Measurement News

Three of Brazil's top measurers discussing their measurements of the Rio de Janeiro Half Marathon. At left is Paulo Silva of Porto Alegre, one of the measurers of the IAAF Road Relay Championship in Manaus. In center is Gabriel Monteiro, longtime Rio measurer and one of the steadiest riders this Editor has seen. At right is Rodolfo Eichler, IAAF measurement coordinator for South America.

* * * * * * * * *

STATUS OF USATF CERTIFIED COURSES

Based on course list of 1 May 1998

Status	Number of Courses
A	9925
A94	30
A94V	11
A95	8
A95P	1
A96	29
A96V	1
A97	36
A97V	2
A98	7
A98V	1
AP	28
AV	73
D	1639
D94	2
DF	5
DP	14
DV	13
F	15
M	3
X	3419
XD	795
XDP	21
XDV	19
XF	14
XM	533
XMD	3
XP	43
XV	22

Total Courses =	16712
All Active =	10152
Renewed =	126
Deleted =	2511
Expired =	4869

Status Codes

"A" = Active.
"D" = Deleted from list by state certifier.
"M" = No map on file, course not in good standing.
"P" = Passed validation.
"F" = Failed validation.
"V" = Passed validation at more than 1 m/km. Considered pre-validated
"X" = Expired - ten years has elapsed since original certification.
"93" = Restored to list after 10 year expiration. The "93" refers to the year the course was renewed.

Sometimes, two or more letters are used in combination. For example, "PD" means passed validation, but later deleted."

Note: "Active" does not necessarily mean that the course is still used. It means only that the course has neither expired nor been deleted by the state certifier. A number of race courses have several numbers. In these cases, the latest number may be presumed to be the currently-used course.
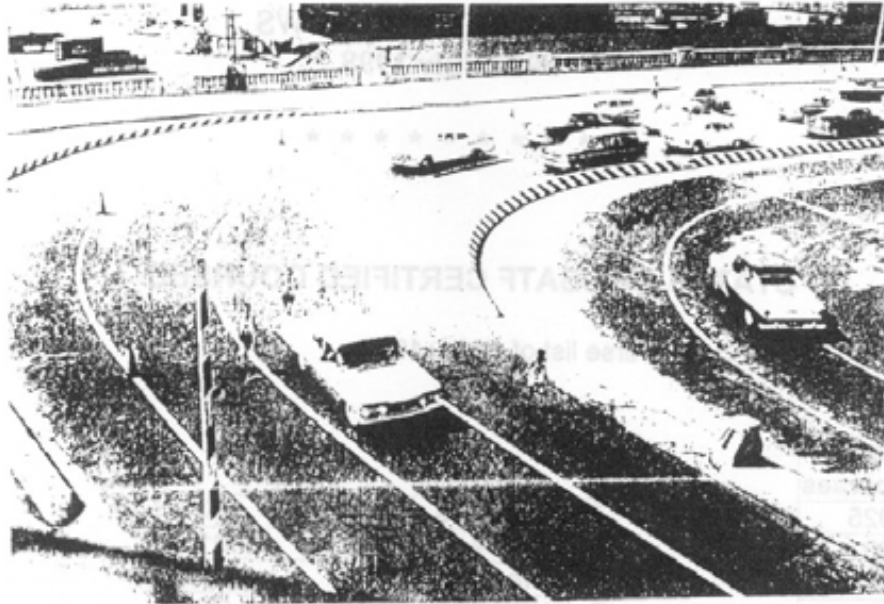
(Caption repeated): Altho contestants in the 26 mile Pan-American games marathon race are supposed to stay in the right lane in Lake Shore Drive, three of the entrants invade lanes for automobile traffic as they cut across one of the sharp turns on approach to river bridge. Motor traffic on the drive during the race was very light.

Photo from **Malcolm Heyworth**, who says:

"I'll also mail a copy of a photo from the Chicago Tribune just to show historically how races were run around here in relation to the cones (the Pan-Am Games were held at Soldier Field in 1959). At least I thought it was hilarious. Times were taken to 1/5 of a second, meaningfully of course."

PUZZLE OF THE MONTH

from **Joe Kasile**

Using a laser transit a friend established a box on flat ground with the corners exactly 1 km apart. The corners are marked with posts. By yourself you wish to establish a personal running course of 10 miles in length. You wish the start and finish point to be identical and that point must not be outside the box. To keep from being bored you wish to run the same direction only once, but out and back is OK. You are left with only a steel cable 0.6 km long and a 100 meter steel tape.

NOTE: Since the posts are exactly 1 km apart to within 5 decimal places because a laser transit was used; and since you will run outside or around the posts, the 1.001 safety factor is unnecessary. Comment?

Design the route and establish the S-F mark. Try to do this without resorting to sin, cos, tan etc.

Variation of Calibration Constant with Surface Texture, Part 2: Effects on Course measurements by Seven Riders using Twelve Tyres

By M.C.W.Sandford, 22 Stevenson Dr., Abingdon, OX14 1SN, UK. Email: m.sandford@lineone.net. 22 June 98.

Introduction

In Part 1 of this article which appeared in last month's *MN* 89 p 12, I reviewed the published data on the sensitivity of tyres to the surface texture. Here I will report measurements of a race course using different tyres. I will summarise the different behaviour of solid and pneumatic tyres. I shall also point out the circumstances which could lead to short courses.

Abingdon 4.5 km Course

Last September I needed a course for use during a measurement seminar for beginners. I chose a loop route which was moderately twisty and contained a number of features that would test adherence to the SPR. It can usually be ridden without encountering obstructions which would slow down measuring and could introduce additional error. The course is shown in figure 1. Part of the course lies along the South side of my Long Tow calibration course. This is the calibration course which I discovered gives me a calibration constant which varies according to whether I ride on the rougher surface near the edge of the road 0.3 to 0.5 m from the kerb, or where vehicles have worn a smooth track approximately 1.1 to 1.3m from the kerb, see *MN* 75 p36 and *MN* 89 p15.
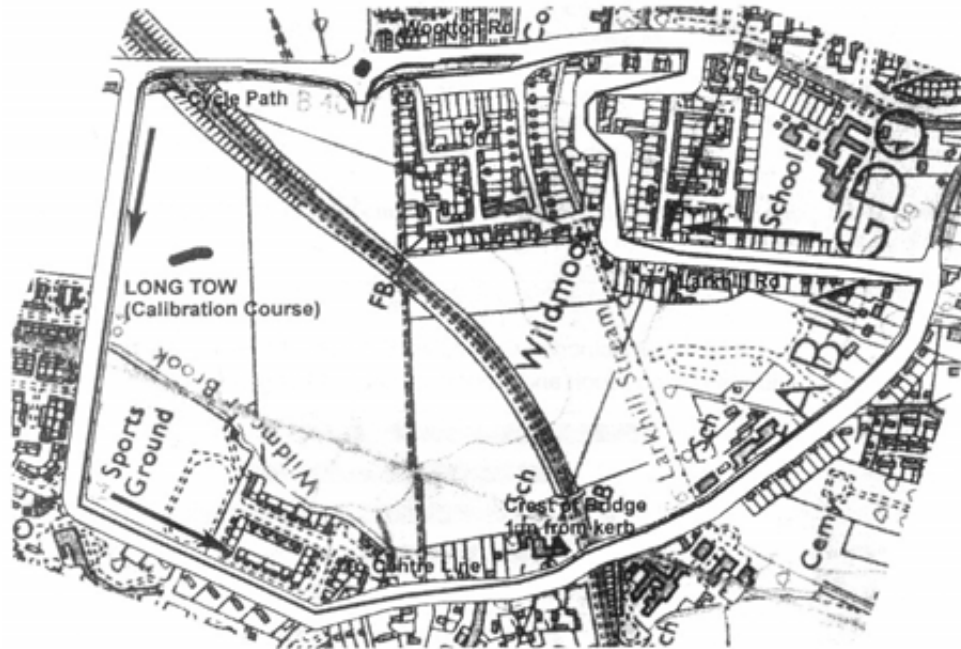

Figure 1. Abingdon 4.5k Course. The route is mostly 30 cm from the left hand kerb, except the full width is used along minor residential roads. A diversion round permanently parked cars is marked with white paint on the road.

My initial aim was to have a well defined course so that I could readily identify faults with beginners' measurements. But I then realised it could be used for a practical test of the importance of surface texture, since I could choose either the rough or smooth surface of Long Tow carry to out calibration and then ride the loop which has various surface changes throughout its length. I have the impression that the average roughness of the course is probably intermediate between the two Long Tow surfaces, but this is a hard judgment to make even qualitatively, since I have no way other than bike measurements of checking and so calibrating my eyeball judgments.

