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APOGEE CENTAUR MAJOR LOUDSPEAKER

Thomas J. Norton

Floorstanding dynamic/ribbon hybrid loudspeaker. Drivers: one 10" polypropylene-cone woofer, one 40" ribbon tweeter. Electrical crossover frequency: 350HZ, second-order. Frequency range: 31Hz-20kHz (no tolerance specified). Impedance: 6 ohms nominal, 3.5 ohms minimum. Dimensions: 18" W by 64" H by 12" D. Weight: 200 lbs/pair. Prices: \$3395 in light oak, black oak, (simulated) anthracite granite; \$3785 in mahogany. Approximate number of dealers: 95. Manufacturer: Apogee Acoustics, 35 York Industrial Park, Randolph, MA 02368. Tel: (617) 963-0124. Fax: (617) 963-8567.

cen'taur / n I any of a race of creatures fabled to be half man and half horse and to live in the mountains of Thessaly

Thessaly is nowhere near the Massachusetts home base of Apogee Acoustics, and I suspect it's been some time since the last man-horse was seen in either location. But although the above may be Merriam-Webster's definition of a Centaur, Apogee has its own: a hybrid loudspeaker consisting of a ribbon tweeter melded to a dynamic, sealed-box woofer. Tell your non-audiophile friends that you have a pair of Centaurs in the living room and they'll likely think you live in a barn—after which they'll call the guys in the white suits. But by now most audiophiles will at least have heard of the Apogee Centaurus line, of which the Centaur Major, the subject of this review, is the star attraction.

Short of finding ways to drastically lower prices, Apogee may have felt that they'd reached a point of seriously diminishing returns in the development of their line of full-range ribbon loudspeakers.¹ Furthermore, their planar systems make rather stringent demands on the user, both in amplification requirements and, especially, in their fussiness relating to optimum placement. They almost demand to be used a substantial distance from the rear wall, sounding—in my experience—bloated and constricted when used too close. Furthermore, they're vulnerable to damage from the inquiring fingers and paws of small children and curious pets—I've heard stories of the latter bracing themselves up against the woofer panel, destroying it instantly. They can be demanding of associated equipment. And, they're expensive to make. That they are highly regarded by audiophiles despite these problems is a tribute to their performance, which can be quite stunning when they're properly set up and driven—as we've noted in several

reviews. Nevertheless, there's a definite market for a loudspeaker which makes use of a ribbon driver over most of its range while minimizing the potential problems associated with the full-range models.

Ribbons have long been admired for their sound qualities, but have been comparatively rare because of their cost and, at least in their early realizations, their delicacy. Ribbon microphones, which to the best of my knowledge predated ribbon loudspeakers, are very fragile; the diaphragm will shatter under the impact of the classic "blow on it" check? And while ribbon tweeters were a bit more rugged, they never really caught on until a few years ago, when both Apogee and Magnepan came out with loudspeakers incorporating long, fairly rugged ribbon tweeters which could be crossed over to magnetic planar woofers at surprisingly low frequencies.

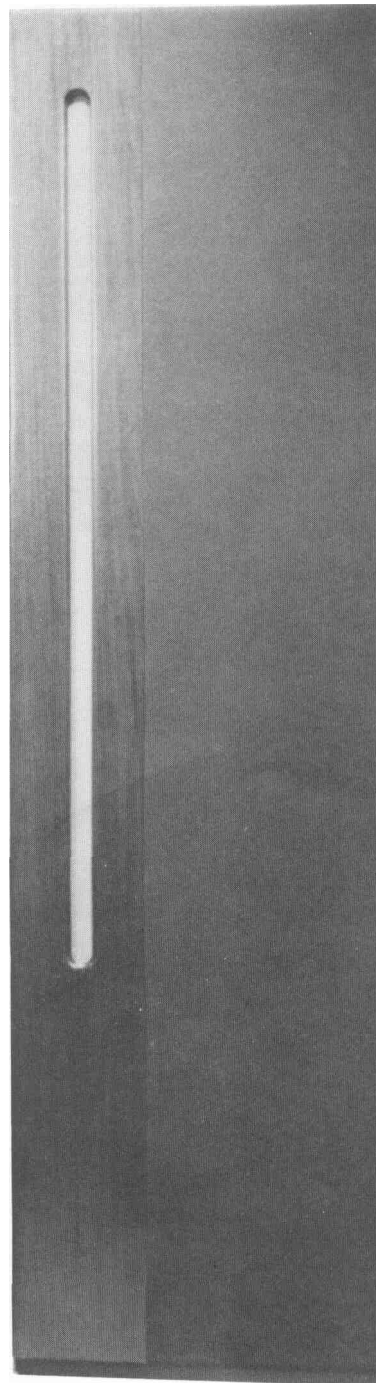
TECHNICAL STUFF

Robert Harley went over much of this same ground in his Vol.15 No.1 (January 1992) discussion of the Centaur Minor, but if you missed that review, some replowing of the same ground would not be wasted here.

