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## STAR-CCM+'s Role In Winning the Tour de France

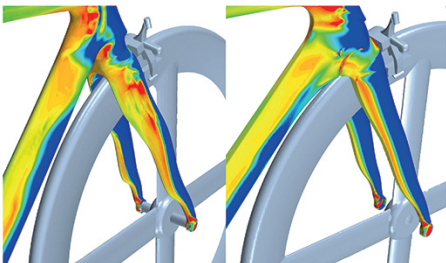


Stephen Ferguson

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When Dave Brailsford announced the formation of Team Sky in 2010, he did so with the explicit ambition of propelling a British rider to the top step of the Tour de France podium by 2015. To cycling experts, it seemed like a brave and almost foolhardy prediction. In the 97 editions of the Tour de France that preceded Brailsford's announcement, no British rider had finished in the top 3 of the world's most important cycle race, let alone threatened to win it. Therefore, it seemed unlikely that Brailsford - a newcomer to the world of professional cycling - would be able to reverse that lack of fortune in such a short period of time.



The experts were wrong and spectacularly so. This

Sunday as the Tour wrapped up its 100 year anniversary (two years ahead of Brailsford schedule) Team Sky rider, Christopher Froome rode into Paris wearing the coveted yellow jersey on his shoulders with a comfortable 5 minute margin over the second place rider. In doing so, he claimed not the first, but the second consecutive victory for a British Team Sky rider at the Tour de France, following in the footsteps of last year's winner Sir Bradley Wiggins.

**So how did Team Sky manage to beat their own prediction and deliver a double British victory two years ahead of their plan?**

According to Brailsford (now "Sir David") the answer is extreme attention to detail:

"We've got this saying, 'performance by the aggregation of marginal gains.' It means taking the 1% from everything you do; finding a 1% margin for improvement in everything you do. That's what we try to do from the mechanics upwards."

Of the many marginal gains, one of the largest comes from equipping his riders with the

most aerodynamic bicycles possible: the Pinarello Dogma. This bike was designed extensively with the help of STAR-CCM+. In both 2012 and 2013, the top two steps of the Tour de France podium have been occupied by riders of Pinarello bicycles.

Perhaps more than any other sport, top-level cycling is dominated by aerodynamics as riders aim to minimize energy expenditure. Small aerodynamic advantages can be the difference between winning and losing the Tour. In 1989, American Greg Lemond trailed French rider Laurent Fignon by 50 seconds prior to the final stage - a 24.5km time-trial in which each rider competes alone against the clock. To most observers, this gap seemed insurmountable, requiring Lemond to ride each kilometer 1 second faster than Fignon. On a warm Paris afternoon, Lemond who wore an aerodynamic helmet and rode a special aerodynamic bicycle beat Fignon who was riding a normal road bike by 58 seconds. He also won the Tour overall by just 8 seconds. Subsequent analysis has suggested that the drag on Fignon's ponytail alone was enough to slow him down by the critical 8 seconds by which he lost the race.

Of course, it's hard to quantify exactly how much the STAR-CCM+ refined aerodynamics of the Pinarello Dogma contributed to Froome's victory in the 100th Tour de France. At times it looked like he could have easily won riding a [Raleigh Chopper](#) [1]! However, the bicycle's aerodynamics was almost certainly responsible for his Stage 18 victory [2].

You can read more about how Pinarello used STAR-CCM+ to improve the aerodynamics of the Dogma [here](#) [3], or if you prefer, just sit back and enjoy the curves of a beautiful piece of engineered machinery by watching [this video](#) [4].

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[2] [http://velonews.competitor.com/2013/07/tour-de-france/tour-tech-how-bike-change-strategy-shaped-the-stage-18-time-trial\\_295701](http://velonews.competitor.com/2013/07/tour-de-france/tour-tech-how-bike-change-strategy-shaped-the-stage-18-time-trial_295701)

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