MEASUREMENT NEWS

September 1989 Issue #37

McBrayers got city on track

By DAGMAR AALUND
Houston Chronicle

Back in the '70s, fun runs in Houston were a rarity.

But now, thanks in part to Tom and Mary Anne McBrayer, they are a weekly event.

The McBrayers have been organizing races here for about 15 years.

They remember when the only trail in Memorial Park was the one pioneering runners blazed themselves. They remember when police were more likely to hassle runners than to block traffic for them on Saturday mornings. They remember when running in one's neighborhood was too embarrassing, when running was an activity best conducted in a gymnasium.

As an example of just how different running was in the '70s, the McBrayers cite a Houston women's run they organized as part of a national series in 1974.

Running notebook

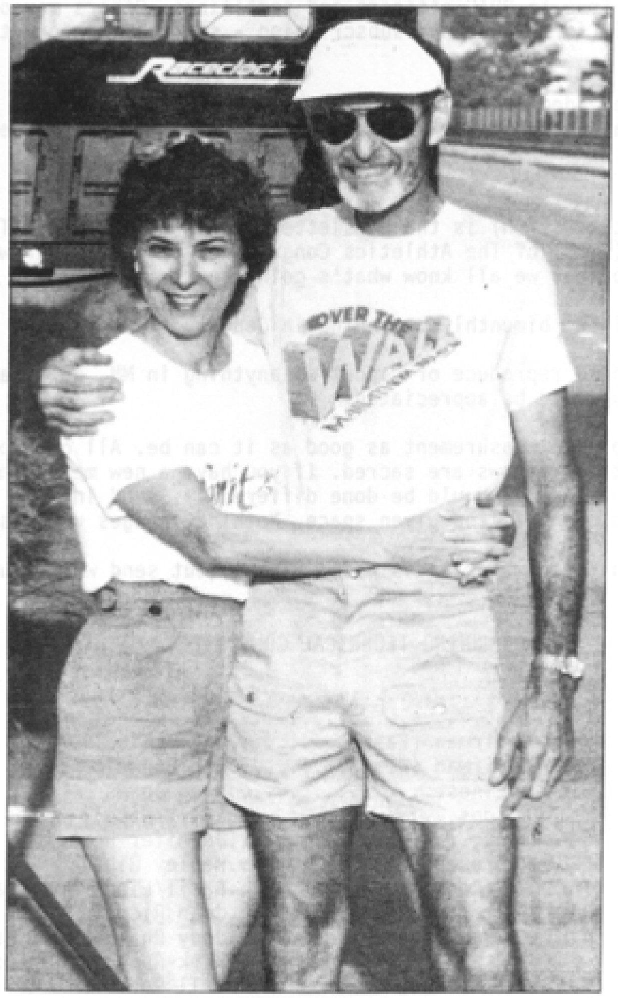
Until that time they rarely saw women running at all.

When 500 women showed up for the race, everyone was surprised.

"As the gun went off there was this big surge of women moving forward," says Tom. "It was reminiscent of the women's movement at the time because they were this huge force that no one knew anything about."

The McBrayers' passion for race organization continued even after they had to hang up their jogging shoes. Mary Anne, 55, stopped when arthritis in her knees made running impossible. Tom, 58, was sidelined by a hip injury.

Sunday, June 25, 1989



Mary Anne McBrayer and husband Tom have been involved in the Houston running scene since it began.

Mary Anne is now vice president of the local Long Distance Running committee, a group under the Gulf Association of the Athletics Congress. She and Tom helped revive the dormant LDR in 1972 and have been involved ever since.

As an LDR volunteer, Mary Anne has published a calendar of events, helped in the effort to light the Memorial Park trail and organized an annual championship series of runs.

For many years Tom has been in charge of the LDR's race equipment, which is used in many fun runs. He is also an active member of the group that measures and certifies courses for The Athletics Congress.

The McBrayers are a friendly, energetic couple whose expertise is evident to anyone who sees them in action. At a recent race the generator powering a computer for timing runners conked out. While others panicked, Mary Anne calmly stepped up to the finish line and called out runners' times as Tom dashed off to find gasoline for the generator.

The McBrayers' main project now is raising the profile of the series of races leading up to Houston's marathon in January.

The series — 20K, 25K, 30K — got a boost in popularity three years ago when they dubbed the races the "Warm-up Series."

But the McBrayers would like for the series to become a part of every marathon runners' schedule.

They will be handing out "Warm-up" entry forms in September at the annual marathon early sign-up event.

Road Running Technical Committee

MEASUREMENT NEWS

#37 - September 1989

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NEW MEASUREMENT BOOK NOW AVAILABLE

Electric City Printing has finished publication of the revised edition of Course Measurement Procedures. The new book is much like the old, except for the section on calibration courses, revised by Bob Baumel to reflect the use of 300 meter (1000 foot) calibration courses. Several of the defects and mistakes in the old edition have been corrected. Basic procedures remain the same. Forms have been only slightly revised.

Every certifier will soon receive five free copies of the new book. Others desiring copies should send $4.00 per copy desired to:

TAC/USA - Book Order Dept. - PO Box 120 - Indianapolis, IN 46206

When you order, be sure to specify "1989 revised edition."

NEW APPOINTMENT

David Poppers has been appointed Final Signatory, covering the state of Colorado. Congratulations, David.