Since I wanted to study how different tyres behaved I carried out rides with six of different tyres. With each tyre my ideal full measurement sequence was as follows, 4 ride calibration on rough Long Tow, 4 ride calibration on smooth Long Tow, 2 rides of loop, repeat both calibrations. This sequence takes approximately 90 minutes to carry out. Sometimes I was only able to carry out one loop ride between the two pairs of calibrations variations. In these
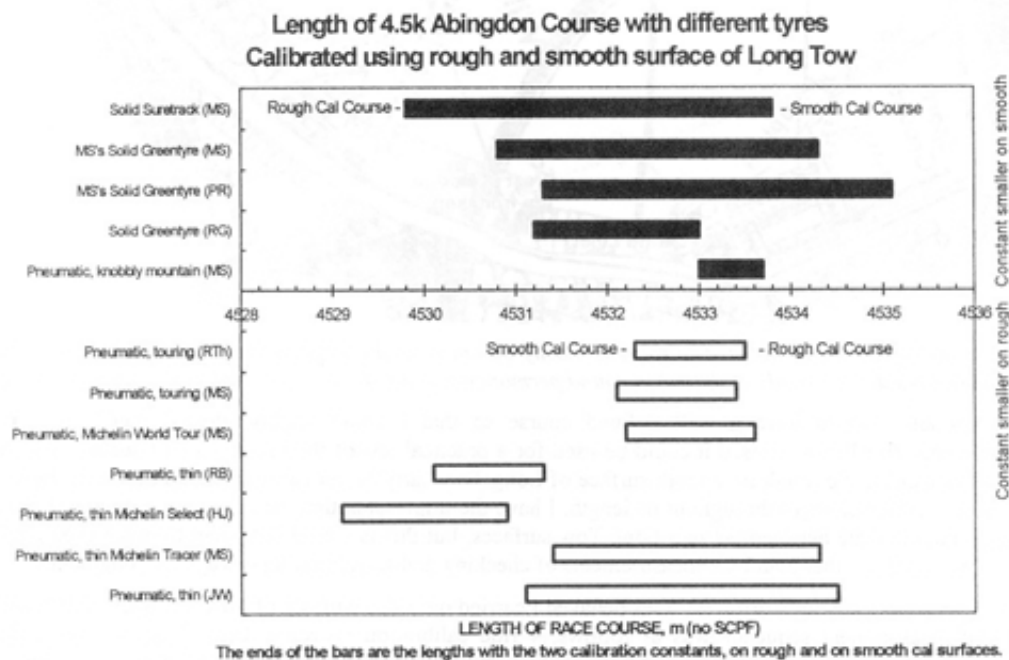
cases I always ensured I repeated the whole sequence on another occasion so getting a second completely independent loop measurement. For all my own rides I thus obtained with each tyre at least two and sometimes three rides of the loop with pre and post calibration on both Long Tow surfaces. The agreement between identical rides was typically better than 0.5 m, even for rides weeks apart. The average values are given in table 1.

In order to widen the range of tyres and to see if different riders would produce the same results, I had measurements made by the 5 experienced measurers who were attending an in-service training seminar on 13 September 1997, we carried out the sequence, 4 ride calibration on one surface of Long Tow, one ride of loop, a pair of 4 ride calibrations on both rough and smooth Long Tow surfaces.

Finally when Pete visited in April he and I both carried out a single ride of the loop sandwiched between two pairs of calibrations. On this occasion Pete used my bike and my solid Greentyre, thus providing a test to see to what extent the effects would be reproducible when only the rider was changed.

	RIDER	ROUGH	SMOOTH	DIFFERENCE
RG's Solid Suretrack	M.Sandford	4529.8	4533.8	4.0
MS's Solid Greentyre	M.Sandford	4530.8	4534.3	3.5
MS's Solid Greentyre	P.Riegel	4531.3	4535.1	3.8
RG's Solid Greentyre	R.Gibbons	4531.2	4533.0	1.8
MS's Pneumatic, knobby mountain	M.Sandford	4533.0	4533.7	0.7
RTh's Pneumatic, touring	R.Thornhill	4533.5	4532.3	-1.2
MS's Pneumatic, touring	M.Sandford	4533.4	4532.1	-1.3
MS's Pneumatic, Michelin World Tour	M.Sandford	4533.6	4532.2	-1.4
RB's Pneumatic, thin	R.Bright	4531.3	4530.1	-1.2
HJ's Pneumatic, thin Michelin Select	H.Jones	4530.9	4529.1	-1.8
MS's Pneumatic, thin Michelin Tracer	M.Sandford	4534.3	4531.4	-2.9
JW's Pneumatic, thin	J.Webber	4534.5	4531.1	-3.4

Table 1. Length m of Abingdon 4.5k course using the rough or the smooth part of Long Tow for calibration. The difference is the smooth calibration - the rough calibration.

Length of 4.5k Abingdon Course with different tyres
Calibrated using rough and smooth surface of Long Tow

LENGTH OF RACE COURSE, m (no SCPF)
The ends of the bars are the lengths with the two calibration constants, on rough and on smooth cal surfaces.

Shortest Possible Route

I estimate the course has 3 full 360 degree of turns. So if every corner is ridden an *average* of 5 cm inside the SPR the course will be measured short by 1 m. Conversely, if the rider is on average 5 cm outside the SPR, the course will be measured long by 1 m. This total range of +/- 5 cm from the SPR may seem rather small, particularly in relation to the tyre width of 3 cm, but I believe it is realistic for the following reasons:

- It is the average kerb clearance which causes an error in length. Superimposed on the average kerb clearance may be larger 'wobbles' of up to +/- 15 cm which will have little effect provided they are also present in the calibration course riding.

- The course mainly had sharp corners. The experienced measurers took great care round these corners. At other places since the total curvature was less, errors in kerb clearance were less important.

- On most corners the 30 cm distance from the kerb could be judged by reference to a 25 cm wide concrete gully. The bikes were ridden just outside this concrete. On some corners where there was no gully I marked the line with a lumber crayon. Although the experienced measurers had only one measurement ride round the loop. I showed them the critical points before their ride, and accompanied them to provide guidance and observe their performance which appeared very good.

- My own rides were reproducible with a standard deviation of less than 0.3 m. While this does not by itself prove that I ride the correct SPR, it shows the variation of my route is insignificant.

My overall conclusion is that when comparing my rides, one with another, SPR errors are significantly less than 1 m. When comparing rides of different experienced measurers, errors of 1 m are possible and 2 m is probably the upper limit. This is confirmed by the rides of PR and MS, which agreed within 0.8 m when using the same solid Greentyre. Most of the differences which were seen between pneumatic and solid tyres were undoubtedly due to surface texture affecting the calibration constant.

Conclusions about Tyres

In Table 1 the tyres are ordered by the difference of course length with smooth surface calibration - course length with rough surface calibration. All the solid tyres have a positive value of 1.8 to 4 m for this difference. Only one pneumatic tyre has a positive value, the knobbly mountain tyre which has a value of 0.7 m. I note that the thick tread of this tyre may have some of the characteristics of a solid tyre.

By contrast all the pneumatic tyres have a smaller value for the difference than any of the solid tyres. In fact except for the thick tread mountain bike tyre they all have negative differences between - 1.2 and - 3.4 m. Further data is needed to identify the reason for the slightly different behaviour of the different pneumatics. It is possible that thickness of the tread on the pneumatic, which could give it properties like a solid tyre may be balanced against properties of the pneumatic which arise from the tyre casing being stretched by internal air pressure. I hypothesise that the stretched casing will give a negative value for the difference in my experiment. But when a pneumatic tyre is has thick tread the effect of the solid rubber just outweighs that of the pneumatic casing giving a difference of + 0.7 m. But for the two touring tryes which have a tread a few mm thick the pneumatic effect is dominant giving a difference of - 1.3 m. Perhaps a tyre with intermediate tread thickness would be independent of surface roughness.

Of the pneumatic racing tyres which do not have much tread, two give large negative values which fits the hypothesis. The other two give smaller differences also the overall lengths are 2 to 3 m shorter than the other pneumatic tyres. This is not explained by my hypothesis and needs further study.

Conclusions about Courses

The most serious problem which this work shows is that with the modest but noticeable difference in roughness of the Long Tow calibration surface 0.9 m further towards the centre of the road, the length that an experienced measurer gets for a course can vary depending on tyre and surface from 4529.1 m to 4534.5 m a range of 5.4 m when the SCPF is 4.5 m.

We should minimise the consequences of these effects by always using a calibration course that is representative of the average surface of the course to be measured. Sometimes this might best be done by laying a calibration course out on the actual race course. Secondly we should pick a tyre which is not sensitive to surface. Some pneumatic tyres appear to be superior in this respect to solid tyres and other pneumatic tyres. Thirdly, until we can fully quantify these effects, validation is probably better done using the same calibration course surface as for the original layout. It would be unfortunate if surface texture contributed to a course failing validation.