A genuine ribbon loudspeaker, of the type used for all of Apogee's mid-tweeter elements, consists of a conducting foil diaphragm, corrugated for strength, suspended between the poles of powerful magnets which extend from the top to the bottom of the ribbon. The Centaur Major's ribbon is secured only at top and bottom, and no matching transformer is required. (To my knowledge, this is true of all Apogees.) The lack of a transformer was required in early, smaller ribbon tweeters because the ribbon had a very low impedance. The magnetic field resulting from the flow of current through the ribbon element interacts with that of the fixed magnets, causing the ribbon to move in sympathy with the signal passing through it. The result: sound.

¹ The woofer panels of these loudspeakers are not, strictly speaking, ribbons, but resemble ribbons more closely than they do conventional, dynamic drivers. For the remainder of this review I'll refer to them as full-range dipoles, which they indeed are.

² The microphone equivalent of checking your phono system by running your finger over the stylus.



Apogee Centaur Major loudspeaker

While ribbon drivers have a distinct theoretical advantage in their very low moving mass, that mass necessarily increases as the ribbon is made longer and wider in order to increase its durability and extend its response to lower frequencies. The Major's ribbon, for example, while it likely has a lower mass than any conventional cone extending down to 350Hz, very probably is more massive than a high-quality, 1" or smaller dome tweeter. Apogee recognizes this in their more expensive Diva and Grand, both of which use separate midrange/tweeter and supertweeter ribbons optimized for their specific frequency range. Nor, as is sometimes claimed, are real-world planar or line radiators free of resonances, or driven uniformly over their entire areas. It takes perhaps more talent and solid engineering to take advantage of a ribbon transducer's potential than that of a conventional design.

NUTS & BOLTS

Apogee certainly has plenty of experience with ribbon mid-tweeter panels and matching planar bass radiators. But a hybrid of a cone driver and a ribbon midrange/tweeter presents new problems and demands new solutions. While the Major, with its lower crossover frequency, presented different design problems from those in the Centaur Minor, the basic difficulty was the same: the never-trivial problem of melding drivers with disparate signatures and radiating patterns. The ribbon is a dipole, the woofer—below its specified 350Hz crossover—is largely omnidirectional.

The Major's 10" woofer is mounted in a sealed enclosure with a surprisingly small 1.1ft³ internal volume. Surprising because the exterior of the enclosure, which protrudes from the rear of the larger front baffle and provides the rear support for the entire system, looks considerably larger. Its substantial construction (1.5"-thick front panel and 0.75"-thick walls, with heavy internal bracing) eat up a lot of its overall volume, as does its slightly trapezoidal shape. The latter appears cosmetic, but is designed to minimize standing waves within the enclosure.

The Majors look like the other members of the Centaurus line: tall and relatively narrow in front cross section. The left and right loudspeakers are mirror-imaged, designed to be set up with the ribbon tweeters mounted inboard toward the center. The woofer is mounted quite high up, well away from the floor. This minimizes colorations, but also makes the woofer's job more difficult as it limits the low-frequency boundary reinforcement used by many floorstanding loudspeakers of similar size. The height of the woofer above the floor, as best as can be determined through the nonremovable grille which covers it (though not the tweeter), is 36-37" just a couple of inches below (my) listening height and also roughly the same distance below the midpoint of the 40"-tall ribbon tweeter.

The Major's ribbon, incidentally, puts out an extremely strong magnetic field. I was reminded of an old (and very bad) science-fiction movie about a magnetic monster which sucked everything ferrous anywhere

near it into its maw; heed the instruction manual's cautions about keeping pens (check your shirt pockets), watches, friends and family members on iron supplements, etc., well clear of these loudspeakers—or of any Apogee, for that matter. The same holds true for television sets, which can be damaged by strong magnetic fields.

On the rear of the Major is a pair of three-position level switches, one for the midrange/tweeter and the other for the woofer. The mid/tweeter control provides for either a specified 1.5dB increase or a 1dB decrease from the standard setting; the woofer control will raise or lower the woofer level by 2dB. The ergonomics of the switch positions are peculiarly nonintuitive—the High and Low positions are configured differently in the mid/high and woofer controls, so the user needs to check carefully that he or she has selected the intended setting. The High position on the woofer also raises the woofer's apparent Q, the Low position decreases it. Two sets of five-way binding posts, allowing bi-wiring or bi-amping³ if desired, complete the rear-panel layout.

Finally, Apogee furnishes spikes to firmly anchor the Majors to the floor. Adjustment of these spikes permits moderate degrees of rake—important to proper setup—and a simple plumb-bob is furnished to facilitate this.

SETUP

Apogee's Jason Bloom came to Santa Fe to help with the initial setup of the Centaur Majors. Jason certainly knows how to set up his own loudspeakers. A necessary skill, perhaps, considering the placement sensitivities of the full-range dipole radiators that until recently were Apogee's bread and butter. But what of the Centaurs—would they be as fussy?