ANT AMBLE FITNESS FOOTRACE PUZZLE

Bob Baumel wins the Rio de Janeiro Marathon t-shirt. There were only two responses to the puzzle. Baumel's answer (9387 ant meters) and discussion appears within. Bob Harrison submitted a guess of 10071.42857 ant meters. Pete Riegel, in devising the puzzle, measured the course twice and came up with 9419 and 9418 ant meters. Pete used a pair of dividers and "walked" it around the course.

THIS MONTH'S PUZZLE

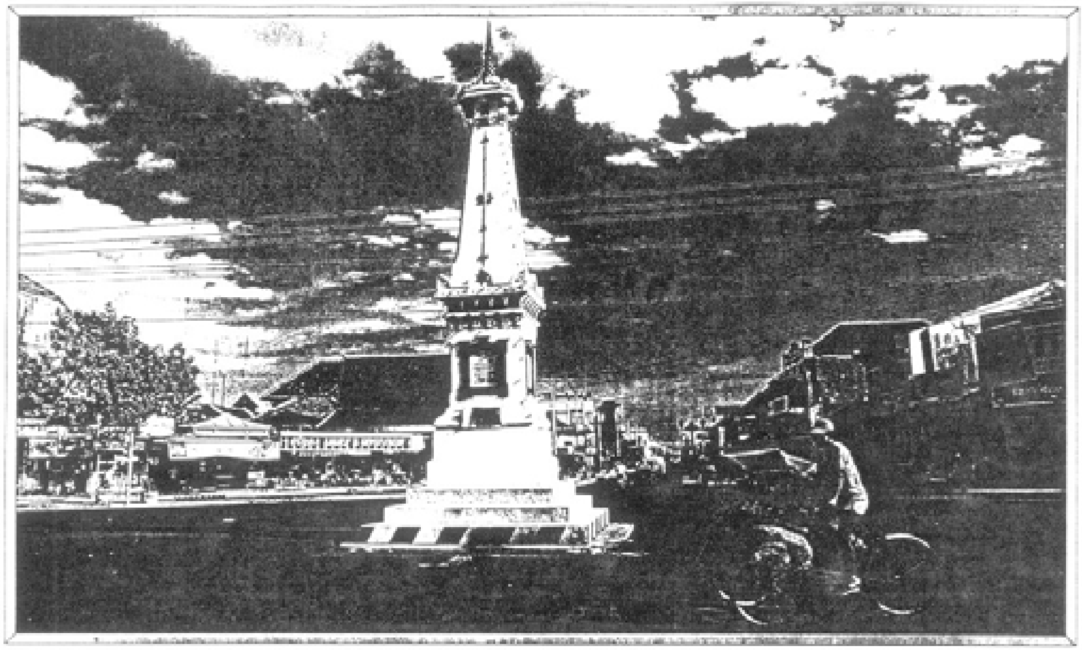
From Ken Young. For uniformity of answers, assume that the circumference of the earth is 40,000 km.

Pete,

Here is another interesting measurement problem. Barrow AK is located at 71.3 N and 156.8 W. Reykjavik ICELAND is located at 64.1 N and 21.9 W. Assume a spherical earth at mean sea level.

(1) How far apart are Reykjavik and Barrow (by the shortest route, over the surface, i.e., no tunneling)?

(2) What direction would you leave Barrow in order to follow this shortest path?



Tugu Monument

Yogyakarta

Yogyakarta 3 Aug 1989

Dear Pete,
You can see in the picture that I've found a new bike for measuring 2 courses at once (just as long as they are parallel courses, just about 1 meter apart). Called a becak (becha(k)). I have finished my measuring at least - after doing 1 marathon, 5 10Ks, 1-2KM, and laying out or rechecking 4 cal courses. It's been hard work but fun and satisfying. My family has been seeing sights & telling me about them. Later I'll write about measuring past families on horse-drawn carts, rice fields, villages where dozens of kids surround you whenever you stop, and lots more. Cheers!

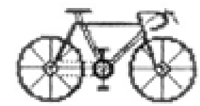
Bob Thurston

Pete Riegel
3354 Kirkham Rd
Columbus, OHIO
USA 43221

The Tugu Monument stands at the northern end of Jalan Malioboro/Mangkubumi — a ceremonial boulevard leading to the Sultan's Palace and Yogya's main thorough fare.

Photo © by Eric Oey

The Athletics Congress
Road Running Technical Committee
E. T. (Tom) McBrayer; 7733 Moline; Houston, Texas 77087
(713) 649-6832



July 13, 1989

Sally H. Nicoll, Validations Chairman
Road Running Technical Committee
3535 Gleneagles Drive
Augusta, GA 30907

RE: Validation of TX86004ETM, 100km racewalk 12.20.87

Dear Sally:

Following your suggestion that we "get on with it," I did indeed start validation procedures the same day (July 5). Since my bike was already calibrated from a measurement done earlier that same day, I thought, "What luck!" It was not be be, however. When I arrived at the county park where the course site was located, I found that bicycles were not allowed on the jogging path that had been used for the race walk. So, after talking with park officials, I was given permission to use my two-cent hand wheel for the validation measurement. (The two-cent wheel serves the same purpose as the world renowned "Nicoll" wheel. It doesn't have all the extras and obviously it's a lot cheaper.) I returned the following day after calibrating the wheel and located the two finish lines: i.e., the clockwise (CW) finish and the counterclockwise (CCW) finish.