THE ANSWER TO "DACKO"

Quote from the "Windsor and Eton Express" published on July 25th, 1908 and reporting on the Olympic Marathon:

"The actual starting point for today's race is just below the East Terrace of Windsor Castle near the bronze statue of Dacko who was buried there."

Note: Much of the mystery surrounding the length of the 1908 Olympic Marathon course arises from the fact that the race wasn't meant to start at the East Terrace. Hence, the word "actual" in the newspaper report.

Watch this space!

John Disley

CORRECT ANSWERS

from **Jim Gerweck**:

Dear Pete,
I forgot to write you before, but does the statue of Queen V's dog mark the start of the Oly Marathon, the first run over the 42,195 distance?

I'm sure lots of others, esp. the Commonwealth readers, got this first. *Ed note: No, they didn't.*

From **Malcolm Heyworth**:

   I could only guess that Dacko marks the start of the 1908 OM but can't see the statue in the video, not that the coverage is enough to rule this out completely!
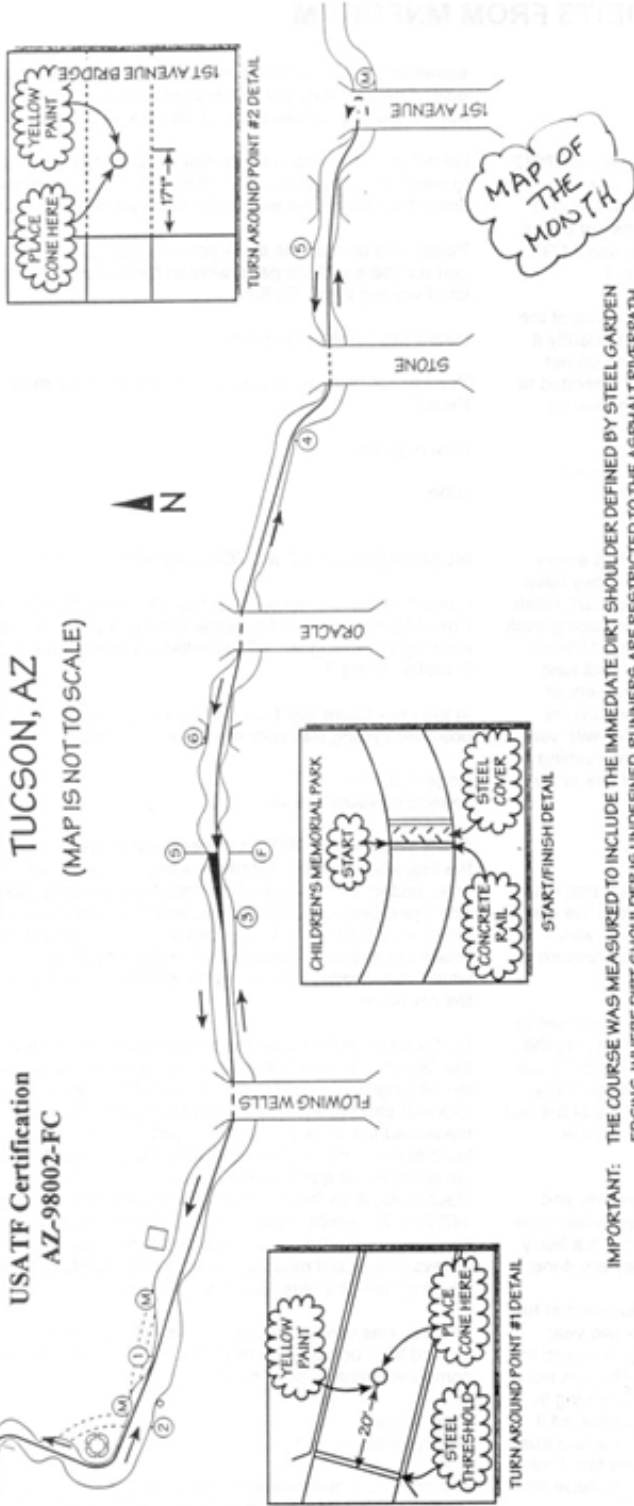

John Disley showing the way. In the 1908 Olympic Marathon the runners came down Castle Hill from Windsor Castle (in background), and turned right at the Queen Victoria statue.

SENIOR OLYMPICS 10K
RILLITO RIVER PATH
TUCSON, AZ
(MAP IS NOT TO SCALE)

USATF Certification
AZ-98002-FC

N

MAP OF THE MONTH

1ST AVENUE BRIDGE
YELLOW PAINT
PLACE CONE HERE
17'±
TURN AROUND POINT #2 DETAIL

STONE
1ST AVENUE
ORACLE
FLOWING WELLS

TURN AROUND POINT #1 DETAIL
YELLOW PAINT
PLACE CONE HERE
STEEL THRESHOLD
20'

CHILDREN'S MEMORIAL PARK
START
STEEL COVER
CONCRETE RAIL
START/FINISH DETAIL

IMPORTANT: THE COURSE WAS MEASURED TO INCLUDE THE IMMEDIATE DIRT SHOULDER DEFINED BY STEEL GARDEN EDGING, WHERE DIRT SHOULDER IS UNDEFINED, RUNNERS ARE RESTRICTED TO THE ASPHALT RIVERPATH.

START   ON THE WEST SEAM BETWEEN THE CONCRETE DRAIN "RAIL" AND THE STEEL DRAIN COVER ON THE RIVERPATH IMMEDIATELY WEST OF THE EXERTRAIL STOP 2 (BENCH LEG RAISES) IN CHILDRENS MEMORIAL PARK

MILE 1   ON THE RIVERPATH, 62' EAST OF EAST EDGE OF CONCRETE POWER POLE BASE IMMEDIATELY EAST OF JACK CONRAD'S GOLF, 1600 WEST RIVER ROAD

TAP #1   20' EAST OF W EDGE OF STEEL THRESHOLD ON WEST END OF RIVERPATH FOOTBRIDGE IMMEDIATELY NORTH OF "STONEHENGE"

MILE 2   ON THE RIVERPATH, 90'8" EAST OF EAST EDGE OF CONCRETE POWER POLE BASE IMMEDIATELY WEST OF JACK CONRAD'S GOLF, 1600 WEST RIVER ROAD

MILE 3   14'10" WEST OF WEST EDGE OF STEEL DRAIN COVER ON THE RIVERPATH AT EAST EDGE OF POWER PLANT FENCE ON WEST END OF CHILDRENS MEMORIAL PARK

MILE 4   ON THE RIVERPATH, 9'6" WEST OF WEST EDGE OF LIGHT POLE NEAREST SOUTHERNMOST EDGE OF SAM'S CLUB, 4701 NORTH STONE

TAP #2   ON THE RIVERPATH (UNDER THE FIRST AVENUE BRIDGE), 17' EAST OF WEST EDGE OF 1ST AVENUE BRIDGE

MILE 5   ON THE RIVERPATH, 59' EAST OF EAST EDGE OF THIRD POWER POLE EAST OF STONE BRIDGE

MILE 6   ON THE RIVERPATH, 2470' WEST OF WEST EDGE OF STEEL THRESHOLD OF RIVERPATH FOOTBRIDGE AT EAST END OF CHILDRENS MEMORIAL PARK

FINISH   ON THE WEST SEAM BETWEEN THE CONCRETE DRAIN "RAIL" AND THE STEEL DRAIN COVER ON THE RIVERPATH IMMEDIATELY WEST OF THE EXERTRAIL STOP 2 (BENCH LEG RAISES) IN CHILDREN'S MEMORIAL PARK (SAME AS START)

MEASURED BY JIM IRISH
TUCSON, AZ
1/18/98

TIDBITS FROM MNFORUM

DATE OF CERTIFICATION

Dear Certifier John, (not his real name)

We just got an envelope from Mike Wickiser. In it was XX 97012 XX, Anonymous 7k. The certificate says the course was measured on 4/97-11/97. It says the postmark was 4/97-11/97. The date of certification is 5/24/97. I can't make sense of this. A simple typo doesn't explain it. If the latest postmark was 11/97, why the long delay in getting the cert into the system?

Please do what you have to do to get courses certified as of the date you receive the LAST piece of data necessary to certify it. We should not still be receiving 1997 courses. Please do not assign numbers before you have ALL the information needed to certify the course, no matter how desperate the race director says he is.

Assign course numbers in the year you issue the certificate.

Pete

Dear Pete - I'll take the blame for the delay. I have had a very hard time getting information from the race director. They have made no measurements that change the established start, finish or turn around since the race date. But we have been going back and forth at a slow rate for months to get the definition of those points. Once the race is over, there interest wanes until next year. They are now in the process of changing a segment of their marathon course. I think they have been walking on my back long enough so am making them follow the rules with very little bending. The race is on May 24th so they will be rushing things to me in incomplete form again. They will not see or hear any course number until I have a copy off to Mike.