Yes and no. To say that Jason "helped" with setup understates the case. As I listened, he schlepped these 100-lb monoliths back and forth, left and right. An inch here, a few degrees of backward tilt there, a bit more or less toe-in. Every change made a difference, and while it would be an exaggeration to say that the individual changes were dramatic—we had perhaps begun with a reasonably optimum location—they did result in important improvements: a tighter image, a bit better sense of space, an increase in clarity and detail. As is always the case, some gains resulted in sacrifices elsewhere; it then became a matter of choosing the best compromise. Closing the drapes covering the windows behind the loudspeakers was a case in point. Though I've long preferred these drapes three-quarters open with Apogee's Stages, closing them with the Majors cured a mild sense of upper-octave dryness, with only a small loss in spaciousness and "air."

We made other changes in room treatment, removing the top half of each 6' stack of 16" ASC Tube Traps that served to damp the

corners of the wall behind the Majors. One of the remaining Traps was laid on its side. Three small hanging absorbers were also removed from the same general area, to be placed lengthwise at the floor-wall junction behind the loudspeakers, tilted up slightly to form a small, trapezoidal cavity with the same wall and floor. The latter tightened up the low- to midbass response. I suspect that something like Tube Traps—or, perhaps even better, quarter-round Tube Traps—would be even more effective.

We hadn't spent all that much time setting up before Jason pronounced himself quite happy with the sound. He also moved my listening seat a foot or so farther back from its accustomed location, apparently preferring a slightly less close-up perspective. Interestingly, the Majors wound up only about 9" farther back than my preferred placement for the Stages in this same room, with just a few degrees less toe-in.

THE SYSTEM

Associated equipment used in auditioning the Centaur Majors included primarily the SOTA Cosmos turntable with Graham arm and a variety of cartridges, the Rowland Consummate preamplifier (prior to the latest module update to the line stage which was installed in late February 1992), Wadia WT-3200 CD transport driving the Audio Research DAC1-20 processor linked by fiberoptic cable with an AT&T interface, and a Krell KSA-250 amplifier. Interconnects were AudioQuest Lapis (processor to preamp), Cardas 300B Micro from turntable to preamp, and (older) Cardas Hexlink from preamp to amplifier (balanced). The loudspeakers were bi-wired with the latest Symo cable. Other equipment was brought into the listening sessions periodically—the Majors remained in my reference system for several months.

LISTENING

Where to begin? I knew the moment I first heard the Centaur Majors at the 1991 Winter CES that I *had to* get a pair into my listening room. And that first afternoon with the Majors, with Jason Bloom in attendance, proved no disappointment. Jason had brought along some of his own choice music selections, keeping me busy writing down notes on recordings that I'd now have to buy. Nothing seemed to trip up the Majors. Their sound was tight, defined, and spacious, with a sometimes startling inner clarity and focus. Imaging was first-rate; if it was perhaps a bit less pinpoint than with the best direct radiators, the loss was not at all obvious. And while the *Stereophile* listening room has never produced the sort of depth I hear with the Mirage M-3s in GL's listening room or the Sound-Lab A-1s in DO's new listening house,⁴ the Majors were certainly never less than convincing in reproducing the third dimension,

³ As of this writing, Apogee is working on a dedicated electronic crossover for the Centaur Major. Watch this space.

⁴ Yes, an entire house, which I would estimate is 75% dedicated to listening (in an excellent main listening room), writing, and storage of sundries related to both activities.

program material permitting.

Over the next few weeks, as I became more accustomed to the big Centaurs' sonic qualities, they were pressed into service in reviewing other components. The positioning determined during Jason Bloom's visit never changed, though I eventually made three other changes. These involved acoustic treatment of the room, searing position, and the switch settings for the midrange/tweeter and woofer. First I returned the extra Tube Traps to their original locations and removed the floor/wall-junction acoustic panels. This had the desirable effect of slightly warming up the sound, without loosening a tight grip on the music. Second, my listening seat soon crept forward in an effort to restore my accustomed ratio of direct to reflected sound. Closer listening, if you can manage it and if the loudspeaker drivers have sufficient distance to blend their outputs into a coherent whole, tends to minimize the "sound" of the room. As to the change in the switch settings, I'll get to that presently.

Despite their making a very favorable first impression, I was more than a bit troubled during those initial sessions by a certain coolness to the Majors' sound. Perhaps it was just a reaction to the fact that my listening room tends to be on the warm side of neutral, and virtually all loudspeakers auditioned there—certainly those of anywhere near this size—have leaned in that direction. More likely it was a combination of that quality and the *single* negative quality I observed early on in the Majors: a tendency to brightness in the low-to mid-treble region. The sound had an analytical quality which could vary from innocuous to distracting, depending on the sweetness of the associated program material and components. The Majors are very definitely not forgiving loudspeakers, sounding at times a bit *too* analytical for their own good. Nor was the fault solely with CDs; I noted it on LPs as well. A case in point was EMI's spectacular recording of Vaughan Williams's *A Sea Symphony* (CD-EMX 2142). This recording has tremendous dynamic range, and is superbly recorded in other ways as well. But the chorus, particularly, did not sound exceptionally clean over the Majors at high levels. The fault, I felt, was a combination of a recording on the verge of overload together with qualities in the Majors which in no way obscured or softened the problem, and perhaps actually exaggerated it.

