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Legacy's Innovative Aeris

The Future of Loudspeakers?

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LEGACY

Legacy Aeris Loudspeaker

Reinventing the Speaker as a Hybrid System

By Anthony H. Cordesman

Photography by Cody Hamilton

The Legacy Aeris is a great speaker by any standard, and I can see why Robert Harley recommended it so highly after a listening session at the Rocky Mountain Audio Show [Issue 230]. It is a truly full-range speaker, with bass deep into the subwoofer region, outstanding performance at every frequency to the limits of hearing and beyond, excellent definition, outstanding dynamics, and a visual image that might win it an entry to the Museum of Modern Art in New York.

It comes with separate 500-watt amplifiers dedicated to each bass driver with a crossover point low enough that you can still get the best sound out of your regular power amplifier, and it has a very well chosen mix of drivers that provides a coherent and naturally detailed sound at any reasonable listening distance, as well as enough dipole radiation to widen the stage and reproduce more natural ambience.

And yet, these are only half of the reasons I'm excited about the Aeris. Bill Dudleston, Legacy's chief engineer, has produced some other excellent speakers, but the Aeris breaks new ground in what for me is the most important frontier in high-end audio: It comes with the Aeris Wavelaunch processor that allows you to tailor the frequency response to be as musically realistic as possible in a real-world listening room.

The Aeris Wavelaunch processor is an electronic unit that goes between your preamp and amplifier. It gives you up to 30 settings that you can use to adjust the sound of the speaker to correct room-interaction problems, partly correct for over-bright, close-miked older recording, and even—if you are fanatic enough—compensate for the different equalization curves in LPs.

Music vs. Technology

Most experienced audiophiles will already be well aware of just how serious room-speaker interaction problems are with more conventional speaker designs. Back in the 1960s, Roy Allison pointed out that low-frequency response in any normal listening room will look like the Alps no matter how accurate the speaker is in an anechoic chamber, or when measured so nearfield that room interaction problems are minimized. There are always peaks and valleys well in excess of 5dB, and almost always serious colorations from such peaks and valleys in the midbass, where the impact is clearly audible. There also are smaller response and reflection problems that affect the rest of the upper bass, midrange, and upper midrange. These can be corrected to some extent by adjusting the location of the speakers and listening position and by room treatment. I have never measured anything approaching a normal home listening room, however, where such preventative measures eliminated such response problems.

Moreover, "flat response" measurements inevitably create a musical sound that is too hard and bright. A single response or target curve also cannot correct for the fact that recordings differ sharply in timbre. This is particularly a problem for classical music fans because today's all-too-typical close-miking, while dramatic in apparent detail, produces an upper-midrange hardness that is often a cause of listening fatigue when a speaker is voiced for "flat" response and placed in a real-world room.

Designing individual components for flat measurements and then voicing them for the best musical performance has severe limits. First, technical measures cover only a relatively limited part of the "error budget" of problems detected by the human ear. Second, any front-to-back walk-through in a concert hall will tell you immediately there is no one "flat" response—and that what you hear on stage is not what you hear live. Third, no one lives in a concert hall. Even a custom-designed listening room is susceptible to significant speaker-room interaction problems unless the system can be equalized to deal with them.

The good news is that we have learned to be tolerant of such colorations, and speaker designers now almost universally use the crossover in their speakers to act as a passive equalizer to both improve frequency response and musicality. The bad news is that audiophiles as a breed are far less tolerant than others. This helps explain why audiophiles often talk about speakers as the most colored component in a stereo system, why they keep changing speakers, and why listening to a speaker in a large showroom where the speaker is precisely matched to the room doesn't guarantee that it will sound as good when you get it home.

No one can solve these problems simply by changing speakers or listening rooms. Our perceptions are not shaped by the character of the speaker or the listening room ***per se***, but by the interaction between them. Moreover, this same interaction means no combination of front-end gear, no matter how good, will be voiced with the nuances that best correct for these problems in speaker-room coloration. As a result, the search for the best high-end sound inevitably means consciously or unconsciously tailoring the system around the speaker-room interaction problem as well as finding the best-sounding individual components.

