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Subject: Tone arm shapes

Posted by [Wayne Parham](#) on Tue, 27 Jul 2004 22:51:23 GMT

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Our recent discussions about drive types and tracking adjustments makes me want to bring up the topic of tone arm shapes. I expect some of you turntable gurus might be up on this stuff.

Remson, Cope, maybe one of you guys have some good reference material on the subject. The object is simple: Keep the stylus in alignment as the record groove radius decreases and the needle moves. But perfect alignment of this delicate moving contact point isn't so simple. Some use straight arms, others use "S" curved and other shapes. These cause the needle movement to form an arc. So some use linear tracking mechanisms to avoid that. What geometry is involved in getting the best alignment? What are the best shapes and why? What tables use(d) them?

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Subject: Re: Tone arm shapes

Posted by [Bill Martinelli](#) on Wed, 28 Jul 2004 02:52:56 GMT

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Good question. I have had a hard time finding answers too. I'm interested in building my own arm and finding any information regarding how to get going and some pro's and con's to different designs, materials, mass and geometry is a tough one. If I find anything more than bits and pieces I'll let you know. I just rebuilt a vintage Empire deck and it plays very well. It has a Grado cart and just the stock high mass arm. I was thinking of selling the car for a nice dynavector or sme arm. The busses run pretty regular around these parts, so what the hey.

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Subject: Re: Tone arm shapes

Posted by [Manualblock](#) on Wed, 28 Jul 2004 12:56:37 GMT

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The simplest explanation or the blue plate ala carte? S-shaped arms are more accurate at the two null points of the arc the arm transcribes across the record surface, but it is less accurate at all other points. The straight arm is a little less spot on at the nulls but more closely aligned throughout the rest of the arc. Linear Trackers are the most accurate however they must be actively driven across the platter which causes another set of problems designing for the least applied bias as well as constant correction applied. Bill mentions the Dynavector DV 505 I believe? That arm uses some tricks to overcome inertia in both the vertical and horizontal planes. The object is to try and provide a large effective mass in the horizontal plane with good damping while effecting the lowest mass in the vertical plane. They have a great tutorial on their website. The longer the distance from pivot point to stylus overhang the better in most gimbal or uni-pivot arms since that allows for the most accurate overhang adjustment and describes a flatter arc. These are simple explanations for very complicated issues. Really asking which is the best geometry is like asking is a 2a3 better than a 300b? It depends on execution. More important than geometry is

bearing integrity and resonance control. Unfortunately good bearing manufacture is expensive. In Gimbal arm bearings the inertia in both planes is the same but the fine line exists between accuracy and friction depending on the bearing tolerances. Uni-pivots solve that problem but in the vertical plane they tend to misalign on large excursions as the stylus is thrust upward. The most important aspect of TT is mating the right arm/table/cart. I have seen very high compliance carts. mounted on high mass arms all the time, not to mention misaligned carts. improperly loaded. Before you go with that bargain cart. check with the manufacturer of the TT. Rule of thumb is gimball bearings on suspended TT and uni-pivots on solid plinths. There is a guy in one of the clubs who built a tonearm out of a no.2 pencil. He built a scaffold out of aluminum and hung the arm from it with fishing wire. The cart. was glued to the erasure and he rigged up a rubber band as a anti-skate device. As the arm traced the grooves the rubber band wound up providing bias counterclockwise to the arc. I never heard it but it got good reviews. Mr. Martinelli, if you are serious about DIY tonearm try this site; Bernhard Kistners Audio Pages. He is building a Linear Tracker that looks real nice. J.R. If you would like my opinion, I use my Linn with the Linn Ittock type LV111 simply because they were made to work together and while slightly bloated in the base and they run a little slow, they still play music better than most other tables within reason. If I were to look for something more modern I would check out the Audionote tables. Maybe we can get some input on those. I really liked the MM cart. they make and I think I am ready to change from MC.

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Subject: Re: Tone arm shapes

Posted by [Wayne Parham](#) on Wed, 28 Jul 2004 14:22:16 GMT

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Good post, great information. Thanks!

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Subject: Re: Tone arm shapes

Posted by [Bill Martinelli](#) on Thu, 29 Jul 2004 02:05:10 GMT

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I understand the Linn is a very nice deck. Thanks for the lead to Mr Kistners pages. I will check them out. I did find some info on building a tonearm and have lost the place temporarily. The Dynavector 5 is nice isn't it? A little over the top for me right now. I have a Grado and a Sure cart. So far I like the Grado on the Empire arm a little better. The Grado has better bass production and is more dynamic sounding. The Sure is more neutral sounding and has a little more detail. Just some observations with a few 75.00 carts. It's a lot of fun and brings the relaxation level of listening to music to another level. Bill

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Subject: Re: Tone arm shapes  
Posted by [Manualblock](#) on Thu, 29 Jul 2004 12:01:52 GMT  
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If I may make a suggestion unasked for. That Empire is a really good table. Why do anything else? There are replacement parts for the bearing if I am not mistaken. The Grado; Alittle high compliance in my humble opinion for that arm. I know this is a radical suggestion but in the DJ shops they sell Stanton carts. for about 50\$. I use one on my Technics. They; at least the one I have, sound pretty damn good, but best of all they work really well in massive arms. You need to track a little high 2.5g's, but as long as the alignment is right that should'nt be a problem as to record wear. And talk about bass response, this is what those people are all about. Glue the stylus to the cart. body and that should do it. Just a little suggestion. J.R.( The first time I played the Stanton I had my old Pioneer SX 1250 driving the Pi4's. Totally oblivious I put on The Who's Won't Get Fooled Again, thats an experience everyone should have.)J.R.