Early on in the reviewing process, therefore, I changed the settings of the rear controls to slightly soften and warm up the sound of the Majors. I moved the mid/tweeter control to "Reduce" and the woofer control to "Normal." That helped considerably. And as the review process continued, the sound of the Majors seemed to soften a bit on its own. I suspect that several weeks of break-in are needed before they reach their designed performance level. Apogee does include a notice in the instructions to the effect that it takes about 50 hours for the woofers in the Majors to reach their optimum; I suspect the tweeter ribbon needs the same amount of time—or longer.

The Majors' tendency to brightness never went away completely, but through what was likely a combination of break-in, adjustment, and acclimation it became a tolerable blemish in an otherwise striking product—the only aspect of this loudspeaker's performance which gave me reservations. Well, OK, its bass extension is not subterranean. Bass freaks may still feel the need for a sub-woofer. But the Majors' 31Hz low-frequency specification doesn't seem out of line, although the response, subjectively, is down considerably by that frequency. But the bass *quality* is striking. Bass drum is solid and tight, double bass is clean and gutsy, and organ *can* shake the room—and the listener—in a convincing fashion. But no, that last octave is not there; Jason Bloom is not a fan of organ music, despite his otherwise wide-ranging tastes. His Centaur Majors will only disappoint those who *must* have their windows and teeth raised to convinced themselves that there is a real pipe organ in their listening room. As for me, I was perfectly content with the extension and room-shaking effect produced on good organ recordings—from CD and LP alike.

As for the Majors' overall low-end capabilities, not to mention its recreation of dynamics, I can come up with no more striking example than its playback of a six-plus-minute compilation called "A Touch of Sonic Madness" from a promotional Telarc CD I picked up at the recent Las Vegas CES. Madness is the word for it: music and sound effects from dozens of Telarc releases spliced together in an incredible torrent of sound and fury. Signifying nothing, perhaps, but nonetheless a lot of fun. I very nearly blew out the woofers on a pair of Thiel CS-5s in the Audio Research room with this track at the same CES.⁵ It was, admittedly, a very large room—probably at least twice the volume of my own listening room. But with that qualifier in mind, the Centaur Majors were a knockout with this selection. Despite the Krell's power rating—250Wpc—the Majors sailed through this selection without the slightest complaint at as loud a level as I would ever care to hear. But Apogee *does* caution strongly—in BOLD letters in the owners manual⁶—that the maximum amplifier power should be 200Wpc. So I suppose I was cheating a bit in using the Krell, although Apogee had used the very same amplifier to excellent effect in their room at the Las Vegas CES.

The quality of the mid- and upper bass in the Majors was similarly tight, clean, and well-defined. Compared with Apogee's full-range "ribbons," it might be judged a shade lean with less bloom and richness, but it is very low in coloration, adding no comforting—but-ultimately-inaccurate warmth. Not that the Major itself lacks appropriate and con-

vincing musical body and foundation. Male voices—Kenny Rankin's *Because of You* (CheskyJD63) being one of the best recent pop examples I can think of—had just the right timbre and resonance without becoming fat or chesty. Cello and the upper regions of double bass were clear and unboxy. If I sometimes wished for a bit more glow and "hum" in the reproduction of full symphony orchestra, it wasn't a particularly pressing wish; if I had but three wishes, I'd certainly find a better use for them (let's see now... a pair of ballrooms with suitable amplification and a grandroom-sized listening room to put them in...).

This leads me to the region in which I was predisposed to search for possible problems: the interface between the cone woofer and the ribbon tweeter. In short, I heard no hint of the transition. It was, for all intents and purposes, seamless. There was no sense of discontinuity through the frequency band near the crossover, no aberrations in transitioning from a basically omnidirectional radiation pattern (the woofer) to a dipole one (the midrange/tweeter). This is at least as much a tribute to the clarity and definition of the Major's cone woofer and cabinet design as it is to the crossover itself.

There was one crossover problem, however, which relates to the lateral configuration of the woofer and the mid/tweeter: Any two drivers which share the same frequency band—as they do primarily in the crossover region—will display a phenomenon known as "lobin^." As you move across the plane defined by the two radiators, there is a pattern of cancellation and reinforcement caused by the interference of the signal from each drive-unit as it converges on the listening location. The relative severity of this effect depends on the crossover configuration chosen and the layout of the drivers. If the drivers are mounted one above the other, as they are in most loudspeakers, the interference pattern will be in the vertical plane. In that case the major concern is proper listening height relative to the drivers. But if the drivers are mounted side by side—as in the Majors—the interference will be lateral, audible as you move from side to side. The common term for this is the "vertical Venetian blind effect," which is quite descriptive of the effect. It can affect the image at different seating positions because only in the central sweet-spot is the effect symmetrical—the same for the left and right loudspeaker. It is a greater problem at closer listening distances, and one reason why proper toe-in can be so important in the setup of loudspeakers—the Majors included—that use a lateral configuration of drive-units.

