

## ASC TubeTraps Creating a Listening Studio

In a listening studio we come equipped with ears that connect to a brain – a combination act resembling a video set unable to differentiate between channels. We get it all, no channel selector. This perception of auditory cues is incredible, underrated, with complex direction and distance filters built in. Eventually we learn to pick and choose among cues, to tune out, or focus. But no matter how sophisticated our auditory processing becomes, we live in a constant noise bath. When a telephone receiver is against our ear, familiar voices sound different. We note the difference when a recording of a voice is made and then played back. This is listening to the main course minus the usual accompanying noise salad.



Operating in this sound salad, with noise ricocheting around us, is somewhat like being smack in the middle of the scene from that grade 10 science film where ping pong balls hurtle around a room after landing on loaded mouse traps. Walls, ceiling, floor, glass surfaces – all contribute to the rate at which sound bounces around as it diminishes. Each space has a characteristic decay rate, or RT60, used as a standard reference point in working with room acoustics. This is the amount of time it takes for the echo of a sound to become 60 dB quieter than the original sound. The RT60 of an anechoic chamber approaches zero. In an absolutely anechoic room, the ear receives none of the information it needs to maintain a sense of space. In such a space, if visual cues are nonexistent, standing upright can be difficult- the ears almost seem to suck in air, trying for spatial reference.

Acoustic products take out (or control) this bouncing sound, allowing us to hear the unmeasurable, low-level sound that our ears are designed to use in orienting and judging distance. Acoustician Peter D'Antonio, of RPG (Reflection Phase Gratings), says, "[T]he music you hear in any room is a distorted version of reality. If you have a performance facility, the room has to be neutral." A neutral room, he goes on,

delivers "all the salient spatial cues, and frequency response information contained in the recording." Or more succinctly, "what the room needs to do is not be there."

I've talked about acoustic problems with John Gibson of EAR Professional Audio/ Video, in Arizona. He says, "I've designed a lot of control rooms using the SRD program [Studio Reference Disc, put out by Prosonus] supplied by ASC. We sweep a room – make the ASC recording – work out a drawing of the room – and ASC specs out what is required. We do systems design and equipment sales, mainly for broadcast and music recording control rooms and studios. I've done many rooms with ASC, generally for between two and eight thousand [dollars]. Loosely designed rooms, not too crazy, resulting in a very workable and usable room. We use them in ground-up situations, and also going in and fixing things. We've fixed some really awful things."

Gibson has also done room treatments "from the ground up."

"I did one room for a company in Maine. This was a ground-up facility where the room was designed with ASC in mind. Before the ASC products arrived, the guy got the room up and running and did some light cosmetic things. Then he brought in a group of percussionists from Berkeley, along with some noted artists from Africa, to record a collection of ethnic material. He had almost tracked the entire album when he took delivery of the ASC stuff. Just for the fun of it, we did a few more tracks, with wood blocks and all. [The difference] was so dramatic that they pulled everybody back and did the entire work over again – because of the difference in the percussion, the airiness and the transparency, the linearity of the decays, and everything." Gibson "can work with ASC" but primarily he has "to work with the room." "You never know exactly what you face," he says. "I don't care who the designer is, I don't care what the budget is. Until you get in there and sweep it and find out what is going on, you don't know what a room really needs."

Both Art Noxon and designer Chris Kline, of ASC (Acoustic Sciences Corporation), are frequently seen at major audio shows. Kline brings and installs the truck loads of ASC products that control sound in demonstration showrooms. The major focus of acoustician Art Noxon's company is designing and building products to solve acoustic problems.

Within the art of recording, the studio is a professional machine. ASC has an unusual degree of passion for providing an acoustic environment, and offers the same professionalism and care that they provide in developing a recording studio for any consumer who asks for their help in creating a home-listening environment. Although some articles have been written on Tube Traps and room treatments, I am not aware of an all-out discussion of acoustic room design using Tube Traps for the creation of a home "listening studio" (with

apologies to Clark Johnsen, of The Listening Studio, in Boston). In past articles, ASC products have been used to correct specific "room problems." Dan Sweeney in Issue 83/84 of The Absolute Sound discusses Tube Traps, and other types of "room treatments." Most consumers are familiar with standard ASC products – half rounds, quarter rounds, full rounds, in diameters of 9, 11, 16, and 20 inches. These are available in customizable lengths and customizable colors (four standard colors, 60 additional colors at additional cost)<sup>1</sup>. Recently ASC has developed a stylish line of room treatments, giving them Italian names such as Mobilio and Bastone. These treatments are functionally equivalent to the tried-and-true Tube Traps.