The location of the start line proved to be a bit more elusive. According to the course map, a picnic table determined the start line and as it turned out, there were three tables in the vicinity that could be used. I measured from all three before I found the one I was looking for. Let it be said, though, an acceptable distance was obtained from all of them.

I do need to mention that the jogging path had been resurfaced earlier this year, but I was assured by park officials that the width was the same as originally laid down and presumably the same as had been measured in 1985.

One other note: I modified the validation report somewhat to allow for both English and metric units. Even though the distance was metric, it had been measured in miles.

I believe this loop course provided me with a good introduction to the new world of validation. If nothing else, it shows just how critical taped distances from permanent landmarks are. What is perfectly clear to the original measurer can be somewhat murky to others. Thanks for the opportunity.

We will look forward to seeing you in Washington in December. Mary Anne sends her warmest regards.

Sincerely,

Tom

E. T. (Tom) McBrayer
Texas State Certifier

ETM:mam
Encls.

cc: Pete Riegel ✓
Bob Baumel

EFFECT OF WIND AND SLOPE ON RUNNING SPEED

Slope - A downhill runner will be aided by the slope, in an amount equal to the product of the slope times his body weight. Or, a 140 pound person running down a 1/1000 grade will receive a 0.14 pound assistance from the slope. Treadmill studies indicate that a slope change of 1/100 produces a speed change of 0.5 mi/hr, at speeds of 10 to 12.5 mph. From this, a slope of 1/1000 will increase the runner's speed by 0.022 m/s. This analysis assumes a 140 pound runner.

For a runner doing 10 km in 30 minutes, this increase in speed will reduce his finish time to 29:53. Put another way, 1 m/km downhill produces a 0.14 pound force, which is worth 7 seconds in 10 km. Or, a 1 m/km slope has the same effect as shortening a course by 4.0 m/km. The aid is proportional to the slope i.e. a 3 m/km slope gives a 21 second advantage, or an apparent shortening of a 10 km course of 120 m.

Wind - Wind also produces a force on the runner, which may be approximated as follows:

Wind force = $C_d*A*d*(V^2)/2$, lb, where:

C_d = Drag Coefficient, dimensionless
A = Area. sq ft
Note: wind tunnel experiments indicate that C_d*A is about 5 square feet, for a runner-size person
d = Density, slug/cu ft (air = .075/32.2)
V = Relative Wind Velocity, ft/sec

For a 30 minute 10 km, the runner will have to exert 1.93 pounds to overcome wind resistance. If he has a 1 m/s tailwind, he must exert only 1.3 pounds. Thus he is aided by 0.63 pounds. Since a 0.14 pound force saves 7 seconds, 0.63 pounds will save about 32 seconds.

The following charts and graph will illustrate the effects of wind on the runner. In developing them, the speeds chosen were all equivalent to a 30 minute 10 km. Specific times used for baseline speeds were:

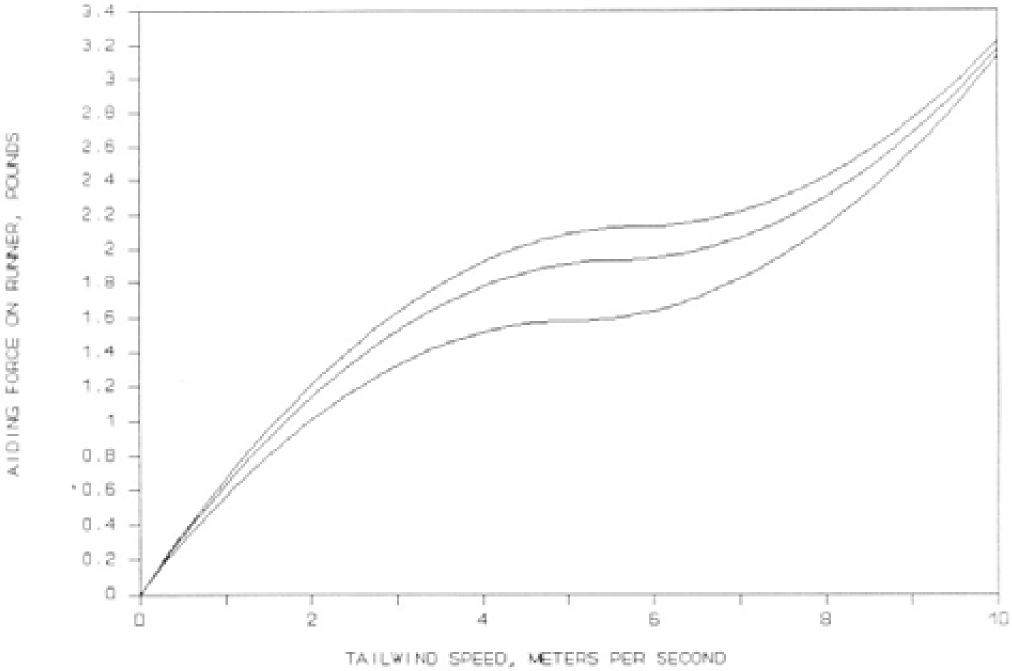
5 km - 14:16
10 km - 30:00
Marathon - 2:20:00

In the graph, an interesting thing may be seen. Each curve has an s-bend in it. This bend occurs at about 5 to 6 m/s, which is the runner's speed. A wind change produces most effect when it is different from the runner's speed. Therefore, changes in wind at speeds in the 4 to 7 m/s range produce little change in force.

