

Third Axis Leveling Re-Visited

Article Courtesy Spot Hogg

You cant the bow differently for each shot your sight pin becomes unreliable. Most picky shooters make a point of holding their bow at the same cant on every shot, and the really picky shooters usually end up with no cant at all because they hold their bow perfectly straight up and down.

It isn't long before the really picky shooters discover the value of having a level inside their sight window. Using a level makes sure that the bow is held vertical and causes the sight pin to become incredibly more reliable. Then, when the shooter executes a good shot, the arrow hits exactly where the sight pin was aimed.

When a level is attached to a bow without being properly adjusted, the centering of the bubble in the level vial will cause the bow to be canted differently for different distances and for up and downhill shots.

With your sight and bubble square on your bow, you will experience left and right problems even on a flat range. One fix for this problem is to adjust your pins so they are no longer in a vertical line but are angled (for a freestyle sight, you angle the slider). This works well on flat ground, but not so well for up and downhill shooting.

As soon as you shoot your angled pins (or sight bar) on some up and downhill shots, you will again experience left and right misses. Unfortunately, when most shooters miss, they blame their shot execution. After all, their equipment is perfect. Their shooting on the practice range proves it. On the other hand, maybe the practice range is lying to us. The problem is if you shoot an up or downhill shot, say at 40 yards, the bow will be held at a higher angle than on the flat range. Therefore, centering the bubble while shooting uphill/downhill will cause you to cant the bow more, than on flat ground.

In order to have a sight pin that is good for 40 yards regardless of whether it is uphill, downhill or flat ground, the bow must be held at exactly the same cant (vertical) for all shots. With the level of the sight properly aligned, the bubble can be relied upon, for each and every shot at all distances and in any manner of terrain. If the shooter misses the shot, at least he knows it wasn't because the bubble was lying to him.

To get the level vial aligned properly with the bow so that the bow stays in the same vertical/cant plane for all shots is often referred to as setting the Third Axis. To set the Third Axis properly, the level vial must be aligned perpendicular to the up and down arc that the bow is moved in when shooting uphill and downhill, not to the bow itself.

To better understand what the Third Axis is and how to set it, think of the level vial on the bow's sight as being flexibly attached at one end so that the other end is free to move up and down and all around (like a video game joystick). Then while holding the bow at the desired cant/vertical, raise or lower the moveable end of the level vial until the bubble is centered. Then lock the up and down end of the level vial so that the movable end of the level vial can now only move back and forth. This sets the Second Axis. The hinge like movement of the level vial back and forth is the Third Axis.

The goal of a properly set Third Axis is to have the bubble centered only when the bow maintains the same cant/vertical for flat, uphill, and downhill shots. Think of the shooter standing next to a wall that is straight up and down. The shooter is standing close

enough to the wall that when he comes to full draw, the top and bottom limb pockets are lightly touching the wall. If he shoots an arrow it will travel parallel to the wall. Using the wall as a reference, the shooter will not cant the bow if he shoots uphill, downhill or flat, because he keeps the top and bottom limb pockets lightly touching the wall.

The level vial will provide the same reference that a wall provides if the level vial is perpendicular to the wall. The shooter has already set the Second Axis of the level vial by referencing it to the bow. However, setting the hinged type action of the Third Axis is not so simple.

Because the sight bar mounts to the side of the riser and the side of the riser seems to be parallel to the arrow, many shooters set the Third Axis so the level vial is perpendicular to the sight bar. It *should* work to have the level perpendicular to the sight bar and the side of the riser. However, it does not.

A level set perpendicular to the sight bar and the side of the riser, would work, if the side of the riser would stay parallel to the arrow and the arrow were delivered dead straight. Unfortunately, that does not happen. When the shooter draws the bow back, the riser does not stay parallel to the arrow. When the arrow is shot, it will hit left or right of where it was actually pointing due to the left and right nock travel that occurs when the arrow is being delivered. When the bow is drawn the draw weight shifts from the string to the cable (or cables), which puts more pressure on the cable guard and causes the riser to rotate. The riser rotates in the shooter's hand to accommodate the limbs twisting, as the load increases on the cable guard the limbs bend down and towards the cable guard. The riser rotating can easily be seen if there is a long stabilizer (about 3 feet long) attached to the bow. With an arrow nocked on the bowstring, the shooter can easily see that the arrow does not align with the long stabilizer the same at full draw as it does when the bow was at rest. The tip of the stabilizer will always move to the right on a right-handed bow. The amount it moves will vary depending on the amount of energy being stored and the design of the bow. The more energy being stored, the more the tip of the stabilizer will change position. The tip of the long stabilizer can only move if the whole riser is rotating.

Because the riser rotates in the shooter's hand when the bow is drawn, setting the levels Third Axis in a bow vice, on a leveling jig or with the bow at rest will not set your level. You must take into account the riser rotating in the shooter's hand or the bubble will cause the shooter to cant the bow differently for up and downhill shots. The uphill shots will be to the right of where they were aimed. The downhill shots will be to the left of where they were aimed. The amount that the arrows will be to the left and right depends on how much the riser rotates.

The more energy stored in the bow, the more the riser rotates. The pressures applied by the shooter's hand will also affect how the riser rotates. If the shooter does not take into account the rotation of the riser when setting the Third Axis, the bubble will lie to them on *ALL* up and downhill shots.

We have a Mach 7 bow set at 65 lbs. When the Third Axis of the level vial is set perpendicular to riser, the arrows will hit 6 inches to the right when aimed 12 degrees uphill at a 40 yard target. When the Third Axis of the level vial is set properly, the arrows are right on the money.