

# MEASUREMENT NEWS



#12 - July 1985

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Measurement News (MN) is distributed to all members of the Road Running Technical Committee of TAC, all regional certifiers and all final signatories. Also to some miscellaneous others.

Subscriptions are available to non-RRTC people. See article this issue. \$15.00 per year.

MN is our way to talk with one another, so that we all know what's going on. It also serves to provide guidance from the RRTC Vice Chairmen to the regional certifiers and final signatories.

MN wants to make measurement as good as it can be. All opinions and grievances are solicited. No cows are sacred. If you have a new measurement technique, or think things should be done differently, send in your contribution to MN. Your opinion will be given space. Nothing will change if nobody tries.

Nice, clean, typed stuff is most welcome, but send what you can!

\* \* \* \* \*

## GRAVEL VS PAVEMENT

Bob Thurston writes: "I think we need stronger language in our non-paved surface comments (handbook, pp. 31,32). I have not reproduced the original experiments this is based on (parallel cal course on different surfaces) but I do see some evidence that certain surfaces produce short, not long courses. Marc Gladney (see course WV-8505-RT) measured, on my request, a straight section of gravel road - 200', by steel tape. Then he "calibrated" on this 200' stretch. His results were 5 counts higher on gravel road than the computed equivalent on asphalt. 599 cts vs 594 cts. This would make a shortfall of 132 counts, or 46 feet, per mile of course. His course had 1.24 miles of gravel road so the estimated shortfall was 57'. He then lengthened the course by this amount - but think of the consequences of not checking!?"

Ed: I think startup wobble on the 200 ft gravel course may have been a contributor here. It would be interesting to see a comparison of Gladney's ride on a 200 ft gravel course vs a 200 ft asphalt course. This subject is by no means closed - if anybody has more data, send it in. A side-by-side comparison is best, but any old dirty data is welcome.

## YOU MAY QUOTE MEASUREMENT NEWS

Bill Glauz wondered if it was OK to use material from MN in his club newsletter. I said fine, go ahead. No restrictions. This applies to anybody else who wants to use material in MN. Use it and welcome to it. We would appreciate attribution, though.

I hope this open policy will not stifle contributions. I believe that if we are open and free with our opinions and technical contributions, it will generally benefit the measurement process. We should have nothing to hide from anybody.

## FINDING CALIBRATION COURSE LAYOUT ERRORS WITH A BIKE CHECK

A bad calibration course is a potential disaster for future measurements. Measuring twice doesn't insure that the same error won't be repeated on the second measurement. There are two major mistakes that are commonly made:

1) Omission or addition of an entire tape length - this leads to a course that's 2540 feet or 2740 feet long, instead of 2640.

2) When the zero mark is at the end of the pull tab, it's not easy to eyeball. In this case sometimes the 1 foot mark is used, and 99 foot lengths are used for layout. This is OK, but signals get crossed. Sometimes the rear tapeman thinks he is supposed to hold on 99, while the lead tapeman thinks he's holding on 100. This results in 98 foot lengths, which are thought to be 99. The cal course thus comes out to be 2614 feet instead of 2640.

The bike check can help to find these errors. It's done as follows:

A 100 or 200 foot length is taped at one end of the cal course to be checked. The bike is ridden over the check length, and again over the whole cal course. A constant, calculated from the short cal course, is used to calculate the length of the full cal course.

<u>Example</u>	Counts for full (1/2 mi) cal course	7502
	Counts for 200 ft cal course	570

Length of full course based on 200 ft course:

$$200(7502/570) = 2632.3 \text{ ft}$$

$$\text{Percent error} = ((2640 - 2632.3)/2640) \times 100 = 0.29\%$$

Because of "startup wobble" there will never be perfect agreement. If the cal course is correct, the percent error will hardly ever be a negative number. Use the following as a guide:

0 to 1% Error - cal course is probably OK

Over 3% Error - suspect an omitted or added 100 foot length

1 to 2% Error - suspect 98 foot layout length instead of 99. If measurer used 100 foot lengths this error probably won't occur.

Old cal courses that do not have a modern certification document should be given a bike check before they are certified. They may have been used for certifications in the past, but should be considered suspect until bike-checked. When I get a course that was calibrated on an old cal course, I certify the race course if it isn't a biggie, but I tell the measurer that I'll accept no more measurements based on that cal course until it's checked.

