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Why Crystal's Arabesque
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EQUIPMENT REVIEW

The Crystal Cable Arabesque Loudspeaker

by Roy Gregory. Photography by Simon Marsh

Glass speakers are not new, and many previous designs have placed emphasis on aesthetics over sound quality. As you can see inside a transparent cabinet, the use of internal acoustic damping largely defeats the object. It's not impossible to build good sounding speakers without internal wadding – but it makes the job much harder. Consequently, glass speakers got pigeonholed as 'lifestyle' products.

That started to change with the arrival of Waterfall loudspeakers from France. With striking, clear cabinets and neat internal construction these sounded way better than anybody expected, proving that glass might well have its uses in loudspeaker construction. But if Waterfall put the material back on the map, Crystal Cable's dramatic debut Arabesque loudspeaker is tilting directly for a place at the audiophile top-table. With a price-tag of £45K, this needs to do a lot more than simply look pretty; glass needs to become an essential part of the design and construction, not just an aesthetic gimmick.

Having said that, just standing in front of this speaker it is hard not to be impressed by its material content and clean, flawless execution. It's weight will impress too; despite its insubstantial appearance, the Arabesque weighs 103kg.

Almost more so than any other product, this is one where the input from your eyes is in danger of overriding the evidence of your ears. After all, it can't be serious – can it? Well, like I said, the price alone adds up to 40,000 reasons why it better had be. Then there are the electrical specs: 95dB sensitivity and a -3dB point of 27Hz from what is, in volume terms, a pretty small cabinet.

Built from carefully cut and mitred sheets of 19mm plate glass, the intricate shape of the enclosure is far from an accident. Each panel enjoys a different width so that no two elements support the same resonant behaviour. But the really clever part of the structural design derives from the use of advanced Comsol FEA software to model both the mechanical behaviour of the cabinet and the gas dynamics of the enclosed volume. Employed by the likes of NASA for product development, it allows a designer to work with incredibly complex shapes in real time, allowing the shape itself to become a critical factor in the resonant behaviour of the system – and resulting in the Arabesque's complicated but precisely calculated, tapered footprint. Shaped rather like a Comma, the curved tail section is left open to vent the internal volume. Referred to as a friction port due to its tapered form and narrow mouth, the precise dimensions of the neck allow equally precise control of the

air mass. This, combined with Comsol's deep insights into the cabinet's mechanical behaviour allows the speaker to virtually dispense with internal damping without compromising performance, arguably actually realizing the potential of glass as a structural material for the first time.

In theory of course, you could take things further, with different thickness panels and mitred construction, the joints would introduce steps into the internal or external faces, as well as ruining the appearance. Likewise, parallel top and bottom panels (the only parallel surfaces in the cabinet) are pretty much mandatory. As it is, even using 19mm glass throughout, each pair of cabinets take nearly a month to complete.

But it takes more than a great cabinet to make a great speaker. The Comsol software allows precise tuning of the speaker's vent, its mouth being partially closed by a slotted 316 grade, stainless steel plate. This is damped to prevent it resonating, while the only other internal damping is an unobtrusive, domed cushion in the base of the cabinet to help control the vertical standing wave.

For once the drivers, that normally get all the attention in a loudspeaker, are in danger of being overshadowed by the striking, clear cabinet, but again it would be wrong to overlook them. The high-frequency driver employed is a specially modified version (employing an amorphous magnet and silver/gold alloy wiring) of the highly respected RAAL ribbon tweeter from Serbia, with an aluminium diaphragm that's claimed to be lighter than the air it drives up to an upper limit of around 100kHz. To match its polar dispersion, the Arabesque uses three of the latest Scan Speak Illuminator bass/



mid drivers, specially modified and arranged in a vertical line. These employ a double skin paper cone with offset lobular reinforcements – the retro version of composite, if you like. These are driven by a powerful motor whose neodymium magnets and contoured housing ensure a small reflecting area in the face of the driver's rear wave, current hot topic amongst cone speaker designers. The benefit is extended to the minimal but carefully profiled legs of the driver basket, whose elegant curves also serve to minimize reflections as

well as offering a pleasing aesthetic touch to the drivers' exposed backsides. The drivers are mated through a second-order passive crossover, although unusually, the tweeter is kept in phase with the bass/mid drivers for a phase coherent output.

