# Measurement News

May 1997 Issue #83

The Tomball Country Classic 12k, in Houston, Texas, was selected as the USATF National Masters' Championship for 1997. It borders a small creek. As a result of an upstream dam release the night before the race, approximately 40 meters of the course was covered with a foot of water. Here **Russell Pizzuto** measures for race-day relocation of the course to a dry route. The relocation was successful, records were set, and the course validated OK. Photo and information from Tom McBrayer.

# MEASUREMENT NEWS
# #83 - May 1997

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## 1996 MEASUREMENT ACTIVITY

This summary is based on the course list as it existed on March 1, 1997. It was assumed that all of the 1996 courses had been received, and indeed few have been received since then. Here is how we did last year:

Most active certifier: Tom McBrayer - 131 courses certified (111 in 1995)

Most active measurer: Chuck Hinde - 49 courses measured (38 in 1995)

Most active state: Texas, with 124 courses certified (104 in 1995)

Measurers active in 1994: 308 (271 in 1995)

State with most active measurers: Texas, with 21 (18 in 1995)

Courses certified in 1995: 1094 (1134 last year)

25 people measured 10 or more courses last year, accounting for 44 percent of the courses certified.

## HIGH STANDARDS

We certifiers are, in a sense, a loose confederation of individuals, operating with a degree of autonomy in our individual areas. However, some universal standards are needed to assure that the whole certification system serves the needs of measurers, runners, and the road running records structure, as represented by Road Running Information Center. In some areas things have been happening that throw sand into the gears, to wit:

1) Course numbers have been issued before the certificate is issued. This causes problems and must stop. See article next page.

2) Some certificates are illegible or appear to have been scrawled in haste. Please try harder if this applies to you. If your handwriting is poor, print. If your printing is sloppy, please work on it, slow down, and give the measurer a certificate they are proud to show.

3) Certificates come in late, months and sometimes years late. Issue all certificates promptly, within a week or two of the time you have the final information from the measurer. Be sure to send them to your Vice Chairman at the same time you send them to the measurer.

# TIGHTENING UP THE SYSTEM

Suppose a measurer calls a certifier and says "I am about to put out my race applications and I desperately need a course number. If you will assign a number to my course I promise I will have the measurement data and map to you within a week."

Should the certifier give him the number?

Suppose it goes like this: "You are a USATF certifier. I will pay you to measure my course and do the necessary paperwork to get it certified. Will you assign me a number now? Please, I really need it."

Should the certifier give him the number?

I see **NO** difference between the two cases above. Some certifiers have been giving breaks to themselves that they will not give to a measurer. This has resulted in angry calls from measurers and race directors wondering why their courses are not listed when they have what they thought was a perfectly good number, assigned to them by their certifier.

**THIS WILL STOP. Effective June 30, if we hear of a course number being assigned without paperwork on record, the certifier who assigned the number may be replaced, and final signature authority may be suspended.** This gives those certifiers who may have developed a backlog to get their affairs in order. This applies to all final signatories, whether they are presently active certifiers or not.

We all want to help the people who put on races. Sometimes our hearts exceed our capabilities. It is better to say "no" than to confuse the system when you cannot deliver your promise. If the supplicant is in a hurry, you must assess whether you can do what any other measurer could do - deliver the measurement data and map in time to get things in the mail by race day.

When course numbers are assigned ahead of time, it can cause letter-writing, phone calls, apologies and general harassment to everybody except the certifier who issued the number. The course list becomes non-informative to those who wish up-to-date information.

Being a certifier confers responsibility. We expect certifiers to conscientiously exercise this responsibility.

The above policy was sent in advance to those certifiers with email, and is open for comment. If any certifiers have a problem with this, I want to hear about it now. If no good reason for canceling it is found, it stands.

Pete

**Mike Wickiser** adds: The same thing happens when certificates are not promptly processed. This has been a problem for some areas for some time. If a course certificate can be produced, it can be forwarded to the appropriate V-C. Don't let them gather dust!

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March 30, 1997

Eastern Regional Certifiers:

It has been a few months since I have been receiving certificates and forwarding them to Joan Riegel for inclusion on the "official course" list. Many of you have expressed congratulations and I want to say Thanks for the well wishes and congratulations.

In this short time some items have come up in the form of questions and concerns from you and there are a few things I want to pass along. After a lengthy review and lots of work with a measurer, Ray Nelson has asked the question " When do you accept a map that is not quite up to standards?". In this case the map was of a 30k course, computer drawn, and only about 4"x5". The rest of the "map" was taken up in detail explanations of restrictions and intermediate splits. Ray reluctantly accepted the map and it appears to meet the minimal criteria for a course map. That criteria is just what Ray writes to the measurer " One of the things I told him was that he may understand his map and I may also understand it, but it should also be represented so that anyone could understand it (even those unfamiliar with the area)." Right on Ray !, a point I have been meaning to elaborate on. Course maps **must** show the course in such a way so that anyone could find the course and locate the exact runners path. You only need to be out of town on a validation alone to really take this to heart. Believe me "Lone Ranger" validations do happen. Consider also as each of you create the certificates that many of these will be going through FAX machines. Light map lines details and runners paths may need to be touched up or enhanced. Pencil maps are the worst but handwritten stuff loses clarity fast.

How much and when to "cut some slack" is another tough call. First time and novice measurers certainly get a bit of leniency to keep from discouraging them from measuring. More experienced measurers may occasionally need consideration if they have gotten into a really stinker of a course. Here is where you, as volunteers and experts, can really help to improve the sport. Work with the measurer to get the best map you can. Go for the route, restrictions, start, finish and turnarounds first, with that, most any course can be recreated. I cannot begin to tell you when any given measurer will give up. If you educate as you critique any measurer's work the results are almost always good enough to satisfy USATF standards the first time around.

Since I am on the subject of standards, there exists a wide variation of certificate appearance quality. Several of you hand write your certs.. Some are typed and others are generated on a computer. John DeHaye went to the trouble of putting a Measurement Certificate into a Word Perfect file. I got a copy from Pete Riegel. My thanks to you John. This is the same one that was in MN #81. Anyone wishing one can get it from Pete or myself for no charge.

( I volunteered you Pete.) Just let us know what version of WP you are using. Those of you without computers, don't despair, all I ask is that the certificate be neat, clean, and free of obvious corrections. Some of the best and worst looking certs. are done by hand. Some are works of art, a few are down right hard to read. If you aren't proud of any certificate you create then please do something about it before you send it out.

I review each of your certificates for drop, sep, and completion. I often wonder why the race date is left blank time after time. I also go over each map to check for the route, start/ finish location and turns/restrictions. I really wince when I see a well done map on the back of a certificate that appears as though it was just scribbled quickly. For the greatest part, my work is to check for accuracy and keep my finger on the pulse of measuring. Some of you send a note along with certificates explaining problems you have experienced and how they were handled. Keep them coming, they are a big help. Occasionally I will shoot a question back about a measurement or even return a measurement certificate for fixing. When and if this happens remember that it is MY aim to serve the sport through the certification program. Course certification is the basis for all records from World Best performances to Uncle Joe's PR at the Podunk 5k.

Best regards,

Mike Wickiser

*THOMAS J. FERGUSON*
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Honolulu, Hawaii 96818-1816

28 March 1997

Pete,

Your message "Tightening Up the System" is one that I cannot believe is necessary. However, I must admit I am naïve in believing that there would be State Certifiers, vouched for by you who would resort to such tactics. I have long been opposed to State Certifiers doing course measurement where remuneration is involved, but I know it has gone on. I hope your message and announcement in the next issue of the Measurement News will serve notice on the few who are trying to take advantage of you, and the rest in the Certifying Community, that a certified course number is not to be treated lightly.

We have had a incident out here that relates to misuse of a Certified Course Number, ironically one that is no longer valid. Last December I received a call from a fellow on Maui who wanted to know what had to be done to get his marathon course certified for a race he was organizing to be run on March 23. I assembled a packet of materials and sent them off with some added instructions that stated positively: 1) Do not advertise this race as being certified until you submit the request for certification and get the certification number; 2) Do not advertise the race as "Certification Pending;"

3) Unless you have a course number, even after submitting a request for certification, announce to all the runners on race day that the course is Not Certfied. More importantly I went over the Maui marathon certification that has been voided, explaining why. Mainly road construction changes which were never updated, and the original measurer and people who put the marathon on (The Valley Isle Road Runners Club) had simply let the race "die." I told this fellow that the Club members who measured this ~~was~~ were still on the Island and could remeasure and get the course in for certification. This organizer, a new comer to Maui never called or wrote back. But that is not the end of the story.

On Sunday they held the race, and I spoke to a fellow who ran in it and asked about the course. From his description it followed much of the original route, with some changes due road realignments. Then in response to my question, "was the race advertised as being run on a certified course?" The answer was yes, TAC certified! When I told him my concern that anyone running a qualifying time for Boston, for example, would probably find his request turned down.

One reason why this fellow wanted the course certified was that he had made arrangements with Japan Air Lines to bring a large number of Japanese runners (and participants) in on a packaged tour deal. As it turned out, both Men and Women's winners, and most of the other top 10, were from Japan.

Last week I received a call from a fellow on the Big Island, who wants to resurrect the old Hilo marathon, and was asking would I measure it for him. When I told him no, he asked was there anyone else who measure the course. I said yes, but he was probably going to have to pay a $1000.00 or more, plus expenses. Further I could or would not recommend such person. So, he said he would have to measure himself, and asked if I could provide information as to how to do it. Again, I got a package together and sent it off (including a copy of the Road Measurement Procedures). I doubt if I will hear from this fellow, particularly as I was not too encouraging about his proposed course. This would be a point-to-point run along a very dangerous, and rather busy 2 lane highway. I went over all the details about not advertising the race as "certified" until he received the certification number, or was assured that the course had gone forward through channels to you. As with the fellow on Maui, he hopes to attract Japanese runners on a tour package deal.

Well a bit long Pete, but just wanted to let you know I strongly support your stand on giving up certification numbers in advance of the actual submission of the request, and ridding our community of those individuals who have been abusing their responsibilities in course measurement.

Alohas,

Tom

Tom

# 1996 CERTIFICATION STATISTICS

**Courses Certified in State in 1996**

| State | Courses |
|---|---|
| TX | 124 |
| IL | 79 |
| CA | 75 |
| NY | 70 |
| OH | 55 |
| FL | 54 |
| PA | 44 |
| NC | 42 |
| SC | 42 |
| KS | 40 |
| NJ | 36 |
| MI | 34 |
| OK | 34 |
| GA | 31 |
| NH | 28 |
| AL | 24 |
| VA | 23 |
| MA | 19 |
| MD | 19 |
| MN | 19 |
| WA | 19 |
| CT | 18 |
| DC | 17 |
| WI | 15 |
| TN | 14 |
| IA | 13 |
| OR | 13 |
| IN | 12 |
| DE | 11 |
| CO | 9 |
| LA | 9 |
| MO | 9 |
| ME | 7 |
| MS | 6 |
| NE | 5 |
| RI | 5 |
| KY | 4 |
| VT | 4 |
| AR | 3 |
| NV | 3 |
| WV | 2 |
| AK | 1 |
| AZ | 1 |
| NM | 1 |
| SD | 1 |
| Total | 1094 |

**Active Measurers in State in 1996**

| State | Measurers |
|---|---|
| TX | 21 |
| NY | 20 |
| OH | 20 |
| CA | 17 |
| FL | 15 |
| GA | 13 |
| PA | 11 |
| AL | 10 |
| NH | 10 |
| IL | 9 |
| KS | 9 |
| MD | 9 |
| NC | 9 |
| CO | 8 |
| CT | 8 |
| MA | 8 |
| SC | 8 |
| IN | 7 |
| MN | 7 |
| TN | 7 |
| VA | 7 |
| LA | 6 |
| OK | 6 |
| DC | 5 |
| IA | 5 |
| ME | 5 |
| OR | 5 |
| WA | 5 |
| WI | 5 |
| MI | 4 |
| NJ | 4 |
| AR | 3 |
| KY | 3 |
| MO | 3 |
| NV | 3 |
| VT | 3 |
| MS | 2 |
| AK | 1 |
| AZ | 1 |
| DE | 1 |
| NE | 1 |
| NM | 1 |
| RI | 1 |
| SD | 1 |
| WV | 1 |
| Total | 308 |

**Courses Certified by Certifiers in 1996**

| Certifier | Courses |
|---|---|
| ETM | 131 |
| JW | 79 |
| WN | 67 |
| PR | 62 |
| DL | 53 |
| BG | 49 |
| RS | 43 |
| PH | 42 |
| BS | 41 |
| WB | 39 |
| RT | 38 |
| BB | 35 |
| AM | 35 |
| SH | 34 |
| DB | 26 |
| WC | 25 |
| RH | 25 |
| JS | 22 |
| DK | 21 |
| RN | 21 |
| JD | 20 |
| MW | 19 |
| RR | 19 |
| MR | 19 |
| DR | 17 |
| GAN | 16 |
| WG | 15 |
| LB | 13 |
| CW | 12 |
| TK | 11 |
| MF | 10 |
| DP | 9 |
| KU | 7 |
| RL | 7 |
| DLP | 3 |
| BC | 3 |
| DS | 3 |
| EM | 2 |
| FW | 1 |
| Total | 1094 |

**Measurers with 10 or more**

| Measurer | Courses |
|---|---|
| Hinde | 49 |
| White | 40 |
| Nicoll | 36 |
| Beach | 35 |
| Brannen | 26 |
| Lafarlette | 23 |
| Scardera | 23 |
| Witkowski | 22 |
| Katz | 21 |
| Hubbard | 20 |
| Thurston | 20 |
| Courtney | 17 |
| McBrayer | 14 |
| Hronjak | 14 |
| Wight | 14 |
| Lindgren | 13 |
| Dewey | 12 |
| Newman | 11 |
| Berglund | 11 |
| Wickiser | 11 |
| Recker | 11 |
| Prytherch | 10 |
| Vanderbrink | 10 |
| Nelson | 10 |
| Sissala | 10 |
| Total | 483 |