In the past, most equalizers that tried to reduce these interactions created as many problems as they solved. Older analog equalizers could partly solve truly critical room problems, but were often badly colored themselves. They also altered dynamics, and took some of the life out of music. Furthermore, they could only affect timbre and not the other problems in getting the best signal at the listening position like phase and time.

A few pioneers have addressed such problems with considerable success. Richard Vandersteen, for example, designed speakers with built-in subwoofers that could be corrected to deal with many real-world problems in the bass below 100Hz without coloring the rest of the speaker's response. Firms like TacT Audio and Audyssey developed digital equalizers that address most of the problems in response, make automatic room corrections, and adjust some aspects of time and phase.

Manufacturers like Rives have improved analog equalizers to the point where any colorations are so inaudible that the benefits outweigh the drawbacks. As Robert E. Greene points out in a recent review, the DSpeaker Anti-Mode 2.0 Dual Core room-equalization system provides the first truly affordable room-correction system that can be inserted into any normal home system, although it has some limits in digital headroom and input flexibility.

The Legacy Aeris System

And here we get back to the Aeris system. The Legacy Aeris is not a speaker as much as a system for ensuring the speaker can be adjusted to solve room-speaker interaction problems in a musically realistic way. This is the single most important area for advances in high-end audio, and Bill Dudleston has pushed further into this area than any designer I'm aware of to date.

You can get a full description of the Aeris on the Legacy Web page, along with its manual and a technical paper on its design. Its technical specification are shown below. In sound, however, the following features define a unique approach to speaker design:

- The signal going to the speaker is shaped by an outboard electronic unit called the Aeris Wavelaunch processor that goes between your preamp and amplifier. It provides 40-bit DSP room correction with a 24-bit CODEC and features balanced analog inputs and outputs, level adjustment, and a USB port to interface with your computer for optimizing performance. It not only provides room correction but also equalizes and time-compensates the sound at the listening position.
- The Wave Launch provides up to 30 different adjustable settings for different frequency response curves.
- The electronics provide signal routing and processing via the 4-input by 8-output matrix and XConsole software. Each balanced input and output of the routing matrix has independent level adjustment and each output can be configured as a submix of any of the inputs.
- The included Aeris algorithm divides the left and right inputs with a customized high-pass and low-pass network to form a stereo two-way crossover. The transfer function for each loudspeaker is pre-programmed at Legacy for linear output from each driver, correcting minor anomalies inherent in the combined array. The output side of the matrix is factory configured for Aeris, the input side (left side of the matrix display in the software) is to make adjustments in your room
- Software with an empirically derived algorithm is integrated into the speaker design to compensate for losses in low-frequency separation by increasing the ratio of difference information in bass frequencies to more closely approximate half space (free space with ground plane).
- The Aeris Wavelaunch processor provides the necessary amplitude and time-domain adjustments to utilize beneficial low-frequency boundary gain while reducing anti-modal resonance. This, in turn, significantly reduces cone excursion requirements, thus decreasing distortion.
- Reverberation is minimized by reducing sidewall reflections via the radiation nulls to the side of the speaker. This open-air arrangement behaves as a dipole from 80Hz to 3kHz, summing into a cardioid pattern with the bass drivers in the band from 80Hz to 200Hz. According to Legacy listening panels in controlled trials have felt that imaging precision and soundstage width are consistently improved over the Legacy Focus system.
- Separate 500-watt full-bandwidth ICE power amplifier modules are provided for ***each*** of the two 12" woofers to reduce intermodulation distortion and prevent the user's main amplifier from encountering up to 40 volts of EMF back-generated by the Aura motor system used in the woofers.
- Increased dynamic range and waveform tracing accuracy are ensured by employing drivers with higher sensitivity and greater acceleration. The high-flux magnetic motors of the midrange drivers are larger than those on most bass drivers.
- The cardioid-shaped radiation pattern decreases boundary coloration from sidewalls while also decreasing modal sensitivity at low frequencies.
- A new dual tweeter based on the Heil Air-Motion Transformer with a range of seven octaves and a sensitivity of 98dB is integrated with a high-sensitivity 8" midrange.

