MEASUREMENT NEWS
August 17, 1983 - #5

Measurement News is an irregularly published, completely unofficial forum for measurers to discuss the subject of measurement, compare notes and learn from each other. It is sent to everybody who is listed as a Regional Representative by NRDC News, plus some others.

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(CONTRIBUTIONS & CORRESPONDENCE SOLICITED!!)

Conversion factors - I had some interesting correspondence with Allan Phillips in which we kicked around the subject of conversion factors. There seems to be some disagreement in various publications. There is none in the accepted conversion.

One inch is exactly 2.54 centimeters. All conversions spring from this currently accepted definition. The history of conversion factors is fascinating, but irrelevant here. At the risk of insulting your intelligence you will find a calculated table of conversions somewhere later in the pages of this newsletter.

Differences between the various versions of conversion are all tiny, but we might as well do it right.

Measurement Accuracy and Precision - The Olympic measurement has been calculated six ways from Sunday, and all methods of calculation agree fairly closely, except for the "standard" version,(because of the 0.1 percent added). Standard deviation for 13 measurers is about 5 meters for the 42.2 full course. Accuracy, as checked by six enroute calibration stretches, is good. Error amounts to less than 0.05 meters per kilometer. (std. method before adding 0.1 %)

Tom Knight sent some data from measurement of the 1983 Oakland Marathon in which 4 measurers, on two separate occasions, got a standard deviation of 5.2 yards. Good precision, in close agreement with the Olympic dope. Accuracy unknown, but if they rode like they did on the Olympic ride, their accuracy should be fine too. for 6 measuremen

Tom also sent some steel tape vs EDM stuff, in which courses were EDM'd, then taped. Agreement was better than 1/10000 in all cases. Strangely, temperature-corrected taping had a slightly greater error than uncorrected taping.

Coming Attractions - Alan Jones inquired as to whether I'd be interested in a writeup of how the Jones Counter, our friend and mainstay, came to be. I said yes! I haven't got it yet, but I'm looking forward to seeing it and passing it on.

Contributions to MN - Some people have sent me money to help defray my expenses in producing this thing. I thank them wholeheartedly. I do not solicit contributions, because the expense is not great and because I think I'm getting more than my money's worth because of what I'm learning from all of you.

Old vs New

When many of us started to measure, the technique was to lay out a set of marks. On the second ride a second set of marks was laid out. Then the distance points were set halfway between the marks. It worked.

I found when I started to review other people's measurements that their data didn't tell me much. I'd get a list of counts, each differing from the last by a constant value. There would generally be a statement as to which bike was ahead at the end, and by how much, but usually very little concerning intermediate points. I found such data hard to review for accuracy.

Bob Baumel was astounded that I was using such an archaic technique. He started measuring in Canada, and the method he uses is to lay out a single set of marks. On the second, third or any number of subsequent rides, he stops at the same marks each time. Not only does this relieve him of the necessity of watching his counter, but the data obtained gives accurate information as to the separation of bikes throughout every portion of the ride. I was skeptical, but I tried it.

It works! It is absolutely great! Bob Letson has converted, and I want to urge all of you to try the method. Your first set of measurements will differ by a constant value, your layout constant. Subsequent interval counts will all be slightly different, giving you precise fixes on how the whole thing went. If you're the measurer, you may not think this is such a big deal. However, when you are reviewing a measurement, the numbers you get back are a lot more informative than when the old method is used.

Which bike is in front? Sometimes during a measurement they switch back and forth. This is hard to follow, if the information even is given to you. Using the new method, it's all there in the numbers.

The instructions I give to prospective measurers uses the new method. If you want a set, send me a ~~buck and~~ SASE. (37¢)

The new method yields all of the information that the old one did, but is much easier to understand and analyze. No sacrifice of accuracy. Final adjustments are dead easy - no confusion. Try it, you'll like it.

CONT. →

KM TO MILES

KILOMETERS	MILES
1	.621371
2	1.24274
3	1.86411
4	2.48548
5	3.10686
6	3.72823
7	4.3496
8	4.97097
9	5.59234
10	6.21371

KILOMETERS	MILES
5	3.10686
10	6.21371
15	9.32057
20	12.4274
25	15.5343
30	18.6411
35	21.748
40	24.8548
45	27.9617
50	31.0686
55	34.1754
60	37.2823
65	40.3891
70	43.496
75	46.6028
80	49.7097
85	52.8166
90	55.9234
95	59.0303
100	62.1371

BASED ON THE EXACT RELATIONSHIP

1 INCH = 2.54 CM

OLD VS NEW - CONT.

An example may help: Two measurers set out to measure a one-mile course. They calibrate and obtain working constants of 15000 counts per mile. After they measure they recalibrate and measurer "A" obtains a constant of 14980, while "B" gets 14990. (see diagram, next page)

Under the Old Way, each rides 15000 counts. Because of unavoidable imperfections in technique, "A" is ahead of "B" at the end by one foot.