Dear John: GOOD!

Dear Pete - As a technical point, I think I'm am correct that if all the adjustments and markings have been made before the event, it is OK to date the certificate at that time. My downfall was letting them know I was going to do it. That took the pressure to finish the job away.

Dear John - Almost right. If you have EVERYTHING you need to issue the certificate, you can give out the number. Finishing the marks and measurements is not enough. They must provide the map as well. If you can't issue a certificate with what you have, the job isn't done. Issue a number that reflects the date of the last submission they send you, and then process the certificate quickly.

Giving out numbers ahead of time screws up the system, and permits abuses such as you mentioned by organizers who, once they have the number, all of a sudden seem not to be in a hurry any more. Once they get the number they figure they are done.

Dear Pete - I have another marathon in northern Elbonia that has been working hard to get things right. It has been a two year struggle and everything was completed last week, just before the race, except the exact location of the starting line. There is not a line pole or sign post within a half mile. They were planning to have the city wheel out more then a half mile so I suggested it might be easier to put in their own permanent post. I would trust a Jones counter location before the city wheeling that far. I was planning to give it an issue date before the race. They have no number now and no certificate exist yet. Is this OK?

Dear John - I've seen courses like this. A long dimension from

something fixed and reliable will have to do if there is nothing else. It helps if they put in a stake or something - maybe a PK nail - to assure a searcher that they are in the right spot.

Do not give a pre-race issue date unless they get ALL you need to issue the certificate before the race. This includes a map good enough to put on the back, with accurate reference distances.

People will take all the slack you are willing to cut them. Orphan cert numbers with no paperwork to back them up have caused a lot of wasted time. Be firm.

Dear Pete - Got it. Be Firm.

You cannot have an issue date prior to the final map details. Period.

Best regards,

John

MEASUREMENT OF MOTOR RACING TRACKS

I read that the course of last week's Formula One Motoring Grand Prix at Monaco was 3.1m longer than last year's course due to road lay out changes . What method is used to measure courses in motor racing ?

In the near future the Tour de France cycling race starts. How does the cycling fraternity measure its courses ?

Roger Gibbons
zeando.globalnet.co.uk

Some years ago (1990) I had occasion to measure the course of the Indianapolis Mini-marathon, a half marathon which, at that time, ended on the track of the Indianapolis Motor Speedway. The Speedway is a rounded rectangle having a nominal circuit length of 2.5 miles. It is bounded on the inside by a white line. Inside the line is a "rumble strip" consisting of grooved pavement which discourages incursions beyond the inner line, as it slows the car down.

I did manage to get one measurement of the entire circuit, using the "30 cm from the line" technique, and was surprised that the circuit length came out quite close to 2.5 miles (2.473 miles, or 143 feet short of 2.5 miles). I had thought perhaps they measured the track along the fastest line, but it appears that, at least at Indy, the Shortest Possible Route prevails. Perhaps a 30 cm offset is not quite what's needed for race cars traveling at Mach 0.25. A 24 foot offset on the turns would account for the 143 feet. So would measuring the fastest line, to an extent. I have no clue how the track was measured, nor how others are. I have always suspected most are short, as this leads to inflated speeds which please the fans. But now I wonder.

The day was windy, I recall, and as I was grinding my slow way around the huge oval I was thinking of the race cars that make a complete circuit each minute.

Pete Riegel
riegelpete@aol.com

I found Pete's observation concerning the measurement of the Indianapolis Motor Speedway interesting and would like to make one small correction. A car going around the speedway at 220 MPH would take a little less than 41 seconds to complete a lap

(200 MPH = 45 seconds). At the time that I started measuring in the early eighties, I was a crew member on an SSCA racing car and we had a number of races at Mid Ohio Race Course. This twisting, up and down course would have been a challenge and fun to measure and many times I wished I had brought my bicycle to do so. I asked numerous people the same question Pete asked, i.e. how the race course is measured and I received many theories but no definitive answer. The most learned opinion was that race courses are measured in the middle of the road. However they do it, they must believe that it is done with great accuracie since they are talking about being short by 3.1m!

Paul Hronjak
hronjak@mindspring.com

Hi Pete,

Based on what you explained about measuring the Indy speedway track I would guess it is actually a long course for cars if one were to allow for the width of the race car and measure along a line 12" plus half the width of the car.

This could present an interesting measurement problem if you indicate the lengths of the straight sections, and assume the car width to be 72". With that information plus the results you obtained using the 30 cm offset the problem should not to difficult . . .

I must remind everyone again I will be out of the country from June 9 to July 14. No counter orders will go out during that period.

Paul Oerth
Poerth@aol.com

MOTOR RACING MEASUREMENT: IMPLICATIONS FOR CYCLE MEASUREMENT.

I once shared an Alpine chalet with the technical director of one of the companies supplying racing tyres for Formula 1. He gave me a joke to use when I had to perform at some terrible fondue party.

"What is difference between God and Michael Schumaker?"
"God doesn't think he is Michael Schumaker."

This one is probably lost on Indy 500 fans. More seriously I tackled him about cycle tyre properties and measurement but further enhanced my reputation as a bore amongst the others in the chalet party.

The most important thing I learnt about racing tyres is that their calibration constant is virtually fixed independent of tyre presssure and temperature. Racing tyres have reinforcing belts running circumferentially around the tyre. The length of this reinforcing is fixed. The tyre acts as a catepillar track and, except for skids, every revolution of the wheel advances car by the length of this reinforced circumference. Distortions due to pressure, temperature do not change the circumferential length although they may change the contact patch.

Thus for a given tyre, the technicians know (or calibrate ?) the revs per lap or per km. They then actually use this to calibrate the cars distance/velocity sensors. I did not ask the details of the calibration because I was more interested in the concept that a tyre's circumference could remain fixed. Clearly this does not happen with pneumatic bicycle tyres. As you pump up an ordinary cross ply bicycle tyre the fibres and rubber stretches and the circumference increases. Slightly more mysteriously the effective circumference depends on the weight supported by the

tyre. Armed with this information the next pneumatic tyre I bought to test on my bike was Michelin Tracer with a kevlar reinforcing belt around the circumference. My cycle shop told me that its purpose was to increase the resistance of the tyre to punctures.

I hoped that since kevlar has a low coefficient of thermal expansion that it might serve to resist the expansion of the circumference with pressure and temperature. Unfortunately it did not. The tyre was just as bad as ordinary crossply pneumatics. I had wasted a good $30. Now, if anyone knows where to get a tyre with circumferential steel fibres......

The other thing I remember is that this tyre designer was convinced that the main factor affecting the calibration constant of car racing tyres was the camber of the circuit. He was quite convinced that road camber and lean of the bicycle would be a major issue for bicycle riders, and that we should all convert to riding tricycles, or even a tricycle with a lightly and constantly loaded fourth wheel to make the measurement. I rejected this argument because of the importance we attach to following the SPR which can be done most accurately with the front wheel of a bicycle. Also the effect of camber and lean has been calculated in early issues on MN and is normally negligeble. We should stick to our basic two wheeler methods, but I would love to find better tyres.

Mike Sandford
m.sandford@lineone.net

More automotive...

For some reason I remember that auto race tracks (ovals, at least) are measured 15 feet in from the outside wall. A number of years ago a couple of the courses on the NASCAR circuit (Atlanta and Rockingham, at least) were remeasured and were actually found to be longer than the previously assumed distance. 500 mile races at Atlanta were shortened from 334 to 328 laps and at Rockingham from 500 to 492 laps. As far as Indianapolis is concerned, I'm sure the sanctioning body for the Indy 500 measures the Indianapolis Motor Speedway whatever way it takes to have it be 2.5 miles. For it to be anything different would be like saying the Boston Marathon course was short. Oops...

On most speedways the racing line runs along the outside wall on the straightaways and along the inside line on the curves. At Indianapolis the two long straights are supposed to be 5/8 mile each, the two short straights 1/8 mile each, and each of the four curves 1/4 mile each. It would be interesting to measure the Speedway along the "groove" to see how far the cars actually travel each lap.

One more thought: There are lots of new speedways being built now (or just opened) and most of them are 1.5 miles in length. Why don't they make them 1.66666 (one and two-thirds) miles so a nice round number of laps is 500 (or 400 or 300) miles? Or better yet, how about 2500 meters, which is approximately the same distance, and would lend itself to metric distances, which are becoming more popular, probably because it makes the race sound longer than it is.

As for straight midwestern roads- they're not always as free of traffic as you would like to believe- especially in the larger metropolitan areas. How about a cal course on the pit road at the Indianapolis Motor Speedway?