The table shows the effect of various winds for the three distances. The last column shows the wind effect in terms of its apparent effect on the course length. For example, if wind speed is 4 m/s, the theoretical 10 km runner's time is reduced by 1:37. This would be the same as if the runner had run without any wind at all on a course that was short by 571 meters.

These wind calculations assume that the runner has a tailwind for the entire duration of the race.

WIND FORCE ON A RUNNER



Upper curve = 5 km
Middle curve = 10 km
Lower curve = Marathon

EFFECT OF WIND							EFFECT OF SLOPE	
Tail Wind m/s	Tail Wind mi/hr	Time Advantage 5 km	Time Advantage 10 km	Time Advantage Mar	Effective Shortening m/km		Downhill Slope m/km	Effective Shortening m/km
0	0	0:00	0:00	0:00	0		0	0
1	2.2	0:16	0:33	2:34	19		1	4
2	4.5	0:29	1:01	4:38	35		2	8
3	6.7	0:40	1:23	6:09	48		3	12
4	8.9	0:48	1:37	7:05	57		4	16
5	11.2	0:52	1:45	7:25	62		5	20
6	13.4	0:53	1:47	7:42	63		6	24
7	15.7	0:55	1:54	8:38	67		7	28
8	17.9	1:01	2:08	10:12	77		8	32
9	20.1	1:10	2:30	12:28	91		9	36
10	22.4	1:23	3:01	15:29	112		10	40

John I. Disley CBE
Hampton House
Upper Sunbury Road
Hampton
Middlesex TW12 2DW

Dear Pete,

Many thanks for your letter and copy of MN. Glad to see that I have managed to fill a couple of pages again. Actually, the Warsaw seminar was very worthwhile and I learnt a lot about what the art of the possible was with a group of non Jones Counter users. It was a pity that you couldn't have stayed on to the end

Just a point on your MN page 30. Why will I get more counts when the wind is behind me? With the wind behind me I sit back and take weight off the front wheel. It is when I'M struggling into the wind that I move forward over the pedals and would expect to have the same posture as when riding down-hill.

Having just been watching the Tour de France every night for two weeks on TV I have a fairly good visual image of what cyclists do on hills and when fighting the wind. In fact, racing cylists probably have more weight on the front wheel going uphill than going down hill. I know that we don't ride like the pro's, but some of the bikes I have been given to ride in strange cities - one-gear jobs, mean that I have often stood on the pedals on the up-hill sections of a course . So much for theory!

Best wishes to Joan - see you soon.

John

Dear John,

I can see that I should have added weasel-words to my conclusions on the uphill/headwind material in MN, as follows: "These conclusions remain valid as long as the rider maintains the same riding posture regardless of conditions." Rather like an automobile. Naturally a rider will adjust his technique to fit the conditions. On a steep uphill I tend to weave much more than when I coast down going the other way, which tends to add counts on the way up instead of removing them.

Pete

Charity Chase 5Km   Measured: 5/18/89

Length of Calibration Course = 804.672 m
Measurements Computed using LARGER Constants INCLUDING 1.001 factor

Dave Poppers

Pre-Calibration:

Start	Finish	Counts
14000	21666	7666
21666	29329	7663
29329	36993.5	7664.5
36993.5	44658	7664.5

Working Constant: 9534.5240 counts/km

Post-Calibration:

40000	47663	7663	T.W.
47663	55322.5	7659.5	H.W
55322.5	62984.5	7662	T.W.
62984.5	70644	7659.5	H.W

Finish Constant: 9530.1701 counts/km

Constant for Day: 9534.5240 counts/km

Course Measurement:

	Counter Reading	Interval (counts)	Interval (meters)	Counter Reading	Interval (counts)	Interval (meters)
Finish	53000			48673		
3 mile	54640	1640.0	172.01	47027	1646.0	172.64
2 mile	69985	15345.0	1609.41	31686	15341.0	1608.99
1 mile	85330	15345.0	1609.41	16346	15340.0	1608.89
Start	00675	15345.0	1609.41	01000	15346.0	1609.52
Totals:		47675.0	5000.25		47673.0	5000.04

(Sum of Shortest Splits = 4999.31 meters)

Pete,   7/15/89

Here is the perfect example of the effect of wind on calibration. On the post-calibration the 1st and 3rd rides were with a strong tail wind, and the 2nd and 4th rides were, of course, with a strong head-wind.

Dave Poppers - Colorado

FINISH LINES

TIME	PLACE
1:08:24	989

Finish Line Sub-Committee
Alan Jones, Chairman
3717 Wildwood Drive
Endwell, NY 13870
(607) 754-2339
September 1989

CERTIFIED OFFICIALS

At the upcoming TAC/USA meeting, the debate over TAC certified officials will certainly continue. In order to sample more of the running community, TAC Officials Committee Chair Jerome Perry made a presentation to the Road Runners Club of American National Convention in Colorado Springs this past June. I wasn't there but ROAD RACE MANAGEMENT was and reported on it in their July, 1989 issue. This summary is taken from their newsletter. (reprinted with permission.)

