

The art of loudspeaker design is the art of compromise. What size enclosure should the designer choose? It must be transportable, yet big enough to provide suitable bass reinforcement. Should he (for it is almost always a man's game) design his three-driver system as a three-way system, or provide two bass/midrange drivers? If the latter, should he opt for a D'Appolito drive configuration, to deliver a peerless point-source sound? Or reject that, because this works only on a single horizontal plane?

Above all, what driver, cabinet and cross-over design choices should be made when a realistic selling price must be achieved?

All the above always apply, no matter whether the speakers will sell for \$1,000 or \$10,000.

But most do not apply to Lenard Audio's Opal loudspeakers. In one respect, the Opal speakers are more a concept than a product since they are custom engineered for each purchaser. However they all have some common characteristics: they are huge, their design adheres to traditional concepts long since abandoned by much of the industry, and they are uncompromising.

How Big Is Big?

The particular pair I auditioned were installed in a home in Canberra, so I shall henceforth call them Lenard Audio's 'Canberra' Opals.

Take size as an example of compromise. The limits on the size of these speakers were imposed only by the height of the ceiling. Thus, each enclosure stands 2.4 metres tall. Designed to be corner-coupled, from above they adopt the form of a square, 900mm on a side, with a corner sliced off.

Then there are the drivers. Any decent driver can produce bass, even very deep bass. But the size will impose limitations on either volume level or distortion. For a smaller driver to produce deep bass, its cone excursion must be greater than a large driver. That inevitably introduces non-linearities, producing harmonic distortion.

Now harmonic distortion is something to be avoided in all aspects of high-fidelity performance, but in fact it is in the bass that avoiding it is most critical. That is because our hearing sensitivity reduces rapidly as the frequency reduces. At lowish sound pressure levels, your hearing sensitivity is 20dB greater at 80Hz than it is at 40Hz. This means that if a subwoofer produces second harmonic distortion at a level of ten per cent, then the distortion will sound as loud as the fundamental frequency itself!

So, all other things being equal, bigger is better for woofers. This system has 27 inch (686mm) diameter woofers, two of them in each loudspeaker, each in its own sealed enclosure. Yes, you read that right. In today's world, where a 15 inch (381mm) subwoofer is considered a whopper, each of these stereo loudspeakers carries two 27 inch drivers. Because they are so large, their excursion is minimal, so the rubber surrounds are considerably narrower than is common on most large drivers, providing an even larger size advantage, since the cone is wider than it would normally be, compared to the diameter of the frame.

To get this in perspective, the four 27 inch drivers have a total cone area the equivalent of more than 25 twelve-inch woofers!

Each of these drivers is contained in its own, huge, independently-sealed enclosure. Cone excursion is minimal, and their sensitivity is prodigious, at 102dB SPL at one metre for a 2.83V input. Lenard Audio says that the drivers will comfortably produce the 16Hz pedal from a 64-foot pipe organ.

These are four-way speakers, with midrange drivers taking over at 100Hz from the 27 inchers. The midrange is split between a couple of different JBL professional series drivers. Between 100Hz and 800Hz, a 15-inch JBL 2220 driver

Lenard Opal Loudspeakers

Brand: Lenard

Model: Opal

Category: Active Loudspeakers

RRP: On Application, See Copy

Distributor: Lenard Audio

Address: 32 George Street
North Lambton
NSW 2299

M: (04) 1044 4171

T: (02) 4957 1362

E: info@lenardaudio.com

W: www.lenardaudio.com



Lenard Opal Loudspeakers



is used. Rated at 200 watts and with a sensitivity of 101dB SPL for 2.83 volts, it also is capable of enormous output levels for microscopic cone excursions (although it is capable of managing up to 16mm from peak to peak).

The band from 800Hz to 6kHz is handled by a JBL 2440 compression driver, fitted into a deep horn turned from a block of wood created by gluing MDF sheets together. This is rated at a mere 60 watts for continuous program handling, but given that its sensitivity is an incredible 118dB SPL, this is effectively no limitation.

Finally, treble is handled by the JBL 2405 Ultra-High Frequency Transducer. Actually, since this is rated to a high end of 20kHz -3dB, I am not sure where the 'Ultra' comes from. This 'transducer' can handle 40 watts and has a sensitivity of 105dB SPL at one metre for 2.83 volts input. It is fitted with a diffraction horn that provides a very wide horizontal dispersion (-6dB at 16kHz at 90° off-axis) and reasonable vertical dispersion (35°).

The midrange and treble drivers are all contained in a separate sealed enclosure, which is fitted within the main enclosure, so their audio production is not modulated by rear pressure from the 27 inch drivers.

Crossing Over

The Canberra Opals were provided with valve amplifiers, with a separate unit for each side. Each contains five 100 watt amplifiers, with an amp dedicated to each driver. Those for the 27 and 15 inch drivers operate in Class A/B configuration, while those that drive the upper midrange and treble drivers are configured for pure Class-A operation, and so are limited to 40 watts.

The separate amplifiers allow Lenard Audio to use an active crossover network, which is designed as a Linkwitz-Riley 4th-order crossover. The relative output level of each of the amplifiers can be adjusted to allow tuning to a particular room.

The Canberra Opals were in a room measuring around five metres wide and six metres deep, with unusual changes in floor level and ceiling height breaking up the normal rectangular shape. A Musical Fidelity CD player and preamplifier were the signal sources.

