

Technical and Tactical Implications of the new FIS Ski Specifications

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The FIS set off a firestorm of controversy and speculation this July when it announced that, starting in the 2012-2013 season, World Cup skis would be subject to new regulations. In an effort to increase athlete safety, FIS sought to reduce what they believe to be significant injury risk factors: the forces on skiers in the turn, the aggressiveness with which the skis interact with the snow (that is, how abruptly they engage, and how difficult it is to make them release), and overall speeds in general. Sidecut for downhill and super-G skis was also increased, as was ski length for all but slalom skis. The rule getting the most attention, almost universally negative, was an increase in the minimum sidecut radius of GS skis: 40m for men's skis and 35m for women's, up from 27m and 23m, respectively. Another change that has come under fire from many quarters is a reduction of the stand height – the distance between the bottom of the ski and the skier's heel inside the boot – for downhill and super-G skis, from 50mm to 45mm.

The GS ski dimensions seemed to be a big step backwards. The proposed sidecut radii haven't been seen on race skis since the 1980s. Current World Cup competitors who tested prototype skis conforming to the proposed regulations gave them uniformly bad reviews. The turning forces were reduced as well as the skis' aggressiveness, but at the cost of requiring techniques and tactics - such as skidding, stepping, and conservative, high lines - that look and feel dated and clumsy. Some feared that fans would lose interest in the sport because the athletes would no longer present a good image of modern skiing. It would be like watching vintage automobile racing, rather than modern Formula 1.

In late August, after World Cup competitors, coaches and equipment suppliers voiced their concerns, FIS backed off their initial sidecut fiat, and reduced the new minimum GS ski sidecuts to 35m and 30m for men and women, respectively. These numbers are much closer to those of skis in actual use today on the World Cup, which generally have sidecuts bigger than the legal minimum. Men are racing on skis measuring around 29m to 32m, and women up to 29m, because, while they don't hold as tight an arc as skis that match the current minimum radius specification, they run faster and are, in the aggregate, faster on most courses. Consequently, the changes in technique and tactics brought by the new skis will certainly be less radical than they would have been if FIS had stuck to its original numbers.

FIS based the new regulations on research conducted for it by Prof. Erich Müller, from the University of Salzburg, and a team of respected sports scientists, all of whom specialize in alpine skiing. They tested a number of prototype GS, downhill and Super G skis to determine how adjusting certain design parameters could reduce the injury risk factors under race conditions, and if the prototype skis were still race-worthy at the World Cup level. The tests were performed using recently retired World Cup athletes and active Europa Cup competitors. The GS prototype skis were tested in GS courses on a variety of terrain and the speed skis were tested on the lower half of the downhill course

at Aare, Sweden. Velocities and forces on the testers were monitored, and the skiers completed questionnaires that evaluated the “skiability” of the prototypes, ranking them in terms of how aggressive they were, how forgiving, and their skidding characteristics.

Tactics, Techniques and Course Setting

Racers like to carve, and coaches like to set courses that allow the racers to do it, within the bounds of safety and course setting regulations. Since the new skis’ natural carving radii will be bigger, so will the turns set by the coaches, where practical. On moderate to flat terrain that isn’t too narrow, the sets will likely be straighter. The turns won’t come as far out of the fall line, so speeds will actually go up and, unless the rules for vertical distance between gates change, the rhythm will be quicker. On steeper pitches, where speed must be controlled, there will be little choice but to set gates that require more skidding than we’re used to seeing.

The turning forces on the skier will almost certainly be lower, and so we’ll see less inclination and high edge angles in the turns. You won’t see Ted Ligety’s inside hip skimming the snow nearly as often as he ducks by the gate. But you may see more and bigger stivots (pivoting the skis sideways going into the turn to scrub speed if necessary, then turning the skis back to a line that can be carved through the rest of the turn), a la David Simoncelli.

The one bright spot in the new rules, which has received positive comments from athletes, is the waist width statute, which for the first time specifies a maximum width, rather than a minimum. We might see narrower skis than have ever been used in GS, super G and downhill. This, combined with the larger sidecut radii, should enable racers to carve with less angulation, less countering, and less aggressive boot setups. The resulting, squarer stance should also be stronger and more supple when carving through irregular terrain. Expect to see a lot more angulation, however, in those situations where the skier has to pivot through most of the turn and make the skis grab and hold below the gate.

The downside of the maximum waist width rule will be the increased potential for booting out. This will be of particular concern in super G and downhill, where the maximum stand height is being reduced to 45mm from 50mm. This rule change, perhaps more than any other, has got coaches, competitors, and equipment suppliers wondering if FIS fully understands the safety implications of its actions.

Some coaches and racers have suggested that the new skis might favor bigger, heavier skiers. But looking back to the mid 1990s, when GS skis with sidecuts in the range of 35m were common, we can find many examples of successful GS skiers who weren’t particularly large. Aamodt, Nyberg, and Von Gruenigen are good examples.

Practical Implications for Teams and the Industry

The schedule on which the rules will take effect is thought by many to be too compressed, and will cause a problem with equipment availability. The new

specifications are to take effect at all levels of FIS sanctioned racing in the 2012/2013 season, just one year after their introduction on the World and Europa Cup. This could cause a scarcity of downhill and super G skis for several years at the Continental Cup levels and below. Skis for the speed disciplines generally have long lifetimes and filter down over a number of years through the various levels of FIS racing, providing good equipment to developing athletes at little or no cost. FIS' schedule will disrupt this supply chain, and impose a significant financial burden on many racers. Requiring the manufacturers to shift gears so quickly also puts them in a difficult position, and many retail outlets are sure to find themselves with an inventory of non-regulation skis they can't sell.