The ribbon extends down to a low crossover point of 2kHz, again echoing an increasingly common current trend amongst high-end speaker designs. The crossover itself is housed in a separate, milled out block of aircraft grade aluminium spaced from the bottom of the cabinet proper. Components are supplied by Tritec (air-cored inductors) and Mundorf (foil in oil capacitors, but employing Siltech/Crystal's proprietary silver/gold alloy as a conductor) and hard wired with Crystal's top of the line Dreamline speaker cable, which also extends up to the drivers.

SPEAKER BURN IN – IGNORE IT AT YOUR PERIL

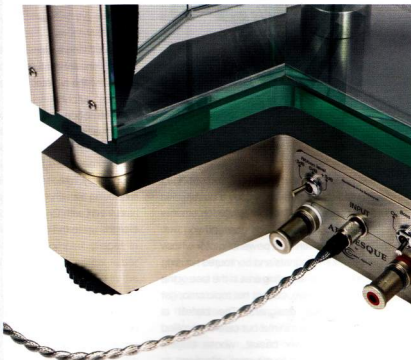
Running-in loudspeakers is one of those topics that gets a lot of loudspeaker designers hot under the collar – one way or another. There are those who swear by it, and those who dismiss it out of hand. So who is right? Well, it could be both sides of the argument as the actual running-in mechanism is poorly understood (if at all) and varies significantly from one design to another, depending on the constituent parts and materials. So, on the one hand both Avalon and Focal are assiduous in running their speakers before delivering them to reviewers, whilst other manufacturers are happy to present brand new units.

The Arabesques arrived with around 12 hours of running time – and sounded nothing like the examples I've heard at shows. Whether that's down to the drivers themselves (there's some suggestion that spider condition is critical to cone driver performance) the crossover components or the wiring, who can say, but clearly these speakers were going to need a lot of running. I left them playing at serious levels around the clock, using a mixture of dense and dynamic musical material and a purpose designed burn-in track, but it was a full six days before they really started to open up and allow music to breathe in the way that previous experience suggested they could. Another two days and they really started to sing, at which point it was high time to reassess their positioning and set-up.

Of course, the company had installed and tweaked the position of the speakers in their original form. Breathing more freely, they demanded revisions to rear wall spacing, an increase in toe-in and a reduction in the distance between them. It's this that makes burn-in such an insidious effect, because even though your speakers will get there in the end, the benefits that accrue could easily be undermined if you fail to revise and optimise their positioning. The very nature of the Arabesque and the manner in which its sound evolves makes the lesson especially stark.

On the recessed, rear face of the crossover block, contained within the curve of the speaker's footprint, you'll find the terminals, as well as a pair of level switches for the drivers. There's a single pair of WBT binding posts that will take 4mm plugs or spades, whilst the two switches allow you to adjust tweeter level in three, 3dB steps and also cut bass output if room boundaries and acoustics demand it. But in some respects, the most interesting feature is found between the WBTs: a sub-miniature four-pin screw socket allows owners to directly connect Crystal's own speaker cables whilst dispensing with the normal single or bi-wire tails. That has to be the ultimate in low-mass connection...

One other aspect of the Arabesque is deceptive. On paper at least, the sensitivity suggests that this should be an easy speaker to drive – and in some respects it is. However, two other sets of figures give rise for concern. The wide bandwidth (27Hz to 100kHz ± 3 dB) coupled with a 'nominal' 4 Ohm load suggest that things could get tricky for smaller amps. In fact, the minimum impedance dips to a 2.8 Ohms minimum and it's no surprise to discover that when it comes to lower powered amplifier options, its push-pull valve amps that seem to do the best job, with their greater control at frequency extremes than their triode brethren and the considerable shelter afforded their output stages by the large lump of iron sat between them and the speaker load. Certainly, the VAS Citation Sound mono-blocs did a sterling job, even if they didn't grip the speakers the way bigger amps did. On the solid-state front, I think around 100 Watts should be considered a sensible minimum, otherwise you'll risk seriously underselling the speakers' capabilities. That impedance dip also means that the speaker cables are under stress, with a noticeable benefit to be had from doubling up – or shotgunning – the speaker wires. Engaging the Bass Cut results in a rather kinder 4 Ohm load, but I'm not sure it's sensible to consider this as an amplifier matching solution, the trade off in bass output being a poor exchange.