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Subject: Re: Tone arm shapes  
Posted by [Manualblock](#) on Thu, 29 Jul 2004 12:09:58 GMT  
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Subject: Re: Tone arm shapes  
Posted by [Bill Martinelli](#) on Fri, 30 Jul 2004 01:01:02 GMT  
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Hi J.R.Thanks I appreciate the info. I'm happy with the deck the way it is. The arm is rough looking from the years and I would like to upgrade its appearance. The high end arms are too pricy for me. I'm looking around for a sme 3009. It's just an ongoing project you see. I agree with you on the Grado in that arm. I'm not sure how low the compliance for the Shure M97xe is. But, with the Grado I was getting some resonance showing in cone movement, that is not there when I use the Shure. I raised the vta a little and the Shure opened up and sounds very nice now. I found good results tracking at 2.1 or 2.2 grams. The Grado was tracking well at 1.8, 1.9 The Shure needed a

bit more. I'll have to give the Stanton a go in a few weeks. Do you have a pointer on glueing the stylus in? Bill

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Subject: Re: Tone arm shapes

Posted by [Manualblock](#) on Fri, 30 Jul 2004 12:50:12 GMT

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Yes; be vewy, vewy careful! Seriously, I just took a toothpick and stuck it in the bead of glue on the tip of the tube, then gently applied it to both of the outer edges of the stylus body, the plastic harness that holds the cantilever. Then carefully pushed the assembly in until it locked making sure no glue touched the cantilever. My old eyes required a small magnifying glass but it works well and sounds better. The Empire is one beauty of a table ain't it. You know I use an Empire MC Gold I have been saving for years on the Linn. I finally decided that saving things at 53 is somewhat counterproductive; so I opened the case and installed the cart. and boy does it sound great. It would be a nice match for your table.

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Subject: Slight correction....

Posted by [Mikey](#) on Fri, 30 Jul 2004 15:23:21 GMT

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manualblock wrote: S-shaped arms are more accurate at the two null points of the arc the arm transcribes across the record surface, but it is less accurate at all other points. The straight arm is a little less spot on at the nulls but more closely aligned throughout the rest of the arc. Not quite true! Let's say you've got two tonearms: one with an S-shaped arm tube, and one with a straight arm tube.... As long as both arms have the same effective length, both arms are mounted on the turntable with the same pivot to spindle distance, and both cartridges are aligned with the same headshell offset angle, then then two arms will trace the EXACT SAME path across the record surface! It can't be any other way! Mike

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Subject: Re: Tone arm shapes

Posted by [BillEpstein](#) on Sat, 31 Jul 2004 23:24:42 GMT

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Ya get some of that art paper and roll it up into a cone shape and then stick a pint in the narra end.....

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Subject: Re: Slight correction....

Posted by [hurdy\\_gurdyman](#) on Fri, 13 Aug 2004 14:03:00 GMT

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This is correct as I understand it. The advantage of a S shaped arm over a straight arm is a matter of lateral balance. A straight arm has a tendency to want to rotate on the tubes axis toward the outside, while a S arm corrects this, but at the expense of more mass and more material, thus greater chance of structural resonance.Dave

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Subject: Re: Tone arm shapes

Posted by [kyle](#) on Mon, 30 Aug 2004 21:07:02 GMT

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I'm a bit late on this but I did notice a couple of things which I think may be misleading.As mentioned there is no difference between S shape and straight arms as far as the alignmnet at the nulls and the arc described across the record. The angle of the S is usually similar to the offset angle on a straight arm.Linear tracking arms are not all actively driven. Most linear trackers are not driven. eg Air Tangent, tri-quartz. I believe radio shack had an active linear arm in the seventies.Having a longer arm will not make overhang adjustment easier, sliding the cartridge in the mounting slots is about the same in both cases, as is the the overhang. Overhang is the distance the arc of the stylus extends past the spindle.Unipivots misalign on large excursions? Maybe on a severely warped record but not due to groove modulation. There is not enough vertical motion following a groove to misalign the stylus signifigantly.I used a Linn for over 10 years and while it's not my favorite table, mine never ran slow. I would have that looked at. I know this sounds somewhat more negative than the usual for this board but some of your info seems incorrect.

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Subject: Re: Tone arm shapes and Audio Note

Posted by [DRCope](#) on Mon, 06 Sep 2004 12:21:18 GMT

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Are you sure about S shaped arms being more accurate? It seems to be that you could draw a straight line between the pivot point and stylus point on an S as well as a straight arm, and that the relationship between them would be constant from lead-in to lead-out.I agree that matching the arm and cart is of primary importance, and the arm/table match following that.In the gimbal v unipivot sweepstakes, unipivots give me fits - just a personal thing. As far as gimbal-suspension and solid-uni match-ups, it's worth noting that Naim makes a very fine unipivot which finds application largely on Linns. Art Dudley is a very big long-term fan of that combination, and man has he wrung out the possibilities with a Linn!FWIW - While I hardly claim to be unbiased regarding Audio Note, I used a Linn for over twenty years; it was the longest running constant in my ever-changing system. The TT One ran circles around it. Speed, articulation, life . . . . You can

read MRanfft's impressions on AA. The TT One is essentially a Systemdek with an upgraded bearing and acrylic platter. (Audio Note bought the rights to the design - all very above board!) The TT Two is the same, but with two motors, lending greater solidity and constant speed to the game. The result is firmer bass and smoother midrange. A potential point of interest - the IQ cartridges have interchangeable styli, so you can buy an IQ1, use it while saving up for an IQ2 or 3 stylus, and then change, keeping the 1 stylus for parties, etc. Another point of interest about the IQ3: The stylus tip and cantilever are the same as that used on the IO1 moving coil which is a couple grand more expensive. Verrrrry detailed and refined sound.

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