Under the New Way, measurer "A" rides 15000 counts and makes a mark. Measurer "B" doesn't read his counter enroute. He merely rides to the mark that "A" has made and then reads his counter. He records 15003 counts.

How does it come out? Look at the diagram. It is possible to locate the proper finish line, and to determine the difference between measurements by either method, but the new method is much more straightforward and simple.

Many people who use the old method will state the difference between measurements as one foot, where it is really 0.8 feet. The separation of bikes is not the difference in measurement.

Also, many, because measurer "A" was ahead at the end, will assume that measurer "A"'s finish line will result in the longer course. It's not always so. Because tires behave differently under temperature change, only recalibration and calculation of the day's constant will reveal the truth.

I can measure either way. I prefer the simplicity of the new method. But where it really shines is in the review process. It is difficult to explain all the "who's in front" business. At least it's difficult for me to follow the reasoning of many who use the old method, whereas the new method comes out much more clear when put on paper.

I have, of course, chosen the numbers in my example to suit my purpose. However, they are not unreasonable numbers, and they do fit reality.

Mile	Count "A"	Count "B"
0	15000	15000
1	15000	15000
2	15000	15000
3	15000	15000

measurer "A" 3.5 feet ahead at end of measurement
(old way)

Mile	Count "A"	Count "B"
0	15000	15003
1	15000	14984
2	15000	14998
3	15000	15005

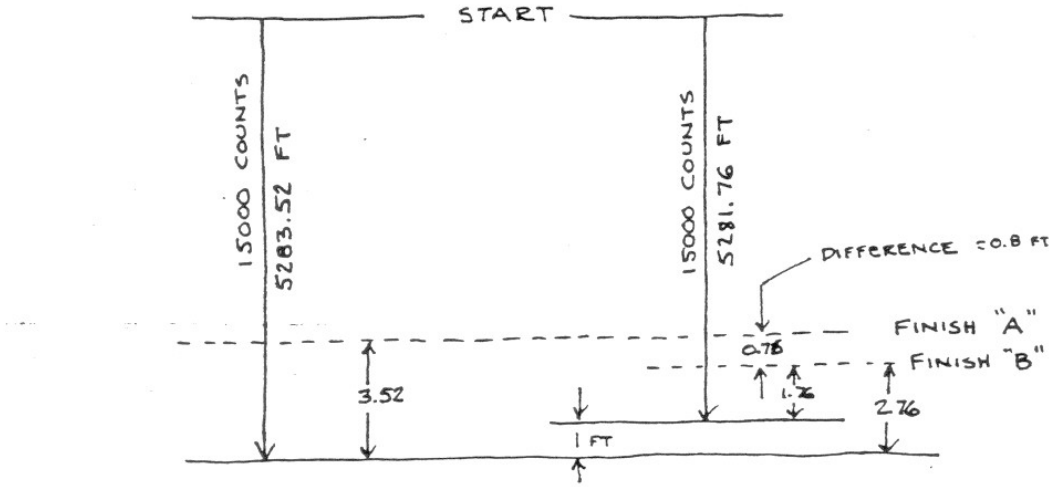
measurers both measured to same points
(new way)

Which set of data above tells you more? The first set, the old way, doesn't say anything about enroute accuracy. The second set, however, done the new way, gives measurement differences about each intermediate point, and even tells which bike is ahead, even though that doesn't matter. It gives much more complete dope.

Neither one - they measure to the same point!

