

## The Sound That Pleases

**GOLFERS LIKE TO HEAR** a reassuring click when they putt.

Unfortunately, engineers at ARA Engineering Inc. of Mesa, Ariz., a consultant services firm, recently discovered that their putter prototype made an unusual, hollow sound when it struck the golf ball.

The noise was different from that of other putters on the market. Perhaps more important, the sound didn't inspire confidence in the golfer, one ARA engineer said.

Engineers knew the putter would need to be redesigned, but they first analyzed the prototype using finite element analysis to figure how to best change its geometry and, thereby, performance.

Using software called NeiNastran from Noran Engineering of Westminster, Calif., they discovered that the way the putter bent and twisted when

it struck the ball caused the sound.

The engineers stiffened certain sections of the putter to give it the appropriate sound.

**Shorter design time is important, as customers swap bathtubs for showers.**