## NUMBER OF CERTIFIED COURSES BY CERTIFIER AND YEAR

This listing includes only those certifiers active in 1996

| | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **AM** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | 31 | 50 | 35 | 45 | 41 | 40 | 35 | 305 |
| **BB** | 0 | 35 | 72 | 81 | 73 | 66 | 60 | 55 | 52 | 74 | 79 | 49 | 56 | 60 | 35 | 847 |
| **BC** | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 2 | 2 | 4 | 1 | 3 | 3 | 20 |
| **BG** | 0 | 0 | 0 | 14 | 37 | 22 | 31 | 31 | 28 | 36 | 38 | 37 | 50 | 48 | 49 | 421 |
| **BS** | 0 | 0 | 0 | 0 | 19 | 43 | 34 | 31 | 51 | 27 | 43 | 27 | 36 | 32 | 41 | 384 |
| **CW** | 1 | 21 | 41 | 38 | 62 | 24 | 51 | 53 | 29 | 36 | 24 | 28 | 34 | 36 | 12 | 490 |
| **DB** | 0 | 0 | 0 | 0 | 6 | 50 | 71 | 38 | 39 | 45 | 43 | 41 | 39 | 31 | 26 | 429 |
| **DK** | 0 | 1 | 10 | 7 | 2 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 21 | 0 | 21 | 67 |
| **DL** | 0 | 0 | 0 | 0 | 0 | 23 | 18 | 16 | 41 | 77 | 68 | 51 | 53 | 66 | 53 | 466 |
| **DLP** | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 8 | 12 | 4 | 5 | 9 | 10 | 5 | 3 | 60 |
| **DP** | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 23 | 27 | 35 | 36 | 29 | 29 | 14 | 9 | 212 |
| **DR** | 0 | 1 | 10 | 15 | 19 | 19 | 19 | 29 | 17 | 19 | 19 | 21 | 20 | 18 | 17 | 243 |
| **DS** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 3 | 6 |
| **EM** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| **ETM** | 0 | 0 | 0 | 10 | 26 | 36 | 64 | 71 | 87 | 71 | 87 | 103 | 101 | 112 | 131 | 899 |
| **FW** | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 5 | 6 | 10 | 10 | 1 | 7 | 2 | 1 | 48 |
| **GAN** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 31 | 24 | 25 | 16 | 111 |
| **JD** | 0 | 0 | 0 | 0 | 6 | 11 | 6 | 24 | 25 | 28 | 21 | 16 | 13 | 17 | 20 | 187 |
| **JS** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 14 | 6 | 19 | 15 | 19 | 34 | 22 | 134 |
| **JW** | 0 | 0 | 0 | 0 | 0 | 0 | 41 | 50 | 67 | 65 | 72 | 69 | 70 | 82 | 79 | 595 |
| **KU** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 15 | 11 | 14 | 7 | 4 | 7 | 64 |
| **LB** | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 13 | 15 | 12 | 9 | 11 | 8 | 14 | 13 | 98 |
| **MF** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 7 | 10 | 7 | 8 | 6 | 8 | 10 | 67 |
| **MR** | 0 | 0 | 0 | 0 | 1 | 19 | 20 | 25 | 18 | 16 | 17 | 18 | 15 | 16 | 19 | 184 |
| **MW** | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 21 | 23 | 15 | 7 | 18 | 16 | 25 | 19 | 154 |
| **PH** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 42 |
| **PR** | 1 | 66 | 110 | 154 | 143 | 97 | 85 | 58 | 66 | 62 | 112 | 75 | 51 | 52 | 62 | 1194 |
| **RH** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 14 | 10 | 33 | 22 | 26 | 25 | 134 |
| **RL** | 4 | 48 | 37 | 61 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 163 |
| **RN** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 36 | 18 | 22 | 21 | 102 |
| **RR** | 0 | 2 | 9 | 27 | 46 | 34 | 12 | 18 | 25 | 16 | 14 | 7 | 14 | 18 | 19 | 261 |
| **RS** | 0 | 2 | 24 | 48 | 51 | 55 | 76 | 68 | 52 | 83 | 61 | 43 | 38 | 60 | 43 | 704 |
| **RT** | 0 | 9 | 41 | 66 | 55 | 61 | 51 | 23 | 22 | 31 | 22 | 30 | 23 | 42 | 38 | 514 |
| **SH** | 0 | 0 | 0 | 0 | 22 | 36 | 31 | 18 | 36 | 17 | 25 | 39 | 32 | 58 | 34 | 348 |
| **TK** | 0 | 11 | 33 | 32 | 43 | 37 | 29 | 8 | 7 | 19 | 11 | 13 | 9 | 15 | 11 | 278 |
| **WB** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 39 | 51 |
| **WC** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 27 | 21 | 15 | 25 | 92 |
| **WG** | 0 | 0 | 0 | 0 | 42 | 70 | 20 | 4 | 15 | 12 | 5 | 6 | 16 | 10 | 15 | 215 |
| **WN** | 0 | 4 | 32 | 123 | 124 | 112 | 106 | 117 | 138 | 148 | 139 | 93 | 81 | 75 | 67 | 1359 |

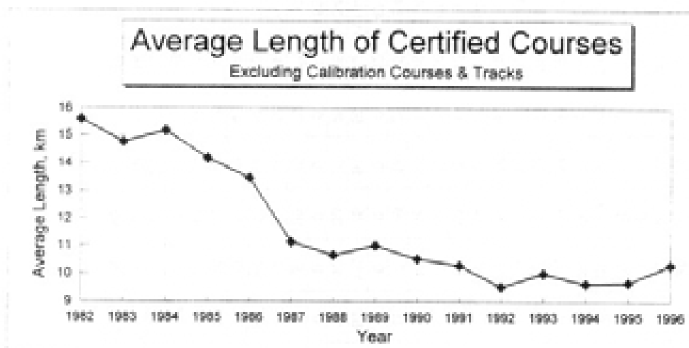
## NUMBER OF CERTIFIED COURSES BY STATE AND YEAR

| State | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AK | 1 | 0 | 0 | 0 | 1 | 4 | 4 | 5 | 6 | 10 | 10 | 1 | 7 | 2 | 1 | 52 |
| AL | 2 | 14 | 8 | 15 | 12 | 11 | 5 | 24 | 27 | 39 | 25 | 28 | 17 | 20 | 24 | 271 |
| AR | 0 | 4 | 5 | 9 | 4 | 4 | 8 | 8 | 13 | 4 | 5 | 9 | 10 | 5 | 3 | 91 |
| AZ | 0 | 13 | 14 | 23 | 20 | 20 | 7 | 10 | 10 | 16 | 9 | 5 | 3 | 2 | 1 | 153 |
| CA | 4 | 67 | 103 | 146 | 130 | 93 | 133 | 129 | 88 | 139 | 103 | 87 | 81 | 112 | 75 | 1490 |
| CO | 0 | 29 | 17 | 15 | 30 | 14 | 20 | 23 | 26 | 35 | 36 | 29 | 29 | 14 | 9 | 326 |
| CT | 0 | 1 | 10 | 17 | 22 | 19 | 21 | 31 | 20 | 20 | 19 | 21 | 22 | 20 | 18 | 261 |
| DC | 0 | 3 | 23 | 25 | 17 | 9 | 11 | 4 | 9 | 7 | 6 | 16 | 11 | 19 | 17 | 177 |
| DE | 0 | 0 | 12 | 25 | 18 | 18 | 13 | 13 | 23 | 23 | 18 | 10 | 11 | 4 | 11 | 199 |
| FL | 0 | 17 | 21 | 60 | 52 | 71 | 70 | 63 | 72 | 84 | 74 | 56 | 59 | 74 | 54 | 827 |
| GA | 0 | 7 | 20 | 50 | 41 | 28 | 32 | 29 | 30 | 35 | 37 | 30 | 24 | 15 | 31 | 409 |
| HI | 0 | 7 | 6 | 9 | 9 | 9 | 6 | 1 | 3 | 0 | 5 | 0 | 3 | 3 | 0 | 61 |
| IA | 1 | 7 | 5 | 12 | 4 | 16 | 5 | 21 | 11 | 14 | 8 | 11 | 10 | 11 | 13 | 149 |
| ID | 0 | 1 | 1 | 4 | 0 | 1 | 0 | 1 | 1 | 2 | 0 | 0 | 1 | 2 | 0 | 14 |
| IL | 0 | 6 | 17 | 11 | 48 | 52 | 45 | 50 | 68 | 70 | 75 | 72 | 69 | 82 | 79 | 744 |
| IN | 0 | 11 | 23 | 36 | 21 | 17 | 8 | 8 | 15 | 10 | 4 | 16 | 16 | 16 | 12 | 213 |
| KS | 0 | 7 | 6 | 12 | 31 | 14 | 21 | 20 | 24 | 23 | 29 | 30 | 33 | 23 | 40 | 313 |
| KY | 0 | 1 | 9 | 19 | 13 | 7 | 16 | 6 | 15 | 7 | 12 | 7 | 1 | 4 | 4 | 121 |
| LA | 0 | 2 | 2 | 11 | 2 | 0 | 1 | 5 | 5 | 2 | 6 | 6 | 4 | 8 | 9 | 63 |
| MA | 2 | 4 | 4 | 17 | 29 | 22 | 17 | 34 | 36 | 36 | 26 | 37 | 17 | 21 | 19 | 321 |
| MD | 0 | 4 | 8 | 16 | 17 | 28 | 14 | 7 | 17 | 5 | 17 | 14 | 19 | 21 | 19 | 206 |
| ME | 0 | 4 | 3 | 26 | 15 | 6 | 9 | 12 | 11 | 17 | 26 | 17 | 16 | 11 | 7 | 180 |
| MI | 0 | 21 | 27 | 37 | 22 | 36 | 31 | 18 | 36 | 17 | 25 | 40 | 37 | 58 | 34 | 439 |
| MN | 0 | 5 | 11 | 27 | 46 | 32 | 12 | 18 | 25 | 15 | 14 | 7 | 14 | 17 | 19 | 262 |
| MO | 0 | 13 | 14 | 10 | 6 | 8 | 10 | 11 | 4 | 14 | 9 | 7 | 17 | 25 | 9 | 157 |
| MS | 0 | 1 | 3 | 18 | 6 | 0 | 2 | 7 | 2 | 1 | 3 | 5 | 1 | 0 | 6 | 55 |
| MT | 0 | 1 | 8 | 5 | 8 | 1 | 4 | 1 | 1 | 3 | 7 | 10 | 0 | 3 | 0 | 52 |
| NC | 1 | 16 | 41 | 88 | 70 | 72 | 55 | 52 | 61 | 57 | 58 | 34 | 25 | 27 | 42 | 699 |
| ND | 0 | 1 | 3 | 0 | 2 | 1 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 10 |
| NE | 0 | 4 | 22 | 20 | 25 | 17 | 3 | 5 | 0 | 6 | 7 | 7 | 1 | 1 | 5 | 123 |
| NH | 0 | 11 | 11 | 21 | 17 | 16 | 9 | 11 | 12 | 12 | 21 | 34 | 13 | 26 | 28 | 242 |
| NJ | 2 | 15 | 13 | 20 | 38 | 46 | 51 | 33 | 35 | 39 | 50 | 62 | 56 | 48 | 36 | 544 |
| NM | 0 | 1 | 0 | 3 | 3 | 5 | 3 | 11 | 11 | 15 | 4 | 4 | 4 | 1 | 1 | 66 |
| NV | 0 | 0 | 6 | 4 | 5 | 0 | 4 | 1 | 4 | 2 | 2 | 4 | 1 | 3 | 3 | 39 |
| NY | 3 | 28 | 60 | 57 | 45 | 44 | 41 | 45 | 41 | 65 | 43 | 62 | 76 | 52 | 70 | 732 |
| OH | 1 | 43 | 51 | 46 | 52 | 56 | 64 | 64 | 62 | 60 | 91 | 69 | 52 | 53 | 55 | 819 |
| OK | 0 | 34 | 69 | 72 | 65 | 51 | 54 | 50 | 51 | 74 | 78 | 47 | 56 | 60 | 34 | 795 |
| OR | 0 | 23 | 32 | 32 | 14 | 11 | 11 | 9 | 12 | 13 | 8 | 11 | 8 | 12 | 13 | 209 |
| PA | 1 | 23 | 24 | 28 | 29 | 38 | 57 | 50 | 48 | 34 | 26 | 50 | 26 | 32 | 44 | 510 |
| RI | 0 | 2 | 1 | 4 | 5 | 1 | 2 | 9 | 1 | 5 | 4 | 10 | 6 | 5 | 5 | 60 |
| SC | 0 | 0 | 15 | 32 | 41 | 52 | 37 | 35 | 51 | 25 | 36 | 22 | 29 | 29 | 42 | 446 |
| SD | 0 | 1 | 6 | 6 | 2 | 0 | 0 | 4 | 1 | 1 | 1 | 2 | 0 | 0 | 1 | 25 |
| TN | 0 | 3 | 10 | 13 | 10 | 16 | 19 | 9 | 14 | 26 | 23 | 18 | 15 | 21 | 14 | 211 |
| TX | 0 | 10 | 22 | 37 | 97 | 105 | 93 | 71 | 83 | 70 | 85 | 101 | 98 | 105 | 124 | 1101 |
| UT | 0 | 0 | 3 | 6 | 6 | 14 | 11 | 6 | 15 | 4 | 10 | 10 | 6 | 7 | 0 | 98 |
| VA | 1 | 12 | 17 | 21 | 23 | 26 | 24 | 19 | 14 | 26 | 15 | 17 | 12 | 31 | 23 | 281 |
| VT | 0 | 0 | 1 | 5 | 3 | 5 | 1 | 4 | 3 | 7 | 8 | 4 | 5 | 1 | 4 | 51 |
| WA | 1 | 25 | 37 | 53 | 34 | 18 | 20 | 28 | 20 | 14 | 18 | 18 | 15 | 17 | 19 | 337 |
| WI | 0 | 7 | 0 | 13 | 22 | 20 | 17 | 4 | 15 | 12 | 5 | 6 | 16 | 11 | 15 | 163 |
| WV | 0 | 8 | 4 | 7 | 2 | 4 | 3 | 3 | 0 | 4 | 3 | 1 | 1 | 4 | 2 | 46 |
| WY | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| TOTA | 20 | 517 | 829 | 1243 | 1234 | 1158 | 1106 | 1082 | 1153 | 1221 | 1204 | 1164 | 1053 | 1138 | 1094 | 15216 |