As stated earlier, FIS' declared motivation for the new ski rules is to increase racer safety. On the one hand, they will have succeeded in reducing the turning forces on the skier as well as the tendency of the skis to grab the snow abruptly and refuse to let go. Narrowing the skis will also reduce the torques on athletes' knees. But these gains will have been achieved at the cost of a rise in absolute speed and an increased likelihood of boot-out, perhaps the most clear and present risk factor of all. The one thing we can say for sure is that things would be much worse if FIS had stuck to its guns with the 40m and 35m GS sidecuts.

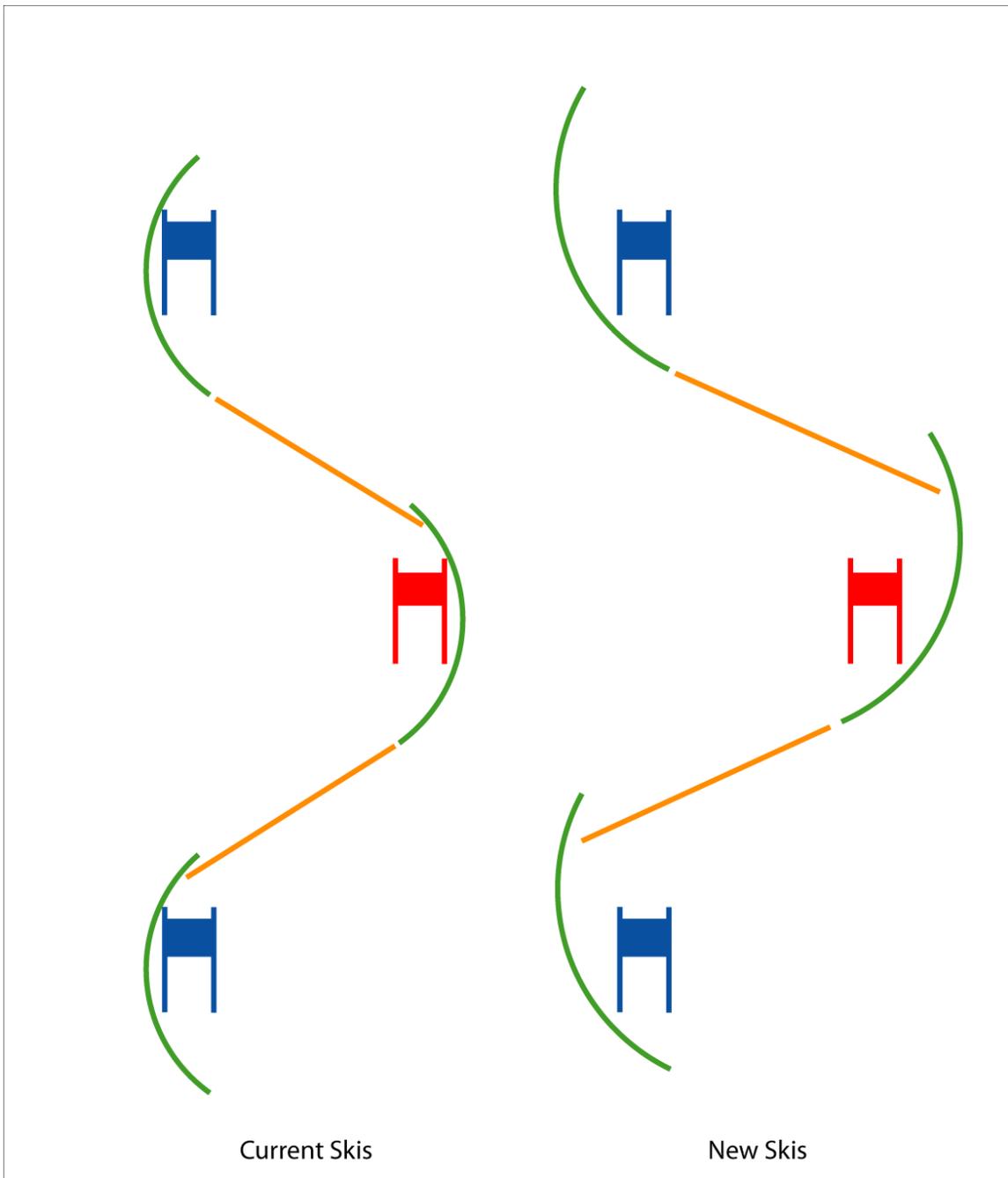
Americans have an expression about such things. We say, "Choose your poison." It appears that FIS may not have made the choices that the athletes and coaches would have made for themselves.



Ted Ligety, the current World Cup giant slalom title holder, carves tight arcs with extreme inclination and early carving. The results are high turning forces, up to several Gs.



Hermann Maier, in Dec.1997, in the first World Cup GS race he won and the first year he won the World Cup GS title. In turns similar to the ones in the Ligety image, Maier doesn't achieve anywhere near the same inclination or magnitude of turning force that Ted does.



Skis made to the new regulations will have a larger carving radius than current skis. They will require more pivoting at the start of the turn than current skis on similarly set courses.



To enable athletes to carve turns like this on the new skis, course setters will have to set courses straighter, resulting in higher speeds.