Jay Wight
jaywight2@aol.com

Milwaukee Mile?

The Milwaukee 200 was run a couple weeks ago. 200 laps on a one mile oval. The measured this course using the RRTC methods and found it to be 0.9775 miles long. The pit is on the inside of the front straightaway. The path I followed was outside the pit wall and then into the pit exit lane which blends into the main course as it reaches the back straightaway. The path taken by those oversized go-carts must be at least a mile. When I finished all my calculations, I got to drive my little Corolla around the track to mark the miles. When the stopped to mark the last one, I looked over and sure enough, there was a police car. I told him what I was doing and he drove away. I couldn't get my speed up anyway with all the stops. The course was measured for an in-line skater to try to set a 5k record. He didn't do it. Probably because those guys never skate in a straight line anyway.

I used a one of the newer counters that had a broken tooth in an emergency and had no problem with the numbers it produced. The adjacent teeth keep it operating smoothly. Not a good practice however.

And yes, I also have found myself driving the SPR.

Bill   WilliamEGrass@eaton.com

Track Accuracy

Here is a discussion from the t-and-f mailing list regarding the accuracy of track measurement and the merits of measurement to 1/100th second to separate photo finishes.

Date: Mon, 08 Jun 1998 17:41:57 -0500
From: "Wayne T. Armbrust" <wta@tranquility.net>
Subject: Re: t-and-f: Auto-times to five digits?

Kurt Bray wrote:

<<<Sure we can measure time quite accurately, but when it comes to determining the winner of a race, taking things out to thousandths of seconds may well be false precision. By my brief calculations I estimate that runners at sprinting speed would travel a little less than a centimeter in .001 seconds.

If I've calculated that correctly then the next question that occurs to me is what is the tolerance for measuring track lanes? All the lanes must be the same length plus or minus a certain tolerance. (Is there a rules maven out there who can tell us the allowable variation in lane lengths?) Will that tolerance support timing lane races out to 0.001 seconds? The lanes certainly will be of slightly different lengths, and it may take about 0.001 seconds or more to run the extra distance in the longer lane. Thus at some point measuring time more and more precisely becomes false precision. The fair thing to do would be to call it a dead heat.

Kurt Bray>>>

IAAF requires that the length of a lap for a certified track be 400 meters with an allowance of up to 4 cm long but no short allowance (Re: IAAF Track and Field Facilities Manual). There does not seem to be anything relative to lengths of lanes being the same plus or minus a tolerance. As a track and field consultant, I can tell you what accuracy of measurement is possible. If care is taken, without consideration to the time involved, marks in lanes can be located to within 3 mm or so. A greater source of error comes in locating the lane lines themselves on curves. Anyone who thinks that he can paint the curve of a track to better than + or - 5 mm tolerance in the radius is kidding himself. These errors will tend to cancel out, with as much of the radius on average being greater as less than

the true radius. However, since the error in the length of a turn is equal to the mean error in the radius times pi, it would be very difficult to keep the random lane-to-lane error in the arc length of a curve under 5 mm. Thus, does it make sense to try to break a tie by going to 1/1000 th of a second? Well, maybe, but just barely, and then only if the greatest care possible is used in calculating, locating, and painting the lines. I can tell you that due to the cost involved, few if any tracks are so striped. MANY tracks, including those used for major meets, are grossly mismeasured. --
Wayne T. Armbrust, Ph.D.
wta@tranquility.net
Computomarx
3604 Grant Ct.
Columbia MO 65203-5800 USA
(573) 445-6675 (voice & FAX)
http://www.Computomarx.com
"When building a track, contact us first"

ROCK 'N ROLL PHANTOM FINISH LINE

Dear Pete

This follows our phone call yesterday.

As you know I was the referee for the Rock 'n Roll Marathon. Letson measured the course and certified it. On the morning before the race he re-measured.

Apparently the SPR he measured on his original ride was not available to him due to the placing of fluid station tables. Therefore his race day measurement was 39m long. The finish line structure and chutes were all set up and could not be moved. So someone decided to set up a 'virtual' finish line 39m before the physical finish line. No one except the timers who were positioned there knew. Runners raced to the physical finish line not knowing that their times were recorded 39m before they reached it. (Fortunately the winner was more than 39m ahead of the 2nd place person but who knows what the actual outcome of any age group or team competition races was) The finish line clocks were set to match the 'virtual finish' times. As I rode on the press truck and was at the start about 2 miles from the finish from 6 am, all this happened without my knowledge.

I would be most interested in the comments of the MN forum readers.

Basil
honikman@silcom.com (Basil Honikman)

RNR COMMENT #1
Jeez! And there was all that publicity about the secret conspiracy in the new X-Files movie! I guess the Truth really is out there (39m out there, to be exact).
Why didn't they just move the start line up 39m?

Jim Gerweck
ZGerweck@aol.com

RNR COMMENT #2
I've made some bad decisions in my days but I'm sure gad I didn't make this one.

I just came back from the RRCA Convention where they showed a video in Billy Mills' 10k Olympic Gold Medal Run. He went from nowhere to Gold Medal in the last 39m.

I ran Boston in '82 and was at 18 miles when Dick Beardley beat Alberto Salazar to the virtual finish line.

Even at the ripe age of 58, I passed two runners in the last 39m at the Steamboat last week.

I hope they have some video so they can at least get the finish order correct. You can't cheat the runners of their kick.

Bill
WilliamEGrass@eaton.com

RNR COMMENT #3 - PHANTOM PHIN(N)ISHE(R)S
(to let Jim have his phun with this topic too!)

Ted Corbitt experienced a phantom phinish once (Nov 08, 1953) but as Ted never complains I had to learn the details from "Charley Robbins' Scrapbooks." Ted wrote ii of the 187 + iii pp of this book but his blurb was neither the "Forward" (by the editor, Gerry Beagan) nor the Intro (by Charley). At 15 2/3 cpi(!) and about 9.4 lpi(!) this book is hell on my poor eyes.

Actually, I had to finish the whole book to fully appreciate the editor's task, and to sympathize with him: "I tried to be true to [Charley's] intent and left much of the text untouched." Charley had obviously spent DECADES tapping at a typewriter. Among MANY mysteries: I found a reference to an earlier event and thought I'd missed something, so retraced my reading but still found nothing, so blithely continued only to discover the reference in the next chapter! I should also explain that I'd long known Charley was/is an MD, but then read he went into psychiatry, which, as I'm a believer in one's absorbing some traits of one's contacts, explained a LOT, the LARGE majority of which will remain unmentioned! Anyway, to pp 96-97:

My 300th was a great "race for Science" promoted by me and financed by Dr. Joseph B. Wolffe, a renowned and wealthy cardiologist from Philadelphia who believed in putting back a large percentage of his earnings into research. ... The arrangement was that he would put up the money for the prizes ($300), and I would get the runners. He would have his staff ... arrange the scientific tests (at his expense, of course!). So the Valley Forge Marathon was launched. ... It was from the Wolffe Clinic and Hospital on Pine Street in Philadelphia to the Valley Forge Heart Institute and Hospital in Fairview Village, near Norristown. It was also my most embarrassing moment, as we will see.

I bought ten watches, all the same, but engraved with the place, as I could get a good buy that way. My friends were all interested in the race, as they were to get a fortune in medical exams-ECGs, xrays, blood tests, isotope studies, etc.. So I got a group of marathoners with probably an average of 15 years experience. Thirty-two started and 30 finished. The field included Old John Kelley, Les Pawson, Jock Semple, George Dickson (English prof at NYU and a runner for 30 years), Charley Brederson, Amos Kujala, over 65. Anyway, it wasn't just a group of new runners for a study, it was a solid group of men who had spent their lives at marathoning. ... The tests were all done at the start in Philadelphia and repeated at the finish at Valley Forge.

The start was uneventful, except that it had snowed and the road was all slushy. ... we set off with me, Corbitt, Old Kelley, Scandurra, Romagnoli, and probably Jack Barry in a group. ... My plan was to run with the group until about two hours and then give it all I had. So just before two hours, I lit out and did I go for about three or four miles! I opened up a good half- mile lead. Then Bang! I fell apart. My legs just gave out. I didn't have to walk, but I was just crawling along. Corbitt was just getting warmed up, of course and was gaining fast. When there were two miles to go, I knew that he could catch me anytime. We were to go to the finish line, do a mile around the hospital grounds and finish. Corbitt was about 50 yards behind with one mile to go. I recall staggering along at a snail's pace, thinking that Corbitt

would be the first black man to win a marathon and that it would be a great feather in the Valley Forge Marathon cap. As it began to snow again, I was glad to be near the finish. Then as I crossed the finish line ready to get around the last mile somehow and get 2nd, I was horrified to hear one of the Doctor officials holler that this was the end. "No, No," I screamed, "We are to do another mile!" "Oh don't worry about that, since it is snowing and you have already run 25 miles we thought you would be glad to do without that last little bit."