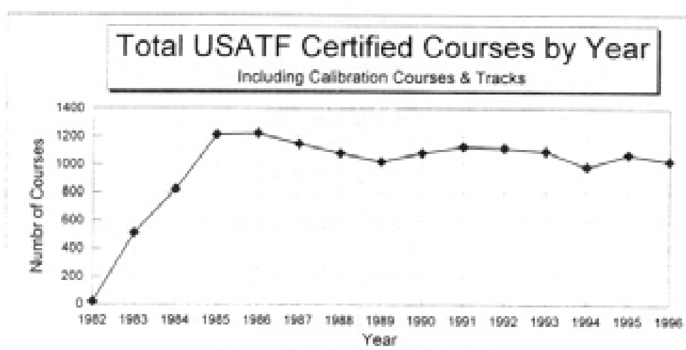
## LENGTHS OF CERTIFIED COURSES

| | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 km | 1 | 59 | 89 | 187 | 275 | 327 | 350 | 344 | 436 | 480 | 475 | 516 | 489 | 513 | 511 | 5052 |
| 10 km | 8 | 199 | 308 | 401 | 372 | 338 | 317 | 304 | 247 | 259 | 241 | 223 | 176 | 188 | 183 | 3764 |
| 8 km | 1 | 43 | 99 | 136 | 102 | 89 | 76 | 73 | 77 | 68 | 65 | 51 | 62 | 71 | 53 | 1066 |
| 5 miles | 2 | 32 | 49 | 90 | 68 | 92 | 70 | 66 | 58 | 64 | 62 | 40 | 34 | 45 | 33 | 805 |
| Marathon | 1 | 49 | 61 | 83 | 59 | 55 | 58 | 54 | 50 | 48 | 50 | 46 | 37 | 59 | 52 | 762 |
| Calibration | 0 | 0 | 3 | 21 | 9 | 9 | 21 | 54 | 62 | 84 | 81 | 65 | 67 | 62 | 63 | 601 |
| Half Marathon | 0 | 20 | 34 | 61 | 54 | 46 | 37 | 28 | 43 | 33 | 38 | 41 | 40 | 40 | 38 | 553 |
| 15 km | 1 | 28 | 29 | 41 | 45 | 23 | 20 | 18 | 24 | 13 | 17 | 16 | 18 | 18 | 11 | 322 |
| 1 mile | 0 | 9 | 8 | 23 | 18 | 38 | 17 | 13 | 23 | 21 | 34 | 24 | 24 | 27 | 20 | 299 |
| 10 miles | 0 | 13 | 18 | 24 | 35 | 16 | 21 | 17 | 23 | 16 | 16 | 15 | 16 | 20 | 17 | 267 |
| 4 miles | 1 | 4 | 13 | 10 | 18 | 13 | 14 | 17 | 12 | 19 | 18 | 23 | 11 | 25 | 25 | 223 |
| 2 miles | 0 | 4 | 7 | 25 | 14 | 20 | 19 | 11 | 15 | 13 | 24 | 16 | 10 | 9 | 13 | 200 |
| 20 km | 0 | 7 | 20 | 22 | 24 | 16 | 5 | 8 | 8 | 11 | 11 | 10 | 9 | 6 | 9 | 166 |
| 12 km | 0 | 3 | 10 | 8 | 16 | 10 | 7 | 11 | 4 | 8 | 12 | 1 | 10 | 6 | 12 | 118 |
| 25 km | 0 | 6 | 9 | 13 | 14 | 6 | 6 | 5 | 4 | 8 | 2 | 3 | 2 | 4 | 2 | 84 |
| 30 km | 1 | 6 | 10 | 9 | 15 | 7 | 4 | 4 | 3 | 11 | 2 | 2 | 4 | 3 | 3 | 84 |
| 50 km | 0 | 7 | 9 | 9 | 13 | 5 | 2 | 4 | 1 | 4 | 1 | 4 | 4 | 2 | 6 | 71 |
| 50 miles | 1 | 2 | 7 | 11 | 7 | 6 | 2 | 7 | 6 | 2 | 3 | 6 | 3 | 2 | 4 | 69 |
| 2.5 km | 0 | 1 | 1 | 2 | 7 | 4 | 10 | 7 | 6 | 6 | 4 | 5 | 4 | 1 | 2 | 60 |
| Track | 1 | 3 | 4 | 8 | 3 | 1 | 3 | 6 | 6 | 9 | 4 | 2 | 1 | 2 | 3 | 56 |
| 3 Miles | 0 | 5 | 4 | 4 | 2 | 2 | 2 | 6 | 5 | 4 | 5 | 2 | 2 | 3 | 4 | 50 |
| 3 km | 0 | 2 | 1 | 6 | 3 | 3 | 5 | 1 | 2 | 8 | 5 | 3 | 3 | 2 | 5 | 49 |
| 100 km | 0 | 4 | 6 | 4 | 13 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 2 | 1 | 2 | 49 |
| 2 km | 0 | 1 | 0 | 2 | 4 | 5 | 2 | 0 | 2 | 4 | 4 | 8 | 3 | 6 | 3 | 44 |
| 3.5 miles | 0 | 0 | 0 | 0 | 5 | 3 | 2 | 5 | 6 | 3 | 1 | 8 | 3 | 3 | 0 | 39 |
| 1 km | 0 | 1 | 0 | 2 | 1 | 0 | 1 | 3 | 4 | 5 | 2 | 3 | 4 | 6 | 2 | 34 |
| 8 miles | 0 | 3 | 0 | 4 | 4 | 3 | 0 | 1 | 3 | 0 | 2 | 1 | 0 | 0 | 1 | 22 |
| 20 miles | 0 | 0 | 3 | 6 | 3 | 3 | 2 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 20 |
| 100 miles | 0 | 0 | 2 | 6 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 1 | 0 | 1 | 15 |
| 1.25 km | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 1 | 2 | 3 | 0 | 0 | 2 | 13 |
| 4 km | 0 | 0 | 1 | 2 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 2 | 1 | 2 | 13 |
| 7 miles | 1 | 0 | 1 | 1 | 1 | 2 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 12 |
| 40 km | 0 | 0 | 3 | 1 | 6 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| 7 km | 0 | 0 | 2 | 1 | 0 | 1 | 2 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 10 |

| Year | Average |
|---|---|
| 1982 | 15.6 |
| 1983 | 14.8 |
| 1984 | 15.2 |
| 1985 | 14.2 |
| 1986 | 13.5 |
| 1987 | 11.1 |
| 1988 | 10.7 |
| 1989 | 11 |
| 1990 | 10.5 |
| 1991 | 10.3 |
| 1992 | 9.54 |
| 1993 | 10 |
| 1994 | 9.65 |
| 1995 | 9.69 |
| 1996 | 10.3 |




| Year | Number |
|---|---|
| 1982 | 19 |
| 1983 | 514 |
| 1984 | 822 |
| 1985 | 1214 |
| 1986 | 1222 |
| 1987 | 1148 |
| 1988 | 1082 |
| 1989 | 1022 |
| 1990 | 1085 |
| 1991 | 1128 |
| 1992 | 1119 |
| 1993 | 1097 |
| 1994 | 985 |
| 1995 | 1074 |
| 1996 | 1028 |



## JONES/OERTH COUNTERS - PRICE INCREASE EFFECTIVE JUNE 1

Subj: Counter Price Increase
Date: 97-04-01 02:20:16 EST
From: POerth
To: Riegelpete

Hi Pete,

I find it necessary to have a price increase effective June 1, 1997.

US Price: $60 for the Five Digit Model
$70 for the Six Digit Model
These prices include first class mail.

Foreign $65 for the Five Digit Model
$75 for the Six Digit Model
Postage is extra: approximately $4.00 for a single unit sent by air mail.

As to the price increase I personally make little or nothing on the counters. The profit after expenses and income tax is fairly small and what there is of it goes to my son, Karl. There is really a great deal of work to produce the counters, and my costs go up every year. The six digit Veeder Root counters cost $26.00 each. I always purchase 200 at a time to get them at this price. That comes to $5629 with tax and always feels like a punch in the side when I write the check.

Best regards,

Paul

## TYPES OF US RUNNING COURSES

The analysis below is based on all US courses (excluding tracks and calibration courses) for which drop and separation data are available. The concept of drop and separation was not incorporated into the course list until 1986.

Thus we see:

a) 90 percent of US courses are suitable for setting records with no restrictions.
b) An additional 3.5 percent are suitable if wind does not favor the runners.
c) 6.2 percent are downhill beyond the 1 m/km limit, and are not record-suitable.

| Year | Standard Courses | Flat but Separated | Downhill | Total Courses | Percent Standard Courses | Percent Flat but Separated | Percent Downhill |
|---|---|---|---|---|---|---|---|
| 1982 | 2 | | | 2 | 100.0 | 0.0 | 0.0 |
| 1983 | 27 | 1 | 1 | 29 | 93.1 | 3.4 | 3.4 |
| 1984 | 32 | 2 | 4 | 38 | 84.2 | 5.3 | 10.5 |
| 1985 | 38 | 9 | 8 | 55 | 69.1 | 16.4 | 14.5 |
| 1986 | 175 | 6 | 10 | 191 | 91.6 | 3.1 | 5.2 |
| 1987 | 992 | 47 | 99 | 1138 | 87.2 | 4.1 | 8.7 |
| 1988 | 967 | 34 | 81 | 1082 | 89.4 | 3.1 | 7.5 |
| 1989 | 920 | 35 | 59 | 1014 | 90.7 | 3.5 | 5.8 |
| 1990 | 991 | 40 | 54 | 1085 | 91.3 | 3.7 | 5.0 |
| 1991 | 1021 | 39 | 66 | 1126 | 90.7 | 3.5 | 5.9 |
| 1992 | 1002 | 35 | 81 | 1118 | 89.6 | 3.1 | 7.2 |
| 1993 | 997 | 42 | 57 | 1096 | 91.0 | 3.8 | 5.2 |
| 1994 | 911 | 30 | 41 | 982 | 92.8 | 3.1 | 4.2 |
| 1995 | 975 | 31 | 66 | 1072 | 91.0 | 2.9 | 6.2 |
| 1996 | 934 | 34 | 59 | 1027 | 90.9 | 3.3 | 5.7 |
| Overall | 9984 | 385 | 686 | 11055 | 90.3 | 3.5 | 6.2 |

# Variability within a 4-ride Calibration Set

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April 1997


#### Summary

I have studied the variations within 257 of the calibration sets which I have obtained in the last year and compared them with data from other riders. I conclude that for most riders the average of 4 calibration rides determines the calibration constant with an acceptable error (one standard deviation) of between 0.4 and 1.5 counts in 10,000. However, I have found two interesting effects. Firstly, riding into the wind causes an unexpected increase of counts, possibly due to an increase in wobbles, in which case it may not average out. This amounts to 3 counts in 10,000 for a gale. Secondly, a solid tyre often contracts when first ridden after some days storage. Once the increase was 9 counts in 10,000. Usually it is 1 to 3 counts. The contraction can easily be eliminated by riding the bike for about 2 km before starting the first calibration ride of the day. The next stage of this work will be to study the variation between pre and post calibration.


#### Introduction

This article deals with the short term changes, less than about 15 minutes, which cause a variation within a set of 4 calibration rides or within a split of 1 to 5 km in a course measurement. Such *intra*-calibration-set variations are easy to measure. Most measurers look at their count variation over the 4 rides of a set and make a judgment on the calibration quality. Many have as their target a perfect set with identical counts, but few regulary achieve this. A range of up to 3 counts in a set of 4 rides of 7,000 counts is not uncommon. By looking at the variations, I have been able to characterise the total error in the mean of a calibration set and make deductions about the various contributory factors. I have also compared my results with other measurers' data, drawn conclusions relevant to practical, day-to-day measuring.

In January 1997, while I was collecting these data, I heard that Malcolm Heyworth had analysed the 5 km splits in the 1996 Atlanta Marathon measurement. He discovered that the variations of the overall course length measured by the 25 riders were not so much due to random variations in the counts for these splits but rather to the variations in 'calibration', i.e. between the calibration constant during the course ride, and that measured before and after. In *MN* 79 p.6, I showed that the variations of 13 of the 25 Atlanta riders were consistent with temperature induced changes of the calibration constant. That analysis left me searching for an explanation of the 12 'inconsistent' rides. In common with others, I speculated that the concerns expressed over the tightness in following the *Shortest Possible Route*, 30 cm from the kerb, could provide part of the explanation. Malcolm's work, which showed that many of my so called 'inconsistent' riders had consistent splits, has helped convince me of the importance of studying calibration changes in greater depth. I have found it convenient to divide calibration constant changes into two categories based on time scale. Here I report on my discoveries concerning changes on a 15 minute time scale within a calibration set. These are relevant to: 1) how accurately one can determine the calibration constant, and 2) calibration variation during splits up to 5 km in length which take less than 15 minutes to ride at 20 km $h^{-1}$ (12 mph).

#### Measurement Details

Since April 1996, I have carried out many investigations of tyre performance on a test course marked by a white line along a cycle path beside Copenhagen Drive in Abingdon. A major activity has been the determination of the temperature coefficient of various tyres. This has yielded 166 calibration sets with a solid Sure-Trak tyre, 39 calibration sets with a solid Greentyre and 52 calibration sets with standard pneumatic tyre of the Vee Rubber brand.

Copenhagen Drive curves smoothly through an arc of 45°, causing Pete Riegel to initially call it a test course, since all measurers should use absolutely straight calibration courses. I have upgraded it for calibration by carefully surveying its actual curved length. I did this by measuring 50 m chords and the displacement of the white line from the chord. From these I calculated a length of 650.603 m. The white line is mostly 14.5 cm wide and gives a good target to follow. A deviation of the averaged bike position from the centre of the line will introduce errors. In *MN* 78 p. 12 I measured an average deviation of 3 cm from the centre of the line by videoing the position of the bicycle wheel. This gives,

Length error = $2\pi \times 3 \times \frac{45}{360} = 2.4$ cm, or ¼ count, since the calibration constant = 9.1 cm per count.

I do not stray much outside the line so my average position is well within the line. An error of ½ count is improbable.

Copenhagen Drive slopes slightly down from the NE end where I always start the first ride of a set. I measured the slope using a spirit level at 10 evenly spaced points, obtaining a gradient of 0.6%+/- 0.2%. The slope is sufficient to make riding downhill noticeably easier than riding uphill, though this effect can easily be swamped by the wind.

For calibrations I read my Jones-Oerth Counter to one tenth of a count. Provided the counter's gears mesh properly, there is a smooth movement of the smallest digit as the bicycle wheel rotates. I may be out by ± 0.1 count, but this is an improvement on reading to the nearest whole count which can be in error by up to ± 0.5 count. Such precision can be useful for short calibration courses or work such as the present investigation of error sources, but I do not advocate all measurers changing to this method. Indeed, there is even the danger that recording an extra digit might lead to a slight increase in the error rate in writing down the correct digits. For normal measurement purposes an error on all 4 rides of a calibration of say 0.5 in 5000 counts, which is 0.01%, uses up a negligible amount of the 0.1% SCPF.

The following table gives an example of the first data obtained with the Sure-Trak tyre.