> Perry stated that the goal of his group is "to provide a resource of qualified officials across the country." He continued, "The officials you select are under your control." Perry advocates certified officials to be used for the starter, referee, timers and chute controllers.
>
> Basil Honikman of TACSTATS summed up the difficulty in this area with his assessment that there exists a dichotomy -- how to provide improved technology and keep the free spirit of the sport.
>
> Julia Emmons of Peachtree and an RRCA Board Member expressed skepticism over being suddenly bound by every TAC rule in the book. She pointed out that everyone gets a TAC sanction these days which means you are supposed to obey TAC rules, many of which "would cause you to freak out."
>
> Carl Johnson, the State Representative from North Carolina, pointed out that for small clubs with informal events the TAC rules are overkill. Most small race directors are "out there for the social experience," he said. In addition, many large races don't perform the basic functions either. "The nub," Johnson sums up, "is (internal) management versus officials."
>
> Former RRCA President Harold Tinsley added, "I don't think road racing should be dictated by a small number (of runners) who hold records."
>
> Perry pointed out that if the dissatisfaction is with the TAC rules, then the RRCA should work to have the rules changed. TAC officials, he emphasized, only enforce the rules that are on the books. Still, many RRCA clubs would rather be left alone.

WIND-AIDED/SLOPE AIDED

While not a "finish line" concern, I've been following the wind-aided/slope-aided debate over the past several years. I mentioned a issue or two ago in MN that I would try to analyze the Boston Marathon course to see how much the hills slows the course down compared to the overall drop which speeds it up. I received the USGS maps. Bob Baumel will be glad to know that they all came in as metric maps at 25,000 to 1 rather than the old 24,000 to 1. The contour intervals are every three meters. Strange. I guess they wanted to keep it close to the old 10 foot interval. Now to sit down and analyze the hills.

Pete Riegel has been doing a nice job attempting to analyze the help one gets from a wind. It looks to me that he has shown that our 10% limit on start-to-finish distance is way too conservative. Even in his worse-case scenario you need a constant wind blowing from one direction during the race to help. I'd love to see the rules change to about a 50% separation but before that happens, we have to have rather general agreement with Pete's results.

MY FIRST COURSE MEASUREMENT SINCE 1984

It's hard to believe that I haven't measured a course for five years (other than helping with the Orange Bowl verification in 1988). I re-did all our club's courses after the 1983 "instant decertification." The local guy I trained just never seemed to get around to doing the paper work so I jumped back in again. I sent the application to our new New York Certifier, Amy Morss. She called me up with some questions and pointed out some improvements I could make in the map and the application. She then said, "Are you related to Clain Jones?" Isn't it nice to be made famous by the exploits of ones son? (Of course the name "Jones" wasn't Amy's clue. It was the fact that I mentioned that our calibrated course was measured by Clain and Alan Jones.) Then she became apologetic for correcting someone that has been in this game so long but I have to say, her suggestions were good ones. I haven't been keeping my skills up-to-date. I'll do better on the next one, Amy. I promise.

By the way, I used Bob Baumel's program for doing the calculations. It's great and it prevented me from making putting the finish line in the wrong place due to a typographic error. I hope more people will use it.

TIME MACHINE

There's a new kid on the block in the form of the "Time Machine." It is a printing timer with a lot of nice features. Therefore, there are at least three manufacturers of timing devices that can do select timing -- Moving Legs (Time Machine), TimeTech, and Chronomix. However, I would venture a guess that most people just use them as timers and do not use the select timing feature. I'm not sure why since one has to do select timing on any race with more than 50 people to get the times with the correct bib numbers. If people ARE using the select timing, let me know. If people are NOT using these devices, how are they getting the select times. Let me know on this, too.

WEATHER INFORMATION SOUGHT

RRTC is currently wrestling with the issue of drop and separation, and with the question of wind aid. We are seeking a way to recognize all legitimate performances.

There is no question that downhill gives a time advantage to the runner. Drop is relatively easy to measure, and does not pose a severe technical problem.

However, it has been suggested that it would be a good thing if we could find a way to recognize fast times set on courses with great separation. Two such examples are 100 km courses. Both the Edmund Fitzgerald (Duluth, MN) and the Philadelphia-to-Atlantic City courses have separation of 90 percent, and very little drop. Dan Brannen has suggested that it would be desirable if records could be set at such races, if the absence of significant wind could be shown.

It does not take much of a wind to give great aid to the runner. Even a 2 m/s wind gives a relatively large boost, and that's only 4.5 mph, barely a slight breeze. At this wind speed the runner will still have wind in his face, and feel no tailwind.

Since RRTC has yet found no way to deal with wind, our only option seems to be to set a limit on downhill slope, and to set a maximum separation such that wind cannot aid the runner significantly no matter how it blows. This will include about 90 percent of presently-certified courses. However, several large and famous races fall outside the contemplated limits. Can a way be found to recognize performances set at these races without putting the vast majority of races at a disadvantage?

It has been suggested that the race organization could submit some sort of proof that wind was not in the aiding direction, and the Records Committee could then judge whether the situation was fair competition.