This vertical Venetian blind effect can be important if you like to sit off-center or if you want optimum listening conditions for more than one listener (actually, there's no such thing with *any* loudspeaker I know of, but that's too long a subject to get into here). My best advice is to audition the Majors the way you plan to listen to them to determine if this might be a concern in your situation.

I *do* know that, in the optimum, central seating location where I did all of my crit-

⁵ Perhaps Telarc can be persuaded to actually release this on a commercial disc of some sort. Or perhaps they're afraid of legal action forcing them to replace millions of blown woofers.

⁶ Brings back memories. Almost as attention-getting as in, "If control cannot be regained by 10,000' above the ground, BAIL OUT."

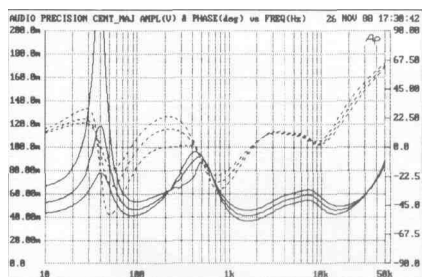


Fig.1 Apogee Centaur Major, electrical impedance (solid) and phase (dashed) (2 ohms/vertical div.). Bottom solid curve below 230Hz and top curve above 230Hz are for the Low switch settings; middle curve is the Normal setting; top curve below 230Hz is the High setting.

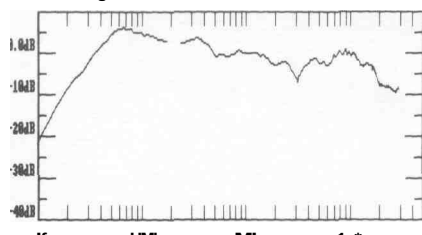


Fig.2 Apogee Centaur Major, anechoic response on listening axis at 45° averaged across 30° horizontal window and corrected for microphone response, with nearfield bass response plotted below 200Hz.

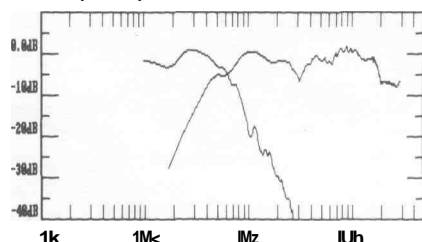


Fig.3 Apogee Centaur Major, acoustic crossover slopes at 45° on listening axis.

ical listening, this was not a problem. It certainly did not require me to put my head in the proverbial vise in order to get a solid, focused image with good lateral precision and a revealing sense of depth and three-dimensionality. The voices of the Swingle Singers were sharply positioned—left, right, fore, and aft—in the "Sakkijarven Polka" from *Around the World* (Virgin VC 91207-2). The tightly anchored images and sense of depth and spaciousness added a chilling dimension to Sondheim's bizarre yet arresting *Assassins* (RCA 60737-2-RC). And the spread of chorus, soloists, and orchestra on Britten's *Noye's Fludde* (Virgin VC 91129-2), a strikingly dramatic, very dynamic recording performed in a large, ambient church acoustic, were defined in a manner which served the music.

I could go on: The midrange was open and uncolored, voices were devoid of boxiness, and dynamic range was impressive. *If Noye's Fludde*, *A Sea Symphony*, and *Sonic Madness* were not enough to convince, then Telarc's *Pines of Rome* (CD-80085), one of the best Telarc recordings ever, certainly did. The climaxes here were stunning, the quiet passages floating, almost ethereal, and the

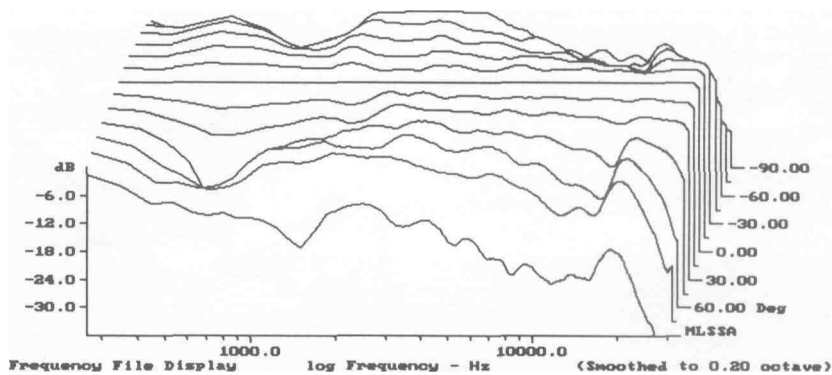


Fig.4 Apogee Centaur Major, horizontal response family at 45°, normalized to response on listening axis, from back to front: response difference 90° off-axis on tweeter side of baffle to response difference 90° off-axis on woofer side.

soundstage—spaced-omni miking or not—was right. In the high end, the Majors were detailed and, regardless of the tendency to brightness on some (but not all) good recordings already noted, free of tizz and grit at anything like reasonable playback levels. There was perhaps a shortage of air at the very top of the range; it lacked the unequivocal feeling that the highs could go on forever. But it never lacked for detail. Subtle and silky on the best recordings, tending to a slight but evident crispness on above-average to very good ones, and relentlessly uncompromising on marginal ones, the Centaur Majors held a tight grip on the program material—and the listener's attention.