In short, the Aeris is not so much a speaker as a hybrid system that integrates speaker design and electronics to a degree I've never encountered before, and with remarkable success. I've had some great speakers in my listening rooms over the years, but I have never before been able to get around so many room-interaction problems. The difference is striking.

Setup

Your dealer will do the initial setup with you and you can listen to music as well as test tones. Setup is not only measured; it is also interactive. You can hear what is happening. You can have the bass adjusted to be as musically natural as possible and then add new settings to the equalization options the dealer installs by using a PC or Mac and experimenting as you listen.

You can also work with your dealer to make sure the initial setup does not overcorrect or undercorrect. Every good automated system I know of does not try to make things truly flat because this over-equalizes the speaker and creates new room interaction problems. But even the best correction system with automated setup has to be designed for all rooms, all speakers and subwoofers, all music.

Working with the dealer to tailor the setup while you are actually listening to music makes a critical difference, particularly because this is an area where measurement alone produces uncertain results. Every FFT and RTA measurement system I have produces at least slightly different measurements at the same listening spot with the same electronics and speaker and the same bass material. One may be "right," but there is no way to know from the measurements alone.

Listening to a "Dealer" Setup

Bill Dudleston set up my review pair just as a dealer would. He measured my room and the speaker response, and then worked with me—just as a dealer would—to ensure the musical results were at least as good as the measured settings. He then tailored the resulting equalization and time adjustments to provide a musically realistic flat setting, a "warm" setting, and a "recessed" setting that compensated in part for the excessive brightness or hardness of close-miked recordings.

The results are typical of what an audiophile who does not want to create his own settings would get, and they were exceptional from the start. The treble and upper midrange were very extended and provided all the air I could want without hardness. The Legacy Dual Air Motion Transformer (the Heil AMT) tweeter was smoother than any previous Legacy I have heard, but did not soften detail in any respect. It was equal to the best ribbons and electrostatics. I have heard speakers that rival the Aeris' capability to get the very best out of the best SACDs and high-resolution downloads, but I have not heard better top-octave sound at any price.

Equally important, the transition to the lower midrange of the "titanium-encrusted" 8" midrange did not encrust any aspect of the music. Many designs I've heard that mix driver technologies have at least minor sonic anomalies in the transition areas between them. The Aeris reproduced the midrange of my best piano and violin recordings seamlessly and with the kind of accuracy that is sometime missing in even the most expensive competition. It did equally well with flute and clarinet and soprano voice, reproducing the difficult passage in voice in ways that showed the strain a given singer was under but that added nothing in hardness or coloration. I can't say that it could salvage mediocre harpsichord recordings, but it did as accurate a job of reproducing the most difficult instruments in the sonic repertoire as I've heard, and it was as natural with cymbals as my recordings allow.

Bach is often synonymous with great music and bad recordings. I know—I have several hundred recordings of Bach chamber music. I found the Aeris did an exceptional job of ensuring all of the detail came through without adding the kind of coloration I often hear even from very expensive speakers. The same was true of Vivaldi and recordings with original instruments, which often are more a curse than a blessing.

You don't have to love classical music or the Baroque, however, to hear the Aeris' sound quality. Try ***Jazz at the Pawnshop*** and you may well hear even more detail than you thought was on the recording. The same is true with acoustic guitarist Bruce Dunlap's jazz recordings and with classic, pre-digital, naturally miked pop recordings like young Joan Baez or Judy Collins. I don't imply that the Aeris is not equally revealing with modern rock and jazz recording, but it is much harder to guess at what is accurate when the recording is not acoustic.