So they grabbed me and started the blood tests and xrays, etc. I wasn't worried about Corbitt, as he knew me and we were both marathoners, but how embarrassing can one get, putting on a race and then having it chopped off just as the guests are about to pass you!

A race report actually said that "The grounds of the Heart Institute will be circled twice for a distance of about two miles." Typically, all Ted has in his marathon record is "Course cut short due to snow." He may not have had even that if it weren't to explain why his time, 2:26:28, isn't his PB. Rather he has his 2:26:44, in winning the 1958 Shanahan CC race (also in Philly), underlined, presumably for this purpose.

Maybe modern race organization is serious enough without our going completely out on a limb to ensure it's that way. Of course, when the top ten got identical watches engraved with their places for a total of $300, it was indeed a different era, certainly less serious.

As a footnote, Charley et al also organized the inaugural Shanahan CC Marathon within three months of the Heart Institute race. It was an outgrowth of their wanting to stay fit through the winter for marathoning in the spring. It was also Ted's next marathon and there's no question he won that one (on his 34th birthday) though again the circumstances are interesting (p 104):

For prizes we decided to give medals--all the same, but marked with the place--for the first ten. To finance the race, we would charge a dollar if the runner wanted a prize (medal) or nothing if he didn't want one. (I had my engraver, so planned to engrave them right on the spot or keep the medal for the next year if refused.) So the Shanahan Marathon was born ... .

... I should tell of Jack [Barry] and I meeting at 10 a.m. ... waiting for the "field" of runners to arrive. Well, it got to about 11:45 and Jack, myself, Ralph Eilberg and Browning Ross, who was to run a couple of laps [of four], were the field. The small, but knowledgeable, crowd began to make cracks that they hoped we would have enough prizes, etc. Then came the most beautiful sight [we] could imagine. A car full of New Yorkers drove up all out of breath hollering to hold up the race, as they had gotten lost. Were we glad to see them! So we had a decent race of nine starters.

Definitely a kinder, gentler America then, especially in the bush known as the east coast, and to think that across the pond some guy named Peters was so serious about it all!

Malcolm Heyworth
Jheyworth@aol.com

RNR COMMENT #4

Dear Pete:

Tell Letson to stop jerking with the measurements.

Regards,

Malcolm

ROAD RUNNERS CLUB

AN ASSOCIATION OF AMATEUR ROAD RUNNERS AFFILIATED TO THE
AMATEUR ATHLETIC ASSOCIATION, N.C.A.A., M.C.A.A.A., S.C.A.A.A.,
WELSH A.A.A., SURREY C.A.A. and R.W.A.

Founder: ERNEST NEVILLE 1883 - 1972

Hon. General Secretary: PETER GOODSELL, 10 Honywood Road, Colchester, CO3 3AS
Tel: 0206 74637

Hon. Treasurer:
GEOFFREY M. PEARSON, 1, Reeves Rest Cottages, High Road, Chipstead, Surrey.
Tel: 073 75 56093

President:
DON TURNER

Past Presidents:
SAM FERRIS
JIM PETERS
JOHN JEWELL
LEWIS PIPER
VIC FOWLE
TOM RICHARDS
C. ARTHUR BOURNE
G.S. DOUBLEDAY
B.W. BALDWIN, M.B.E.
H.B. LEE, F.R.C.S.
BRYAN DOUGHTY

Chairman of Council:
H.B. LEE, F.R.C.S.
7, Warren Hill,
Loughton,
Essex. IG10 4RL
Tel: 01 508 4447

*Overseas Hon. Secretary and
Hon. Editor of Newsletter:*
JOHN JEWELL,
296 Barkham Road,
Wokingham, RG11 4DA
Tel: 0734 780 306

Hon. Registrar:
Mrs. J. GOODSELL,
10 Honywood Road,
Colchester, CO3 3AS
Tel: 0206 74637

*Subscriptions
Hon. Secretary:*
J.G. FORREST,
'Ashburnham',
High Road,
Chipstead, Surrey.
Tel: 073 75 55258

Hon. Statistician:
BRIAN NOTT
10 Wynton Grove,
Ashley Park Road,
Walton-on-Thames,
Surrey. KT12 1LW
Tel: 093 22 44803

Fixtures Hon. Secretary:
JOHN A. GEBBELS
17 Lebanon Gardens,
Wandsworth,
London, SW18 1RQ
Tel: 01 870 3588

Trophies Hon. Secretary:
IAIN THOMSON
40 Derby Road,
East Sheen, London, SW14.
Tel: 01 878 6422

Minutes Hon. Secretary:
CHARLES BANNISTER
104 Elm Park Gardens,
Chelsea, SW10
Tel: 01 352 6974

Sales Hon. Secretary:
D. BONSER,
80 Benhill Wood Road,
Sutton, Surrey.
Tel: 01 644 9742

*London—Brighton Race
Hon. Organiser:*
JOHN DIXON
9 Lyncroft Gardens,
Ewell, Epsom, Surrey.
Tel: 01 393 3405

Entries Hon. Secretary:
MIKE TOMLINS
56 Squires Lane,
London, N3
Tel: 01 349 0234

296 Barkham Road, Wokingham, Berkshire, England.
November 15th 1979.

Dear Tom Ferguson,

Your letter raises many interesting and pertinent points.
However, firstly my kind regards to Scott Hamilton, who is
a member of this organisation. Ted Corbitt is also well known
to us in this country, and has competed in our London to
Brighton race four times, and he made the U.S. 24 hour track
record here. I think a bit of history may throw some light
on the questions you have asked about road measurement, and
make my answers more intelligible.

In the fifthies, doubts arose about some of the times, which
were being recorded in some of our road races, whose number was
steadily increasing. This led sometimes to unpleasentness
and arguments amongst those interested. It was obviously a
matter which required investigation, and as a scientist I
endeavoured to tackle this in a rational way.
It soon became apparent that measurements were made in a variety
of ways, without any knowledge as to their accuracy, really
the whole matter was in a very unsatisfactory state.
Some organisers even doubted the importance that road courses
should be accurately measured, and some still do.
After a couple of years work, I put my findings into a report
and this eventually led to the IAAF instructions. The technical
operation of accurate course measurement does not present any
real difficulties. The real difficulty is persuading people
to adopt accurate methods. This is a continuing operation; to
spread the knowledge. Further if they have been doing their
measurements for years and years, it is only human nature
that they are non-cooperative when it is pointed out that their
measurements have significant errors.
I cannot elaborate on the many problems which have been sorted
out, and the struggles this has led to in this country.
Early in the history of the RRC, we decided to institute a
standard certificate scheme, based on performances over varying
distances. Clearly unless the distance of a road race was
accurate, these would be of little significance.
Hence we have 'Vetted' courses, your 'certification'.
Similarily ranking lists would be rather meaningless; they have
limited significence in any case, as course varry, and
weather conditions play an important part in the performance.
I would think that our Standard certificate scheme has been
of as much importance in getting accurate course measurement,
as in providing an incentive to the runners. It has meant a
lot of work however.
Ted Corbitt started to work on the same lines in the U.S.A.,
and as you will know you have a very fine system of certifying
road courses. I have had correspondence with Ted Corbitt
over about the past twenty years. He has often sent me the
data about road courses in the U.S.A. and asked my opinion.
I can say without boasting that until I visited the U.S.A. in
1956, no accurate measurement had been made of the Boston
Marathon route. Ted and myself think on similar lines.
I think I have gathered more data from Ted than I have got from
some of our own road race organisers.   P.T.O.