The Arabesques come with a concise but extremely useful manual that includes excellent advice when it comes to speaker positioning.

► SET UP AND SYSTEM

The Arabesque's mirror imaged and asymmetrical cabinets mean that they can be positioned with the 'tails' pointing into the soundstage or out. Which you opt for depends on the size of your room and the width between the speakers, with the argument for pointing the tails in strengthening the closer the speakers get to the corners. Despite my large listening room, I tried the cabinets configured both ways, but quickly opted for the added sense of width and space afforded by the outward pointing attitude. Initially, tails in gave a greater sense of depth to the soundstage but this soon emerged as a proportional change, with images started to clump together on a narrower frontage, robbing the music of its bounce and freedom.

Of course, this only applies to the comparative luxury of a wider room and in a more constricted environment the benefits of cleaner, more linear bass might easily outweigh or even reverse this perception. It also takes no account of the Bass Cut switch, which again was clearly inappropriate in a larger listening environment. RAAL supply sets of magnetically fixed foam wedges that can be used to tailor the tweeter response if listening in the near-field, and their inclusion reflects the lengths that Crystal have gone to, to create a speaker which will work in a range of different rooms, again helped by the sophisticated Consol modelling software. Reluctant to cart nearly a quarter of metric tonne of plate glass up the stairs to my older and somewhat smaller room, I'm in no position to comment on the effectiveness of these steps. What I can say is that the speakers certainly work as advertised in larger spaces.

Once you've positioned the speakers you'll need to level them, essential if you want natural acoustic proportions from the longish lines generating the sound. Each cabinet is supported on seven adjustable disc feet, each one moulded from engineering polymer and designed to help spread the considerable load of the speaker evenly across the supporting surface. The small degree of flexibility inherent in the material is also designed to ensure close coupling with less than even surfaces. Trying to adjust seven feet is far from easy – so don't bother. Wind three down to support and then level the cabinet, then wind the others down to share the load.

Although I tried the speakers with various amplifier and cable combinations, the vast majority of my listening involved the Connoisseur phono and line stages, feeding the latest Berning Quadrature Z monobloc amps through a range of suitable cables including Crystal Dreamline. Sources were the ARC Reference CD8 and Wadia 781 CD players, along with the Grand Prix Audio Monaco/Triplanar turntable, carrying the Lyra Titan, the VPI TNT/JMW and the Kuzma Stabi XL4/4POINT. All played their part as I explored the limits of the speakers' musical performance. I didn't try alternative spikes or feet under the Arabesque, largely because of the practical implications of trying to hoist them off of the ground, although in situations where a really uneven floor challenges their stability or level, this would be an option.

One final point: the Arabesques come with a concise but extremely useful manual that includes excellent advice when it comes to speaker positioning. It may not offer an inch perfect solution but it definitely offers a great starting point. For once, don't forget to RTFM!

► Reviewing products is all about performance – and balancing that performance against cost. As I stated at the outset, given the price of the Arabesque and their high profile competition, they're clearly going to have to bring more than just a pretty face to the party. Trying to share space with established heavy hitters like Wilson Audio and Avalon, or even newcomers like Magico and YG, takes some front. Will the Crystals, with their demure, domestically friendly appearance and modest driver complement compete when it comes to sound quality?

This is *un vrai* Crystal, sharing the fluid, expressive, understated qualities that make the Company's cables so unusual and impressive. The Arabesque is that rare product that lets the music do its talking for it, a capability that's intimately connected to the lack of contribution from its cabinet.

