The effect of bridge length on contact point accuracy

supporting:
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From the triangle above, the possible error in the cue ball contact point depends on aiming line accuracy and bridge length according to:

$$\Delta x(\Delta \phi, L) := 2L \cdot \tan\left(\frac{\Delta \phi}{2}\right)$$

Example values:

$$\Delta \phi := 1 \text{ deg} \quad \text{the error in the cue stick aiming line is 1 degree}$$

$$L := 1, 1.25, .. 16 \quad \text{the bridge length is varied from 1 inch to 16 inches}$$

In addition to the aiming line being off, the contact point error ($\Delta x$) can produce unwanted English resulting in deflection (squirt), throw, and curve.

$$\Delta x(\Delta \phi, 6) = 0.105 \quad \text{The contact point error is 1/10 inch for a stroke error of 1 degree at a bridge length of 6 inches.}$$

$$\frac{\Delta x(\Delta \phi, 12)}{\Delta x(\Delta \phi, 6)} = 2 \quad \text{The contact point error doubles when the bridge length is doubled.}$$