I found one supposedly 2700 foot cal course that was actually 2800 feet this way. The 1/2 marathon measurement showed the old course to be 1/2 mile short. No wonder. The course was 200 miles from the measurer, but I wouldn't certify until he checked it. I was glad I was right, because it would have been a cruel wild-goose chase.

Bob Thurston wrote of another way to check a cal course layout. Instead of laying out even 100 foot increments, just lay out each segment a bit shy of 100 feet. Then record the actual distances between the marks both ways. This requires a lot of addition, but does give a double-check of each and every segment, and does not depend on counting a number of supposedly equal 100 foot segments.

Bob recommends reading the tape to hundredths of a foot and estimating to thousandths. Also to be sure to pay attention to temperature correction.

MEASUREMENT OF 1985 NEW YORK CITY MARATHON COURSE

On June 21, 22, and 23 Pete Riegel, Bob Letson and Wayne Nicoll came to New York to assist Bill Noel in laying out the course of the New York City Marathon for 1985. It's basically the same course, but with a few minor changes.

Last fall, during the validation ride of the 1981 NYC course, Tom Knight and David Katz laid out a 2000 foot calibration course in Central Park. We checked it and got a measurement that was within 0.1 feet (1/20000 difference). This was encouraging. This mildly short cal course was used in the measurement because a full-length cal course on city streets would have required riding across intersections while calibrating - necessitating stopping for the cross-traffic.

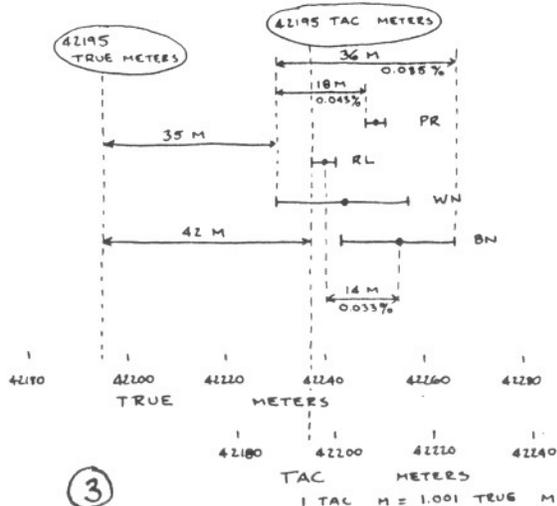
Results are shown below. The measurement bands for each rider show the measured distances obtained using larger constant, smaller constant, and average. All four rides agreed within 14 meters (0.033 percent), using average constant, or within 18 meters (0.043 percent), using larger constant.

The spans of Riegel's and Letson's measurements are very small because they used solid tires, while Noel and Nicoll used pneumatics. But no matter how the data is sliced, the measurement had very nice agreement.

No rider convincingly outrode another. I want to point this out because Bill Noel has received some bad press over the 1981 NYC Marathon, and his reputation as a measurer has suffered. In spite of being the lead rider, constantly shouting things over his shoulder at us, he managed to ride a line as tight as any of us. He knows how to ride, and he showed it.

David Katz and Terpsie Toon, a new measurer, rode a portion of the course with us on one day, but since neither of them rode the entire course their measurements were not considered as "official". Nevertheless, on the day they rode, Terpsie, the new girl on the block, outrode the pros by 5 meters in 21 miles. And David was on the low side too.

The New Yorkers know what they are doing. I had heard that David preferred measuring at night. I never considered that, preferring early morning, but after riding in that NY traffic I can see why he likes it that way. He made a believer out of me. If I ever have to do some measuring in a strange city again, I will do my best to set it up for a 3 AM ride. On this ride we had good police protection, so we didn't have to do a midnight ramble.



## MEASUREMENT OF THE NANISIVIK ROAD RACES

The Midnight Sun Marathon is held each June or early July. The course is a crushed rock road running from Arctic Bay to Nanisivik, Northwest Territories, Canada.

Because of the near-unrideable quality of the road, prohibiting a strict adherence to the Shortest Possible Route (SPR) principle, I decided to use a calibrated truck wheel to measure the course along a path that closely approximates the way it is run.

I jury-rigged a Jones Counter to the right front wheel of a Chevy Suburban, borrowed from Nanisivik Mines. Then we drove the course. Enroute, when we could find enough straight road, we laid out 500 foot calibration stretches, four in all, each traversed once in each direction. Two were on steep hills and two were on the flat - one at sea level and one at 500 meters elevation.