But don't stand up when listening seriously to the Majors. The vertical dispersion is limited—despite that long ribbon—and the mid and top end drop considerably in level unless you're comfortably seated in your listening chair.

Though practically all of my observations are based on auditioning the Majors with the Krell KSA-250, I did spend some time with the Threshold S/550e. The latter has a marvelously silky top octave, with a decidedly less crisp though no less detailed sound than the Krell. The Threshold also has the slightly richer midbass and is somewhat richer and more palpable through the lower midrange. Its sound is overall more forward and immediate than the Krell, which is a mixed blessing: It tended to be a bit too insistent through the midrange and lower treble, with a less deep, transparent soundstage than the Krell. The two amplifiers are neck and neck in the low bass, the Krell having more sheer *v'hump* while the Threshold is marginally lighter. Overall, I prefer the Krell's transparency, but the Threshold is more convincing in the lower midrange and cleaner at the very top.

MEASUREMENTS

The sensitivity of the Centaur Major, A-weighted, measured 83.1dB/Wm, this rather low figure suggesting that a hefty power amp is advised to get the best out of the loudspeaker. The impedance is shown in fig.1. The bottom amplitude curve (solid lines), below about 230Hz, and the top curve above

that value (the top and bottom curves cross over at that point), is for the Low setting of the rear level switches. The middle curve, for the full spectrum, is the Normal setting, and the top curve below 230Hz (the bottom curve above that) is the High setting. The only significant difference in the values is at the 40Hz resonance point of the scaled cabinet/woofer. Also note that the impedance, with one very minor exception, remains above 4 ohms at all times.

Fig.2 shows the anechoic response of the Major averaged across a 30° lateral window. This is a composite of five standard MLSSA response plots taken at 45° from the loudspeaker and corrected for the known response of the B&K measurement microphone. This is combined with the woofer's response measured in the nearfield. The splice is made at 200Hz, with the relative levels set for the smoothest transition at that frequency guided by the in-room response. (Though this process is inexact, it is the best that can be done using in-room measurement techniques.) The apparent rise in the response below 500Hz didn't translate into any heaviness in the sound. The dip at 3kHz appears most likely to be a diffraction effect. Note that there is a slight elevation in the treble response in the 6kHz-12kHz octave, and a moderate dropoff above this frequency (although the response does not roll off seriously until above 20kHz). That rise in the mid-treble correlates with the degree of brightness heard in the Majors. It's interesting to note that the response measured for the Apogee Stages in the review of that loudspeaker was quite similar in the high end (even including the diffraction dip—although the latter was at a higher frequency). There are differences in the responses of the two loudspeakers, however, both in the top end and overall—just as they do not sound precisely the same. But DO's description in his review of the Stages of a sort of "zippy aftertaste" would apply to my experience of the Majors as well; a quality not at odds with the measured high-frequency responses of both loudspeakers.

Fig.3 shows the separate on-axis responses of tweeter and woofer. Note first of all how close the HF on-axis response matches the 30° averaged response in fig.2, indicating

Fig.5 Apogee Centaur Major, impulse response on listening axis at 45° (5ms time window, 30kHz bandwidth).

excellent lateral dispersion, at least across this window. Also note that the *acoustical* crossover, falling at about 600Hz, differs somewhat from the specified 350Hz *electrical* crossover (not unusual, or something to be concerned about). Both crossover slopes are very well behaved, especially that of the woofer, which shows only a minor aberration in its rolloff just above 1kHz, this well down in level.

Fig.4 is a composite curve of lateral off-axis responses we have not shown before in quite the same way. The straight curve in the middle is the reference on-axis response with all inherent deviations subtracted out. The rest of the curves are *normalized* to this flat on-axis response; they are the off-axis responses which would exist *if the* on-axis response were perfectly flat. Put another way, they show the response deviations due *only* to moving off-axis in either direction. Starting at the flat (on-axis) curve in the center and working toward the front shows the response changes by moving off-axis on the woofer side 7.5°, 15°, 30°, 45°, 60°, and 90°. The curves *behind* the center curve show a similar progression in moving off-axis on the tweeter side (the 90° curve in this case is hidden behind the others in this "three-dimensional" plot. In both directions a diffraction dip can be seen at the crossover between the woofer and the tweeter—more evident on the woofer side. And you can more easily see how consistent the response is across that ±15° front window.

Looking at the response changes in the vertical plane, the sound first brightens either side of the listening axis, but then drops off across the entire range of the ribbon at the cabinet top—just a bit below an average standing height. Fig.5 shows the Major's impulse response. The woofer's and tweeter's separate impulse responses (not shown) indicate that both drivers are wired in-phase. The Major does not invert the incoming signal's overall phase; the negative-going leading edge of the pulse is due to the differing balanced conventions of the Rowland Consummate preamp (used in non-invert mode) and Krell KSA-250 power amp used in the measurements.