When we refer to "hearing the box" of a loudspeaker, the statement is literal; you are actually hearing additional or altered output as a result of the box. Some of that acoustic output will be as a result of the cabinet panels vibrating at their resonant frequencies, directly into the room, energised by the driver baskets and the back wave that the cabinet is designed to absorb. More worrying is energy that is absorbed by the cabinet and then released back into the drivers, becoming an addition to the signal itself. But the energy that travels from the back wave, through the cabinet and back into the drive units is especially destructive, because of the additional time delay involved and the fact that it's blending directly with the driver's acoustic output, slurring detail and tonality, altering the distribution of energy within both the time and frequency domains. In other words – screwing up the harmonic character of instruments but more importantly, the

musical timing. Why is this more important than tonal aberration? Because the ear is remarkably adaptable when it comes to harmonic character – after all, we recognize a violin whether it's playing in a concert hall, our front room or the bathroom, despite its very different sound. But we can't correct is errors or inadequacies in timing, which is why they are so critical.

If you want to hear just how successfully Crystal have controlled the mechanical behaviour of the Arabesque's cabinet then just listen to the taught, uncluttered clarity of the speaker's bottom end. Play *This One's For Blanton* and listen to the shape and texture these speakers deliver on Ray Brown's plucked bass notes, the sense of catch and release. But listen too, to the spacing, the precise placement of the notes and the way they play off of Ellington's piano lines, underpinning the melodies, echoing them and stepping forward to fill the gaps that the Duke leaves in the musical fabric. With only two instruments, there's nowhere to hide and consequently, many, many systems reduce this to a meandering shapeless mess, with rounded bass and no real musical relationship between the two players. The Crystals provide clean, articulate bass lines, with an attack and vitality that gels perfectly with the percussive piano lines, the intricate bass melodies (and their demanding fingering) clear to hear, bringing the music an almost addictive groove as you marvel at Brown's dexterity and the emotional range the musicians are drawing from such sparse material. The only other speaker at anything like this price that I've heard come close on this album is the MartinLogan CLX – and that's no coincidence!

But speakers are all about balance, and a lot of that bass quality also comes from the treble, where the clean, extended top-end is devoid of ringing or glare. Ellington hammers those right hand keys and in many cases they can sound brittle and glassy as treble units struggle to handle the transient energy, but they're crisp and clean on the arabesque, emphatic without being strident, pointed without being edgy. The RAAL ribbon clearly lives up to its stellar reputation, matching the unexaggerated excellence of the better diamond and Beryllium tweeters that mark the state of the high-frequency art.

So, with both frequency extremes securely and impressively in place, what about tying them together. Lest we forget, this is a hybrid speaker, with all the potential issues that entails when it comes to integrating the drivers. Fortunately, Crystal have taken those issues seriously and the result is integration that puts the Arabesques in the very top flight. Add to that the super fast and well behaved, laminated and reinforced paper cones of the bass drivers and the shallow second-order, in-phase crossover design and you've got good impulse response to go with the even dispersion. After that, the use of identical cables to all the drivers, extending to the alloy employed within the crossover caps, becomes a fairly thick layer of icing on top. The result is a sound that is both impressively involving and singular.

One (extremely) experienced listener felt that the Crystals reminded him of the Apogees – and he is definitely in a position to know. I can see what he was getting at. I've already cited the lack of boxy effects, but with their broad, wide-open soundstage, superb definition of height and super stable image quality, the Arabesques certainly present in the same way as the Apogees. Of course, that's partly down to the ribbon driver and the use of line arrays, but it also suggests just how efficiently the rear slot port evacuates energy from the shaped, glass cabinet. Stand behind the speaker and put your hand ►

*The result is integration
that puts the Arabesques
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- ▶ against the port openings and you'll suddenly find it less than surprising that this speaker drives the room in a manner akin to many dipoles. Which may or may not be a good thing, depending on your point of view...