For lower cost but with most of the Tube Trap effectiveness, ASC has devised Tower Traps. Tower Traps are six feet high by ten inches in diameter (Tower Slim) or five feet high by 15 inches in diameter (Tower Stout). Tower Traps have distinctive pedestals and caps. Other consumer products from ASC include Shadow Casters (floor-standing panels that look like Dayton-Wright electrostatic speakers or Quads, containing four small concealed Tube Traps for absorption and reflection), Sound Flags (triangular, corner-loaded, edge-mounted wall panels with 12 inch and 14 inch sides, for diffusion and absorption), Wall Panels (absorptive wall panels) and Wave Panels (directional sound absorbers, designed for side walls).

ASC provides complimentary consulting when working with a consumer on a home listening room. For extensive design work, for construction of listening rooms or studios involving collaboration with an architect, they charge a fee. Art Noxon designed my listening room from the early concept and blueprint stage. The room uses standard Tube Traps: full round 20-inch diameter units (two floor-to-ceiling), full round 16-inch units (three floor-to-ceiling), half round 20-inch (two floor-to-ceiling), half round 16-inch (eight floor-to-ceiling), and half round 11 inch (two floor-to-ceiling).

### **Why Use Acoustic Products?**

According to Art Noxon, "We want to be listening to the speakers, the components, the interconnects, the tracks. We don't want our listening compromised by shuddering walls, doors, windows and ceiling." Considering how recordings are done, and the extent of acoustic concern given to building concert and opera halls, it follows that the room is a major factor in any sound system. Improving room sound has a more significant effect on what can be heard than any equipment upgrade. The smaller the room, the more it affects sound. The more capable the system is at recreating bass frequencies, the more acoustic concern is required.

Listening to an exceptionally fine speaker system in a resonating room loses the intended sound of the speaker. The same is true of every other part of the audio system. Room sound can be a dominating and defeating factor that no equipment can overcome. To use digital room correction devices or speaker equalization may be the way of the future, but such devices cannot correct all problems, and factoring in more electronics is apt to add other problems.

### **What Acoustic Products Do**

(1) They control bass. There are two bass problems. First is a prolonged decay rate once a room's resonant mode has been excited. Second is antiresonant decay, where a frequency that is close to a room's resonant mode causes this mode to be excited, coloring the sound. For control of bass problems, a primary ASC solution is to put Tube Traps in room corners – behind speakers and additionally in the corners behind the listeners. (2) They control reflections. Reflections from the speaker wall and side walls need to be absorbed and diffused. Tube Traps, Wall Panels and Wave Panels along the walls of the listening room absorb sound and diffuse coherent reflections.<sup>2</sup>

### **Starting at the Architectural Level**

It is ideal to start with ASC at the architectural level, and begin acoustic work with a known quantity. Since this is generally both impractical and unusual, ASC in general designs and works to install acoustic products that solve the problems of existing rooms. This has been derisively known as the Band-Aid Approach, but having run through a lot of Band-Aids in my life, I say that's reality, and let's appreciate and recognize its validity!

Where a more aggressive approach is wanted, ASC provides consultation and products that make either building from scratch or the installation of a new constrained damping shell within existing construction reasonably attainable. Additionally, ASC provides consultation for determining ideal room dimensions. Sound-wave characteristics make it easier to achieve neutrality within certain room ratios. A square room or a room where dimensions are multiples of each other are tough to tame.

### **Determining the Room Treatment**

When empty, the room is reflective. The echo characteristics give a room sound similar to the prototypical dungeon or, more cheerfully, a classic champagne cellar. Without any acoustic products, my room has an averaged RT60 of 1.1 seconds. When listening to a recording in this environment, I hear that sound is smeared and phrasing is off. The bass effect is blown out of perspective. Normal construction allows bass to leak out. With solid, European-type construction, bass is contained and echoes. Any room, even if built from the ground up, offers an array of variables; there are no formula fixes. Therefore, correction is an iterative process. ASC uses a sequence of tones called the MATT (Music Articulation Test Tone) to determine both the articulation and bass frequency response of the room. ASC supplies the tape, either the Prosonus SRD (Studio Reference Disc) or the Stereophile Test CD 2. The consumer makes a cassette recording of the sound in the room as the test is played (the quality of the tape recorder used is irrelevant). The recording is sent to ASC for analyses of room characteristics. Then a first pass at products is recommended. When this set of products is in the room, a further test is made. Testing and the addition (and subtraction) of products continues until the desired room sound is achieved. The MATT consists of a set of transient tone bursts

starting at 20 Hz rising to 800 Hz, and then descending back to 20 Hz. These bursts have precise timing and frequencies. ASC equipment analyzes the tape, and plots the results on (hard-to-interpret -without-help) charts. Even without charts, with a little practice it becomes possible to interpret a MATT as it plays over a system. With good articulation, the tone bursts sound like a rising “tat, tat, tat.” Inarticulate frequencies sound more like “buddala, buddala, buddala.” By timing inarticulations, it becomes possible to determine the frequencies that are giving room problems.