The amplitude-frequency-time waterfall plot corresponding to the impulse response of fig.5 (fig.6) is clean, with no major aberrations. The diffraction dip can be seen to be at about 3.2kHz. The lower treble response is noticeably cleaner than that which we measured in the Stage—though the latter was still quite respectable.

All of the above curves—with the excep-

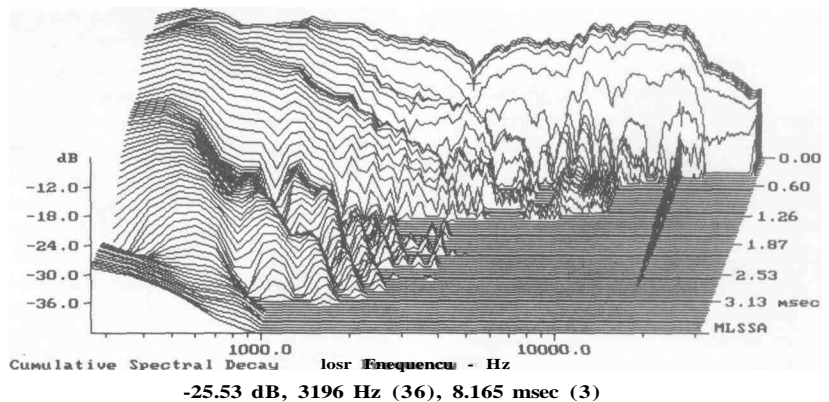


Fig.6 Apogee Centaur Major, cumulative spectral-decay plot.

tion of the noted impedance curves—were taken at normal settings of both rear-panel level setting controls. In the *normalized* response (fig.7) we see the changes resulting from placing the mid/high control on High and the woofer control on Low. Note the total change of about 3dB (± 1.5dB), shelved at approximately 300Hz. This agrees quite closely with the specified effect of the controls.

Finally, the Centaur Majors' woofer cabinet responded to the "knuckle rap" test with a resonance rather high in frequency and very high in Q. That is, it emitted a sharp, relatively high-frequency "ping" rather than a dull thud. Many designers feel this to be a desirable characteristic, as it places the cabinet's fundamental resonance mode (*not* to be confused with the low-frequency woofer/cabinet design resonance) above the operating range of the woofer, thus minimizing its chances of being excited.

CONCLUSIONS

From the sidebar containing my follow-up to DO's original review of the Apogee Stages, the lowest-price full-range Apogee dipole, you'll undoubtedly gather that the Stage is a tough act to follow. It is. Even if you include the stands for the Stages (and you should), they cost considerably less than the Centaur Majors. So the Centaurs should be a clear step up, right?

Well, yes and no. The Centaur Majors are certainly a solid contender for Class B in *Stereophile's* "Recommended Components." They are, overall, probably more accurate than the Stages in octave-to-octave musical balance, with a more linear, better defined low end. They also hold up better under strong, abrupt low-frequency transients. The Stages will handle such transients without difficulty up to a point—actually quite high—beyond which the woofer diaphragm will bottom out with a pronounced and alarming crack. The latter is not a frequent problem, depending on your musical tastes and preferred playback levels, but it can happen quite abruptly. At one playback level the Stages sail along, but increase the level just a bit and they lose it. I've never actually caused damage to the Stages because of this,

i.W

-1MB

-2UB

-3U1

-<d1

Ik IMz lift IBb

Fig.7 Apogee Centaur Major, effect of tone control switches: difference introduced by switching the mid/high control to High, the woofer control to Low.

but I'm certain there's a point at which damage *will* occur. Though no loudspeaker is bulletproof, the Major's woofer appears to have a considerably higher overload point. Recall my comments on *A Touch of Sonic Madness*. I haven't yet had the nerve to play this selection through the Stages.

In overall *quality* of low-end response, the Majors are more linear and perhaps extend a bit deeper, while the Stages give the impression of a more massive sound in the lower octaves. The latter have a decidedly more visceral sound.

The imaging of the two Apogees is closely comparable; I'd have a tough time choosing one over the other. But the slightly low aspect of the Stages, even on stands, reportedly bothers listeners (though not me) particularly sensitive to image height. With the Majors, there's no such problem.

But it is in overall sonic impact that I find myself vacillating. The Majors' clean, uncolored midrange commands respect, but the Stages' rich, immediate sound in the same area is truly compelling. Switching back to the Stages after weeks of listening to the Majors was no relief, but neither was it in any way a letdown. Even as my intellect told me that the Majors were more accurate and revealing, my emotions revealed in a majestic quality that the Stages project so well and which the Majors can't quite match. And while the Stages also have a touch of brightness in the low to mid treble, it is less evident than in the Majors—probably because of their weightier tonal balance.

The Stages *are* the more demanding in terms of room placement. And while they

have the reputation of being sensitive to what they're driven by, I've gotten quite good results with a number of different amplifiers. As to power requirements, in an informal A-weighted pink-noise measurement I actually measured the Stages, with both left and

right loudspeakers driven, to be about 3dB more sensitive than the Majors.

