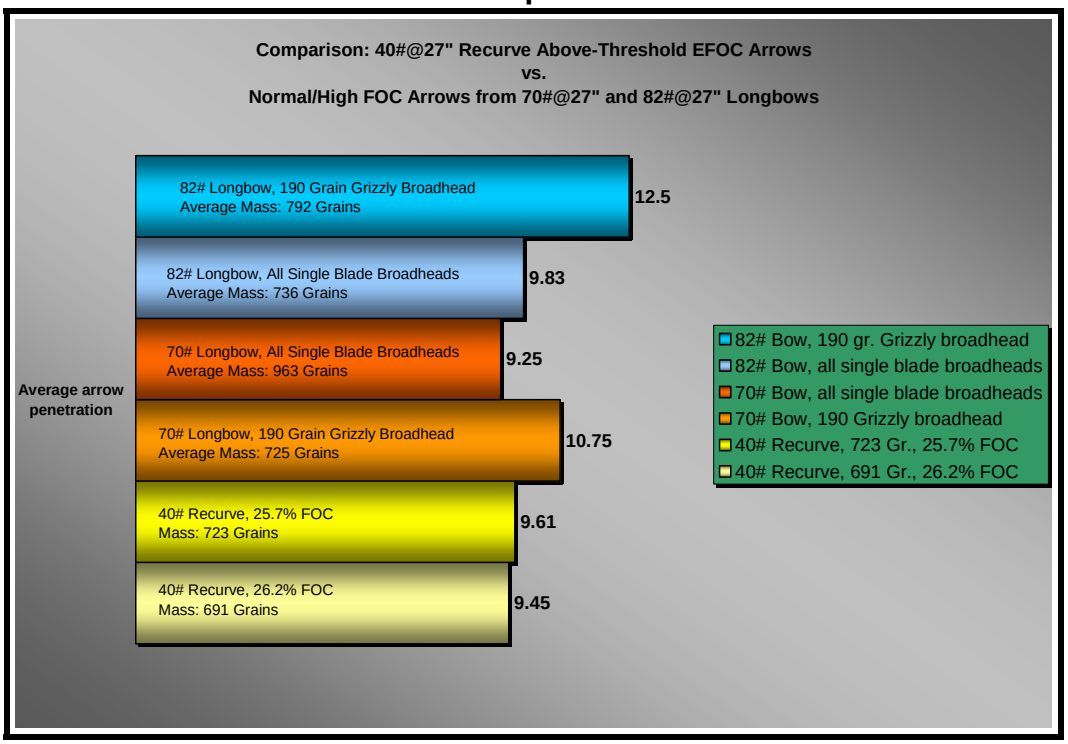
2008 Study Update, Part 2

By

Dr. Ed Ashby

Part 1 of the current Update series presented the results of the 40# bow's Heavy Bone Threshold/FOC testing. In this Update we begin a comparison of the performance of those arrows to the results shown by 'commonly used arrows' from heavier draw weight bows.

Graph 5



Graph 5 gives an a comparison between the two penetration-enhanced, above-threshold EFOC arrows from the 40# recurve and all comparable shots with Normal and High FOC arrows from the 70# and 82# longbows. Arrows from the heavier bows are shown in two groupings. The first grouping shows 'all single blades' while the second has only those arrows having the same broadhead used in the 40# bow's testing; the 190 grain Grizzly.

To make the comparison with the 'normal arrows' from the heavier bows more applicable we're considering only the heavier bow's arrows at or below a total mass of 800 grains, and all shots where no arrow structural-failure was encountered. Only broadside, back of the shoulder thorax hits from the same shooting distance are included.

While comparing, remember that some arrows in the heavy-bow groups do not possess as many penetration enhancing factors as those from the 40# bow. Some have a poor ferrule-diameter/shaft-diameter ratio, several have either 'Hill type' serrated, micro-serrated or file sharpened edges, and some have barrel-tapered shafts. Among 'all single blades' there is great variation in mechanical advantage, blade profiles, cutting angle, edge angle and tip profile. However, collectively taken they represent a typical aggregate of 'commonly used arrows' and single blade broadheads.