After reading the first MATT test, ASC sent a 16-inch full round for each speaker corner, a 20-inch full round for each listening end corner, and a 16-inch full round to place at the center of the speaker wall. (All the Tube Traps are two-section, eight-foot columns.) The room was swept again, and then two 20-inch half rounds arrived to place along the rear wall, two more 16-inch half rounds for the speaker wall, and ASC Shadow Casters for the middle of the side walls.

The Shadow Casters turned out to be too visually imposing – they are placed far out from a wall. I returned these, and replaced them with four half rounds to put against each side wall (three 16-inch, one 11-inch), and finally the room received an additional pair of 16-inch half rounds. With the final set of Tube Traps, correct placement was critical – in some configurations the room became anechoic – a startling and unpleasant effect. This pair of towers was removed and sent back with the Shadow Casters. Even so, this sounds like a lot of Tube Traps. And it is.

Using the Liberty Audiosuite program to perform measurements, with a full complement of ASC products in my listening room, the average RT60 had dropped to 0.387 seconds.<sup>3</sup> To be more precise, the RT60 at various frequencies is .51 seconds at 60 Hz, .42 seconds at 300 Hz, .36 seconds at 1 kHz, and .34 seconds at 10 kHz.<sup>4</sup> (Most acousticians think that a room with good acoustic behavior does not have a flat RT60 across all frequencies, but instead the RT60 should rise a bit in the bottom.)

## Sound of a Neutral Room

Many of the changes audiophiles make are geared to hearing differences. A neutral room affects the ears as soon as you step into it. The air is physically different. In my room in its original state, the room sound was live, with much active reverberant/echoey pressure on the ears. With acoustic products, the sound is mellow. Not as if the walls have moved out, more as if the walls are not defined in space. With speech and conversation, the lack of pressure produces an impression of great space. When listening to someone speaking, with your eyes closed, you cannot determine the size of the room.

Noxon says, “We want to eliminate all artificial interjection of energy that contributes to [the inability to perceive] musical transients. We’re supposed to be listening to the audio track; we’re not supposed to be listening to our room humming along with the audio track.”

The primary effect of ASC products is on transients. This is what Noxon also calls articulation. Transient reproduction in a neutral room is so coherent that it is startling. This applies to synthesizer transients in the Orbit recordings, the drum kits of Neil Young and Crazy Horse, or pretty much any percussive instrument. Voices also are strikingly articulate. When listening to the 45 RPM Phil Collins extended version remix of “In The Air Tonight” [Virgin VST 102-B], this recording has incredible dynamics – bass and vocals. A before-and-after comparison makes a mockery of the articulation in the untreated room. And while decay is certainly affected by acoustic products, the room does not become over-damped and dry – there is a sense of real instruments being played in an acoustic space.

A secondary and related effect is upon imaging. And this is where the imagery becomes at times holographic. The soundstage can stretch effortlessly far past the room boundaries. The Banco de Gala recording of Last Train to Lhasa [Planet Dog Records BARKPO11, on quadruple vinyl] is a great example. The sound of the train not only moves in space, it arcs away and behind the speakers on its nearly visible track. The infinite number of sounds on this recording present an auditory landscape. This is audible with mini-monitors such as System Audio speakers, with IRS Betas, with VMPS FF-3 speakers or with the Genesis 200 system in full bore. The Chesky Sibelius Symphony No. 2 in D Major [CG-903] also has an incredible audio palette; the plucked strings and all the haunting sounds of a great symphony orchestra are in their place on stage. Recordings that play around with phase information, such as the Roger Waters Amused to Death QSound CD, present further examples of both holographic imaging and full presented transients.