Until we invent the perfect loudspeaker, the models we choose to live with will remain those whose inevitable compromises resonate best with our individual judgments as to

which compromises are *right*. If you tied me down and forced me to choose to live with *either* the Stages or the Centaur Majors, I'd have to choose the Stages. But the choice wouldn't be easy—they are both terrific loudspeakers.

THE APOGEE STAGE: FURTHER THOUGHTS

The Apogee Stages presently on hand here at *Stereophile* are not the same pair which DO reviewed in Vol.13 No.8 (August 1990). Shortly after the review appeared, a new pair of Stages arrived with updated tweeter ribbons. We also received a pair of the stands made specifically for the Stages.

This most recent pair of Stages floats in and out of my reference system as **the** need arises: to either review other loudspeakers, or substitute a loudspeaker which tells me something about a component under review which the Apogees cannot. There aren't many examples of the latter; deep bass, perhaps. But the Stages are by no means lightweight in the low end; I have definite reservations about their being pegged in Class B—restricted LF—in our "Recommended Components" list. Their bottom end will frequently knock your socks off. But it's a bit euphonic and Technicolored, and not effective much below 35-40Hz. The aforementioned stands do help considerably in tightening up the bass (and in raising the effective soundstage to a more reasonable height), but cannot completely eliminate the problem. And certainly the room may bear part of the responsibility.

But for whatever reason, there is a fullness to the Stages' sound which, while not entirely accurate, can be immensely seductive. On full-scale orchestral material the Stages can sound more majestically convincing than any number of other audiophile loudspeakers, many of them far more expensive. Bass drum will pin you to the wall. While the effect is certainly somewhat exaggerated—our measurements indicate a sharp response peak in the general vicinity of bass drum fundamentals—it somehow sounds *right*. Perhaps it has something to do with the fact that the membrane of the Stage more closely resembles a drumhead than does a conventional woofer cone. That explanation does not particularly satisfy me—

too close to technobabble for comfort. **But** for whatever reason, I find the Stage's way with drums, and with the low end in general, to be subjectively more satisfying than that of many loudspeakers more textbook-accurate in the bottom octaves. But you should note JA's comment, in the original Stage review ("Measurements"), that the characteristics of the Stage's low end may be less than compatible with rock, of which I listen to very little. Something to watch for if your musical tastes run that way.

I'm not in a good position to compare the top end of the newest Stages with that of the original samples; the new Stages arrived in Santa Fe only shortly after I did, and while I did hear the earlier pair, it was without stands and in the *Stereophile* listening room's previous incarnation; *ie*, pre-update (see Vol.14 No.10, p.93). I do know that there is a remarkable solidity yet delicacy to the top end of the new pair. There is also a degree of brightness in the mid-treble, but it never sounds etched or over the top. I do prefer the Stage's tweeters set on "Normal" rather than the "Increase" setting favored by DO when he shared the listening space. At the very top of the range is a certain lack of air and spaciousness to the sound, the latter rendered less troublesome by the dipole nature of the Stage's radiation pattern.

The Stages throw a wide, relatively deep soundstage. Positioning, while less precise than that from small, direct-radiating loudspeakers, is well defined. I would never refer to the Stages as holographic in my listening room, but their soundstage is, for me, fully satisfying. I tend to toe them in a bit more than Apogee recommends, though still well short of aiming them directly at the listener; this arrangement tends to give a strong, well-defined central image. For this I sacrifice a bit of width, which I consider less important. I listen to a considerable amount of vocal music, and well-positioned soloists

are important to me. The Stages **fill** that * requirement superbly. Like the Majors, however—and perhaps even more so—the Stage demands to be listened to sitting down; stand up and a wet **blanket** goes over the sound.

Indeed, it's what the Stages do with vocals, and the midrange in general, that makes them a great loudspeaker. I have (over-?) used the word "palpable" before, but you'll know what I mean when you hear a pair of these small Apogees properly set up. Soloists have a presence, a "thereness," which can be spooky. This has nothing whatever to do with any presence peak or boxy colorations—the latter are totally absent. But there's a tightness about the sound of the Stages through the midrange which is riveting. It startles me every time I return to them after spending time—often enjoyable time—with other loudspeakers, many of them excellent in their own ways. I always wonder if, somehow, the Stages will lose some of their magic after I've spent time with other designs having deeper or tighter bass, more airy, spacious highs, or more pinpoint soundstages. Perhaps some day I'll hear a loudspeaker that does all of the things the Stage *docs plus* all of those other things. It hasn't happened yet.

When I heard Apogee's flagship Grands at the 1991 Summer CES, a dream came to me shortly thereafter. The Grand, you'll note, is also a hybrid, though their cone subwoofer crosses over quite low—below 100Hz, I believe. Why not a Baby Grand, based on the Stage but with a supertweeter ribbon added, and a powered subwoofer built into a slightly larger base? Combining the strengths of the Centaur Major (while extending the bottom end a bit further), the Stage, and the Diva—all in a package of workable size and relatively reasonable cost. Don't wake me up.

—Thomas J. Norton 9