**GPS Readings on Certified Marathon and Half Marathon Courses**

Thank you for your comment and question about the length of the Big Sur International Marathon. Because more runners are running with GPS-enabled watches, we have developed this standard response.

The course you ran was certified as accurately measured by USA Track and Field, the governing body for road running in this country. All road race courses are measured by a standard bicycle fitted with a calibrated mechanical counter on the front wheel. Courses are not measured by GPS, tape measure, surveying equipment, car, or by walking the route with a measuring wheel.

GPS readings on certified course are almost always longer than the actual measured distance. There are several reasons for these differences:

1. Courses are measured by the shortest-possible route. This means that the measuring bicycle is ridden within a foot of the curb/pavement edge and turns are “straightened out” as much as possible. This method is used to ensure that no runner can possibly run shorter than the stated distance unless they cut the course. For most runners not at the very front or very back of the race, however, this shortest route is not always available. This is because of the thousands of other runners on the course, running to one side to access a water stop or a restroom, the desire to run alongside friends, yielding the fastest line to passing runners, etc. This is true with any road race but you would be surprised how much these small changes in position can add up over the course of the race.
2. All certified courses include a 1/10th of 1 percent (one-thousandth percent) "short course prevention factor." This is a small extra cushion to make sure no one runs less than the stated distance. For example, a little over five feet is added to each mile of the course. For a full marathon, that means more than 138 feet. This extra distance is spread out throughout the course, not simply added to the start or finish, and is present in ALL certified courses.
3. And, lastly, GPS devices, while amazingly-accurate, are still not 100% perfect. After all, they are receiving signals from at least four different satellites more than 12,500 miles above the earth! We have found most GPS devices measure 1-to-2% long. GPS accuracy is affected by elevation, the number of turns, tree coverage, tall buildings, bridges and overpasses, and the quality and quantity of satellite reception.

How much difference can 1% make? In a full marathon, 1% is more than 1,480 feet or more than a quarter mile. So even if your GPS is 99% accurate in a marathon, it will still show a reading at least 0.25 miles too long. And because almost all race courses feature some combination of tall buildings, trees, bridges, overpasses, and numerous turns, readings of 26.50 miles *or much more* for a certified 26.21876-mile marathon are not at all unusual. This doesn’t mean you ran that far: it means this is the distance your GPS recorded.

I realize this may be a long answer to a simple question, but we take course distance very seriously. All of our races are certified by experienced measurers, many with decades of experience. For example, I am an internationally-accredited measurer with over 16 years of measuring experience. I have measured the Big Sur race as well as courses in San Diego, San Antonio, Las Vegas, Seattle, New Orleans, and throughout Northern and Southern California. When I measure, I have a Garmin Edge 705 GPS mounted on my handlebars to compliment the calibrated counter on my front wheel. My Garmin reading is *always* longer than the distance measured with my mechanical counter. For example, I recently measured a half marathon from start to finish with a police escort to allow me to safely measure the shortest route. When my mechanical counter indicated I had completed 13.10938 miles, the distance of a half marathon, my GPS read 13.35 miles.

The GPS is a useful and informative training device. I use one every time I run or cycle. I have come to understand and accept that the information it provides me about distance, pace-per-mile, average pace, elevation, etc., is close, but not 100%. I do trust the stopwatch function, of course, but I know the distance feature will always give me a reading that is “too long” when I race on a certified course. Consequently, if I use the "pace per mile" or "average pace" functions, they are going to register times that are a bit too fast. If my Garmin tells me I am running a 10 minute-per-mile pace, I may actually be running 10:05-10:08 minutes per mile.

If you want to learn more about how courses are measured, visit the “Course Certification” area in the “Products and Services” section of the USA Track and Field website (<http://www.usatf.org/events/courses/certification/>). You can also print out the course certification map on the same site for the event you just completed (or almost any other certified course in the country). If you compare this map to the course downloaded from your personal GPS, it should confirm you ran the correct course.

Note that if you used a smart-phone based measuring system (e.g., Mapmyrun on your iPhone), the measured distance is usually even less accurate than a GPS-only device. A website search comparing various measuring devices found a very comprehensive:

<http://www.dcrainmaker.com/2011/06/2011-sport-device-gps-accuracy-in-depth.html>

If you have any additional course measurement questions, please contact me directly at doug@bsim.org or by phone at (831) 625-6226.

Thanks for your participation and best wishes for your training and racing.

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