Listening

Knowing I would be visiting an environment allegedly capable of delivering prodigious bass, the first CD I selected was J. S. Bach's *Passacaglia and Fugue in*

C minor. Called by Leopold Stokowski the 'most sublime' piece of music ever written, I went through a period in the 80s acquiring five versions before I finally happened upon one with satisfactory bass (even the relatively recent Teldec DVD-Audio disc is pretty much useless on this front). Through most of the *Passacaglia* the theme is carried on the pedals, and the closing note of each repetition of the theme is the lowest C the pipe organ being used is capable of producing. Most pipe organs, even on the long pipes, carry high levels of harmonics, so that the fundamental frequency of the C is relatively muted. But not so with the Great Organ at Methuen, captured in 1979 by Telarc (CD-80049). As the thunderous finale gets underway, the room shakes with the tall pipes... or it should, if only one's loudspeakers can deliver the necessary 16Hz tones.

I placed this CD in the Musical Fidelity unit, pressed 'play' and advanced the volume control. Into the room entered an organ. A huge organ with mighty pipes. It was into the room, rather than moving me into a concert hall, because without any form of digital signal processing the only realistic reverberation was that originally recorded. But that is thanks to the room. Had these loudspeakers been installed into a large enough space, I have no doubt that they would have overcome even that limitation.

As it was, every element of deep bass was there, at huge volumes as required. Yet there was scarcely any cone excursion even as 16Hz was pouring deafeningly out of the loudspeakers.

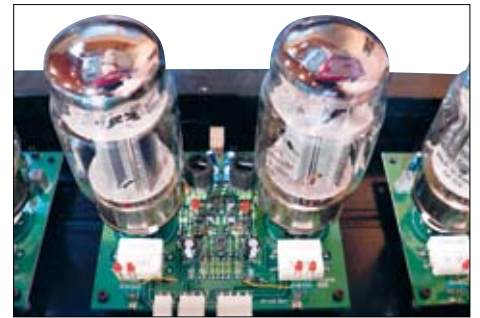
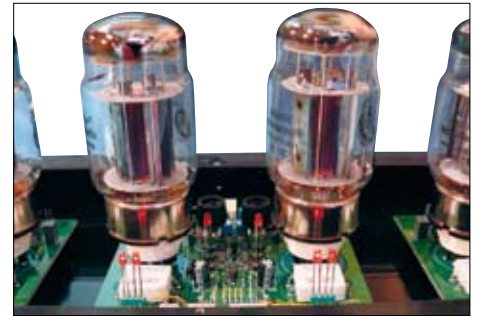
I had always considered that this CD, for all the merits of its bass, to be a trifle brittle in the upper ranges. Through the Canberra Opals this was banished. Instead it was clean and every note (of which there are many) was clearly discernible.

If you love organ music, these are the loudspeakers that you need.

But I have never been inside the Methuen hall, so something more comprehensible was required. I opted for the track *Nobody* from Ry Cooder's 1978 album *Jazz*. This is a male group *a cappella* song, in which the bass voice could all too easily predominate. After all, with four 27 inch bass drivers and four hundred watts of power available to them, it would be tempting to wind them up a touch.

But they weren't. Instead, there was extraordinary balance across all the voices, with the higher-pitched tones riding effortlessly over the bass underpinnings. I was especially interested in imaging on this track, given that high-efficiency horn-loaded drivers do not have a reputation for





delivering imaging depth. But in this case it was there, with a clear horizontal focus on each individual voice, and a tangible solidity to each imaged voice. There was fore-and-aft range as well. Not as much, I realised when I got home and replayed the track, as with my own speakers. But these are mounted well forward of the rear wall which, in turn, is covered with sound-deadening material to reduce midrange and treble reflections. Given that the Canberra Opals are tucked into the room's corners and separated by a wall of hard, acoustically reflective glass, the performance was absolutely amazing.


For dynamics, you cannot beat jazz. I chose Weather Report's 1982 self-titled CD and my favourite track, *Dara Factor One*. This features unusual rhythms of drum work under a wide frequency range of instrumentals, a synthesised bass carrying the theme at the opening, pierced by the cymbal-heavy kit. The dynamic sense was palpable, without any of the limitations in range that I normally sense. If a peak was demanded, a peak was delivered, completely uncompressed. I suspect that with the enormously high sensitivity of these loudspeakers, the amplifiers were merely idling and that there would have been almost no heating of the driver voice-coils, in large part accounting for this.

But what about rock and roll? Well, to approximate that in the stylings I preferred, I chose Primus' 1993 CD 'Pork Soda'. For those unfamiliar with it, Primus is a three-man group consisting of electric guitar, drums and bass guitars. The bass guitarist, Les Claypool, is a celebrated virtuoso on the instrument and also doubles as the vocalist.

The form of the music is frenetic, the vocals often delivered with machine-gun rapidity, and the drum rhythms convoluted and complex. Often the melody, such as it is, is carried on the bass with the rhythm guitar providing ornamentation. All too easily this music becomes confused because of its complexity and wide frequency range, but mostly because the only way to play such music is loud. But what the Canberra Opals did was clarify it, primarily by revealing the quiet amongst the noise. Each strike of the drum was delivered into the room, but the few milliseconds before the next strike were filled with a golden silence denoting the absence of ringing or overhang. The drivers delivered what was asked of them, and nothing more, silencing instantly in accordance with the signal. Meanwhile dimensions of Les Claypool's strange voice were revealed in a unique intimacy, with each tiny grind of his throat and shape of his mouth aurally revealed in a way I had never before experienced.

Conclusion

Unfortunately the Canberra Opals are unique. The world's entire supply of 27 inch drivers was used up with this set of loudspeakers. And they are by no means inexpensive. Although the owners were a little coy about the total cost, I gathered that it may well have pipped the six-figure mark.

However Lenard Audio *does* build Opals with other drivers (lower-cost options than even the JBL Professional Series drivers are available). All I know is that if I had an unlimited budget for stereo loudspeakers, Lenard Audio would be my first stop. 

Stephen Dawson