Now, as to your first question; 'How do we know we are running 26m 385y'.
The measurement has been made, and checked by an approved method(by the bodies
mentioned) based ulimately, either on a steel or fibre glass surveyors tape,
or possibly by on a lenght of road measured to a high degree of accuracy by
an electronic distance measurer(infra red beam), as used in surveying.
The method is by comparison with this standard using a wheel operated under
certain specified conditions. This may not be very well expressed, but it should
be easier to give an explanation after studying the IAAF instructions.
Now to another thorny matter, Clayton's world best time in Antwerp, not
Brussels 1969. This is quite a story with which I was concerned, and which I
followed up, not like yourself to discredit his performance, but to find out, if
possible, if it was correct. As you will know all kinds of people promote road
races, some may be aware of the necessity of accurate measurement, some could
not care less,; some may be ignorant, but some like yourself understand the
responsibilities of the job and take considerable care to ensure accurate
measurement. Belgium had a poor reputation for the authenticity of road
performances prior to Clayton's race. Hence it was especially interesting to
me to check whether the claim was correct, not just to take as gospel, what
had appeared in the newspaper. Clayton came to this country shortly afterwards
and visited me. He had little information about the race, not even a programme,
let alone a map of the course, or for that matter any intermediate times.
No fault of his. The race had been under the auspices of an Antwerp newspaper
to celebrate the opening of a new tunnel under the river. They had thought of
a cycle race, but decided on a marathon. The newspaper report had little factual
information, apart from the result and the 10 km time. I was told the organisation
had been in the hands of Belgian athletic officials, ie local. When I approached
the Belgian governing body in Brussels I could obtain nothing further. I
persisted for about two years without any further information coming to light,
asking our own governing body is they could find anything out. This is not
really supprising; it would not be much use asking the AAU if the Honolulu
marathon was the correct distance..
It was fair at this stage to say that the claim of a woold fastest marathon
was unproven, and I personally was not prepared to accept it. I think I did
have a query from 'Runners World', and I was misquoted. I said there was no
proof that the distance had been correct, whereas they published that the
course was short. I would suggest you do not publish my name in anything you
may write. Here the matter rested for quite a number of years, until the
establishment of the Belgian Spiridon Club, which like our two RRCs consists
of those interested in these matters, and prepared to go to some trouble to see
that things are correct. They took the matter up with the Belgian governing
body, and with course measurement in general for Belgium. I was told in confidence
the whole matter of course measurement was a mess, which I really knew along.
I think they also said the Clayton course was short. Some two years ago I
talked to a well known British International Marathon runner, who has lived
in Brussels for a number of years, and become involved in their road races.
He said the Clayton course was 'measured' by a car odometer(completely unsat-
-isfactory) and that the instrument read only 40 km at the stadium.
I have never been able to persuade my friend Roger Gynn whose joint work with
your Dr Martin,'The Marathon Footrace' has just been published, to face the
fact that no credence is given to the 2-8-33. His comment in the book is poor.
Therefore the answers to your questions seem to be-
I. The course was not certified according to our meaning; only bodies such as
   ours certify. 2. No further races on the course, which may now have been
   altered by road construction. 3. See above. This is the general method in
   Belgium. 4. Only mine at the time as far as I know, ie had the course been
   accurately measured? maybe others did wonder, and in the course of years
   doubts have arisen. The newspapers could not worry less what they publish;
   it was news at the time.
Choysa Marathon. The result appeared immediately in our newspapers, and I wrote
to Auckland where we have an excellent correspondant, 'What nonsense is this'?
Our letters crossed, within a week I checked on the large scale maps of
Auckland, available in London, as he had sent me a newspaper sketch map of the
course and a description?   P.T.O.

ROAD RUNNERS CLUB

Of course the reason for the times was immediately apparent, what was it some
1½ mile short! The organisers hadn't a clue. World class athletes had been
brought from Europe, and some £60,000 spent on the race. The leading group
knew as soon as they saw the 5km time that something was wrong.
For our standard certificate scheme the times are set to One minute, so that
the distance has to be correct to half a minutes running, and this amounts
to some 175 yds in the marathon for a top runner; ie if the distance is
26m 385y + or ↓ 175 yds, and the time recorded is 2hrs 20 mins, it is 2-20,
and not 2-21 or 2-19. We know the measurement can be made verymuch
more accurately than this, but for our 'vetted' courses,we try and make
things easy for the organiser, certainly errors like Auckland and Antwerp
would never get by. Middlesbrough. Yes it was short the first year; they
were told how to do the job, but nothing was doneor the right person was
not informed. At least when it was only too apparent after the first race,
they set to.and made the distance correct for the second race.
You are only too right about professionalism. It is a current question here,
as last year a big scandel came to light in conjunction with the Edinburgh
Games; some of your athletes were the offenders in the first place.
Our rules and the IAAF rules are in a mess. However you are now opening up
a big question , and perhaps this letter best be confined to the 'world's
fastest marathon! I hope I have managed to answer your questions, and I am
relying on your discretion in anything you may publish. I might just
mention another matter which has arisen only just in the last week, also
concerning Antwerp. They sent me the full result of this year's race, in
September won by Smet in 2-10-0. His 5km to 10 km times is given as 13 mins
42 secs, and the average time of the first six finishers in the race is
14 mins 19 secs. There maybe an explanation; the race has been held for ten years,
and I think the first year about the first ten competitors made personal
best. I have made a polite inquiry, hope I don't make myself too unpopular.
Maybe we will keep in touch.

yours sincerely

John Jewell

PS RRC standards, we wanted a goal for the general road runner, different from
the standard time for any particular race; the idea being to base it on alround
performances. 1st class not so easy, 2nd class fairly easy for the beginer.
Took 2-40, and 3-10 for the marathon as the basics, over 20 years ago. These
apparently easy, were only a third of the requirement since two other distances
included. Assessed equivalent performances at other distances by examination of
results of many individuals, then put on graphs; average speed against distance.
Concluded 2-40 marathon equivalent in value to 55 min/10mile, etc, rather similar
to decathlon scoring. Some years later standards reduced by lowering the basic
marathon to 2-35 1st class, 2nd class to 3-5, and all others proportionally.
Vets standards and women's standards later introduced. Much correspondance with
Corbitt, but he could not find anyone to do this in the U.S.A.

THE SLOT-CAR CIRCUIT PUZZLE

Last month **Jean-Francois Delasalle** sent a photo of his slot-car circuit, which he had measured using the tiny wheel with the Jones counter attached. He challenged readers to use the photo in some analytical way, and to arrive at the lengths of the two circuits (inner and outer) of the track.

Pete Riegel to Roger Gibbons
I don't know whether you have applied yourself to the solution of JFD's little slot-car track. I have been trying, and having all sorts of fun applying my version of the laws of perspective to the photograph. I have not yet got a solution. I seem to be stuck, but think I am getting closer.

A few days later:
Dear Roger - I finally gave up trying to be elegant and used some primitive methods to arrive at an estimate for the length of JFD's slot-car track. I sent him my guess and await his reply with the right answer.

So, when you are ready, email me what you've got. My methodology was so crude that I cannot even accurately describe it, but if I am within 10 percent I won't feel too bad. I didn't bother trying to distinguish between the inner and outer tracks.

Roger to Pete:
I looked at the puzzle and guessed there are rules for calculating perspective, but don't know them. I would think we would need to know the height of the camera above the and in front of the track, together with the focal length/angle of the lens before it could be calculated anyway. The quality of the repro was poor. Do I detect a 'banked' bend at both ends ? I estimate a track length of around 15m but that's worth nothing. I am a sucker for such competitions but this one is outside my capability.

Malcolm Heyworth to Pete:
If you're keen and have the original photo of JFD's slot racing circuit I'd appreciate your transmitting that. Hopefully it will be clearer. I've thought of positioning and orienting it to project onto our dining table, aligning the sides of both tables. I don't know how well it would reconstruct. I THINK the projection should, in theory, be unique, but I may be wrong. It's gotta be easier to measure a model than mess with calculations.

Pete to Malcolm:
You asked for a better picture of JFD's slot-car setup. The one he sent me was printed by his color printer. I scanned it and used the result in MN. The result was not much better. The original was a bit lame. To keep myself honest I did not use the original in my own work. I used what came out in MN, which I'll admit is not much material for one who wishes to be exact. But that is what you are stuck with. For God's sake, Malcolm, be a man!

The Correct Answer from JFD:

4 precals and four postcals all yielded 146 counts per 2.414 metres, for a constant of 60.480 counts per metre.

The external loop was measured at 941 and 942 counts, for length of 15.56 m and 15.58 m
The internal loop was measured at 908 and 909 counts, for length of 15.01 and 15.03 m

Steel tapings of the circuits yielded 15.57 metres and 15.005 meters.

Editor's note:
JFD's performance as a race car driver was impressive. The record for the inner loop is 5.24 seconds for 15.01 m, or 10.312 km/hr. When scaled up from the 1/32 scale of the slot car track this yields a speed of 330 km/hr (205 mi/hr).

Pete's carefully and frustratingly calculated estimate was 13.14 meters.
Roger Gibbons' estimate was 15 m.
Malcolm Heyworth submitted: lane 1= 15.219 m and lane 2 = 15.937 m

The winners are (lane 1) **Roger Gibbons**, whose eyeball produced less error than most bike measurements, and, (lane 2) **Malcolm Heyworth**, who dealt masterfully with flawed material.