As would be expected with a truck and short calibration courses, the measurement had more variation than would be obtained with a bike, since the measuring wheel could not follow the same route "back" as it did "out". Nevertheless, in spite of one stretch where we had a 0.1 percent disagreement, the two overall measurements agreed within 0.054 percent, or 23 meters for the 42 kilometers. Because of calibration variation the total band of measurement uncertainty is 141 meters wide.

I used the "larger constant" approach, except that I eliminated the high and low of the 4 two-way calibration averages, and used the larger of the two remaining. I used the measurement that gave the shorter course.

The course is not measured along the SPR, nor is it claimed that it is an official, full marathon. Nevertheless, the stated distance of the course (41900 meters) is probably an accurate reflection of course length as it is available to the runners.

The Jones Counter showed some wear and tear from 50 miles of bouncing around on the truck wheel in abrasive dust. I was worried that it would fail, but it held up OK.

### Questions -

1) Has a course measured like this got any business being "certified", since it was not measured along the SPR? I will admit I measured it just because I had the time and inclination, and had the hardware to do it. Since it's all dirt roads, with horrendous hills, there's no possibility that anybody will ever set records on it (even if the thing was adequately monitored to keep them near the middle - it would take more monitors than the combined populations of Nanisivik and Arctic Bay to do that). It also turns out to be a non-standard distance, since it's a bit shy of a marathon. I figured that the runners would be happier with a better-known distance to the course, since it had previously been measured using only an auto odometer.

2) What is the purpose of Certification, anyway? It does support TAC's records committee, but it also gives the average runner, who will never set any kind of a record, a meaningful standard to test himself against.

3) Did I abuse my office when I certified this course? I don't think so - I would have certified it if somebody else had sent me the data. It's at least as well-measured as some courses I know of.

I applied to the Canadian Track & Field Association for certification as well. I'll let you all know what they think when I hear from them.

# NANISIVIK ROAD RACES

- MEASURED -  
7-2-85

CALIBRATIONS: 1 OR WAY ON 4 ENROUTE 500 FT STEEL-TAPED CALIBRATION COURSES ON ROAD.

CRUNCH	TERRY FOX	MARATHON MADNESS	ARCTIC BAY
1341	1343	1339.5	1339
1339.5	1341	1339	1343
AV = 1340.25	1342	1338.75	1341

(20 COUNTS PER WHEEL REVOLUTION)

2ND HIGHEST AVG (ELIMINATE HI & LO, USE HIGHER REMAINDER) = 1341

$$\text{OFFICIAL CONSTANT} = \frac{1341 \text{ COUNTS}}{500 \text{ FT}} \times \frac{5280 \text{ FT}}{\text{MILE}} = 14160.96 \text{ COUNTS/MILE}$$

$$= 8799.21 \text{ COUNTS/KM}$$

POINT	- BETWEEN POINTS - - ELAPSED COUNTS -		CUMULATIVE COUNTS - 1ST RIDE	CUMULATIVE	
	1ST RIDE	2ND RIDE		KM	MILES
START	0	0			
1ST BAILEY	74824	74886	74824	8.50	5.28
2ND BAILEY	63263	63254	138087	15.69	9.75
TERRY FOX PASS	80171	80053	218258	24.80	15.41
AIRPORT RD.	6128	6155	224386	25.50	15.85
NANISIVIK RD	49092	49218	273478	31.08	19.31
DOCK	45400	45455	318878	36.24	22.52
NANISIVIK RD	45400	45455	364278	41.40	25.72
FINISH	4777	4780	369055	41.94	26.06
	369055	369256			