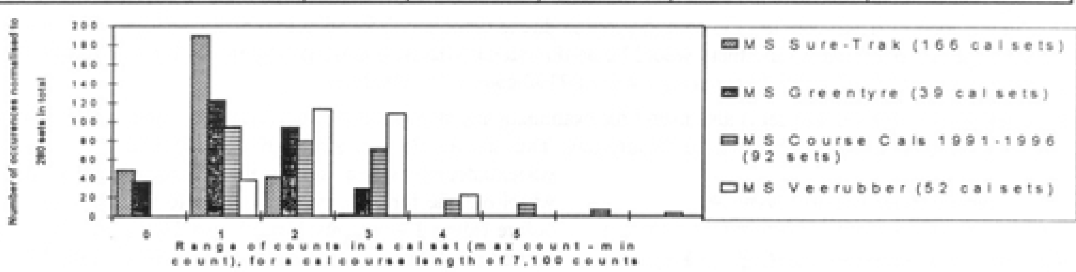
| | | | | JONES/OERTH COUNTER readings for 4 rides | | | | | RIDE LENGTHS in Jones Counts | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | TIME | Temp C | Comment | Ride1 | Ride 2 | Ride 3 | Ride 4 | Ride4 end | Ride1 | Ride 2 | Ride 3 | Ride 4 | Average | Range | Variance |
| 06-Oct-96 | 1527 | 14.6 | See below | 90752.8 | 97886.5 | 05020.0 | 13032.5 | 20165.1 | 7133.7 | 7133.5 | 7133.3 | 7132.6 | 7133.28 | 1.1 | 0.23 |
| 13-Oct-96 | 1235 | 17.6 | | 17375.2 | 24504.5 | 31634.0 | 38763.3 | 45892.3 | 7129.3 | 7129.5 | 7129.3 | 7129.0 | 7129.28 | 0.5 | 0.04 |
| 13-Oct-96 | 1328 | 18.3 | | 25305.4 | 32434.2 | 39564.0 | 46694.1 | 53823.5 | 7128.8 | 7129.8 | 7130.1 | 7129.4 | 7129.53 | 1.3 | 0.32 |
| 16-Oct-96 | 0727 | 7.5 | | 65386.9 | 72519.5 | 79651.9 | 86784.2 | 93916.5 | 7132.6 | 7132.4 | 7132.3 | 7132.3 | 7132.40 | 0.3 | 0.02 |
| 16-Oct-96 | 1131 | 14.2 | | 14502.0 | 21633.5 | 28764.5 | 35895.4 | 43026.0 | 7131.5 | 7131.0 | 7130.9 | 7130.6 | 7131.00 | 0.9 | 0.14 |
| 19-Oct-96 | 0813 | 7.6 | Damp | 20233.5 | 27367.5 | 34501.2 | 41635.5 | 48769.0 | 7134.0 | 7133.7 | 7134.3 | 7133.5 | 7133.88 | 0.8 | 0.12 |
| 19-Oct-96 | 1037 | 14.5 | | 69347.5 | 76478.9 | 83610.1 | 90740.5 | 97872.0 | 7131.4 | 7131.2 | 7130.4 | 7131.5 | 7131.13 | 1.1 | 0.25 |
| | | | | | | | | | | | | Average range = | | 0.86 | |
| Note: Between rides 2 and 3 the wheel did not remain clamped. The start count for ride 3 was 05899.2 | | | | | | | | | | | | Variance = | | | 0.16 |
| | | | | | | | | | | | | Standard deviation = | | | 0.40 |
| | | | | Standard error in the calibration constant = standard deviation/ sqrt(no of rides) = 0.20 in 7130 = 0.3 in 10,000 | | | | | | | | | | | |

***Statistical Analysis***

The column labeled range gives, for each set, the count difference between the maximum and the minimum ride. Following standard statistical procedure, the variance of a set is calculated from the sum of the squares of the deviations from the mean of the set divided by the number of degrees of freedom, in this case 3, which is one less than the number of rides in a set, because one degree of freedom has already been employed when the mean was calculated from the four rides. If we take the square root of the variance averaged over the 7 calibration sets we obtain the standard deviation of an individual ride, 0.40 counts in this example. The standard error in the mean of each calibration set will be 0.20 counts which is calculated by dividing the standard deviation by the square root of the number of rides in a set. This is a very small error in a ride of 7130 counts, approximately 0.003%. The conclusion to be drawn from these 7 calibration sets is that the total error in the calibration constant due to variations within a set is negligible compared to the 0.1% SCPF.

I have applied this analysis to four different groups of calibrations shown in the following table.

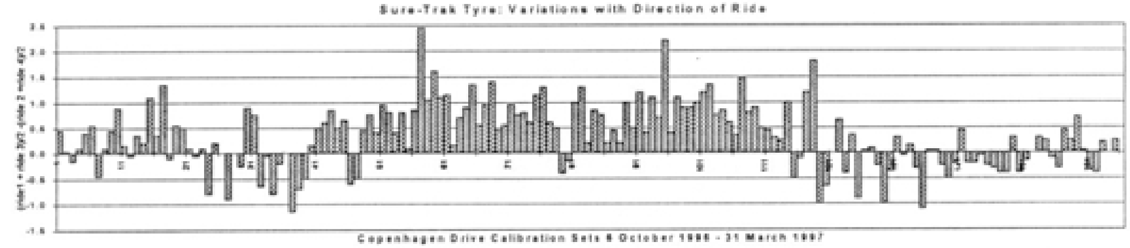
| Tyre (Counts are un-normalised. There are about 7000 counts per ride, see text) | No of sets of 4 rides | Average range in a set of 4 | Ave. variance of a ride | Standard error of mean of a set of 4 rides | Average of (ride 1 + ride 3 - ride 2 -ride 4)/2 |
|---|---|---|---|---|---|
| Solid Greentyre (Copengagen Drive) | **39** | **1.12** | **0.34** | **0.29** | **-0.18** |
| Solid Sure-Trak (Copengagen Drive) | **166** | **1.00** | **0.27** | **0.26** | **0.33** |
| Pneumatic Vee Rubber (Copengagen) | **52** | **1.68** | **0.68** | **0.41** | **0.59** |
| Pneumatic Michelin World Tour (1992-1996 Course Measurements) | **92** | **1.75** | **0.86** | **0.46** | |




In the final row are data from all the calibrations I have recorded during the measurement of 40 courses in the period 1992-1996. They were all carried out on my Long Tow calibration course using a pneumatic tyre brand named Michelin World Tour, which is broadly similar in characteristics to the Vee Rubber tyre. With this longer course and a different tyre there were about 7600 counts per ride, except for the first 20 sets using a different counter which had 6600 counts per ride. All these Long Tow data have been lumped together ignoring the small correction of about 7% that would be necessary to exactly compare them with the Copenhagen Drive rides which had about 7100 counts.

### *Effects of Slope and Wind*

The standard calibration procedure is to take equal numbers of rides in each direction as a means of averaging out effects due to wind and minor slope variation. These effects can make a contribution to the intra-calibration-set variation, resulting in an increase of such statistics as the standard deviation. To check for such an effect, I calculated in the right hand column of the above table the difference between the ride 1 and 3 average and the ride 2 and 4 average. For the Sure-Trak and the Vee Rubber tyres about 40% of the range is due to the variation with direction of ride. For the Sure-Trak tyre the data are shown for each set in the following graph:



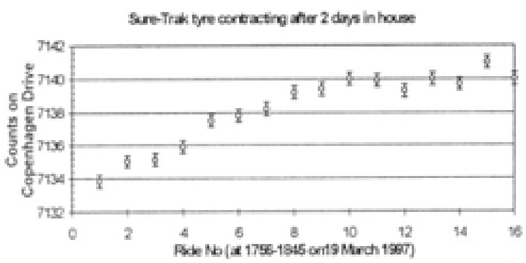

The block of calibration sets between number 49 and number 96 were taken during the period 16 February to 2 March when there generally strong south westerly winds. I believe the persistent average difference of about 0.7 counts during this period is related to the wind. It was significant that the set having the largest up/down difference was set 57 on 19 Feb when there was a SW gale so strong that I could only just ride into it using my lowest gear. Although I was actually riding down a slope of 0.6%, it felt like riding up a hill with a gradient of about 10%. The other count difference of more than 2, in set 95, was also into a very strong SW wind on 2 March.

It is interesting that this wind effect is in the opposite direction to that which I expected. Based on what I remember of rather uncontrolled observations with pneumatic tyres, I had expected that a measurement into a strong wind would give a smaller count since the wind striking the bike and rider, together with the additional propelling force as a result of harder pedaling produces a couple which tends to reduce the weight on the front wheel. I can only explain the larger count if increased wobbling arising from the action of pedaling harder overwhelms the effects of any expansion of the front tyre. It is not unreasonable to expect an increase of wobbles in such conditions and it certainly felt worse, much harder to follow the line. In *MN* **78 p 12** I reported the measurement of wobbles using a video camera on one ride with the wind behind me, and calculated an increase of 2.5 counts due to wobbles. The increase observed when riding into the gale could be explained if the wobble addition doubled from 2.5 to 5 counts which seems plausible.

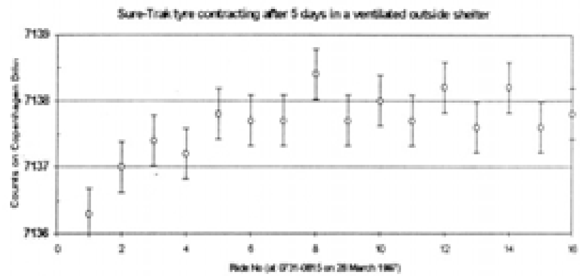
### *8-Ride Calibration Sets*

To determine the underlying rider variability I made a number of 8-ride calibration sets with the Sure-Trak tyre. These can be analysed as two conventional 4-ride sets. Alternatively from rides 1,3,5, and 7, all down the slope, I can calculate a variance and a standard deviation. Rides 2,4,6, and 8 give a second sample. The results from 26 such 8-ride sets give a standard deviation of a downhill ride of 0.37 counts and for an uphill ride of 0.39 counts. This is the standard deviation the underlying variability of measurement due to wobbles and errors in following the centre the line. My video of a single ride showed that wobbles contributed 23 cm or 2.5 counts. If that ride was representative then the present data suggest that, excluding wind induced wobbles, the normal addition due to wobble is 2.5 with a standard deviation of 0.38 counts. On a flat course without wind, where there would be no directional effects, one would expect to obtain a standard error for the mean of a set of 4 rides of 0.19 counts in a ride of 7130 counts i.e. 0.0026%.

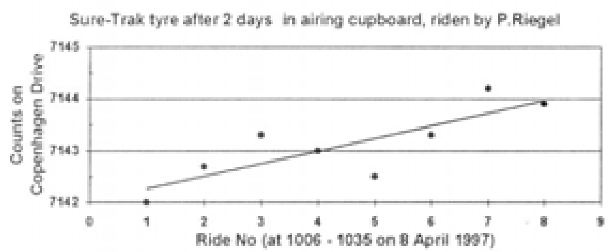
An increased number of rides in a set is also useful for examining any steady trend throughout a set. I had noticed that the first ride of a set of four often seemed to be slightly low. This showed up very strikingly one day after I had dried the wheel indoors beside a radiator for two days. I then placed the wheel outside for 30 minutes to come to thermal equilibrium before riding 1 km to my Copenhagen Drive test course, and carried out 16 rides, obtaining the data plotted on the left. The error bars shown on each point are ±0.38, equal to the standard deviation derived from the analysis above. Any small difference between the odd-numbered downhill rides and the even-numbered uphill rides is swamped by the 6 count increase observed during the first eight rides. It amounts to nearly the full SCPF. This is the largest change I have seen.



Having discovered such a large unexpected change, I then searched more carefully for such effects in normal circumstances, i.e. with the bicycle stored in its normal unheated, well-ventilated shelter. I perceived a pattern where the first few rides of the day were low by up to 1 count. It seemed that I was able to enhance this effect slightly by pushing the bike the 1 km to Copenhagen Drive. The idea being that if it was the cycles of compression and relaxation as the wheel rotated that was inducing the tyre to contract then the effect would be reduced in magnitude if my weight was removed from the bike. The result of this test was a slightly larger contraction of 1.7 counts as shown in the this plot. Notice that on this day the wind on Copenhagen Drive was causing the odd numbered, downhill rides to average 0.3 higher than the mean, so after applying a correction for this effect the contraction was probably about 2.0 counts.




During Pete Riegel's trip to measure the London Marathon, I was fortunate to receive a visit from him, and he kindly cooperated in making an independent measurement of this effect. In order to maximise the effect I had stored the tyre in the airing cupboard for two days, then carried it to Copenhagen Drive before installing on the bike on which Pete had just completed two practice rides along the white line. I accompanied Pete and observed his riding quality. Despite the limited practice he had, and the unfamiliar bike he was using, he was riding well, with only a few short excursions outside the white line. My guess would be that his wobble performance was rather similar to my own. I was very pleased to see his data showed a rise of about 2 counts over 8 rides confirming the effect was not due to some oddity of my riding.

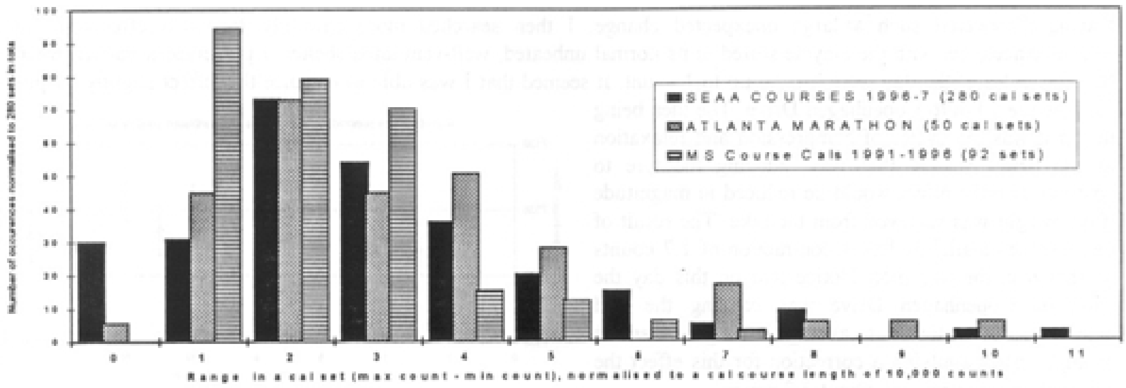



***Comparison with Calibrations at Atlanta Measurement and by South of England Measurers***

I have compared the distribution of the range which I obtained during calibrations for my 1992 - 1996 course measurements with two sets of data from other measurers; firstly the data from the 50 calibrations performed by the 25 riders during the Atlanta Marathon measurement 1996, and secondly from 140 course measurements (280 calibrations) performed by 48 South of England Course Measurers during the period Jan 1996 to February 1997. All the data were normalised to a ride of 10,000 counts. The results in the following table and histogram show a rather similar range for the US Atlanta data and the English measurers. My own calibration measurements have a mean range of about 70% of that of the other two groups of riders, but a few Atlanta riders and English riders have a smaller range than mine. Under the special conditions of riding along the white line of Copenhagen Drive trying to obtain high quality data with which to study tyre variations, my performance, see table above, is still better with a range after normalisation of half that of the other two groups of measurers.

