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Schulich School of Engineering GPS innovation helps Canadian Alpine Ski Teams train for Olympic gold

Canada's top alpine skiers are in Lake Louise, Alberta, preparing for intense competition in this weekend's World Cup. A little-known gadget developed at the University of Calgary's Schulich School of Engineering has helped the country's best ski racers train for such events, including the 2010 Olympic Winter Games.

It's an invention that could drastically change the way many athletes train but until now, the developers couldn't talk about it because the project was top-secret. The result is a world first: the Sensor for the Training of Elite Athletes (STEALTH). It is a GPS-based system that helps alpine skiers perfect their technique and route, or line selection, down a course. It helps them get down a slope in the fastest and most efficient manner.

STEALTH is a partnership between the Schulich School of Engineering, Alpine Canada Alpin and Own the Podium, a winter sport technical program designed to help Canada become the number one nation in total medal count at the 2010 Winter Olympics. STEALTH has been in the works for years and the men's Canadian Alpine Ski Team has been training with it since 2007.

Specifications for the project required a minimum accuracy of 10 cm to detect differences in line selection for the downhill, super-giant slalom, and slalom disciplines. STEALTH performs even better.

"STEALTH performs with an accuracy of five centimetres and up to a timing accuracy of .1 millisecond. We're the first in the world to do this with such a high level of accuracy and with a unit that weighs less than 300 grams," says Gérard Lachapelle, Canada Research Chair/iCORE Chair in Wireless Location. Lachapelle heads up the Position, Location and Navigation (PLAN) Group at the Schulich School of Engineering. Lachapelle, along with graduate students Richard Ong and Aiden Morrison, designed STEALTH.

The system includes a small sensor worn on a skier's belt. It tracks the speed and position of a skier down the mountain. When the run is played back later on a monitor using STEALTH's Alpine GNSS Graphics software, coaches and skiers can easily see where improvement is needed.

"The perfect line allows a skier to come out of a turn in perfect position to make the next turn. This is critical when traveling at these speeds. For this technology to be accepted and used by the team, its size and weight had to have minimal effect on the skiers," explains Gerald Cole, an expert in biomechanics at the U of C's Faculty of Kinesiology. Cole was a consultant on the project, acting as a liaison between researchers and the skiers, advising on the specifications and needs of the ski team.

"When I started working with the ski team, people were searching around the world for the 'GPS solution'. I think the most important thing I did on this project was to show everyone that we had the experts in our own back yard."

Size, weight and accuracy are critical because alpine skiing is a highly technical sport in which athletes reach speeds of up to 150 kilometres per hour. A hundredth of a second or a centimetre or two can make all the difference in competition.

STEALTH was developed under an Own the Podium research and innovation program, Top Secret.

"Top Secret is a world-unique program designed to give Canadian athletes the edge in performance, which can ultimately make the difference between finishing on or off the podium," said Roger Jackson, chief executive officer, Own the Podium. "Own the Podium has worked closely with all winter sports to ensure they have access to the resources they need to win. The STEALTH GPS-based system is another critical resource that will help Canada's alpine skiers gain a competitive advantage against the world's best athletes."

Own the Podium provided key hardware for the STEALTH project as did NovAtel, a key sponsor of Alpine Canada. Schulich School of Engineering funding was provided by Alberta's iCORE (Informatics Circle of Research Excellence).

"The Schulich School of Engineering has shared Alpine Canada Alpin's vision that putting our athletes on the podium requires a commitment to ensuring everything that could be done was done, that no stone was left unturned in our pursuit of medal performances. The dedication of the Schulich School of Engineering to the STEALTH GPS project, along with the continued commitment of partners such as Own The Podium, has taken us an important step closer to our goals," says ACA President Gary Allan.

Own the Podium began in 2005 and is a partnership of Canada's 13 winter national sport organizations, the Canadian Olympic Committee, the Canadian Paralympic Committee, Sport Canada and the Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games (VANOC).

Alpine Canada Alpin (ACA) is the governing body for alpine ski racing in Canada with more than 50,000 athletes, coaches, officials and volunteer members and over 200,000 supporting members. ACA manages the high performance programs for the athletes of the Canadian Alpine Ski Team and the Canadian Para-Alpine Ski Team who represent Canada throughout the world.

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