Bob Letson's Rock 'n Roll Marathon Puzzle

Peak flow = 23 runners in 3 seconds at 42.2 km finish time of 3:56:22 =   14182 seconds
Minimum runner space = 2.5 feet wide by 5 feet long
Bridge is at 38.1 km

Peak flow = 23/3 runners per second at 42.2 km   7.667 runners per second
At 38.1 km this will be (42.2/38.1)*7.667 =   8.492 runners per second
Each runner occupies 2.5*5 square feet =   12.5 square feet

Try this:
Speed of runners = 42200/14182 =   2.976 meters per second =   9.762 feet/sec
Each runner occupies 2.5*5 square feet =   12.5 square feet
Bridge is 12 feet wide
If bridge was 9.762 feet long (one second's worth) it would contain:
    9.762*12 =   117.15 square feet
    This area can contain 117.15/12.5 =   9.372 runners
Capacity of bridge =   9.372 runners per second

Peak flow of 30,000 runners at 38.1 km is: 8.492 runners per second
Capacity of bridge is thus (9.37/8.49)*30000 =   33109.94 runners

Pete Riegel - 8 May 1998

Solution to Rock 'n Roll M puzzle from Malcolm Heyworth:

For a bridge 12 ft wide there can be (by Assuumtion b) 12/2.5 = 4.8 runners abreast, meaning at most 4 runners abreast. They can fit into the assumed 5 ft (of travel), meaning at most 4/5 = 0.8 runner(s)/ft   (0)

For 30,000 starters, at the 38.1-k bridge there will be at most $(15 + 4 + 4)/3 * 42.195/38.1$ runners/second   (1)

and the running pace will then be $(26*1760 + 385)*3 / ((3*60 + 56)*60 + 21)$ ft/second   (2)

The ratio (1)/(2) gives the maximum runners/ft at the bridge (for 30,000 starters), but this can be no more than the 0.8 of (0), so, at most, number of starters = 0.8 / [(1)/(2)] * 30,000

    = 27,593.6

23

To: Peter Riegel
Fr: Robert Letson, 2870 Amulet St., San Diego, CA 92123-3137
Da: 29 April 1998
Re: Puzzle for MN

San Diego plans to host the equivalent of the New York City Marathon in
June (RnR Marathon), and I was asked (regarding a temporary bridge that is
being built especially for the race)

   "How many runners can be in this event without causing delays
    on a bridge 12 feet wide at 38.1 km?"

ASSUMPTIONS:
   a. Distribution of runners is same as '97 NYCM (30,000 runners).
   b. Minimum space for each runner is 2.5 feet wide, 5 feet long.
   c. Pedestrian bridge is at 38,100 meters.
   d. Race length is 42,195 meters.
   e. Speed of runners is constant.
   f. Delays up to 3 seconds are allowed.
   g. The peak 3-seconds flow in the '97 NYCM is:
          3:56:21   15 finishers
          3:56:22   4 finishers
          3:56:23   4 finishers

MY ANSWER:

Rn	= RnR_RUNNERS	= (to be determined)
RL	= RUNNER_LENGTH	= 5 feet
RW	= RUNNER_WIDTH	= 2.5 feet
F	= MAX_3_SEC_FLOW	= (23 runners)/(3 seconds) = 7.67/sec
S	= MAX_FLOW_SPEED	= (marathon/3:56:22) = 9.76 feet/sec
Nn	= NYCM_RUNNERS	= 30,000 runners
RDF	= RnR_DISTANCE_FINISH	= 42195 meters
RdB	= RnR_DISTANCE_BRIDGE	= 38100 meters

L   = FLOW_LENGTH   = S/RL runners/sec. long at NYCM finish
      (e.g., (9.76'/sec)/(5'/runner) = 1.95 runners/sec long)

W   = NYCM_FIN_FLOW_WIDTH   = F/L runners/second wide at NYCM finish
      (e.g., 3-sec flow: W = 7.67/1.95 = 3.95 runners wide)

Wf = NYCM_FIN_FLOW_WIDTH_FT = W(2.5'/runner) feet wide at NYCM finish
      (e.g., 3-sec flow: Wf = (3.95)(2.5) = 9.87')

RWf = RnR_FIN_FLOW_WIDTH_FT = Wf(Rn/Nn) feet wide at RnR finish

BRWf = RnR_BRIDGE_FLOW_WIDTH_FT
       = RWf(RDF/RdB) feet wide at RnR pedestrian bridge
       = Wf(Rn/Nn)(RDF/RdB)

Rn = Nn(BRWf/Wf)(RdB/RDF) runners
      (e.g., 3-sec flow, 12' bridge:
             Rn = (30000)(12'/9.87)(38100/42195) = 33,000 runners)

From: Robert A. Letson, 2870 Amulet St., San Diego, CA 92123-3137
Date: 23 June 1998

VALIDATION of LENGTH
Rock-n-Roll Marathon, 6/21/98
San Diego, CA

The 1998 Rock-n-Roll Marathon course, run in San Diego, Sunday morning,
June 21, 1998, has a validated length, from the Start Tower to the Finish
Timing Point, of at least 42236 meters (not including the 1.001 SCPF).
This validation pertains only to the course available to runners on June
21, 1998, which was blocked by numerous water stations.

One validation measurement was performed by the certifier for the course,
Robert A. Letson, from 5:30 am to 8:00 am on the morning of the race, using
a Jones/Oerth counter and bicycle with solid-rubber-inner-tube, riding the
shortest possible route everywhere with the advantage that the course was
marked/blockaded/ready for runners so it was possible to measure all
tangents instead of approximating them. Differences between the certified
and validated routes are as follows:

1. Many water station tables blocked the certified route,
   adding maybe 20 meters.

2. The left-turn from Pacific Highway to Sea World at 8 miles
   was coned one lane further to the right than certified,
   adding maybe 6 meters.

3. The gentle right-turn on Sea World Dr. after Pacific Highway
   was coned on the right-side of the center-island (instead of
   along the center of the center-island),
   subtracting maybe 3 meters.

3. The transition from full-width to right-half-only on Crown Point
   at 11 miles was coned one block earlier than certified,
   adding maybe 3 meters.

4. Cones enforcing right-half-only from 12-miles to 20-kilometers
   blocked the conservatively-measured certified route,
   adding maybe 5 meters.

5. The left-turn on Pacific Highway at 19.7 miles had cones that
   prevented runners from using the fast lane, adding maybe 3 meters.

6. Tangents throughout the course were measured during validation,
   adding maybe 6 meters.

7. START_TOWER was located at Certified Start + one meter.

8. FINISH_TOWER was located at Certified Finish + one meter.

The "maybe ... meters" above are guestimates.
Validation measurement data is on the following page.

```
21 JUNE 1998, 4:30am-8:00am, R.A.Letson, solid-rubber-inner-tube
   Aero Dr. 880 yards, 4:30am
     681880
     690933 9053
     699984 9051
     709034 9050
     718085 9051   18102.5/milo  11.248/meter
   Mission Bay Mile, 6:50am (during measuring)
      52152
      61203 9051
      70253 9050   18101.0/mile  11.247/meter
   RnR Race Course, 5:30am - 8:00am
     START_TOWER       724469
     M/2 (half-way)  962214 237745 for first half-marathon
     x              1049540  87326
     ----Mission Bay Mile
     x               72860
     FINISH_TOWER    223341 150481  237807 for second half-marathon
                                    (half-mar. difference = 5.5 meters)
     total counts/course =  475552
     length of race      =   42277 meters (without 1.001 SCPF)
                             42235 meters (with 1.001 SCPF)
                              (40 meters oversized)
```

Because the certified course was blocked by aid stations and cones, the
validation measurement was assumed to be more correct for this race than
the certified length. A conspicuous feature was found 31 meters prior to
the FINISH_TOWER: a manhole-cover next to a 30'-tall-black-pole. I told
Judy Ikenberry of RACE CENTRAL (in charge of FINISH timing) that the course
was oversized 40 meters due to blockage on the course, and that timing
could be performed at the manhole. One hour later, when the winner
finished in about 2:10:30, I noticed a white line/tape across the road
about 8 or 9 meters prior to the manhole. Not knowing which point was used
for timing, I decided to compute the validated length of each:

   Measurements to the manhole, 8am June 21, are: (bike wobbled)
     FINISH_TOWER 224325   224980
     manhole   224680 355 (31.6m)   224630 350 (31.1m)

Two days after the race I failed to find any trace of the white line/tape.
I remember the line being not further from the FINISH_TOWER than the west
end of the center island, so I measured this extreme:

 23 June 1998, 9:45am - 10:20am, R.A.Letson, solid-rubber-inner-tube
  10:10 AM Balboa Park 1/3 Mile
           530000
           536035 6035 - ride   18105/mile
           542031 5996 - walk
           548027 5996 - walk   17988/mile   11.177/meter
   9:45 AM Finish-Tower   504000
           W.end island   504460 460 - walk
           Finish-Tower   504921 461 - walk 41 meters

This results in the following validated lengths:
        FINISH_TOWER = 42277 meters
        manhole   = 42246 meters
        white line   = 42236 meters

Hence, the 1998 RnR Marathon was longer than 42236 meters.
```