The data from the 48 South of England Course Measurers give clear evidence of variation of performance between different measurers. At one extreme a measurer using a 390m calibration course giving 3600 counts contributed 15 of the 30 sets with zero range. Another measurer contributed 4 of the 8 sets with more than 7.5 counts per 10000 range. He used a small wheeled bike on a very short 200m calibration course giving 2700 counts.

| All these data have been normalised to a 10,000 count ride. | Sets of 4 rides | Ave. range in a set | Average variance of a ride | Standard Error of mean of set | Average of (ride 1 + r3 - r2 -r4)/2 |
|---|---|---|---|---|---|
| Pneumatic Michelin World Tour 1992-1996 course measurements by MCWS | **92** | **2.33** | 1.53 | 0.62 | |
| Atlanta Olympic Marathon - 25 riders | **50** | **3.31** | 8.77 | 1.48 | 0.03 |
| SEAA measurers reports 1996/001 to 1997/025 | **280** | **3.08** | | | |




***Conclusions and Implications for Measurement Practice***

Most riders, more than 80% in the two samples which I have examined, have a range in a set of 4 calibration rides of 4 or fewer counts in 10,000. This corresponds to a standard error in the calibration constant of 0.01%, one tenth of the SCPF, which is completely acceptable for normal measurement purposes.

A very small number of riders have some calibrations with a range greater than 0.08%, which corresponds to a standard error of about 0.02% in the calibration constant. Such a large error will slightly increase the chance that a course will be laid out short. If any rider occasionally gets a range of more than 0.08%, 8 counts in 10,000, I recommend that a further 4 calibration rides should be done and an average performed over 8 rides. In the unlikely event that a rider regularly obtains such large values, I recommend that he seeks advice about his equipment and technique.

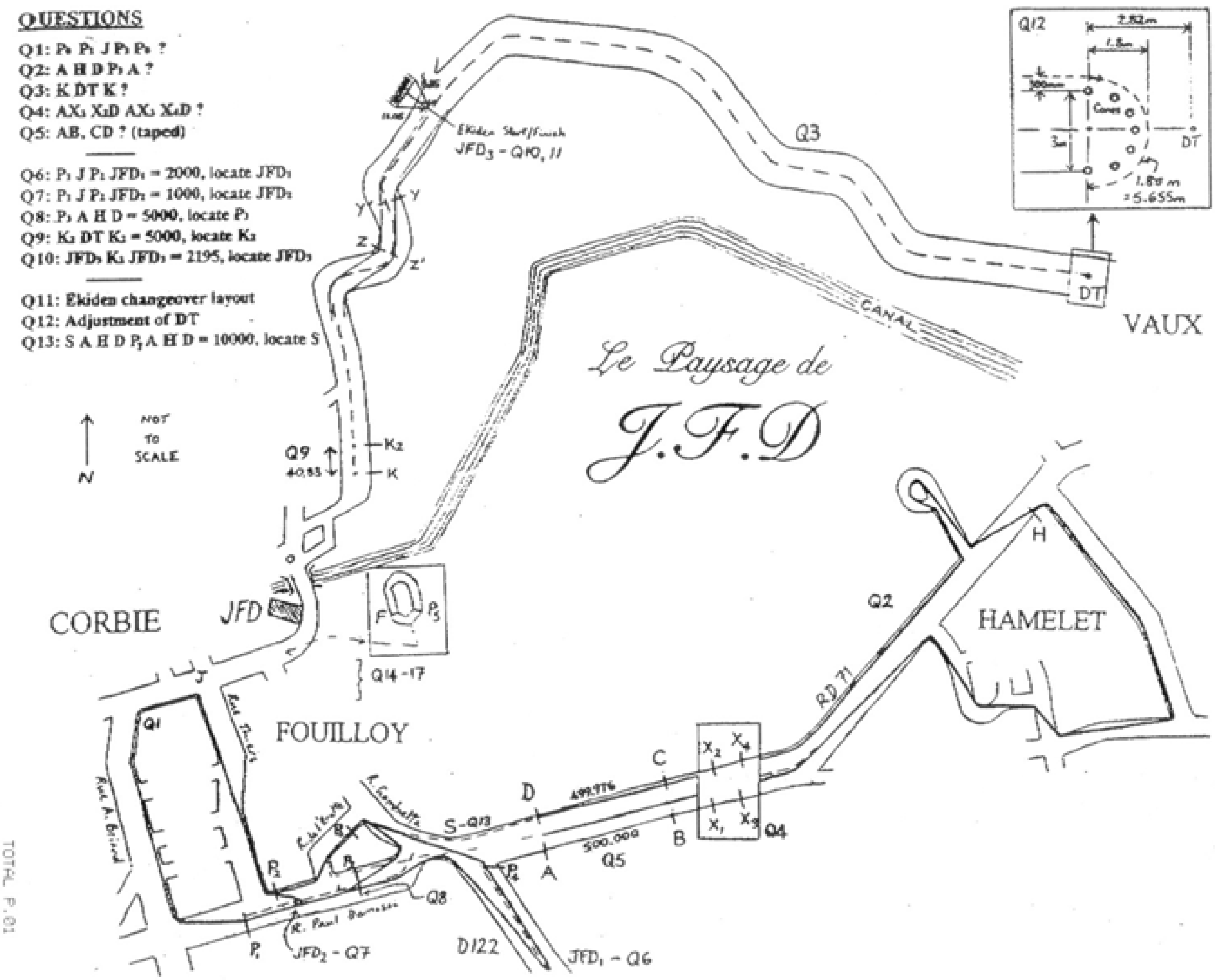
The effect of the 0.6% slope in Copenhagen Drive seems to be swamped by that of the wind. It was a surprise, however, that riding into the wind did not produce the expected decrease of counts as the weight on the front wheel is reduced. I explain this as an increase in wobbles due to harder pedaling overwhelming the effects of tyre expansion. The consequence could be that practice of riding calibration courses in both directions may not average out the wind effects. Perhaps we should just measure in conditions no worse than a light breeze. However, there are indications that the magnitude of the effect may be small enough to be covered by the SCPF. A gale produced a 0.035% change, and few would persist with measurement in such conditions. More experiments are needed to determine whether averaging the ride directions is effective in reducing this error.

Some measurers claim that it is good practice to ride the bicycle for a few minutes before a measurement to allow the tyres to warm up which causes a small expansion. I have never believed that there was sufficient energy expended through flexing of a tyre ridden at 10 m.p.h. for this effect to be significant. If anything, I have had the impression of a slight shrinkage of the tyre. The data I have now obtained from my 8-ride calibration sets confirms that the predominant effect is a shrinkage with on one occasion a spectacular change of nearly the full SCPF. I speculate that this is due to the polyurethane/nylon tyre adapting to a slightly compressed state with the rider's weight on it. However, because of the magnitude of the effect which I have occasionally witnessed, I recommend that riders of solid tyres do a 2 km ride at the beginning of the day to bed down the tyre before calibrating. I do not yet know what happens with pneumatic tyres.

Although in this work I did not experiment with calibration courses of different length, it is obvious that, even if the variations reported here do not scale with course length but remain fixed, then a course with as few as 3500 counts could still yield satisfactory results with a good rider. Provided the rider quickly adopts his standard riding position at the start of the ride, thus minimizing end effects, it could be possible for a good rider to obtain acceptable result on an even shorter calibration course.

In my report on wobble measurement, ***MN* 78 p 12,** I hypothesised that all the variations seen within calibration sets and between sets might be due to variations in wobble performance. The present work, however, shows that a rider's wobble performance can be very reproducible, with 0.005% standard deviation on short time scales, except possibly when pedaling hard. The tyre compression reported here and long term changes undoubtedly dominate as the main error sources. My data supports Malcolm Heyworth's conclusion following his examination of the Atlanta splits; the calibration process itself is not the main contributor to measurement error. The important question now is to determine how and why the calibration changes over time scales longer than the 15 minutes it takes to ride a calibration set. I am analysing the large data set reported here to investigate *inter*-calibration set variations and will soon report on these.

*Many thanks to Malcolm Heyworth for comments on the manuscript, Pete for his ride, and Roger Gibbons for his tyre.*


QUESTIONS
Q1: $P_6$ $P_1$ J $P_5$ $P_6$ ?
Q2: A H D $P_3$ A ?
Q3: K DT K ?
Q4: $AX_1$ $X_2D$ $AX_3$ $X_4D$ ?
Q5: AB, CD ? (taped)
Q6: $P_1$ J $P_2$ $JFD_1$ = 2000, locate $JFD_1$
Q7: $P_1$ J $P_2$ $JFD_2$ = 1000, locate $JFD_2$
Q8: $P_3$ A H D = 5000, locate $P_3$
Q9: $K_2$ DT $K_2$ = 5000, locate $K_2$
Q10: $JFD_3$ $K_2$ $JFD_3$ = 2195, locate $JFD_3$
Q11: Ekiden changeover layout
Q12: Adjustment of DT
Q13: S A H D $P_3$ A H D = 10000, locate S
N
NOT TO SCALE
Q12
2.82m
1.8m
300mm
Cones
3m
DT
1.80 m
=5.655m
Q3
Ekiden Start/Finish
$JFD_3$ – Q10, 11
Y
Y'
Z
Z'
CANAL
VAUX
Le Paysage de
J.F.D
$K_2$
K
Q9
40.83
CORBIE
JFD
F
$P_3$
Q14-17
HAMELET
H
Q2
RD 71
J
Rue Thiers
Q1
FOUILLOY
Rue A. Briand
$P_2$
B
R. Gambetta
S-Q13
D
499.976
C
$X_2$
$X_4$
$X_1$
$X_3$
Q4
B
500.000
Q5
A
$P_4$
Q8
R. Paul Bonnetain
$P_1$
$JFD_2$ – Q7
D122
$JFD_1$ – Q6

25 April 1997 THREE PAGES

ATTN: Pete Reigel, +1 614 451 5610

FROM: Hugh Jones, +44 171 916 0356

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Dear Pete,

I said that I would send something about JFD's seminar, so here's some words to help you fit together the photocopied material I gave you at the London Marathon.

"The entire morning will be dedicated to finding the measurement of three courses close to the village of Corbie" said Jean-Francois Delasalle's initial instructions for an international measurement seminar held on 5/6 April. We were in Amiens ("Amee-on"), a French town about 100km north of Paris, and Corbie lay about 10 miles to the east. We drove out there and fixed our bikes with Jones counters at JFD's house.

I had brought my own bike, on the roof of a rented car, through the Channel Tunnel on "Le Shuttle", a roll-on, roll-off train. Many others were lent bikes, including Norrie Williamson, the only other measurer there from the "Anglo-saxon" sector. We lie outside JFD's formal jurisdiction - which is 'French and Spanish-speaking Europe and Africa', but he is keen to maintain awareness and co-operaton between both camps and offers a delectable programme and fine hospitality as irresistible incentives. Norrie had brought his own solid-tyred wheel, but when he inserted it in the front fork he lost the service of the brake.

We calibrated on two 500m courses allowing us to ride with the sparse traffic. As there were 16 of us, divided into four groups, we then went separate ways to avoid crowding each other. I teamed up with Christian Delarue, who I'd met on your Atlanta Olympic measurement exercise, and R Callier, from Bordeaux. Our fourth man (Isabelle Marechal, also in Atlanta, was the only female participant) was one of an Italian group of four. The Italians are only now setting up a working system of course measurement, much as the Spanish did five years ago and the Portuguese within the last two years. These developments are largely due to the personal leadership of JFD. Under these circumstances, and due to lesser fluency in French and English than the Spanish and Portuguese, the Italians' desire to stick by each other was understandable.

Our first stop was the Vaux ("Vowe") lap - an out-and-back on a curving section of road white-lined down the middle. This made the riding straightforward, although we had no vehicular protection. I was impressed with the courtesy shown to us by French drivers, despite our outwardly eccentric behaviour and apparant lack of road sense. For much of the route we hugged the right kerb going out and the white line coming back, but there were some tangents to swing and a few tricky departures from the line before returning to it. We took readings at one intermediate point outward, at the turn and at another intermediate point on the return. I later figured the distance as 5081.76m.

We returned to the calibration course, which coincided with the start selected for another lap between the villages of Fouilloy ("Foo-yoy") and Hamelet ("Amai-lay"), dumbell-shaped, involving turn-around loops connected by a road. Half of the width of the connecting road was used in each direction. We took intermediate readings at one point on each of the turnaround loops, and when coming back through the starting position. I later calculated the dumbell lap as 5,299.15m

We started measuring the last course, within the village of Fouilloy, from a point on one of the dumbell ends of the previous course. The lap was again dumbell-shaped but the section of the connecting road used in both directions was so small that on the map it resembled a knee- high boot with an exaggerated toecap. Our start and finish was on top of the toes and our two intermediate points were taken at the arch of the foot. We did two measurements of this lap, and my lesser one yielded a distance of 1494.70m

Returning again to the calibration course (a hundred metres or so from th tip of the toes) we next undertook 'tests a ligne droit' - straight line riding to and from points beyond the end of the calibration course. We did this to/from two different points on each side, which gave us four different lengths. I calculated them as 637.44m, 647.64m, 689.46m and 695.52m. We then re-calibrated and steel-taped both calibration courses.

I did this last task of the morning with Christian, who had a slightly novel approach. He produced a set of flat metal arrows which he proceded to lay on the asphalt surface pointing to the end of each tape length, instead of making marks on bits of masking tape. It was a lot quicker, but we had to be very careful to ensure that the tape didn't nudge the metal indicators as we moved up, or that they weren't dislodged when Christian tugged the tape and my hands were momentarily pulled sideways along with it. On our second taping I had to call him back to one point where it looked like the marker had changed position. He agreed, thinking it must have been traffic. We were taping well into the road, along our riding line, so it could have been - but it may also have been the tape itself, entangling with the marker as we dragged it along. We did the temperature correction and our figures gave an exact 500.000m for the south side of the road, and 499.976m for the north side.

Returning to JFD's I managed a half hour run beween calculations and a good French lunch. We then received our second set of instructions, which immediately set us to scribbling figures again before we ventured out. We were to make adjustments to the morning courses so that in the case of the Hamelet loop we fixed a start which would allow an out-and-back to finish at the start/end of the calibration course after 5,000m (incl SCPF). From our morning measurements this could be done entirely by calculation and taping.

More complicated was the conversion of the Fouilloy village circuit into two different laps of precisely 1000m and 2000m. We added a dog-leg to get the longer lap, and "cut off the toes" of the boot to get the shorter one. Both adaptations involved fixing the position of 180-degree turns in the road. In the case of the shorter lap the turnaround was too close to a turn to ignore the difference between the diagonal distance to the turnaround and the distance along the kerb - ie it was something noticeably less than 180 degrees.

This done, we repaired to Vaux to shorten the out-and-back course to a precise 5000.00m. This was a simple subtraction of half the measured overdistance along the centre line of the road. But we then had to locate the changeover position if the lap was used for an Ekiden relay: 10km and 5km stages no problem - anywhere on the circuit would suffice, but the last 2,195m of the final 7.195km stage had to start and finish in the same position on the lap. Very definitely **not** 2195/2 m back down the centre line of the road, although that could have served as the first iteration of a series which would have located the spot.

