

# ROGUE

MORE POWERFUL. MORE FORGIVING.

## THE JAILBREAK EFFECT

IN ROGUE, ROGUE DRAW AND ROGUE SUB ZERO DRIVERS

Callaway's new Rogue drivers - Rogue, Rogue Draw and Rogue Sub Zero - all feature a series of technologies that work together to promote faster ball speed. Two in particular, Jailbreak and X-Face VFT (Variable Face Thickness) technology, support each other in an especially critical way.

*"We aligned these technologies to amplify what we call the Jailbreak Effect," said Dr. Alan Hocknell, head of Callaway R&D, "which is all about promoting faster ball speed on both center and off-center hits to help golfers get more average distance on nearly every drive."*

### THE NEXT GENERATION OF JAILBREAK



Jailbreak's function, and how it works, remains the same. The bars' position inside the head, behind the face, effectively stiffens the body to prevent the crown and sole from deforming and bulging outward at impact. That changes how the face behaves at impact, allowing it to focus more energy on the ball. Callaway calls that "Energy Lensing," and it promotes more ball speed for longer distance.

What has changed about Jailbreak is the shape and weight of the bars. Their new, hourglass shape makes them 25% lighter than first-generation Jailbreak bars. This is important because in club design, every gram that can be moved to a place where it contributes to enhanced performance, matters.

### ENHANCING THE JAILBREAK EFFECT WITH IMPROVED X-FACE VFT TECHNOLOGY

Callaway's X-Face VFT technology entails varying the thickness of the face in strategic ways and places to help the face flex faster, especially on off-center hits. In Rogue, we enhanced VFT through a sophisticated optimization process that consists of successive iterations using finite element analysis to simulate the impact of the ball at more than 100 unique impact locations on the face. The thicknesses of every point on the face are incrementally adjusted during each iteration, based on the allowable stress limit of the face material and the face-speed limit established by the USGA.

*"A recent addition to this optimization process is a fatigue analysis in which the stress allowables are based on the number of expected impacts at any given location on the face over the life of the club, or what we call the clubface impact probability distribution map," said Evan Gibbs, director of metalwood development. "This map is based on the fact that players tend to impact the clubface more frequently at some locations than at others, which ultimately allows us to further reduce the off-center face thickness in strategic areas to further increase ball speed on the average mis-hit."*

### RESULT: FAST BALL SPEED FOR LONG DISTANCE ON CENTER AND OFF-CENTER IMPACTS

The overall benefit of Jailbreak Effect in all three Rogue drivers is the promotion of fast ball speed for long distance from a relatively large area of the face, to help golfers attain long distance more often, both on center-face contact and off-center contact.

*"That's a perpetual goal of ours," said Hocknell. "No golfer makes solid impact every time. We continually work to develop new ways to help golfers maximize their distance on every swing, even the imperfect ones."*



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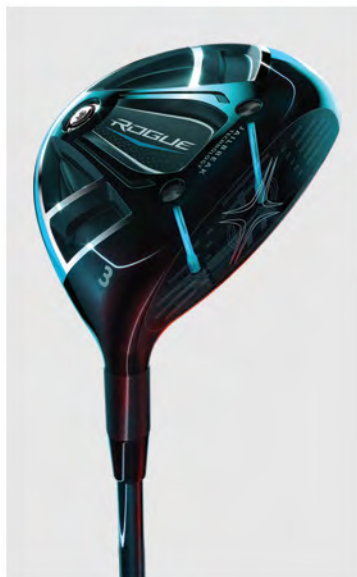
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## MEETING THE CHALLENGE

OF INCORPORATING JAILBREAK TECHNOLOGY INTO A FAIRWAY WOOD

The Rogue fairway wood is the first fairway wood with Callaway's Jailbreak ball-speed-enhancing technology. Making that happen is a significant achievement in metalwood engineering, according to Dr. Alan Hocknell, head of R&D.

*"We faced two big challenges in putting Jailbreak technology to work in a fairway wood, starting with the clubhead's smaller size and shallower height," said Hocknell. "Determining the size, weight, geometry and positioning of the bars took significant time and testing."*



The second challenge was figuring out how to make Jailbreak and Callaway's renowned Face Cup technology complement each other. Face Cup promotes fast ball speed for long distance, and expands the area of the clubface that delivers fast ball speed, helping golfers maintain good distance results on off-center hits. It played a key role in making Callaway the game's most popular fairway wood during the past two years.\*

In Rogue fairway woods, the ultra-thin, 455 Carpenter steel clubface is cast separately for precise rendering of Face Cup's renowned cup-like architecture, especially the rim around the face's perimeter. The shaping and varying thicknesses of the rim are critical to its ability to flex and rebound at impact, which promotes fast ball speed, especially on off-center hits.

Another challenge was determining how to make Callaway's Internal Standing Wave (ISW) technologies co-exist with Jailbreak. ISW incorporates a precisely shaped steel bar that's precisely positioned low and forward in the head in order to establish an optimal CG location. Achieving the proper position in Rogue fairway woods required that the ISW bar be attached to the Jailbreak bars, yet determining how to securely bring them together was the big question. The answer was to cast the body, Jailbreak bars and Internal Standing Wave weight all as a single piece of high-grade steel.

*"That requires a sophisticated combination of design, engineering and production expertise," said Hocknell.*

*"Succeeding allows Jailbreak to fulfill its intended function of stabilizing the sole and ultra-thin and light triaxial carbon composite crown at impact, allowing the face to take on greater impact-load to promote faster ball speed, just as it does in our drivers."*

*"In fact, the technological synergy between Jailbreak, Face Cup and Internal Standing Wave technologies is what makes Rogue fairways an engineering marvel, and an absolute powerhouse," said Hocknell. "The combination of ball speed, high launch and low-spin it promotes is truly exceptional."*

\* #1 Fairway Wood claim based on Golf Datatech reports confirming Callaway as the best-selling fairway wood brand in the U.S. throughout 2017.



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