MEASURER "A"
PRE-MEASURE CONSTANT
= 15000 COUNTS/MILE

MEASURER "B"
P.M.C. = 15000 COUNTS/MILE



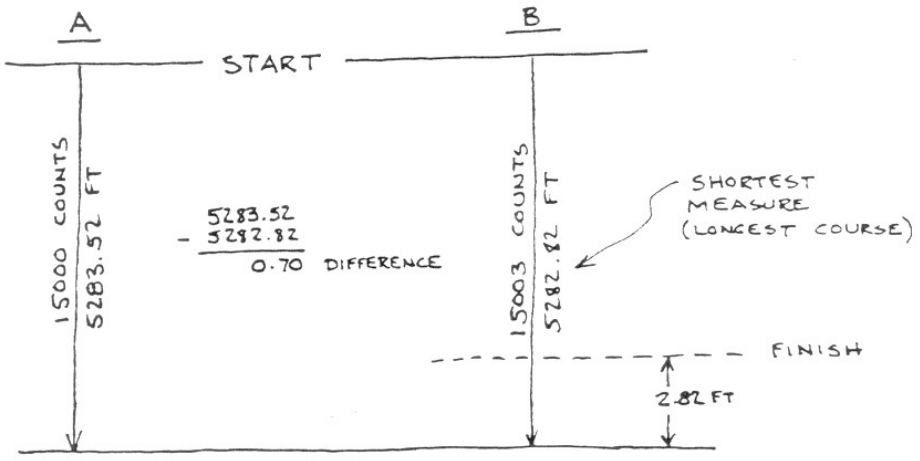
POST-MEASUREMENT CONSTANT = 14980

DAY'S CONSTANT = 14990

POST M.C. = 14990

D.C = 14995

OLD METHOD



NEW METHOD

Calibration Rides

Have you ever wondered, after making your four preliminary calibration rides, just how well other people do it? On the Olympic measurement we had a chance to compare the skills of 13 measurers under the same conditions. Here's how it came out: (course length - 1 kilometer)

First ride - 7 to 7:30 AM, April 24, 1983 - 50° and raining. Four rides.

Variation, Counts	Number of Riders
0	1
1	1
2	5
3	0
4	5
5	0
6	1

Mean variation - 2.85 counts. SD - 1.63 counts

Second Ride - 1 PM, 75° and clear. Two rides.

Variation, Counts	Number of Riders
0	2
.5	2
1	4
2	2
2.5	1
3	0
4	1
5	0
6	1

Mean variation - 1.65 counts. SD - 1.65 counts

On the first ride, the average constant obtained by the 13 measurers was 9467 counts/kilometer. One count is thus 0.106 meter. This says something about the ~~precision~~ which we may expect on a given measurement, but at this point I am confused by conflicting ways to look at the data.

accuracy! precision? both?

In any case, in the hope that the above data may be of interest, there it is. Anybody's opinion on its potential meaning is earnestly solicited.

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After calculating everybody's measurement of the course by several methods, an attempt was made to try to correlate the best calibrator (least variation) with the best measurer (shortest measurement of the course). No correlation was apparent - the points were a shotgun pattern.

Gadgets for Measurers

A bare bike with a Jones counter, and big pockets to carry a notebook and a can of spray paint will get you by, but there are some nice things out there that make measuring a lot easier.

Handlebar pack - Well worth the twenty bucks or so that they cost. Lots of room for all the junk that's nice to have along on the ride. Some have transparent pockets on top. These are handy for holding the piece of paper with the counts where you're supposed to stop and mark a point.

Electronic Odometer - I fell in love with this one when I saw Dave Katz's outfit. He had (and I now have) a Cateye Cyclometer. It has a magnetic ring on the front wheel, with a hub-mounted pickup and a wire to the readout unit on the handlebars. You can read all sorts of speed-time relationships, but the best is the easily-resettable odometer that reads to 0.01 miles. I have a bad time trying to read my Jones counter on the fly, but since I got the Cateye I just keep an eye on the readout, and when it gets close to what I want, I slow and get ready to use the Jones counter for the final measurement. It sure makes life a lot easier.

There's another cyclometer, the Avocet, that promises to be even better. It can be programmed to greater accuracy than the Cateye, and it's cheaper (Cateye - $40 Avocet - $25). Unfortunately, although they're widely advertised in the Bike magazines, they are having production difficulties and are supposed to be ready in October.

"Eliminator" airless inner tubes - I got a set of these ($15 each) because I'm paranoid about getting a flat tire at a critical point in a measurement. I fear no more. These things are like stiff hula-hoops that go inside the tires on your bike. They even give you a little sticker to put over the unused hole where the valve stem used to live.