We had the intermediate readings, Y and Z to go on, and they suggested that the changeover wouldn't be very much further into the lap. But they were not parallel to each other. Norrie and I settled on a joint approach whereby we offset these marks towards the centre line of the road, marking points Y' and Z'. The readings from Z' - Y, and Y' - Z differed by one count in 700. We then had a string of figures for Y' Z K2 Y, revealing th part of the lap west of Y/Y' to be about 1525m. Subtracting from 2195 and halving it located the changeover as 335m further down the road. We each marked our point based on our own sets of calculations (the offsetting was where we had really needed each others' co-operation). Then we checked them with a fresh ride. I needed to shorten my distance by 20 counts, Norrie about the same. This would have been due to the slightly longer line on the return (at the centre line) than we had measured outward along the right kerb ("curb") of a very gentle rightward bend when setting out our provisional points.

There endeth the second chapter of the day's activities. It was only after a convivial dinner back at the hotel that I realised there was to be a third. It was now nearing 22.00, and we sat down to complete a formal exam-like submission in answer to some further "written theoretical questions".

These included a layout for the start, finish and changeover of the Ekiden relay course and amendment of the turnaround from a single cone to an arc of 1.5m radius. The Hamelet 5km of the afternoon became the Hamelet 10km of the evening, and we recalculated to fix a new start line accordingly. More complicated was the layout of 10km, 20km and 50km walk courses starting and finishing in a hypothetical stadium lying specified metres away from two different points on the circuit. Given a fixed finish, we had to locate the startline, specify the number of laps of the track and of the village lap for each race (I stuck with the now conventional 3 laps of the track and out). Then we were asked to locate positions for clocks and chip timing mats which would allow splits to be given for each kilometre. This was tricky, because I couldn't be sure that the second kilometre would be on the village lap, or before the lap was reached. The numbers made it look close. Finally, we calculated revised positions for start and split kilometres if the last half-lap on the track was to be walked in lane five.

This had us burning the midnight oil - almost literally, as there was a power failure which temporarily put us in the dark. We tottered off to bed around 01.00. Next day I had a far less strenous exercise to perform: running a 10km race in Amiens.

Best wishes,

Hugh.

## LAYING OUT A CALIBRATION COURSE WITHOUT HELP

**Chuck Hinde** was the first to report single-handed layouts of a calibration course. He used a 500 foot wire with a loop at each end, calibrated under measured tension. He set a nail in the middle and measured out 500 feet in each direction to give a 1000 foot calibration course.

**Wayne Nicoll** reported using a standard tape, and pounding intermediate nails enroute, looping the tape over each nail and measuring to the next nail.

I like the method, because it removes all uncertainty concerning the capabilities of the person at the other end of the tape. His capabilities are mine. The method takes a bit longer because of the time spent walking back and forth to unhook the tape.

I reported a similar exercise in November, 1996 *Measurement News*. I recently received an inquiry from a measurer concerning the methods to be used, and he outlined his procedure in correspondence shown on the next page. His measurement data is shown below:

March 30, 1997

Jim Gerweck laid out using nails pounded at random distances, hooking the tape over the previous nail and reading the following nail. Data as follows:

Note: 0.006m must be subtracted from the readings. This represents the offset from the nail center to the zero mark on the tape.

Temperature = 18 C

After calculation, the calibration course was lenghtend by 0.119m and nailed. The intermediate nails were removed.

| First Measure | Offset | Corrected Meters | Second Meas. | Offset | Corrected Meters | Difference |
|---|---|---|---|---|---|---|
| 49.969 | 0.006 | 49.963 | 49.966 | 0.006 | 49.960 | 0.003 |
| 50.000 | 0.006 | 49.994 | 49.996 | 0.006 | 49.990 | 0.004 |
| 49.993 | 0.006 | 49.987 | 49.989 | 0.006 | 49.983 | 0.004 |
| 49.999 | 0.006 | 49.993 | 49.995 | 0.006 | 49.989 | 0.004 |
| 49.986 | 0.006 | 49.980 | 49.985 | 0.006 | 49.979 | 0.001 |
| 49.985 | 0.006 | 49.979 | 49.985 | 0.006 | 49.979 | 0 |
| Total | | 299.896 | | | 299.880 | |
| Average | | | | 299.888 | | |
| Temp. Correction Factor | | .9999768 | | | | |
| Corrected Length | | | | 299.88104 | | |
| Final length after addition of 0.119m | | | | 300.000 meters | | |

Subj: Solo Cal Course Layout
Date: 97-03-15 14:27:56 EST
From: ZGerweck
To: Riegelpete

## LAYING OUT A CALIBRATION COURSE SINGLE-HANDED

Dear Pete,

I have one or two (hopefully) last questions about laying out a solo cal course.

1. Will this fly in CT. I got the impression Dave Reik either doesn't approve of this method, or at least looks down on it, since it isn't explicitly detailed in the Course Meaurement Procedures book;

2. Your article in MN 80 on the Crazy Eights validation gives a pretty good example of how to do a solo cal. course. I note in your calculations that you ADD a small distance to your actual measurement figure to account for the nail center to zero mark offset. I think this means your zero mark is short of the nail center (i.e., on the tape itself, not at the ring end), is that correct?

My tape has the zero at the ring end, so I believe I will need to SUBTRACT a distance (probably smaller than yours) to get the correct distance. Is my thinking right on this? Also, it seems difficult to find exactly where the zero is, given the nature of the ring. Should I work backwards from 10 cm to the nail center and figure that way instead?

Thanks for all your help.

Sincerely,
Jim Gerweck

*Subj: Re: Solo Cal Course Layout*
*Date: 03/15/97*
*To: ZGerweck*

*Dear Jim,*

*I did another solo cal course 4 days ago. The zero mark was on the tape itself, so a small length had to be added to each interval. Here is how I determined it:*

*1) Make a cross on a piece of paper. Call it point "a."*
*2) Stand a nail (like the one you use for nailing the cal course) on its head directly over the mark.*
*3) Hook the tape over the nail and pull out the slack.*
*4) Mark the zero point. Call this point "b."*
*5) Measure a to b. This distance should be added to every tape interval used in the layout, whether a full interval or a partial interval.*

*If the zero lies at the very outside end of the hook ring, typically it will mean that you should REMOVE a few mm from the indicated lengths obtained. I am going to have a short article on this in next MN, with diagram.*

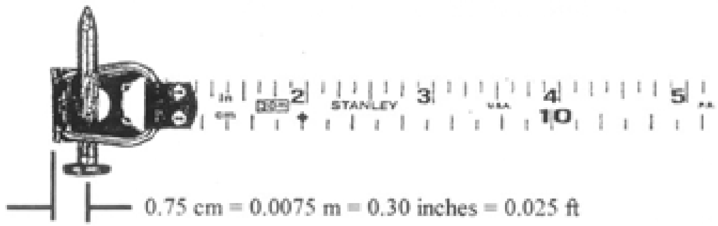
*You are right about Crazy Eights. Both tapes had the zero on the tape itself, not at the ring end, but the distance was different for each tape.*

*As long as you clearly describe your methodology, I can't see how David Reik could have a problem with this. Show him a copy of this if he doubts the validity of the method. I am moving more and more to it as my standard method, as if I do it this way I have complete knowledge of who did what, and am not dependent on the actions of the guy at the other end, who is usually an inexperienced person.*

*Best regards, Pete*

# SOME EXAMPLES OF ZERO OFFSETS

## ZERO MARK AT THE END OF THE PULL RING




B A A to B = 0.75 cm = 0.30 in = 0.025 ft

In the above example the zero mark is at the very end of the pull ring. The distance to the center of the nail is 0.75 cm or 0.30 inches. This amount should be subtracted from distances which are read on the tape.

| | | |
|---|---|---|
| Example: | Indicated length = 30m | Actual length = (30-0.0075) = 29.9925 m |
| | Indicated length = 100 ft | Actual length = (100 ft - 0.025 ft) = 99.975 ft |

---

## ZERO MARK OFFSET FROM THE PULL RING


A B A to B = 9.7 cm = .097 m

In the above example the zero mark is offset from the pull ring. The distance to the center of the nail is 9.7 cm. This amount should be added to distances which are read on the tape.

| | | |
|---|---|---|
| Example: | Indicated length = 30m | Actual length = (30+.097) = 30.097 m |

**NOTE: THE ABOVE EXAMPLES ARE NOT FULL SIZE.**

"Zeando",
Swannington,
Norfolk. GB
11 March 1997

Dear Pete,

Thank you for the latest MN - great reading as usual. Are you visiting London in April ?

I could not resist the challenge of Bernard Conway's puzzles:

LAST MONTH'S PUZZLE -ANSWERS-

1. $5.11

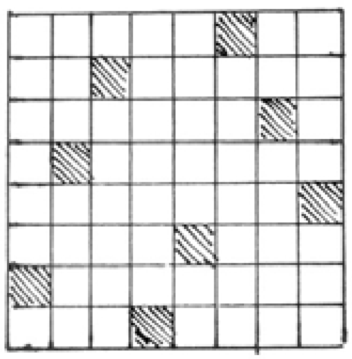
2. Twins of 3, and 8

3. (a) 8000m

   (b) 4828.4271m2

   (c) 2613.1259m

4.



This last question is a variant on the classic problem of placing 8 queens on a checkerboard so that none can mutually 'attack'.

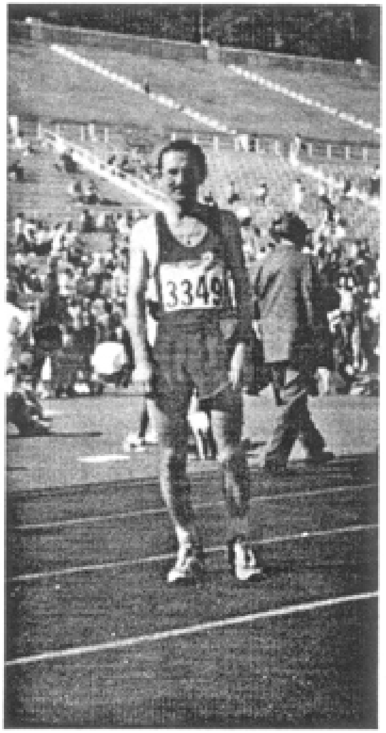
Solomon W Golomb, the American mathematician in his fascinating book "Polyominoes", claims that there are 92 different answers to this problem, which reduces to 12 distinct cases if all rotations and reflections of the checkerboard are taken into account - Bernie's restriction of fixing the position of the first one is one of the twelve.

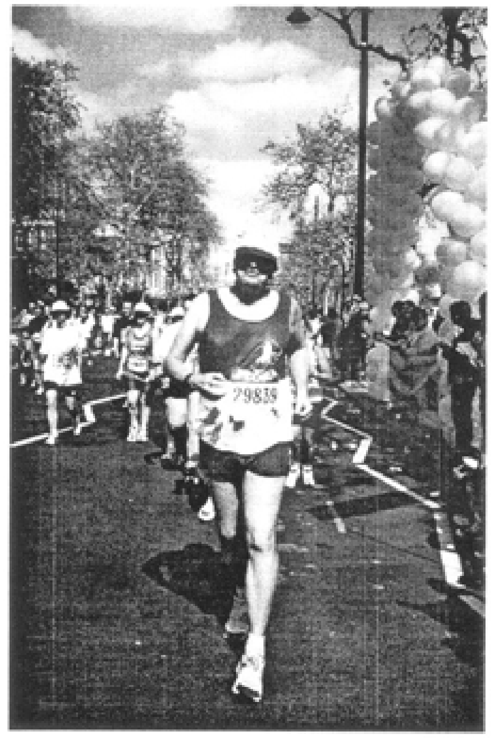
Regards,

Roger

Roger Gibbons

## MARATHONING MEASURERS




Many course measurers are also active as runners. Most of us were runners before we became measurers. Above we see **Tadeusz Dziekonski** (L), IAAF "A" measurer from Poland, and **Bill Grass** (R), RRTC's Wisconsin certifier.

Tadeusz wrote "I enclose for you the photo, which was made in Athens at the historic stadium. It was a great pleasure to take part in this race (Marathon to Athens Classic Race). Only the travel by car through Romania and Bulgaria was terrible." Tadeusz finished in 2:56:09.

The photo of Bill was taken by Pete Riegel at the London Marathon. Pete, who finished the race in 2:06 (riding in the lead car) was walking along the Embankment after the race and spotted Bill nearing 40 km, about 4:55 into the race. He inquired of Bill "Are you having a good time?" to which Bill replied, beaming with pleasure, in the affirmative, also adding that his time goal was to break five hours. Pete said supportively "I don't think you're going to make it, Bill" to which Bill replied "By MY watch I will." Because of the huge field Bill started well back in the pack, and started his watch when he crossed the start line.

(BILL FINISHED IN 4:58!)

Send photos!

# MEASUREMENT TO RECORD STANDARD: RELIABILITY OF ROAD RACE PERFORMANCES

by JF Delasalle (AIMS/IAAF/AIMC expert)
08 December 1996 [transl. Hugh Jones, February 1997]

## 1. HISTORICAL

The validation of road race performances is not new, but dates back to when road racing officially began.

It is only a century since the first Olympic Games marathon was organised on 10 April 1986 in Athens, over a distance of 40km. It should be noted that the course, which had been projected as 48km, was shortened by the organiser after a test run made some weeks before the Games raised fears that there would be few finishers.The race was carried off by the Greek shepherd Spiridon Louis, in 2 hours 55 minutes.

Amost immediately the idea arose of doing better and breaking this time. In August of the same year an identical race was organised in France at the suggestion of the "Little Newspaper", with the single aim of beating the "record". This was substantially achieved since the first nine bettered Spiridon Louis's time on a 40km course between Paris and Conflans. The winner, the Englishman Leonard Hurst, ran the distance in 2 hours 31 minutes and 30 seconds, with a margin of six minutes over a Frenchman by the name of Bagre.

In this way, scarcely three months after the first Olympic Games, all the components of the problem of road race performance validation were evident, without as today, a century later, the answers being known.

This first example immediately indicates many of the biggest problems we encounter:

- In Athens: a race organiser changing the course after the original measurement.

- In Paris, for the record attempt, firstly: the absence of documentation on the distance run. A single improvement of 24 minutes seems a lot, even for very different race conditions and different kinds of athlete (professional/amateur). It would be enough to imagine a course five or six kilometres short, in order to be certain of breaking the "record" and getting a spectacular result for the media.

- Secondly: the role played by the media was immediately formative, as journalists and sporting pundits for the first time used the term 'record' in this sense, in speaking, since 1896, of the "world record". Today these pressures and the absence of objective references sheds grave doubt on the reliability of these road race performances.

Other famous cases followed regularly as the time came down over the years. Here we simply cite the most significant of these.