What form could such proof take? It ought to be something checkable - wind-gauging provided by the race organization would vary from race to race and not be standard. The proof ought to be something that an independent person could come up with from some sort of public records.

Moreover, the proof ought to deal with the specific locale of the race, or at least quite close, and the same time of day at which the race was held.

Does anybody know of any place that publishes such information? In the Columbus Dispatch, my local newspaper, there is a nice summary of the previous day's weather. Unfortunately, no mention of wind is made. Perhaps other newspapers are more informative.

Some believe it is unfair to penalize courses with extreme separation for the mere possibility of wind. I suggest it is only unfair if there is a fairer option. We seek such an option, and we seek specific examples of the form such an option might take.

If you have seen any published weather information that might typically do the job, please send it to Pete Riegel. Opinions on this are also welcome.

FROM
KEN YOUNG

21 August 1989

Dear Pete,

I have read all the correspondence regarding drop/separation and records. It does tend to go over the same ground I went over some years back and reaches pretty much the same conclusions.

One interesting possibility that you haven't considered is the case of a course designed to take advantage of surface roughness. Consider a long, narrow loop course with one "long" leg in a heavily forested region and the return "long" leg in the open. If run under windy conditions, the open leg can be run with the wind, and the forested leg can be run into the wind. The effect of the trees will be to eliminate virtually any head wind.

The 1981 New York City Marathon was run with a strong tail wind for roughly 14 miles (from the southwest) in an area with relatively little roughness. The return 6 miles into the wind was run in an area with taller buildings and a considerable portion was in Central Park which is sufficiently forested to reduce the wind speed at ground level substantially.

The point is that surface roughness is a dominant factor in determining the effect of wind on performance. The flow of air over and around obstacles such as hills and buildings (and clusters of buildings) means that even the direction of the wind may vary markedly over relatively short distances (a few kilometers).

There certainly are wind data available for most populated areas. However the usefulness of such data is highly questionable in most instances. We know that even a 2 m/s tailwind is considered to provide significant advantage in say a 100 meter dash. Such a breeze is barely noticeable. Even with calm winds at a nearby airport, local heating differentials during the day can provide regions of convergence and divergence that will produce local winds of greater magnitude than 2 m/s in a pattern that is virtually impossible (without sophisticated computer modeling) to predict. Even at night, drainage winds caused by colder air "flowing" downslope may reach 2 m/s.

If, after all this, you still think wind information will help, the main sources are the National Weather Service (NWS) offices and also many of the smaller airports have FAA offices where wind is recorded. The main problem is getting ahold of the data. Success here varies from office to office, some are quite helpful, others don't want to be bothered. The published data provides wind information for most of the NWS stations. The data are summaries every three hours (00Z, 03Z, etc).

Universities are another possible source of wind data, if they have a meteorology department or teach courses in meteorology. You may also find wind information from agricultural colleges. Universities are usually more amenable to outside requests for data than the NWS.

Personally, the only wind data I would consider would be wind data gathered on site, during the course of the race. I would also suggest that the burden of proof be such that the race director can demonstrate that there was a net head wind during the race. The uncertainty in determining winds is such that a measurement of say 1 m/s net tail wind could cover a 3 m/s net tail wind whereas a measurement of 1 m/s net head wind is much less likely to be measured under conditions where there is actually a 2 m/s net tail wind.

Unfortunately, it would be very easy to take several dozen wind measurements on the course and only report those most favorable to getting a possible record accepted.

Use of the synoptic scale pressure field to determine prevailing winds is certainly feasible but only when the pressure gradients are large enough to overwhelm local effects. In other words, I can tell you about a 10 m/s headwind or a 10 m/s tailwind but trying to determine a 2 m/s headwind or tailwind from synoptic charts is simply not feasible since the local effects will dominate when the synoptic scale pressure gradients are that weak.

Conditions that clearly do not provide an advantage to the runners (uphill or definite headwind) that one would be inclined to accept for records, are highly unlikely to produce potential records in the first place. Can anyone cite an example of a "record" that was set while running into a definite headwind? Check Marc Nenow's 10K pt/pt record for one example of a record set with a probable tailwind on a course with no net drop. Any fast mark set on a point-to-point course will always be subject to uncertainty.

In summary, I don't think increasing the allowable separation to 30% will permit signficant wind-aided marks to be accepted, i.e., let's do it. I do believe the 2 m/km drop should be tightened to 1 m/km. Accepting marks on courses with greater separation based on wind information from any source is highly questionable and encouraging race directors to gather such extra information in the hope that a mark might be accepted is probably a disservice to the race director.

Sincerely,

Ken

Copy also sent to Dan Brannen

Docteur J.-F. DELASALLE
Domaine de CHANTRAIGNE
B.P. 25 - 80800 CORBIE

Amiens, May 30th, 1989

This from Andy Milroy

Dear Andy,

Thank you for your letter of May 23rd in which you ask for more information on how we measure courses with the electronic bicycle odometer.

So, I am asking Lysiane to translate the instructions about the measuring technic we use in France.

You will see when reading this method that we proceed exactly in the same way as Dan Brannen and P. Riegel in order to standardize our odometer (by checking the reference kilometre until the odometer reads 1,00 and we measure the extra distance with a measuring tape in order to have the real C.E.H. The terminology we use is:

C.E.C : Standardization constant of the electronic bicycle odometer.