1ST RIDE, BEING SHORTER, IS OFFICIAL

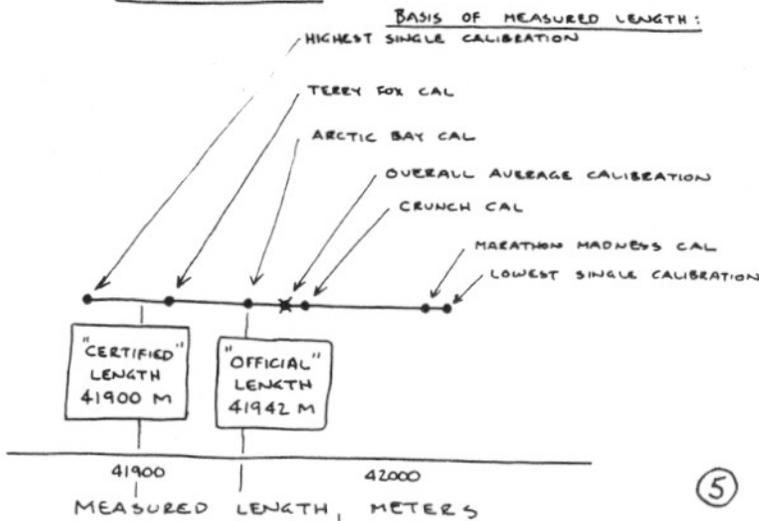
$$\text{DIFFERENCE} = 201 \text{ COUNTS} = 22.8 \text{ M} = 0.054 \% \text{ (LESS THAN } 0.08 \text{ IS OK)}$$

$$\text{MEASURED LENGTH} = \frac{369055 \text{ COUNTS}}{8799.21 \text{ COUNTS/KM}}$$

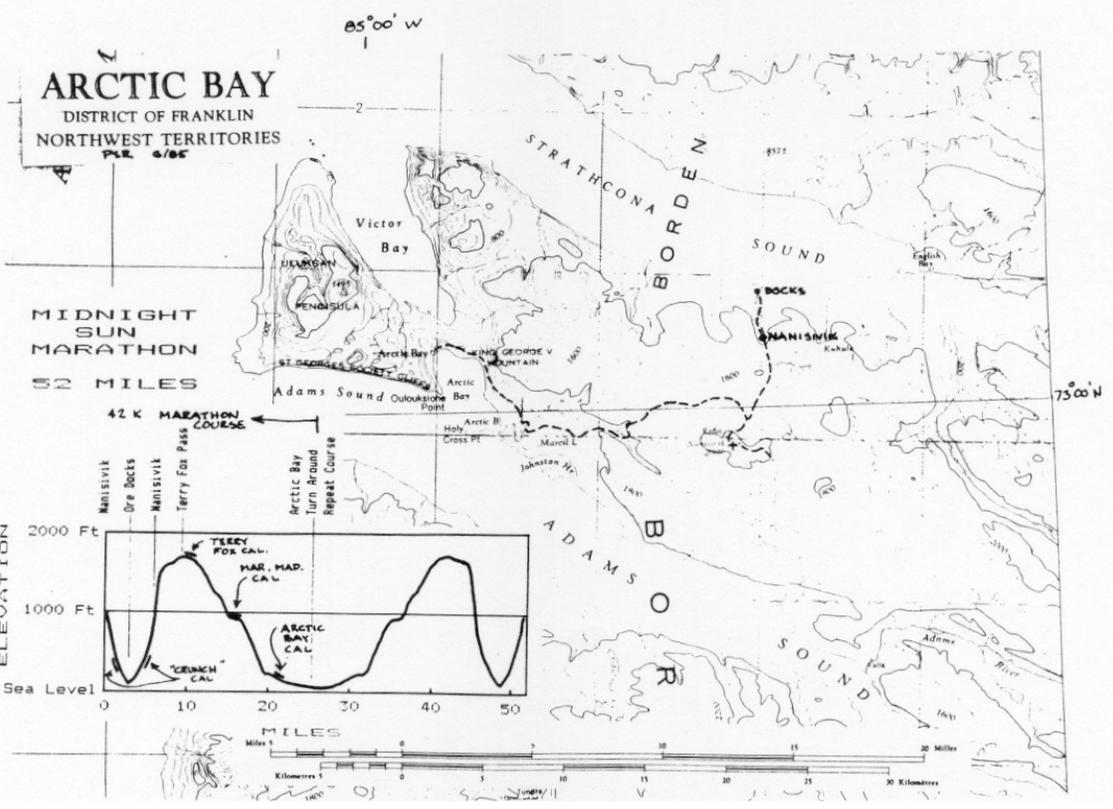
$$= 41.942 \text{ KM}$$

$$\text{CERTIFIED DISTANCE} = \frac{41.942}{1.001} = 41.900 \text{ KM}$$

## VARIATION



(5)