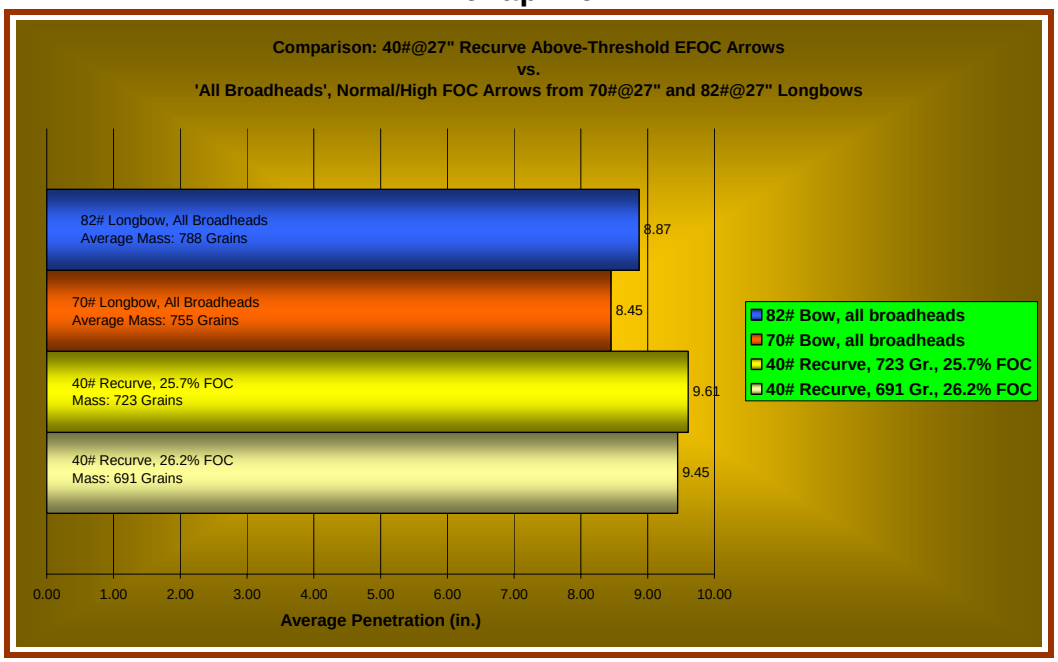
There is an up-side to making comparisons in which these many differences are present. It gives the light-draw shooter who uses a penetration-enhanced arrow an indication of how his arrow's penetration-potential stacks up against a heavier draw-weight bow, when the heavy-bow shooter pays little or no attention to enhancing his arrow's penetration potential (other than having well tuned arrow flight). It also shows the fallacy of using only a bow's draw-weight as the guide to the "likely outcome" tissue penetration you can expect.

The two above-threshold EFOC arrows from the 40# recurve compare very favorably with the average penetration shown by the 'all single blades' sets of 'commonly used' arrows from both heavier bows, and isn't far behind that shown for the 'same broadhead' sets. On heavy bone impacts they show, respectively, 2.2% and 3.9% greater average penetration than shown by the 70# bow's 'all single blades' group. They show 96.1% and 97.8% as much penetration as the 82# bow's 'all single blades' group.

Compared to the 70# bow's 'same broadhead' group the 40# bow's penetration-enhanced, above-threshold EFOC arrows show 87.9% and 89.4% as much penetration, respectively. Even when compared to the 82# bow's 'same broadhead' group they show better performance than most would expect. Shot from a bow with less than half the draw weight they gave a 100% bone-breaching rate while averaging 75.6% and 76.9% as much penetration *on heavy-bone hits*.

The heavier bow's comparison sets in Graph 5 are limited to single-blade broadheads; ether 'all single blades' or the same broadhead as used with the 40# recurve. What happens if we include all fixed-blade broadheads (excluding the mechanicals) in the 'common arrow' group for the heavier bows? This gives a truer cross section of 'commonly used arrows' for the heavier bows. (Mechanicals were excluded because their inclusion *drastically* lowered the average penetration.)

Graph 6



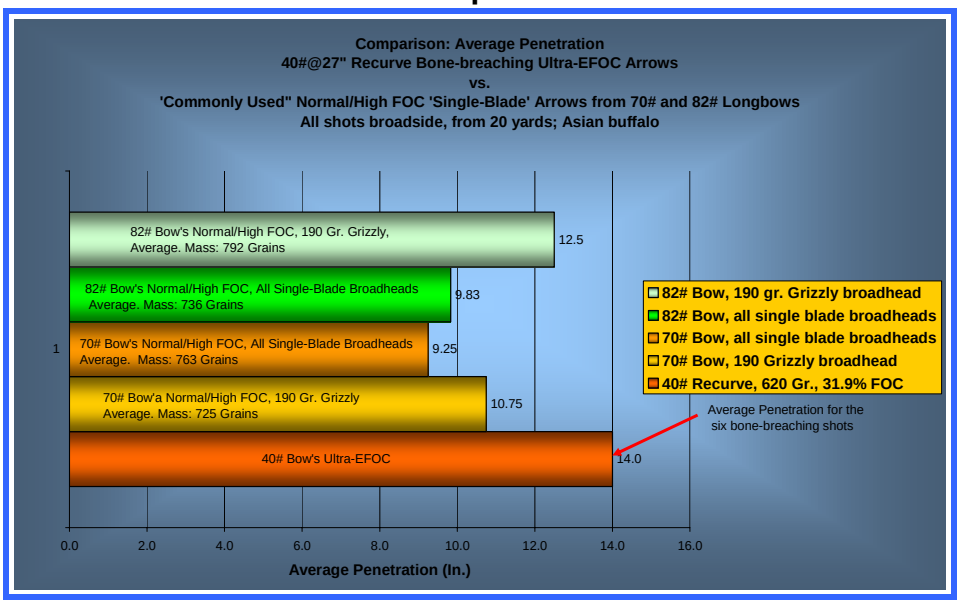
When all fixed-blade broadheads are included in the 'commonly used' Normal and High FOC arrows for the heavier bows there is a noticeable decrease in the average penetration. Compared to the 'all single blades' groups shown in the previous graph (Graph 5) the average penetration decrease for the 70# and 82# bow is 8.6% and 9.8%, respectively. That's fairly dramatic when one considers that only 10.5% of the 'all broadheads' shots are with multiblade broadheads. This reflects the marked difficulty multiblade broadheads have on heavy-bone impacts.