C.E.H : Standardization (or true constant) for ratification (calculation value after standardization).

K.M.C : Kilometre read on the odometer (direct reading)

K.M.H : Ratified mileage after correction calculation.

I also want to point out a detail which is important to take into account when you calculate the K.M.E and the C.E.H : at the beginning of the measuring the impulse odometer on the wheel must be placed in front of the receiver/ receptor which is on the frame of the bicycle (so that you count the first impulse after a complete revolution of the wheel), otherwise there is a risk of an error of one revolution (that is to say about 2 metres for 1000 metres).

It is also obvious that you must not in any situation go backwards with the bicycle when you make the standardization or when you measure a course because if you did the odometer would add extra impulses (we always pay great attention to this).

Also, you must never stop by leaving the two impulse captors facing one another, which would mean you could post several successive impulses whereas no distance has been covered.

As you may see it, I think our method is the same as the one used in the U.S and I am very pleased about it because to my mind, it is the most accurate and we have taken the same precautions to avoid any kind of error.

I hope we will meet soon in order to definitely adopt this method, in Paris next June (the meeting will probably take place on late saturday afternoon).

Yours in sport

Jean François DELASALLE

Instructions for measuring courses
on road or circuit, with a calibrate
bicycle.

TERMINOLOGY :

C.E.C = Standardization constant of the electronic bicycle odometer.
This constant is fixed when first putting the electromagnetic impulse odometer on the bicycle.
Only the odometers with a 4 figure C.E.C - which means they can be adjusted for each unit, therefore to one milimetre for one wheel revolution, can be used for that kind of measuring (i.g. compteur cycles Lejeune).
Many odometers used by bicycle tourers, only have a C.E.C which can be adjusted to 3 figures, which means to one centimetre for one wheel revolution) the odometer will calculate the distances by multiplying the sum of wheel revolutions (or impulses) with this C.E.C, and will indicate the distance every 10 metres as soon as the calculation passes another 10 metres.

K.M.C = Kilometre read on the odometer (direct reading).
When measuring a course (the measure known in decametres can be sharpened (more precise) to the metre by calculating at the end of the measure the difference in metres as opposed to the mark which must be measured when the odometer changes figures.

K.M.E = Standardized Kilometre, settled when checking standardization before (and after) measuring, by doing a standard Km on a straight line with a ratified hectometre tape.
The K.M.E is the exact distance done with the bicycle on this standard Km so that the odometer reads 1.00.
The K.M.E has 2 decimals, that is to say to the centimetre).
Determining the K.M.E implies the disapearance of variations which can be observed according to tyre pressure or atmospheric conditions.
Example : K.M.E = 1001,25 means that when checking the odometer before a measurement, by doing the reference Km, the odometer read 1.00, exactly I.25 metres after the exact line of the reference Kilometre.

K.M.H = ratified mileage : distance calculated with the help of the previous factors. The K.M.H uses 3 decimals, which means to the metre.
Only the performances done on circuits measured with the calibrate bicycle and for which the distance has been ratified with K.M.H, I.A.U can be kept on the record lists and best performances.

C.E.H = Standardization constant (or true constant) for ratification (calculated with the help of K.M.E and C.E.C)

These abbreviations correspond to the following french terminology :

- C.E.C = Constante d'Etalonnage du Compteur
- K M C = Kilo Mètre Compteur
- K M E = Kilo Mètre Etalon
- K M H = Kilo Mètre Homologué (distance officielle)
- C.E.H = Constante d'étalonnage pour Homologation

réf : JF Delasalle
IAU France
BP 25 - 80800 Corbie
FRANCE

GENERAL RULES FOR CHECKING MEASUREMENTS

- The measurement must be done according to the direct line of the runners, that is to say by following the shortest line the runners might take during the race.

- the prescriptions of rule 165 of the I.A.A.F must be respected in particular the "short course prevention factor" of 0,1% if the standardization of the odometer is not checked again just after the measurement.

- When on the starting line of a circuit, one must be careful with the rotative impulse captor which must be fixed right in front of the receptor, fixed on the frame so that the first revolution of the wheel be counted in its totality.

- A detailed statement of fix marks on the course will be done and given to the organizer. It can also mention kilometre marks as indicated to the runners on the day of the race. (so that it will be easier to make any eventual modification for the organizer if differences are to be found).

- The races taking place in small circuits will need a measure checking with several lapses of the circuit (so as to obtain a KmC of more than 10 KmC).

CALCULATION OF THE RATIFIED DISTANCE OF A CIRCUIT (measured with a calibrate bike)

3 parametres must be known to determine the official distance K.M.H :

- C.E.C (standardization constant of the electronic bicycle odometer).

- K.M.E (standardized kilometre)

- K.M.C (Kilometre read on the odometer- direct reading).

With the C.E.C, the NT can be calculated, the sum of wheel revolutions that the bicycle will have to do so that the odometer reads 1.00 (that is the absolute value of 1000 : C.E.C + 1)

The C.E.H is fixed : C.E.H = K.M.E : NT

The ratified distance is calculated with the help of the correction calculation

$$K.M.H = K.M.C \times \frac{C.E.H}{C.E.C}$$

Would you be interested in being a member of the IAU Technical Committee - advisory - input on matters on course measurement, Event Guidelines etc. Won't be too demanding - I know how busy you are. Harry Arndt found Measurement News too difficult - his English isn't very good. Harry, Delasalle + Soto Rojas - I will be suggesting for a course measurement seminar for Western Europe organised by John Disley. All the best, Andy

ref: JF Delasalle
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Dave met Delasalle in Paris - reckons O.K.