Above all we should recall the famous "world record" of the Australian Derek Clayton, who ran a marathon in 2:08:33.6 at Antwerp in Belgium on 30 May 1969. This caused a real headache for the statisticians of the day, to determine if it really was the best performance of all time over the marathon distance. The organisers first supplied a statement, with a report, from a private surveyor in which he maintained that the course was longer than 42,195m. Then a control study returned a verdict putting the distance too short by a few hundred metres, without being more precise. The Royal Belgian League came up with the final explanation, which we can today interpret best: at the time all courses in Belgium were measured using several cars and the average of the readings obtained from their odometers was used. This was the method officially recommended by the Belgian Federation for its approved courses. Today we know that this kind of reading, without any prior calibration of the vehicle odometer, reduces the distance of a marathon by a minimum of 400m but more often 1000 to 1200m and sometimes more. This brings Clayton's performance down to around 2:11 or 2:12, which was the world standard of the time [although Clayton himself had run 2:09:36 in Fukuoka]. This does not reflect upon the qualities of the athlete himself, but shows how pseudo-rules advised by the official structure could prevent the evolution of a proper system of measurement.

- Other "imitation marathons" were also widely talked about at the time:

- The Auckland Marathon (remeasured at 39,726m) was emblematic of the world elite's search for a miracle course.

- In 1970, with Clayton's performance in doubt, the world record for the marathon was ascribed to the Chilean Jose Ramirez who had won the national championship in Santiago in 2:09:04. The response was prompt, and an immediate check on the course found it to be 38,462m - this for a runner whose best performance was around 2:20. To suddenly gain 10 minutes, at this level, was never anything quite so easy...

- The only moral of these stories is to systematically check the measurements of all the courses on which the record is broken.

- This was also the case with the Englishman Ian Thompson's time of 2:09:12 at the 1974 Commonwealth Games in New Zealand. Then the Japanese, Shigeru Soh's 2:09:05.6 at Beppu in 1978. These were validated without recourse to any rule - since there was no particularly systematic way to proceed in the validation of distances.

In France the same problems were encountered and the cognoscenti knew perfectly well that the classic French record of Jackie Boxberger from the Paris Marathon in 1985 was particularly subject to suspicion. Fortunately it was bettered under ratified conditions by Luis Soares, who ran 2:10:03 in the 1992 Paris Marathon.

Similar misadventure befell Dominique Chauvelier in his national 25km title at Blanquefort on 10 June 1990 where a world best performance could not be validated because of a shortfall of 515 metres.

This incident had the benefit of stirring the French Federation into instituting real control over distances in all French Championships and above all in all classified courses and qualifiers for the championships. It put an end to interminably sterile discussion - since nothing had been standardised in the way of measuring road courses up to that time.

Here I would also cite the sad but significant case of Chantal Langlace who pioneered women's long distance running. All of her world or national records fell victim to the march of technology and the official rules: 2:46:18 at Nivelles in Belgium on 9 June 1974, then 2:44 at Neufbrisach in France, and 2:35:15 at Oyarzun in Spain - all world best marks at the time - and followed by a sub 2:35 at Creil, a French best performance, on a course 800m short. Over 100km in 1981 at Amiens she ran 7:27:22, then in Migenes in 1984 7:26:01, where in the first official French championship she finished fifth in the open category. Her two world best performances of the time could not be externally validated because of a shortfall verified several years later, of 600m and 1200m respectively. For a race of 100km this constitutes a modest enough error in comparison to those at 25km or the marathon.

Still, this athlete - a great figure in the development of women's distance running - was probably worth a 2:38 marathon and 7:30 at 100km. Even today, 12 years later, this would be a French women's best at 100km. Her performances of the time were certainly worth a place in the annals of road race history, under the heading of 'best performances' achieved given the organisational constraints of the day in road racing.

Evaluation of road race performances is still subject to many issues raised.

## 2. COURSE MEASUREMENT AND TIMING

The main problem is always that of course measurement. Performances on the track are rarely questioned, because timing systems are reliable. It is very different with road racing because the problem lies in the measurement of courses.

At 20kph a top level athlete travels at 5.5 metres per second. An error of 50m in the measurement of a course would therefore imply a difference in performance of 10 seconds. An error of 500m would distort by around 90 seconds.

In such cases nothing is gained by the use of precise, reliable timing - to the nearest hundreth or thousandth of a second carried out by official, certified timekeepers. Systems of information may be ever more perfect, but error in the measurement of distance generates the real imprecision.

It was therfore essential to find a reliable method of course measurement. Unlike track races which took place on officially standardised 400m tracks, road courses were all different from one another. Each race used a different course: only the measurement allowed any standardisation and comparison to establish records or lists of best performances.

No such technique was precisely defined until 1982
Each race organiser made their "best efforts", often an estimate of race distance taken from simple road maps, or on the ground using a car or motorcycle, or with a little less uncertainty, a surveyor's wheel.

From extensive studies, led in particular by the Englishman **John Jewell from 1961,** it was demonstrated that compared with measurements made with a certified 50m steel tape those made with vehicle odometers or surveyor's wheels had a significant margin of error. For the most part this yielded courses much shorter than the distances declared.

These errors can be estimated, on average, as:

- between 1% and 3% for vehicle odometers (100-300m for a 10km, 400-1200m for a marathon)
- between 0.6% and 1.5% for surveyors' wheels (60-150m for a 10km, 250-500m for a marathon, variations that depended above all on the quality of the road surface (smooth or rough).

John Jewell therefore proposed the use of a method based on counting the number of revolutions of a bicycle wheel previously calibrated on a section of around 1km of the course to be measured, that section itself precisely measured by a steel tape. For this he used a little counter and also calculated the fractions of a revolution completed by using the 24 spokes of the bicycle wheel. A real Chinese puzzle, but the results were remarkable. The Bristol Marathon, was the first road course of its type, officially measured in 1961.

**In 1964** an American, **Ted Corbitt**, had also proposed using a bicycle to measure race distances to the American Federation, by counting the number of revolutions (and fractions of revolutions) made by the wheel over the total distance of the course. The circumference of the wheel was calibrated on the same day as the measurement along a straight line of prior defined length. The principle of measurement "by calibrated bicycle" was born.

His improved procedure allowed this method to spread very easily after **1970,** when another American, Alan Jones, invented his eponymous mechanical counter. The Jones counter can be fixed to the front wheel of a bicycle within a few seconds, and records exactly 20 counts for each revolution of the wheel (one count therefore represents a distance of around 9-10cm depending on the type of bicycle used and the calibration).

The application of this method, called the calibrated bicycle, presented several advantages:

- Ease of use, and therefore teaching of the method spread.

- Easily obtained equipment (an ordinary bicycle and a counter of about $60 value)

- Rapid measurement, which could be done at a speed of around 20kph

- Use of a path identical to that of runners in competition; the direct line of the course

- Reproducibility: multiple measurements of the same course by different officials gave comparable results

- Reliability and precision to the order of 0.1% (10m for 10km, or 42m for a marathon), thanks to a very precise calibration technique performed for each use of the counter.

**AIMS (Association of International Marathons and Road Races)** formed, in 1982, the first international structure grouping together a number of renowned international events (London, New York, Boston, Rotterdam, Paris...). It imposed the use of the calibrated bicycle method for measurement of courses. The Association originally comprised marathon organisers, but AIMS extended its field of activity to all road races when, at its fifth World Congress in Melbourne in 1989, it imposed the same calibrated bicycle method on all organisers of large international races. The purpose was to avoid disputes and put performances run on their courses beyond question. Lists of standardised world best performances even began to be published, and were represented to the media as unchallenged "world records" of the road.

**The International Olympic Committee** began to use this method at the Los Angeles Olympics in 1984, at the initiative of the Americans, and then at Seoul in 1988 - where the first seminar for qualifying measurers in Asia was organised. Latterly, it was also used in Barcelona in 1992 and Atlanta in 1996.

**The International Amateur Athletic Federation (IAAF)** finally recommended the use of the calibrated bicycle method in its rules relating to road events, and created machinery to spread the teaching of this method to all countries through its centres of development. There have been training operations since 1990 in Argentina and Indonesia, in 1993 in Australia and Kenya, in 1995 in Portugal, Puerto Rico and Russia, and finally in 1996 in China and South Africa.

In February 1993, in Nice, France, the IAAF and AIMS decided to recognise a single list of international experts skilled enough to measure big international events by this same method, and recommended use of the calibrated bicycle method to measure all events on the road, making measurement by an expert obligatory for all events on the international calendar. A technical sub committee run by four administrators was also set up for long-term monitoring of the problem of road measurement, and to update the lists of international measurers.

The IAAF also tried to encourage national federations to establish their own officials skilled in the use of the method. This is how France has, over the last few years, accredited over 200 active and official measurers.
Since many federations are following these recommendations, uniformity and greater reliability of results is possible.

Most countries recognise two levels of qualification for official measurers (regional or national) with standard course reports registered by the national federations. This allows instant evaluation of performances, done to a world standard of road measurement and checked by independent experts approved by the International Federation.

Measurement in this way allows validation of world best performances (although the lists are still managed by AIMS) pending IAAF recognition of real world records on the road for the classic distances.

## 3. RACE CONTROLS

PROPER MEASUREMENT DOES NOT MEAN AUTOMATIC VALIDATION OF PERFORMANCES... far fom it.

The second problem which arises is that of the control of the races themselves.

It is above all essential that the organiser fulfils all the conditions specified in the measurement report. The course presented to the runners should be exactly the same as the one measured, not only in the path described, but also in terms of all restrictive conditions laid out in the measurement report. For example, there could be specific lanes of wide, multi-lane roadways that are reserved for the runners. Or a particular running line may be enforced by temporary markers laid out on race day itself, often effected by traffic cones or tape-linked barriers in a configuration enforcing a specifically planned loop.

All this must be ascertained at the time of the race for performances to be validated; if not, measurement achieves nothing.

It should be noted here that the role of the race referee or technical delegate in official road racing is all-important. This role entails taking advice from the race measurer if he has the rank of race referee or, for a race referee delegated by the federation, having witnessed the measurement and having the measurement report available to him in its entirety.
For five years all international competitions have included the course measurer within their race juries to enforce correct course marking and instruction of runners. This allows closer agreement between the actual course and the one measured.

**This does not eliminate all errors.**

- Recently the most flagrant error was, as everyone probably remembers, at the world championships marathon in Gothenburg in 1995 . In the women's race stadium officials forgot one of the three laps of the track run at the start of the race. Maria Machado won the world marathon title after a race of 41,795m instead of 42,195 and the times could not be officially accepted.

Many asked why had the officials not added an extra lap at the finish, because the mistake was obvious from the first split times at 2, 3, 4 and 5km. This would have been very easy, with the placement of cones along the fourth lane of the track from 150m out [from where runners entered the stadium to the position of the finish line]. The answer was never very clear but it is worth noting that the most likely explanation lies in the obscurantism of various official international techniques and technical officials in the field of road measurement

- The latest mistake with significant consequences was a lot more subtle and insidious. It was when Paul Tergat set a world record for the half marathon in Milan on 31 March 1996 in 58:51 (the old validated record was held by Moses Tanui who ran 59:48 in the same race in 1993). This was a potentially huge improvement of 56 seconds.

All the standard requirements seemed satisfied: the course measured by a German expert, timing by the Italian Federation FIDAL, the race clearly and consistently filmed in its entirety, perfect organisation at the start and finish, doping control, assurances from the Italian Federation that the race conformed absolutely with IAAF regulations...Yet detailed examination revealed that there had been a mistake in the positioning of the turnaround point. This was wrongly positioned on race day because of a mistake in the paint marks on the ground, shortening the complete course by 48.80m (because four laps had been run).

The Measurement Administrator himself shows a course to be short by 49m... testifying that the initial measurement by the German expert was perfectly correct for the course planned, but that unfortunately its integrity was not observed. Even with an additional 50m Paul Tergat would have smashed the old record by 45 seconds, but he would never be able to cover those 50m and Moses Tanui still holds his world best performance.

Other parameters are often discussed in order to compare road performances, in particular the profile of the course and the overall influence of the wind.

It is immediately apparent that criteria should be defined to prevent the validation of performances recorded in unduly favourable conditions.

## 4. THE DIFFERENCE IN LEVEL OR "DROP" (course profile)

It is not necessary to be a great scholar to see that a runner descends a lot quicker than he or she climbs. Those who may think otherwise need only take a look at courses like Marseilles-Cassis or Marvejols-Mende in France to see that the leaders climb at 15kph but come down the descents at close to 25kph.

A 10km with 700m of negative difference in level (this is the difference in height between the finish and the start) was run in 1996 in the United States in under 25 minutes - that is to say two minutes quicker than the fabulous world track records of Gebreselassie and Salah Hissou: it would be senseless to validate these actual performances.

A maximum tolerance was defined. It is one metre per kilometre which for a 10km race means that the height of the finish should not be more than 10m lower than the height of the start (or 21 metres for a half marathon and 42m for a marathon). This is what is called "drop" in English and which in French technical language is called the "denivele differentiel".

## 5. THE PERCENTAGE SEPARATION OR "SEPARATION"

(influence of the wind)

The influence of the wind may also be felt in road racing.

"Tailwind" can assist runners as it assists sprinters, long jumpers and triple jumpers. The difference is that with relatively 'straight-line' courses it will assist them for a lot longer, gaining them considerable time.

In contrast to the track, where wind is measured with only occasional problems (cf Pedroso's long jump "record"), it is difficult to imagine how to simply quantify the exact influence of the wind. A road race is run, for example, with a favourable overall wind from one point to another.

But it would be necessary to put anemometers every 200 or 500m along the course to get precise readings of wind speed at the time the leaders passed by. Although this has been tried once it is impossible to put it into actual practice.

This is why courses which are vulnerable to an overall favourable wind - where the direction from start and finish is a relatively straight line - cannot be accepted as standard. It is therefore necessary to design the route of road race courses so that the finish line is as close as possible to the start line, with a maximum tolerance of 30% of the total length of the course.

This is what in English is called the "separation" and which in French technical jargon is the "pourcentage de separation". It is calculated by dividing the distance separating the start and finish, as the crow flies, by the total length of the course.

This percentage varies from 0% for a loop course with a start and finish line in common to 100% for a straight line point-to-point course (therefore all calibration courses should be 100%).

## 6. DOPING CONTROL

The final factor in the validation of a performance at world level is, of course, doping control. But it is a subject with which we need not detain ourselves as there is nothing specific to road racing which is not equally applicable to other athletic events.

## CONCLUSIONS

The advance in validating road race performances is demonstrated by the recognition of the term **record** for road races in place of "best performance".

It should be noted that "record" is an English word which is also a verb meaning "to register".

Why have we for so long resisted the registration of road performances if minimal conditions for validation are met?

A century of waiting for complete recognition of the marathon (and subsequently, other road distances) on the same level as other athletic disciplines of the Games, is rather long.

Today we have all the means necessary to easily assess the validity of road race performances. This does not diminish the standing of track distances; it is in fact more likely, in an important way, to reclaim an undivided identity for athletes in years to come.

National federations are completely free to use the term "record" in any event they administer.

