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— Martin Martinez
President of Engineering Science Analysis Corp.

Golfers, get ready for liftoff

Engineers apply rocket science to club design

By John Davis
The Arizona Republic

When he won the FBR Open three weeks ago, Phil Mickelson noted that he was hitting his driver too far to use it on some holes where he normally would.

Despite limitations placed on clubs and golf balls by the U.S. Golf Association, the arms race in golf is continuing, and equipment makers are in full launch mode.

Engineering Science Analysis Corp., a Tempe company that specializes in product development for the aerospace industry, is trying to take that to new heights by applying rocket science to club design, as well as baseball and softball bats.

ESA President Martin Martinez says the application could help club manufacturers reduce the cost of designing new clubs, which could keep costs down for consumers. The basic premise is to use sophisticated computer programs to predict and simulate the performance of equipment given its specifications — making it less of a trial-and-error process.

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While they haven't taken it to extremes, top equipment makers such as Phoenix-based Ping use similar technology in designing clubs.

At the turn of the century, new clubs were being created predominantly with a time-consuming design-build-test-adjust cycle.

"We've seen the biggest impact in metal woods," said John K. Solheim, vice president of engineering for Ping. "In the past, it was build-and-try, and most of the time they failed right out of the chute.

"By applying CADs (computer-aided design), we can go into that design with a lot more confidence now. We've been able to save a lot of time in the design process."

The computer programs take into account materials, loft and lie angle, size and launch angle of a clubface, spring-like effect and center of gravity. With that information, they can determine the forward, lateral and vertical speed the club will produce, and spin rate, which results in hooks and slices.

Tim Koors/The Arizona Republic

Carl J. Poplawsky, an executive with Tempe's Engineering Science Analysis Corp., says this new design process can even predict the sound a club will make.

"We can even tune the acoustics so that the club produces a certain sound when the ball is struck," said ESA Vice President of Engineering Carl J. Poplawsky, "and we can do it without going through the entire process of building the club first. What we do is compress product development."

Within a matter of hours, club specifications can be changed to predict the performance of a different model. The simulations also have been useful in expanding the "sweet spot" of clubs, which makes them perform better on off-center hits.

Although the process is relatively new, the Tempe firm has been enlisted for performance analysis on one popular driver, and it's hoping to attract more club makers. It's also worked with Louisville Slugger on baseball bat engineering.

ESA has found another application, which might not thrill some golf equipment companies.

"Every time a new club is introduced, the equipment maker issues information explaining that by doing certain things with the design, it will produce this ball flight or that result," Martinez said. "Sometimes we laugh at that, because our simulations show it can't happen."

While the simulation programs have proven to be accurate in many regards, Solheim said the real performance test always would involve a human element.

Hands-on testing, he said, is critical in determining the "feel" of a club.

"I would say the finite element isn't the end-all of design," Solheim said. "I have doubts that you can know everything about a club before it's built. We can get a pretty good indication of what the feel will be like, but we've found that there still are some surprises once the part comes out.

"We think it would be a big mistake to design a club without feedback from the actual golfer that takes everything into account."

After all, he said, computers don't take divots. Humans do.