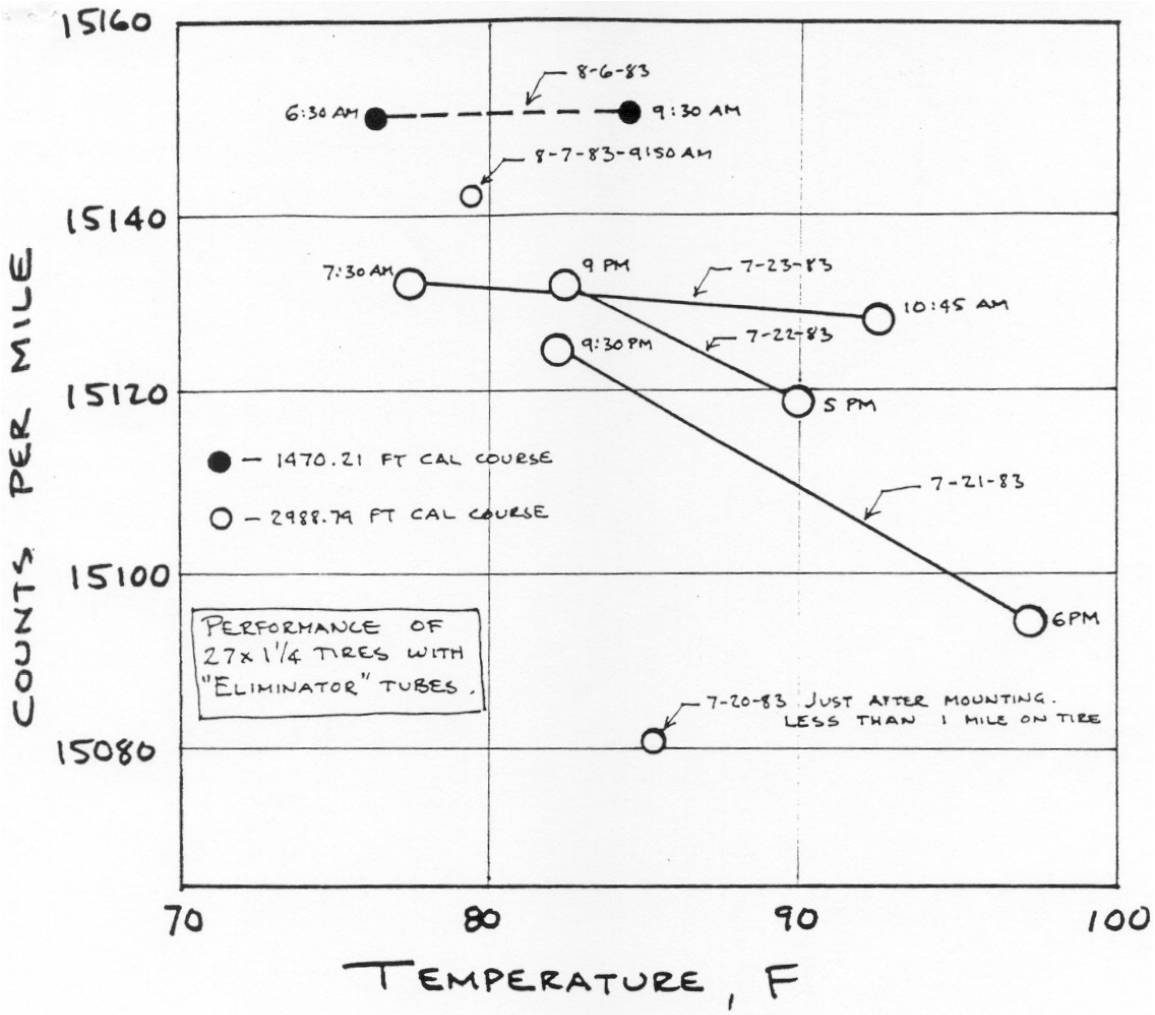
The ride seems a trifle harsher, but pedal effort at measuring speed (which is where I do most of my riding) doesn't seem different. Since I put them on the bike, my riding constant is about 100 counts per mile larger than it used to be, so I know the tires are a little softer. The tire sits a trifle cockeyed on the rim. This is unavoidable if the tube is a good, tight fit, because of the equilibrium forces in the tire-tube-rim system. It is only slightly noticeable.

Even though the tire no longer depends on air pressure to keep it fat, there is a temperature effect. It seems not very different than that of an ordinary inflated tire. I've been keeping track of my riding constant vs temperature, and there's a graph of how it's worked out so far somewhere in this newsletter.

I've measured four courses with the "Eliminator" tubes, and I'm quite happy with their performance. It's a big load off my mind now that I no longer have to worry about getting a flat.

Prices and availability - go to a bike store and/or get a copy of "Bicycling" magazine. There are loads of ads for this kind of stuff.

If you've been using anything that makes life easier, let me know what you've got and I'll pass it on. I know Bob Letson used a solid tire on his Olympic marathon measurement, and I hope he's got some performance dope.



Here's all the dope I have to date on the performance of my Eliminator tubes. I'm looking forward to some cooler weather so I can see how they do then, but must wait. Some trends seem apparent, but it's early to say. The short cal course was used on measurement of a 10 K where I had only 2½ hours to measure. I had to have a course close to the race course, or I'd use up measurement time in driving, so I laid out the short course, used it, and checked the next day at the mid-temperature on my home course, which is full size. The short cal course appears to have produced a slightly long race course. I hated to use the short course, but the race course is out on a peninsula, and the longest straight stretch was ¼ mile. I'd have had to drive miles over slow terrain to use a conventional course. And there wasn't time.

The course was at an amusement park that lets the crowds in at 9 AM. First light was about 6:30. Only a preliminary car-measurement had been done, so I needed every bit of the available time I could get. The safe thing would have been to calibrate under the streetlights at 3 AM, drive the 140 miles to the course, measure, and return to Columbus to recalibrate. This would have been "legal" but the short cal course seems to me to have been the better choice. I hope Ted sees it that way too. I have no intentions to use a short cal course again, unless normal operation is impossible.