When compared against the heavier bow's 'all broadheads' group the 40# bow's two penetration-enhanced, above-threshold EFOC arrows show a distinct penetration advantage. Against the 70# bow they show an average penetration increase of 13.7% and 11.8%, respectively. Against the 82# bow they show increases of 8.4% and 6.5%. Also remember that the 40# bow's penetration-enhanced, above-threshold EFOC arrows showed a 100% penetration rate on the hefty buffalo ribs. That's something that can't be said for either of the heavier bow's commonly used 'all broadheads group', where 47.1% of the multiblade broadheads and 10.9% of the single-blades failed to penetrate the entrance-side rib.

In Part 1's 40# recurve testing we saw that the 50% of below-threshold Ultra-EFOC arrows that breached the entrance rib showed a large post-breaching penetration increase over the above-threshold EFOC arrows. How does the performance of these

six Ultra-EFOC arrows compare with the above arrow sets from the heavier bows?

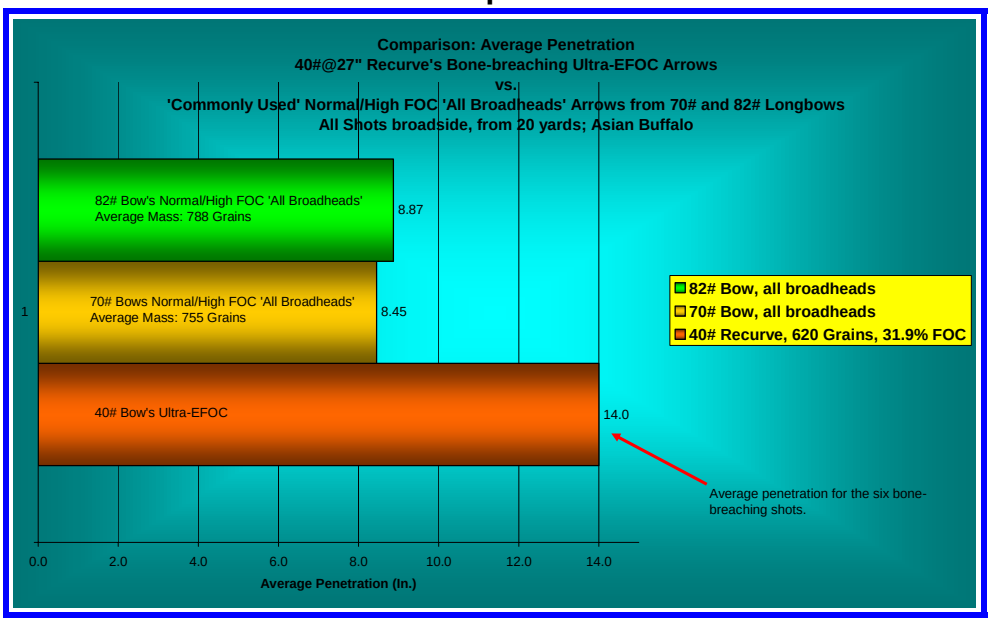
Graph 7



The average penetration for the 40# bow's six bone-breaching Ultra-EFOC arrows exceeds that of each heavier bow's 'all single blades' and 'same broadhead' groups. The percent of increase in penetration they show over the other groups, from top to bottom, is: 12%; 42.4%, 51.4% and 30.2%.

Now let's factor in the multiblade broadheads and look at the two heavier bow's 'all broadheads' groupings.

