tin pan as fans were reduced.

Sylvester done

This leads to the desire to try to hold the flexibility while increasing the longitudinal stiffness while decreasing the lateral.

This concept is also supported by the experience with 52-1-10 where adding lateral stiffness produced the worst tin pan I've ever seen.

There might be some credence to the theory that high frequency modes a emphasized around the upper bout. The present design clef holes compromise this and so it must be investigated.

In the light of this, guitars 3-4 and 11-2 were taken to Ovation and tapes were run of their audio signatures. Beyond this, nodes and anti-nodes were identified by location.

11/4/74

The following comments will pertain to the characteristics of 11-2:

Bowl resonance covers region from E to G or a little above while the fundamental top resonance occurs from E to G and the next harmonic. The next peak occurs at the next octave of G and is predominantly on the sides of the bridge out to the rim. The tin pan hole at B which follows is related to the area in front of the fretboard, while a resonance occurring immediately thereafter at D flat is centered principally in the top region between the clef holes and the fingerboard.

There is another resonance at E flat which predominates at 5" below the bridge. There is another resonance at very high A that is active 3" off each side of the bridge. We now have amplitude calibration and this guitar produced 3 DB more output than the best custom legend. Sound is somewhat better than the Carbon 3-4 and comparing the traces 3-4 has a substantial hold between F and B. This also accounts for some tin pan.

It is noted that the area in the perifery of the big bout plays virtually no part whatsoever in these resonances.

The aforementioned theory of moving the clef holes to this region is hereby supported.

We will also experiment with tops constructed with the 30° angle and a 0° angle for the birch veneer. It is currently believed that increased longitudinal stiffness relative to lateral while holding the net K to not over K-.090 will eliminate the tin pan on the E string for us. Also since this area of resonance occurs in the region of the upper bout moving of the holes should be of material help.

In summary then at this time carbon 11-2 has the most beautiful balance of mid-range and bass with great clarity that we have seen. It's only deficiency is a weak E string at B and C and a reduced output of the E string in the overall. The aforementioned changes will be investigated to correct this deficiency.

11/4/74

11/21/74

Comparing Carbons	3-3	Blood — flat 45°
	11-2	45° Clef
	14-1	6 holes 0°
	12-4	Thin 45°

3-3 Has the best overall sound so we covered the port holes, reduced bass out of the sound. Still clear on treble triad but can hear some tin pan on B and D.

11-2 Differences to 3-3
3-3 has heavy shelf
Blood holes cross brace at top
Flat top
Short fingerboard

11-2 has weak shelf
Clef holes
5 fans
Softer bowl material
Very tin panny E string when holes are covered still less sound than 3-3 with emphasis on tin pan of E string.

14-1 Compared to 3-3
Has 0° veneer
Weak shelf
6 holes
CMcD fan #3 configuration (resembling Master #1)

Less output than 3-3 but very close
Tin pan on F $B^{\flat}$ $E^{\flat}$ but triad and A note are big.

CONCLUSION:

Hole location on big bout ineffective and severely restrictive to bass response.

12-3-74

CRITERIA FOR GOOD SOUNDING CARBO

1) FLAT TOP
2) HOLES AT TOP 10 "A" or 9 "A"
3) PLY @ 45°
4) THICKNESS .048"
5) HEAVY FANS LIKE 2-1
6) POSSIBLE BEAM BELOW HOLES
7) REASONABLE STRENGTH RIM
8) TUNE TO 82.4 cycles
9) K = .070 - 080 PREFER LOWER
10) RL .09 - .10
11) SN .06 - .08
12) NO FINGERBOARD INSIDE BLOCK