As for the bass, the Aeris will reproduce all of the bass detail that is actually on even the most demanding bass spectaculars. Saint-Saëns, the deepest organ music, Kodo drums, Telarc bass spectaculars, bass guitar, synthesizer—take your pick. What is more important is that the Aeris Wavelaunch processor smoothed out the midbass and upper bass and created a smooth transition into the midrange to well over 500Hz—one of the great advantages of a system that is not automatic and not limited to frequencies below 80 or 100Hz.

The Aeris can overdrive my room at every bass frequency that is musically relevant, although you will still need a subwoofer for earthquakes, thunderstorms, explosions, and communication with elephants. The Aeris has exceptional bass detail from the deepest musical bass smoothly up into the midrange, and yes, the claims about reducing boundary problems are true. The Aeris not only provides great bass detail, it does so more evenly throughout the room. I normally can hear and measure far more room-boundary effects in the bass both with music and test tones.

The dynamics are just as good as everything else. The Aeris does not have any sweet spot in loudness. The upper-octave drivers and midrange do an outstanding job with low-level detail in even the most complex orchestral material. The same is true at levels well over 110dB, although my tolerance does not extend beyond a few brief moments at that level. I left it to friends to abuse their favorites at sustained listening levels with deep bass being played at well over 100dB. They were as impressed with the Aeris as I was unimpressed with their judgment.

The soundstage was roughly the equivalent of a point source, but broadened by the dipole feature of the speaker and given impact by the exceptional bass. The Aeris holds an excellent center image and stable overall stage with very good width and depth. If you want exaggerated width you won't get it, but you will get what is on the recording and get a relatively wide listening area, as well. The driver height of the AMT tweeter is also almost perfect for a seated listener, and imaging depth, width, and proportion have a realistic balance that does not favor one good recording's soundstage over another. A pleasure regardless of whether the music is solo guitar or the new Cyrus-Beiber version of the ***Ring*** cycle.

And if You Are Willing to Experiment

I did have two complaints. One is that the LEDs, which can easily be switched off, should be blue to match my electronics. The second is that adjusting the Aeris Wavelaunch processor can become addictive.

Bill Dudleston did warn me that he had clients who tried to adjust the Wavelaunch

SPECS & PRICING

Type: Six-driver, 4.5-way loudspeaker with integral woofer amplification and DSP speaker/room correction
Tweeter: Dual Air Motion Transformer System (one 4" AMT tweeter, 1" AMT super-tweeter)
Midrange: 8" titanium-encrusted, accordion-edge
Midwoofer: 10" accordion-edge
Subwoofer: Two 12" spun-aluminum diaphragm with cast frame
Internal amplification: Two 500-watt ICEpower modules for bass section
Frequency response (+/-2dB): 16Hz–30k
Impedance: 4 ohms
Sensitivity: 95.4 dB
Cabinet dimensions: 14.5" x 58" x 16"
Base dimensions: 19" x 1" x 15"
Weight: Approximately 200 lbs.
Price: $18,500; premium finish, $19,750; exotic finish, $20,800

LEGACY AUDIO
3023 E Sangamon Ave.
Springfield, IL 62702
(800) 283-4644 or (217) 544-3178
info@legacyaudio.com

Comment: **www.theabsolutesound.com**

processor for individual recordings. I found, as I began serious listening, that I was using my computer to do something very close to this. I started by slightly adjusting the frequency extremes for older recordings and then created another setting to deal with the excessive midrange energy in far too many recent recordings.

My addiction grew once I found I could tweak the sound as I listened and come close to correcting for different LP equalization curves, improving the sound of poor or mediocre recordings on the fly. In the process I learned more and more about the equalization and compensation process. As a result, I started creating individual settings for different types of music.

About the only thing that saved me from a major intervention was the fact the Wavelaunch processor settings have to be recalled manually (no remote yet) to select the different curves. As a result of the immense effort in walking 30 feet, and having to actually reach out my arm to reach the switches, I was able to bring my addiction under control. I got my settings down to a reasonable number in addition to Bill Dudleston's set-up options, and restricted my tendency to tweak the recording as it played to a few recordings that actually justify the attention.