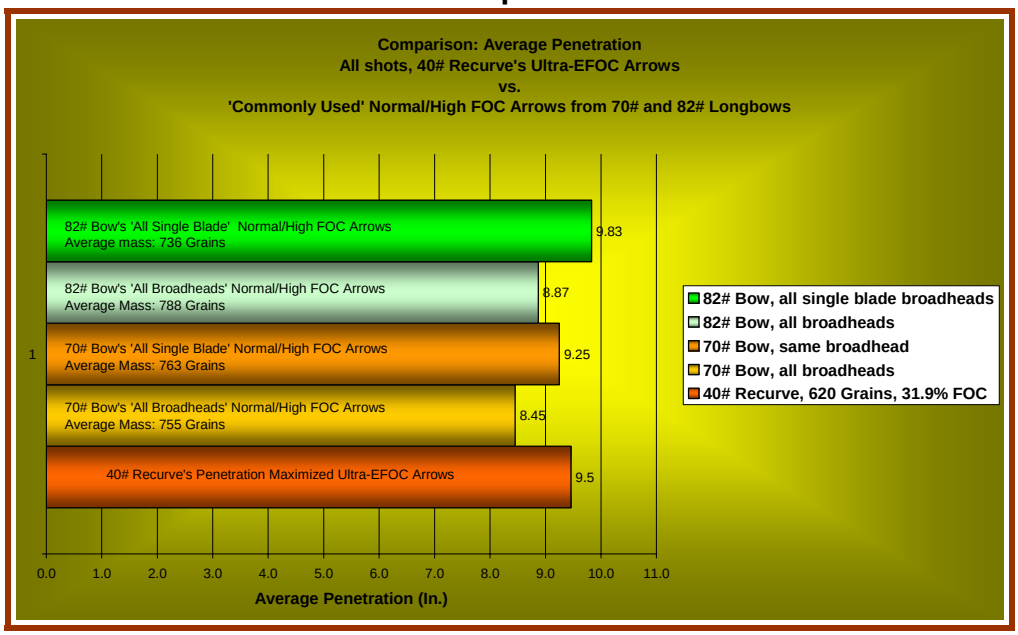
Graph 8



Average penetration for the six bone-breaching Ultra-EFOC arrows from the 40# bow is 65.7% greater than that shown by the 70# bow's 'all broadheads' group. They show 57.8% greater average penetration when compare to the 82# bow's 'all broadhead' group.

While the performance of the six bone-breaching hits with the below-threshold Ultra-EFOC arrows from the 40# recurve are little short of astonishing there still remains that threshold barrier. If we consider the overall penetration average for all its shots; the six bone-breaching hits and the six shots stopped by the rib; how do the below-threshold, penetration-enhanced Ultra-EFOC arrows stack up against the Normal/High FOC arrows from the heavier bows? Let's look at that comparison.

Graph 9



Many will consider the results shown in Graph 9 a fairer and more direct comparison of the performance of the below-threshold, penetration-enhanced Ultra-EFOC arrows from the 40# recurve. In some ways that is true; it does show the overall "likely outcome" penetration for a heavy bone hit. On the other hand, in some aspects the "likely outcome" is skewed in favor of the arrows from the heavier bows.

Why is there a skewing of results in favor of the arrows from the heavier bows? The Heavy Bone Threshold is highly dependent on arrow mass. The vast majority of arrows in each heavy-bow grouping have a mass-weight exceeding the heavy bone threshold. In fact, 82.7% of all shots shown for the 70# and 82# bows are with arrows having a mass-weight above 650 grains,

whereas 100% of the 40# bow's Ultra-EFOC arrows had a mass-weight *below* threshold value. This gives arrows from the heavier bow a decided 'opportunity advantage' to show post-breaching penetration.

Despite the handicap imposed by the Heavy Bone Threshold, average penetration for all 12 shots; the six shots breaching the bone and the six not penetrating the bone; the 40# bow's below-threshold, penetration-enhanced Ultra-EFOC arrows exceeds that of each heavier bow's arrow grouping shown, except for the 82# bow's 'all single blade' group. Even this group only exceeds the Ultra-EFOC arrow's overall average penetration by 3.5%. That's pretty dramatic average penetration when one considers that 50% of the below-threshold Ultra-EFOC arrows were stopped by the entrance side rib! For now, one can only conjecture what the outcomes would have shown had the 40# bow's penetration-enhanced, Ultra-EFOC arrow had a mass-weight above-threshold.

These results provide one of the clearest examples of the degree of penetration advantage that can be gained by optimizing the design features which enhance your hunting arrow's penetration potential. It's good news for those who are forced to hunt with a lighter draw-weight bow; especially when pursuing heavier game. It means they have arrow setup options which offer a penetration potential exceeding that of a bowhunter using a much heavier draw-weight bow, when the heavier bow shooter employs a commonly used, less efficient arrow setup.

In Part 3 of this Update series we'll look at what both these and the other Heavy Bone Threshold test tell us about the effect impact force has on the threshold value and more about how the degree of arrow FOC affects post-breaching arrow penetration.