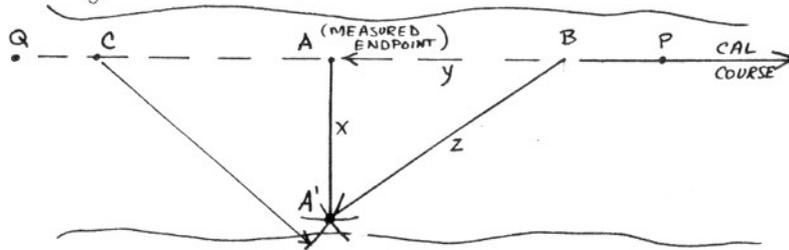


### ③ OFFSET METHODS

Both yours + Bob's methods are probably fine I think. But both road edges and center stripes can be tricky - i.e. not straight or not parallel or whatever.

We've used chalkline to get a good baseline, and then Pythagoras to construct right triangles.

MORE DOPE ON  
OFFSET CAL COURSES  
FROM:  
← BOB THURSTON  
BEN BUCKNER →



This part I'll have to think about: what is optimum shape of right triangle to use (for accuracy)?

1. Measure to A (endpoint)
2. Use chalkline between A and last measuring point P to establish straight line PAQ.
3. Measure along the line a convenient distance to B - and if possible, the same distance to C.  
As shown,  $\overline{AB} = \overline{AC}$ ; but this would work with  $\overline{AB} \neq \overline{AC}$ , or without C altogether (it's a nice check if you have it)

4. Now measure across the road to find your preferred distance  $\overline{AA'}$ , or  $x$ .

5. Use Pythagorean theorem:

$$x^2 + y^2 = z^2 \Rightarrow z = \sqrt{x^2 + y^2}$$

$$\text{so } A'B = z = \sqrt{(AA')^2 + (\overline{AB})^2}$$

→ With a tape marked in tenths of a foot and a calculator, you can use any distances  $\overline{AA'}$  and  $\overline{AB}$ .

→ Without that equipment, you could construct a 3-4-5 triangle to solve the problem. Example  $AA' = 36'$ ,  $AB = 48'$ ,  $A'B = 60'$

- ⑥ Swing measurements from  $A=B$  to find point  $AA'$ .  
Check by using  $A'C$ . Any discrepancy, re-check all measurements.

OSU

The Ohio State University

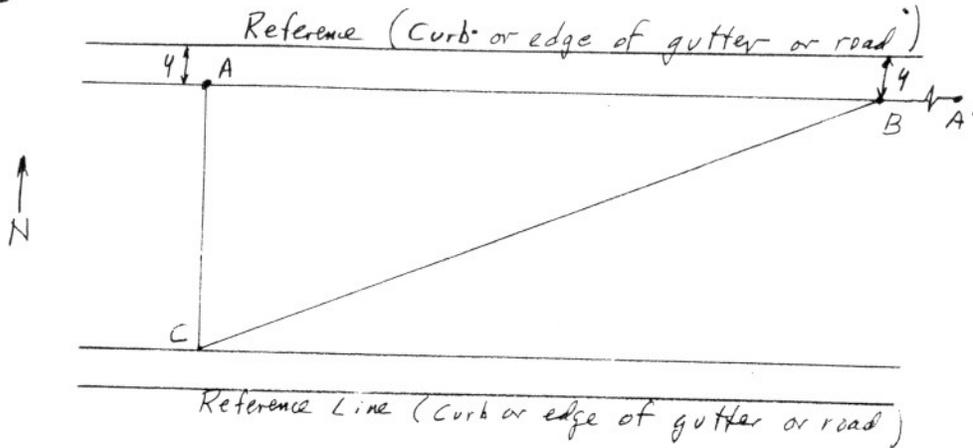
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1958 Neil Avenue  
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5/21/85

Parallel Calibration Courses - Part 3

Ben Buckner



Problem

Measured cal. course from east terminates at  $A$ . It is desired to have parallel course on south side of street. The street is straight. " $A$ " is distant  $\frac{1}{2}$  mile or more from  $A'$ . Reference line is straight (not jagged or undulating).

Solution:

1. Measure " $y$ " at " $A$ " from reference line.
2. Go to  $B$  at some arbitrary and convenient distance (perhaps 40 to 70 feet) and set " $B$ " at distance " $y$ " from same reference line as " $A$ ".
3. Measure  $AC$  as close to  $\perp AB$  as possible using "hard swing" method ( $\rightarrow O \leftarrow$ ) or whatever, placing " $C$ " at convenient place across the street.
4. Compute  $BC = \sqrt{AB^2 + AC^2}$
5. Measure  $AC$  and  $BC$  crossing arcs to set  $C$  at  $90^\circ$  to  $AB$ .