One performance trait that is definitely dipole-esque is the nature of the images themselves. While the Arabesque throws a wonderfully transparent acoustic space, with plenty of that space evident between and around individual images, those images themselves are positively voluminous, with a real sense of three-dimensionality. The fact that the speaker doesn't plumb the depths when it comes to low-frequency extension robs the acoustic space of the firmest boundaries and the images themselves of a little solidity or body, but that's only when compared to (much) larger speaker systems. More importantly, these images are refreshingly life sized, which may come as a shock and certainly a contrast to those more accustomed to the pinpoint precision and point-source imaging of the ultra-definition school of speaker design. Which is correct is a much bigger and more arcane issue than I've space for here; I'm merely pointing out the effect so that listeners can look out for it and reach their own conclusions.

The Arabesque allows the music to breathe – even more so when used in conjunction with the matching Dreamline cables. The rhythmic fluidity and expressive musical timing of the Crystal speaker, products of its low frequency agility and lack of overhang, allow music to set its own pace, the musicians deciding the tempo rather than the way the cabinet handles low-frequency energy. Changes in pace, rhythmic hesitations as a player holds a note or sustains one are key contributors to the human quality in a performance, its expressive and emotional impact. Just listening to a familiar track like 'Hard Headed Woman' it's remarkable how vivid and vibrant the presentation is on the Crystal speakers. From the opening, heavily reverbed vocal to the way the attack on the strummed guitar accents and shapes the song's progress and line. The vocal is stable and full of the subtle inflections that betray just how hard the singer is working his instrument. The wide dynamic range of the recording plays to the track's sudden contrasts, giving it real impact and drama, while the detail and immediacy allow natural decay to cymbals and a host of tiny, incidental sounds to emerge. Indeed, the air and space that these speakers reveal in recordings is another highlight, adding to the sense of musical freedom and naturalness on both acoustic recordings and even the most heavily of Protocol mixes.

That lively, responsive midrange and the way it joins so seamlessly with the frequency extremes sets the Arabesque apart. It's pristine in its delivery and full of purpose, making its musical points with a directness that's both impressive and effective. But that deft touch and lack of sloth bespeaks an absence of padding in the nether regions which whilst I'm glad to be rid of, others might not agree. After all, we are used to having that extra weight there, adding ballast and the impression of low frequency power. In comparison, the Arabesque might be found lightweight, in the same way that some listeners describe the Avalons. But just like those faceted speakers, testing the low frequencies clearly demonstrates that the notes are there when they should be – and not when they shouldn't. The Blanton is a case in point, with no loss of weight or body as the melodic lines dip down. Orchestral bass is fulsome, with both weight and texture, but there's no escaping the fact that if you are used to hearing the Gladiator soundtrack via a couple of 12" drivers with a singalong cabinet then the Arabesque will come up short. It will play loud – and it will do it cleanly if the amp is up to the job – but if you want to blow out the windows then there are other speakers that will do a better(?) job at far lower prices.

It's easy to get this speaker wrong. It's looks remarkable and it sounds remarkable, but it's really all about music – whatever that music is. So the sardonic humour of Ian Dury is served as well as the bombast of Beethoven's 3rd Symphony, the fragile angst of Janis Ian as well as the snarling defiance of The Clash. All have passed through the Arabesque without fear or favour, stress or strain. But what is most remarkable is that a company with no speaker building experience can create a design as accomplished as this from such a challenging material.

Perhaps the answer to their success lies in embracing that material and truly incorporating it into the design as a whole. For make no mistake, the conception and execution of this speaker are just as holistic as the sound it produces. With so many manufacturers making progressively more and more exaggerated claims for their products, it's refreshing to meet a speaker that lets the music do the talking. +

TECHNICAL SPECIFICATIONS

Type: Two way hybrid loudspeaker
Driver Complement: 1x 140mm RAAL ribbon tweeter
 3x 180mm Scan Speak Illuminator laminated paper coned bass/mid
Bandwidth: 27Hz – 100kHz –3dB
Sensitivity: 95dB
Impedance: 4 Ohm nominal, 2.8 Ohm minimum
Crossover Point: 2kHz
Peak Output: 115dB
Weight: 103kg/227lbs ea.
Dimensions [WxHxD]: 490mm (19.3") x 1305mm (55.7") x 570mm (22.4")

Price: £45,000 per pair

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