In all seriousness, it is one thing to buy one great speaker with one set of trade-offs and sonic nuances and another to be able to keep a flat setting as a reference and branch out to adjustments that allow you to explore a wide range of sounds and choose the most musically realistic mixes. You will eventually have to either trust your judgment or the dealer's setup, but do remember there is no way you can get truly accurate response—or the most musically natural results—from a given speaker in a given listening room unless you do make such adjustments.

Given the fact there is no one recording standard, no one recording equalization, and

no predictable room-speaker interaction, this really does make a difference and I suspect many other audiophiles are going to go through the same experience. Best of all, it really is easy. If you want see what I mean, just go to the video demos on the Legacy Web site or on YouTube. If you can download the videos, you have the smarts to operate the Wavelaunch.

Compatibility and Setup

This is a complex system to install and weighs about 200 pounds a side. Dealer help and support will be critical, and you need to make sure the dealer will work with you during setup. I'd also consider paying for a revisit after a month of listening if you don't want to adjust the unit yourself.

Other than that, the Aeris' built-in bass amplifiers simplify the load and the speakers' high efficiency simplifies their power needs. I would not use single-ended triodes, but any amp of over 50 watts is in the ballpark and a 100-watter is more than safe.

I did not experience any particularly sensitivity to speaker cables. My reference AudioQuest and Kimber worked fine, and so did some older model Straight Wire. I'd go for longer interconnects and shorter speaker cables with no trick impedances, junction boxes, or capacitive loads.

The Wavelaunch processor benefited from good interconnects but ordinary, high-quality balanced cables work just fine. I would recommend that Legacy include higher-quality XLR connects as the ones provided had poor lock-in features. You may even need specialized XLR cables to go from your preamp to the Wavelaunch.

You may also need to get a set of adapter cables (available from Legacy) that attenuate the signal coming from the Wavelaunch to your amplifier, a useful device if the amplifier has a high input sensitivity. At first I had some low-level noise from the processor using my Pass preamp, but zero noise with the adapter cables—even with my ear near the drivers.

The digital headroom in the Wavelaunch was outstanding, the software reasonably intuitive in a form-follows-function way. The controls were easy to operate with both the Mac and PC after a little experimentation, and the readouts were clear. I would like to see an easier way to make the cursor lock onto a given curve to adjust it upwards, downwards, or in width, but this seems a simple software fix that will probably be solved by the time you read this.

I was not a fan of the speaker's appearance without the accessory grille cloth, or of the AMT's large gold logo. I doubt many partners who are not total audiophiles will go for the "techie" look as well. Get the optional grille cloth. It is magnetic and easy to remove.

Finally, Bill Dudleston tells me that by the time you read this, there will be a set-up CD that can be used with one of the FFT/RTA applications for the iPad and similar tablets to measure frequency response and perform other tests. I would want to be able to make such measurements and be able to do my own setups. In fact, I can't figure out why most speaker manufacturers don't provide such set-up discs tailored to their speakers and an easily affordable device like an iPad. Not every speaker can come with a Wavelaunch processor, but every speaker benefits from getting the bass response right and the highs on the proper axis. You'd still have to listen, but ignoring the help measurements can give is as silly as failing to listen.

Summing Up

The Legacy Aeris is a speaker that helps redefine the state of the art. Every improvement in audio components matters, but there are two that rethink what an audio system should be. The first is integrating speaker design with room compensation and the ability to set up different frequency response curves to compensate for the problems in recordings. The second is the creation of music servers like the Meridian Sooloos that can store vast amounts of music in ways that not only allow you to listen to high-resolution digital audio but play back the music with far more flexibility, and compare different performances, artists, and composers with an ease that can redefine your listening experience. Great as many stand-alone speakers are, the Legacy Aeris is the avatar of what the next generation of speakers should be. tas