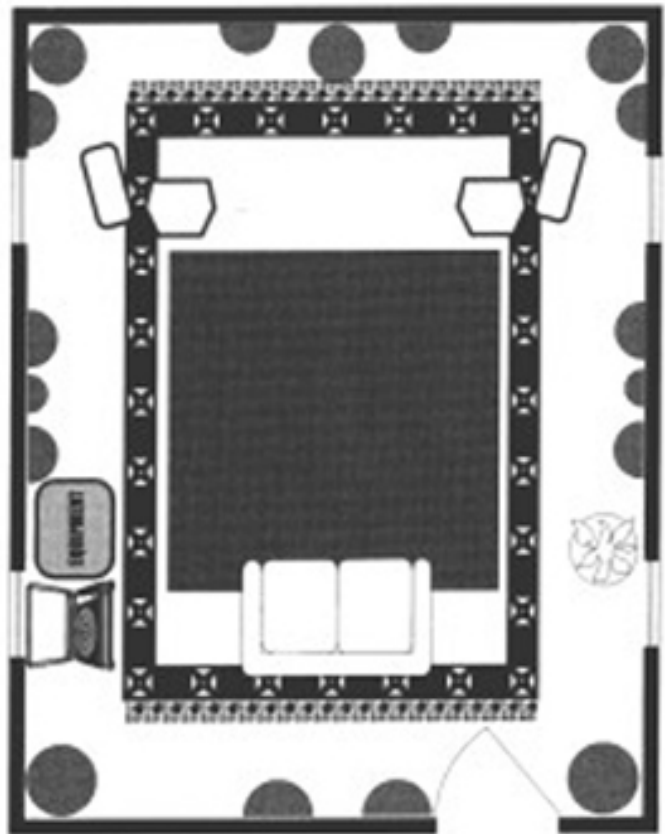
While the imaging and articulation effects of Tube Traps are startling, Tube Traps were originally designed to control mid-bass- and bass reflections (while individual 20-inch units absorb bass down to 60 Hz, a series of them on the wall can be used to break up bass reflections for frequencies as low as 20 Hz).<sup>5</sup> A beautiful example is what happens to the low bass tones on the 12-inch single “Million Town” by Strange Cargo [N-Gram Recordings 7 4509-99575-0]. When these tones occur in the untreated room, the effect is one of wildly thumping uncontrolled bass, with room resonances dominating the sound. With Tube Traps, the sounds are there, they are loud, the concrete seems to shudder, but the sound has precise pitch and definition, along with a sense of space. On the more subtle side, playing Akira Kurosawa’s Dersu Uzala [Criterion Collection Laserdisc #256], in which heartbeats and a hand rubbing against skin are part of the soundtrack, every sound is palpable, free to make its intended impact.

## Conclusion

A neutral room makes it possible to assess even the smallest differences in components. This helps in building a system. ASC products can be repositioned, or products added to give the exact acoustic space I require when using different audio/video equipment. The listening room is easy to maintain, an idyll, a wonder. This is my listening studio, my place of solace. Where music is involving. And where video is theater.

1. Pink ASC products, shown in New York at Hi Fi '96, were bought by singer Cindy Lauper for her recording studio.
2. An article titled Coherent and Incoherent Diffusion is available from ASC.
3. An ideal RT60 rating is theoretical/arguable but 0.367 seconds is the figure given by E Alton Everest in *Acoustic Techniques for Home & Studio* (p. 187, Tab Books, ISBN 0-8306-1696).
4. My room without room treatment has an RT60 of 1.56 seconds at 60 Hz, 1.04 seconds at 300 Hz, .95 seconds at 1 kHz, and .72 seconds at 10 kHz. As can be seen, the Tube Traps have a significant effect on the room's behavior.
5. Tube Traps installed vertically don't handle ceiling reflection. In my room this gives a slight signature boominess at around 200 Hz. Dan Sweeney (in Issue #83/84, *Anatomy of the Listening Room Part II*) suggests how Tube Traps can be used to control ceiling reflections. However, I have chosen a different approach – I use line source speakers (line source speakers have minimal floor and ceiling reflections). Another potential solution is to add ceiling acoustic products such as Skylines from RPG Systems.

My listening room is 15' 4" wide, 19' 2" long, and 7' 10" high. Built to be soundproof, it has eight-inch reinforced concrete walls on three sides with an even thicker concrete floor. The ceiling and the wall behind the listener use a glued soundboard sandwich fastened to the studs by resilient isolation channels, all finished with a layer of stucco. (Gluing soundboard layers is an unforgettable experience so miserable, so fume laden, and so time consuming a job that now ASC provides saner constrained damping materials for installation as part of their package -this is the WALLDAMP system. It uses sheet adhesive, strips and squares to do the job.) The room has a solid wood soundproof door that seals itself at the bottom on closing. The windows are two foot squares with extra thick, vibration-minimizing glass on the outer wall and glass block on the inner wall. The concrete floor has an eight-foot square bass trap Inset, filled with a section of bass absorbing Tectum, covered with felt and an area rug. The room has a dedicated ventilation/heating/air conditioning system. Also, because it is soundproof, there is an intercom connected to the rest of the house and the doorbells, plus a phone line.



## Associated Equipment

Front End (analogue):

Goldmund Reference turntable; Graham 1.5t pickup arm; Clearaudio Insider Gold cartridge

Front End (digital):

Goldmund Mimesis 39DA Electronics: AHT Non-Signature Phono Stage; Conrad Johnson ART Preamplifier, Audio Synthesis Passion [passive line stage]; AHT custom triode amp

Speakers:

Genesis 200

Cables and Interconnects: Nordost Flatline Red Dawn and SPM Reference interconnects and speaker cables, Cardas Golden Cross speaker cables and interconnects, Goertz Alpha-Core speaker cables

Accessories:

Art Noxon-engineered listening room; ASC Tube Traps; Audience, Cape Cod, Marigo, Musical Surroundings power cords; VPI HW-17 Record Cleaner; Room-Tunes Deluxe Just-