#### MAPS AGAIN!!!!

Almost everybody is getting maps right these days, with one exception, a final signatory who must have sent me 30 certs this year with bad maps. This is distressing to me, because I'm trying to be helpful and expeditious, yet continually having to turn around this guy's lame maps is a drain on my time. Self-pity is not a pretty emotion, but it's something that comes over me when I get an envelope from him. I can't understand why, after the score of letters I have written to him on this subject, he continues to plague me with stuff that I have to send right back to be done over. After all, the guy is a final signatory and supposed to know his job. I just wish he would do it.

A map must show the location, measured from a nearby landmark, of start, finish, and turnaround (if any). It must show all the roads that are followed. If the map is not drawn as shown in the Measurement Book, I forgive. I make all sorts of exceptions. Not everybody can draw maps like Bob Letson. In these cases it is assumed that SPR was everywhere measured, unless stated otherwise. This is not a complicated thing to do.

I will point out that NRDC is not accepting any courses that do not come through me, with the exception of George Delaney, who works through Ted Corbitt, and Wayne Nicoll and Bob Thurston, who have shown by their impeccable work that they need no further supervision.

In other words, if I don't send the course to NRDC, it doesn't get put on the list. And, for all practical purposes, the course is not certified. So, please pay attention to those maps. If someone draws them for you, take a critical look at the product, and ask yourself if you could follow every aspect of the course, using that map alone.

I don't know whether Paul Christensen has problems like this with his final signatories. I do not think so. I hope not.

We are all overworked. Let's not add to the work by sending junk to one another.

#### MORE ON ELIMINATOR TUBES

Last month I reported on Bob Baumel's unease concerning the performance of Eliminator tubes on curvy courses. Like a good investigative scientist, he called for data, and Tom Knight sent some comparisons of his riding with other measurers who used pneumatics. He found nothing he could put his finger on to show that there was any difference between results gotten with Eliminators versus pneumatics.

On the NYC Marathon ride, I used Eliminators. Bob Letson used his own solid front tire (not an Eliminator - another brand). Bill Noel and Wayne Nicoll used pneumatics. The data doesn't seem to show any particularly obvious difference either way. More info is sought.

SEE A GROWN MAN CRY!

WATCH OUT FOR THIS GUY'S PROPWASH!

Fred Pilon, Editor of Ultrarunning Magazine and measurer of the Riverside Twilight 5 Miler (which recently passed Wayne Nicoll's validation check) reports that "some guy" was coming into his area to measure 5 courses in one day! Now that's flying. I hope all the preliminary work is OK. The most I ever did was three (10k's), including a 1/2 mile cal course layout - and I had three good courses that were already pretty accurate, and they supplied a rider to help measure. It was a busy day, and I still had some riding to do the next day. I hope this guy has help!

TEMPERATURE CORRECTION CONFUSION

I just had a call from a measurer who had some trouble with the temperature correction calculation as shown on the "Steel Taping Data Sheet". He was getting a correction factor that was huge, and he knew something was wrong. There should be parentheses around a couple of terms in the equation, as shown below. Computer people will assume that multiplication precedes addition, but regular folks will not. So assume parentheses where I've shown them if anybody should ask.

BY "THE BOOK"

3. Average Raw (uncorrected) Measurement of Course \_\_\_\_\_
4. Temperature Correction. Use the average pavement temperature during measurement, in whichever formula is appropriate (for Celsius or Fahrenheit temperature). Work out answer to at least seven digits beyond the decimal point.
 

Correction factor	=	1.0000000	+	(.0000116	x	[Temp (°C) - 20]
Correction factor	=	1.0000000	+	(.00000645	x	[Temp (°F) - 68]
Correction factor	=					

ADD PARENTHESES
- NOTE: For temperatures below 20° C (68° F), factor is less than one  
For temperatures above 20° C (68° F), factor is greater than one
5. Multiply the temperature correction factor by the average raw measurement of the course (line 3).
 