The French Federation no longer seems ready to do this, since in 1995 the board of directors refused a proposal to this effect from the CNCHS under the pretext that the IAAF still does not recognise records on the road. The United States and Great Britain were the first federations to ratify records for road races, then other countries - the last of which, in 1995, were Spain and Portugal.

For authentic use of the word 'record' as far as road race performances are concerned, the different structures involved in the development of the rules must be properly understood. Also the conditions under which some proposals were rejected, and as much at the national level as internationally.

Proceedings almost came off in Athens in 1990, when the IAAF Council ratified proposals specifying conditions for standardised road records. But the Tokyo Congress on 19/08/91 did not follow the IAAF Council on this point, professing that the technical criteria concerning drop and separation were too complicated and there were not enough experts in the world to measure courses adequately...

Perhaps Congress that day took on too much ballast concerning road racing. They had earlier decided to accept proposals for a half marathon world championship (at the request of the Asian and English-speaking countries), for a road relay world championship (at the request of the Japanese hosts of the Congress who were big sponsors of these sorts of events - at the time practically unknown in Europe) and lastly for the official recognition of world mountain challenge races and 100km races. It was probably asking too much for them to also accept the idea of road records.

The problem has not been raised again since, because there must be a certain number of federations expressing the same wish for the question to be reconsidered.

We are therefore in a kind of vicious circle, as the French Federation won't recognise road records because the IAAF won't, and the IAAF won't reconsider the resolution approved by the Council in 1990 because there are insufficient countries asking it of them.

If the majority of member countries of the IAAF recognise this kind of record, the IAAF's position will most likely then prove easier to change.

The problem also lies with those who occupy decisionmaking positions in these structures; they are not always knowledgeable about the everyday technical conditions that we face.

# Running

**Ed Phillips**

# Miss as good as 26 miles for these marathon men

CARLSBAD — It's 11 o'clock on a gorgeous October Saturday morning, and although Bob Letson and Ron Grayson are standing in the sunshine just a couple hundred yards from the Pacific Ocean with their job about two-thirds completed, their day has just turned ugly.

They're standing with their bicycles alongside a red number 18 that Letson has just spray-painted in the bike lane of Carlsbad Boulevard — the old Highway 101 — just a little ways north of La Costa Avenue. Their location is the problem.

The two of them are out there with counters attached to the front wheels of their bicycles to certify the new course for the Dec. 8 San Diego Marathon, to make sure that its length comes out to exactly 26 miles, 385 yards (plus or minus the one-tenth of 1 percent error permitted by The Athletics Congress).

When they're certifying a course, Letson and Grayson talk in terms of thousandths or 10-thousandths of a mile. Or maybe meters or yards, they're unitarily multilingual.

And now they're standing there at an exact, certifiable 18 miles, 180,000 10-thousandths of a mile, if you want to take the big view of the small view. But according to Letson's preliminary survey and the distances they've already calculated back to the finish line in Plaza Camino Real, they should be another 250 yards along.

In layman's terms, they're off by a lot. The figures don't lie.

"It's my fault," says Letson, a tall, greying computer programmer who is given to worrying. "I screwed up. I should be whipped."

"It's not so bad," says the shorter, darker, more intense Grayson, a self-described "rocket scientist" (He's in aerospace). His favored approach to problem-solving seems to be the frontal assault.

"If we put the turnaround at the end of the traffic island at La Costa, that will make up some of it, and we can just move back the finish line," he says.

"We can't do that," says Letson. "We'll have to make it up someplace else."

"OK," says Grayson. "So we go ahead and certify the whole course and then we just have to make the adjustment and move a few mile markers. Look," he continues, gesturing toward the La Costa intersection. "We've got 76 yards right here . . .

("My eyes are calibrated," he explains to a guy from the newspaper who looks a little skeptical at the pronouncement of 76 yards.)

## Backward business

" . . . We've got 76 yards down and back, that's 152 yards, and we just tell (race director) Lynn Flanagan that she's got to move the finish for the other 200."

"None of this would have happened if we'd just ridden the course backwards," says Letson, leaving the certifiers' police escort, Officer Riggin of the Carlsbad Police Department, looking somewhat bemused.

Letson doesn't explain it at the time to Riggin, but riding the course backward actually does make sense. A race director will usually know exactly where he or she wants to put a finish line in order to accommodate timers, chutes, etc. The starting line, which needs nothing more than a fairly large open area on either side of it, can then be adjusted accordingly.

Letson and Grayson are riding forward on this particular course because it uses both northbound lanes of the highway for an out-and-back section, and when they're out riding in the traffic lanes they (and Officer Riggin) want to be going in the same direction as the traffic.

The certifiers measure with a device called a Jones Counter clipped to the front wheel of each bike. It measures revolutions, or fractions of revolutions of the wheel. Their calibrations are different, but on Grayson's bike, each click of the Jones Counter amounts to something over three inches of pavement traversed. One mile is 15,496 clicks of the counter.

As they approach each mile — that's 15,496 clicks, 30,992, 46,488 . . . don't worry, they use calculators and they've got it written out — they slow down, coming to a stop exactly where the signal numeral ticks over. Each marks the pavement with a spray-paint dot.

They don't always come out at exactly the same place. Both try to cut corners and stay as far to the inside on turns as they possibly can, so that the line they follow represents the absolute minimum distance a runner could cover. For certifying and record purposes, it's better if the course is just a little long than just a little short.

But the two of them do take slightly different lines, and as the morning goes on, Letson's stopping marks move ahead of Grayson's. Beside each of his farther-on marks, they spray a numeral: one at each mile and one at each five kilometers.

## The Odd Couple

Now, coming back over their somewhat short course, they stop while Letson sprays a red 19 on the asphalt bike lane. "That'll never show up," he says, almost to himself.

Grayson shrugs and sprays a highly visible red 19 on the concrete traffic lane, underlining the numeral 9 to indicate direction.

"I don't like all that paint," says Letson.

"Bob, it wears off," says Grayson, playing Oscar Madison to Letson's Felix Unger.

They get a minute or so into what has become an off-and-on discussion of where they screwed up and how they can fix it when Grayson offhandedly suggests, "Why don't we just run a turnaround up Poinsettia?"

Poinsettia Lane is the next intersection. Its access to the coast road will be closed on race day, anyway. They'll only have to adjust three of their mileage markers.

It takes 23 minutes to eliminate the southbound straight stretch across the Poinsettia intersection and replace it with a U that's 0.1218 miles long, but once they've done it, Letson and Grayson know they have the course spot on, again.

They don't even bother to check it against a segment they already measured for the half-marathon, although Grayson does, when asked to by the newspaper guy. It comes out, to the yard.

The figures don't lie.

FROM TOM KNIGHT

# Using a Computer to Create Course Maps

**by Jim Gerweck**

Hardly a day goes by that a new use for computers to make life easier is found, and it seems that course measurement and certification is no exception.

A computer's greatest asset is in reducing paperwork, and an information and form intensive activity like course measurement can benefit immeasurably from this capacity.

Most notable is the list of all U.S. certified courses, maintained by Bob Baumel, which can be downloaded and then sorted and indexed in an almost infinite fashion by anyone with a modem. Baumel has also contributed to computerizing the field with a program that performs calculations and reports of a course measurement, and creating templates of forms for state certifiers to use. Several measurers have followed his lead, doing the same for the measurement application forms.

But perhaps the biggest boon from computers comes in the area of course map making. Instead of drawing, erasing and redrawing maps by hand, computer graphics programs can make the process quick, neat, and publishable in a wide variety of formats (more on this later).

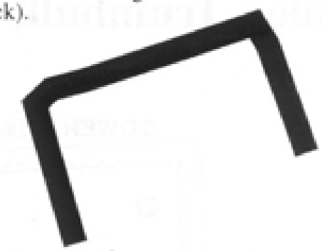
I have used several programs to create maps, including Adobe Illustrator and an elegant little application called SmartSketch, but have settled on Macromedia's Freehand as my software of choice. Apparently I am not alone - there is a Web page devoted solely to the use of FreeHand in cartography.

The process is relatively quick and simple. I begin by scanning a street map of the course and importing it into FreeHand (those without access to a scanner could tape a copy of the map to their monitor screen). This scanned map is set in a background (non-printing) layer in the FreeHand document.

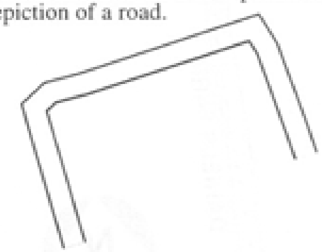
A new layer is created in front of the scan, and using either the pencil or bezigon tool, the course route can be traced with excellent accuracy.


Illustration 1

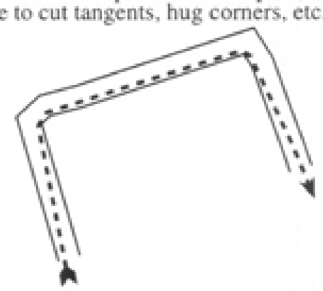
This path is then assigned a width and color (usually 12 points and black).



The clone comand creates an exact copy of this path, which is then modified to be a few points thinner and white, creating a depiction of a road.



The path is cloned once again, then modified to a dotted line one or two points thick, with arrowheads added if desired. By moving the anchor points on this path, the measured route can be made to cut tangents, hug corners, etc.



With practice, this entire process takes about 15 minutes. Mile points, street names, and start/finish details are added, and the map is essentially complete. Many of these are repetitive elements which, once created, can be electronically cut and pasted into subsequent documents.

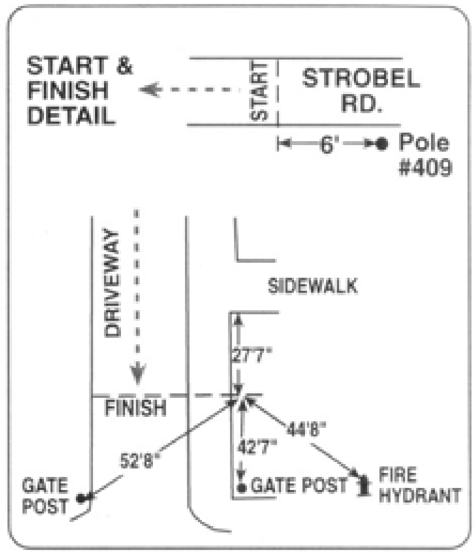
The finished map can then be output on a laser printer, with detail and quality unmatched by all but the most skilled human hand, at almost any reduction or enlargement, any number of times. And if modifications to the map prove necessary, just that section, rather than the whole document, need be reworked.

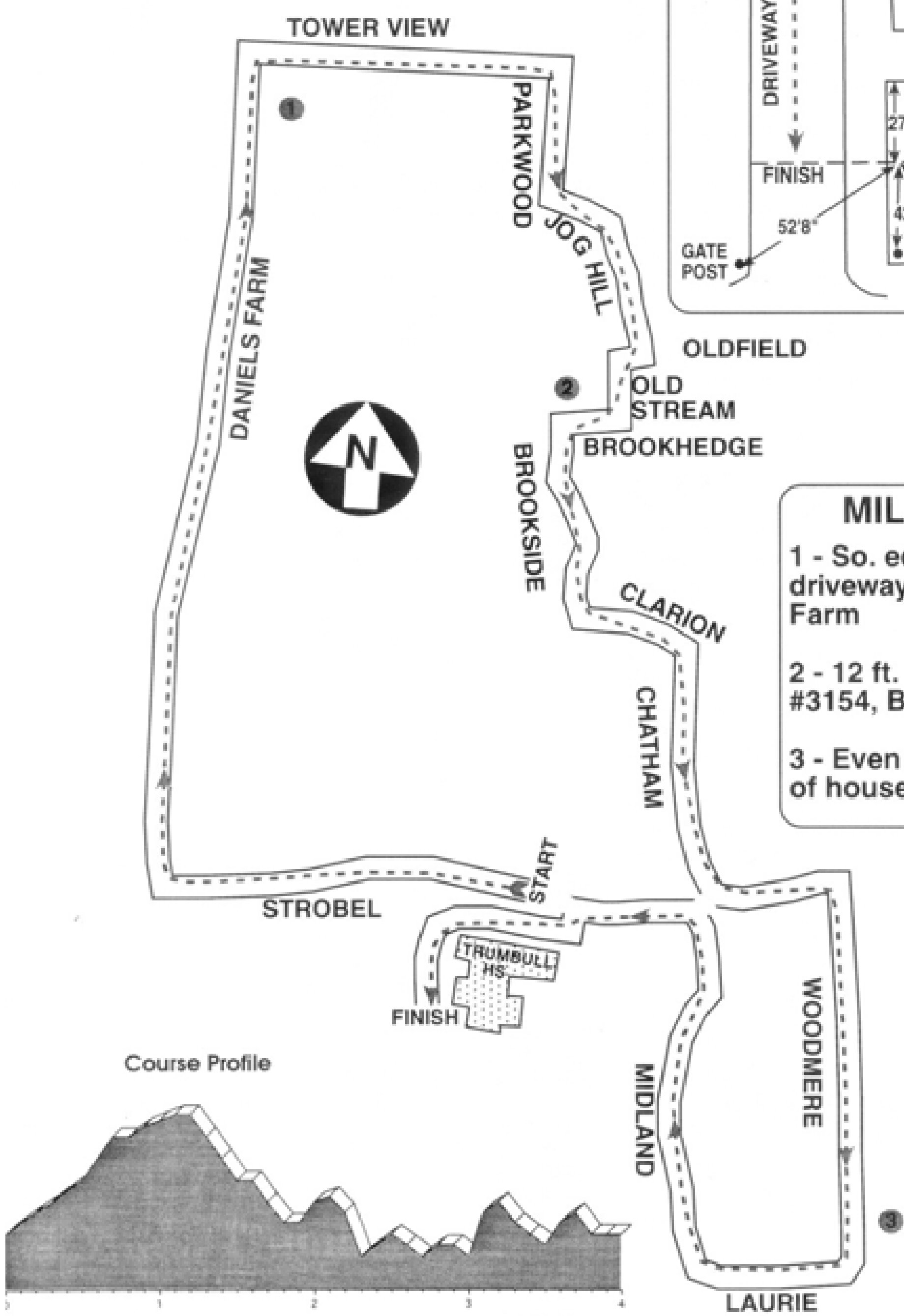
Another advantage to maps created this way is that they can be saved as GIF or JPEG files and uploaded directly to a Web site, allowing runners to preview a course hundreds or thousands of miles away. To enhance this type of presentation, multiple colors are often used, something easily accomplished in FreeHand.

Certainly it is not necessary to use a computer to measure courses or produce maps. But with one, and the right software, it is possible to complete the entire measurement process without setting pencil to paper once you get off the bike.

# GREAT PUMPKIN CLASSIC

## 4 Miles, Trumbull, CT




### MILE POINTS

1 - So. edge of driveway, #835 Daniels Farm

2 - 12 ft. so. of pole #3154, Brookhedge Rd

3 - Even w/ front door of house, #64

Measured by Jim Gerweck,
19 October 1994