_____	x	_____	=	_____
correction factor		avg. raw measurement		corrected measurement

OLDER VERSION - STILL CORRECT -

3. Average Raw (uncorrected) Measurement of Tentative Course \_\_\_\_\_
4. Temperature correction factor. Use the average pavement temperature during measurement. Correction factor will generally be less than six inches or so.
 

Correction factor	=	.00000645	x	(length)	x	(Avg. pavement temp - 68F)
Correction factor	=					

Note: Temperature below 68F - correction factor will be negative  
Temperature above 68F - correction factor will be positive
5. If temperature correction factor is negative, subtract it from the average raw measurement from line 3. If it's positive, add it to the average raw measurement.
 

Corrected average measurement of tentative course	_____
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#### WESTERN STATES UPDATE

Carl Wisser reported on his check of Pierre LaPlant's measurements of the Western States 100 mile course - a trail run. He says:

"We used Jones counters on mountain bikes, with Cateye solar computers as backup. I had previously compared this setup against a steel-tape measurement of a hilly East Bay course (Woodminster - 8 miles) & the bike method showed only 0.4 percent error, which encouraged me to go ahead."

LaPlant got 91.4 miles. Carl got 91.9. At this writing I believe that distance will be added to the course, although there has been heated debate regarding the wisdom of this.

LaPlant has been badly blasted in the press for making his measurements public. The thought seems to be that he should have quietly submitted his results to race management rather than tell anybody else. This may have been the tactful thing to do, but few have questioned his data. Rather he has been criticized for his motives, which I consider irrelevant.

This does raise an interesting question - What is the duty of a measurer who checks out a course without consulting race management? Is a course "owned" in a sense by its management? Should other folks stay away unless asked to measure? Is it bad manners to give out the results of a measurement that conflict with the advertised course length?

This Western States brouhaha reminds me of the story of the Emperor's New Clothes.

#### ON THE INTERNATIONAL SCENE

John Disley (London Marathon Course Director and AIMS European Coordinator for measurers) wrote to Bob Baumel, reporting that Continental measurement practices are much like ours and outlined some of the things that AIMS does to assure course accuracy. They take pains to do things right, and the only important thing on which AIMS and TAC differ is that AIMS does not presently require a validation remeasurement when a record is set on a course. (Editor's note: Pressure from AIMS course directors on which records were not set may alter this) Their concept of the SPR is the same as ours, and he points out that the SPR is also the IRL, or "Ideal line of running" referred to in IAAF rules.

AIMS is presently working to establish a cadre of official measurers to take care of the courses governed by AIMS, and they have had several international seminars on the subject. He wonders when TAC will do the same.

He says "Finally, I would like to think that we can stay close together on the philosophy and practice of measurement so that at the end of the day the IAAF will have to listen to an orchestrated petition from the world of road-running to 'put the rules down' and accept measurement as a skill just as necessary as time-keeping or judging."

MN SUBSCRIPTIONS NOW AVAILABLE

A number of people who are not RRTC members have asked me if I would put them on the MN list. I have refused in the past, since it is easy for it to get out of control. When you give something away, people will ask frivolously. But, at the same time I have thought that measurers may benefit from some of the stuff we do. So, I'm now offering subscriptions to Measurement News. Here's how it will work:

- 1) If your name appears in NRDC News as a member of RRTC you will continue to get MN free of charge. It's our way of communicating with each other.
- 2) If you wish to receive MN you can send the Editor \$15 for a year's subscription. A "year" begins on 1 January and ends on 31 December. After June 30 the rate for the remainder of a year drops to \$8.00.
- 3) The number of issues will vary. In general 4 to 6 issues per year are mailed.
- 4) If, for any reason, I stop putting out MN, you will not receive a refund. At present I see no reason why I should stop, but life is a funny old ~~thing~~, and the future is uncertain. Sooner or later MN may stop, and at that time maybe somebody else will do it and honor subscriptions - but maybe not. Poor taste
- 5) Anybody who wants to copy MN and distribute it himself is welcome to do so. Get it from an RRTC friend if you wish. Might be cheaper.
- 6) No reminders will be sent when the subscription period is up. A notice will appear in the last issue of the year, however,

If all this seems loose and arbitrary, it is. I want to get the info out, but I don't have the time to run it in a well-organized, magazine-like manner. I hope you can live with it.

TALKED WITH A  
RUNNER WHO SAID  
THEY ADDED 7 MILES

BACK ISSUES  
\$2.50 EACH.