THE ATHLETICS CONGRESS
OF THE USA

Road Running Technical Committee
Peter S. Riegel, Chairman

3354 Kirkham Road
Columbus, OH 43221
614-451-5617 (home)
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July 14, 1989

Andy Milroy - 3 Bellefield Crescent - Trowbridge, Wilts, UK BA14 8SR

Dear Andy,

Thank you for sending the copy of Delasalle's letter of May 30. It appears that he indeed has a good grip on the methodology of using an electronic odometer for course measurement.

Here in the US we are still locked in to the Jones Counter. Because all Jones Counters are alike, it has made a standardized instruction process easier for us to implement. We may be forced to use something else soon, since the parts used to make Jones Counters have been obsolete for some time, and the New York Road Runners Club has the remaining inventory of drive gears. Supplies wil be exhausted in three or four years. I wrote to Stewart-Warner, the gear manufacturer, to see whether they could make any more, but did not receive a reply. I must persist.

A knowledgeable and perceptive person like Delasalle can figure out how to properly use an electronic odometer with accuracy, but I am perplexed as to how we could make a broad-based set of instructions for ordinary measurers to use. Measurement of US courses is proceeding at the rate of about 100 per month, and the only way we can do this is to educate people, allow them to measure, and check their paperwork. We may be forced to write a set of instructions for electronic odometers, and design some easy-to-use forms for people to use. I don't look forward to the task. All electronic odometers are not alike, which makes the job harder.

The Jones Counter is primitive, but a record of counts obtained at various points in the measurement is obtained. This makes it easy to review the procedure used in the measurement. I don't trust electronic devices, because it is easy for mistakes to be made by people who do not truly understand what they are supposed to do. And generally the mistakes will not show up in the data. Delasalle obviously has thought about the problem thoroughly, and has a good grip on the procedure.

I think I will publish his letter in next Measurement News. We need to be ready for the day when the Jones Counter will no longer be available. I hope we can find a new source, but the number of customers is probably too small to interest any large manufacturer. In the old days we used to use a mechanical counter to keep track of full wheel revolutions, and then count spokes to divide the wheel accurately. The arithmetic gets complicated, but it works. It could be made simpler by painting 20 divisions on the rim. Then the "Jones count" would be 20 times the whole wheel revolutions, plus the number of divisions on the wheel. This would not be hard to do.

I would differ with Delasalle on only one key point - in his second general rule for checking measurements. He says that the short course prevention factor of 1.001 must be used "if the standardization of the odometer is not checked again just after the measurement." The 1.001 is used in all layouts by TAC, AIMS, and IAAF. It is not optional. Moreover, the calibration of the instrument is always checked after the measurement, and the average value is used in determining the length of the course. When recalibration is complete, and course length is known, a small final adjustment is made to bring the course to its desired length.

The 1.001 is used so that differences of opinion - always present - will still agree that the course is at least as long as it is supposed to be. This is particularly important when a course length is checked after a record is set. If I should lay out a race course at 10000 meters, and a record is set, someone will check its length. Odds are 50-50 that his measurement will show a shorter length than mine. If the checked length comes out to 9995, then there is dispute about the validity of the record. However, if I lay out the course at 10010 meters, the checked length will come out to 10005, and no one will argue.

This was disputed for years in the US, but now we have settled on always using the 1.001. AIMS followed us in this, and IAAF now uses it also.

Once again, thank you for sharing Delasalle's letter with me. It is a real pleasure to see work of his caliber. Talent is rare.

Best regards,

Pete

PS:
I will be happy to be a member of the IAU Technical Committee, subject to the limitations of my time. I have to put TAC first, then my other commitments. However, if I can be of help I will be glad to give it when I can.

xc: JF Delasalle - BP 25 - 80800 Corbie - FRANCE

Ant Puzzle Solution

by Bob Baumel

To solve this problem, I first had to decide whether to **measure** the course (more or less as we measure real-world courses), or to **calculate** its length geometrically. The latter possibility suggested itself because all the lines in Pete's drawing appear to be straight line segments or circular arcs. If Pete intended to draw all these line segments (and arc centers & radii) at nice round-number positions, then in principle, one could calculate the "exact" answer based on Euclidean geometry. Nevertheless, the thought of all the geometrical and trigonometric calculations needed for doing this was too daunting, so I opted for the first-mentioned strategy; i.e., an empirical measurement of the course analogous to our measurements of real courses.

Another decision was whether to respect the rule of measuring 30 cm from the road edges. However, as the calibration course of 1500 ant meters is about 47 mm (people measure), the required clearance of 30 ant centimeters is only about 0.01 mm in people measure—which is considerably less than the width of the lines in Pete's drawing. Thus, I concluded that following the 30 cm rule was totally impractical, so I should just measure directly on top of the lines marking the inside edge of the road on curves. (By the way, the ants have really nice wide roads to run on—about 250 ant meters!)

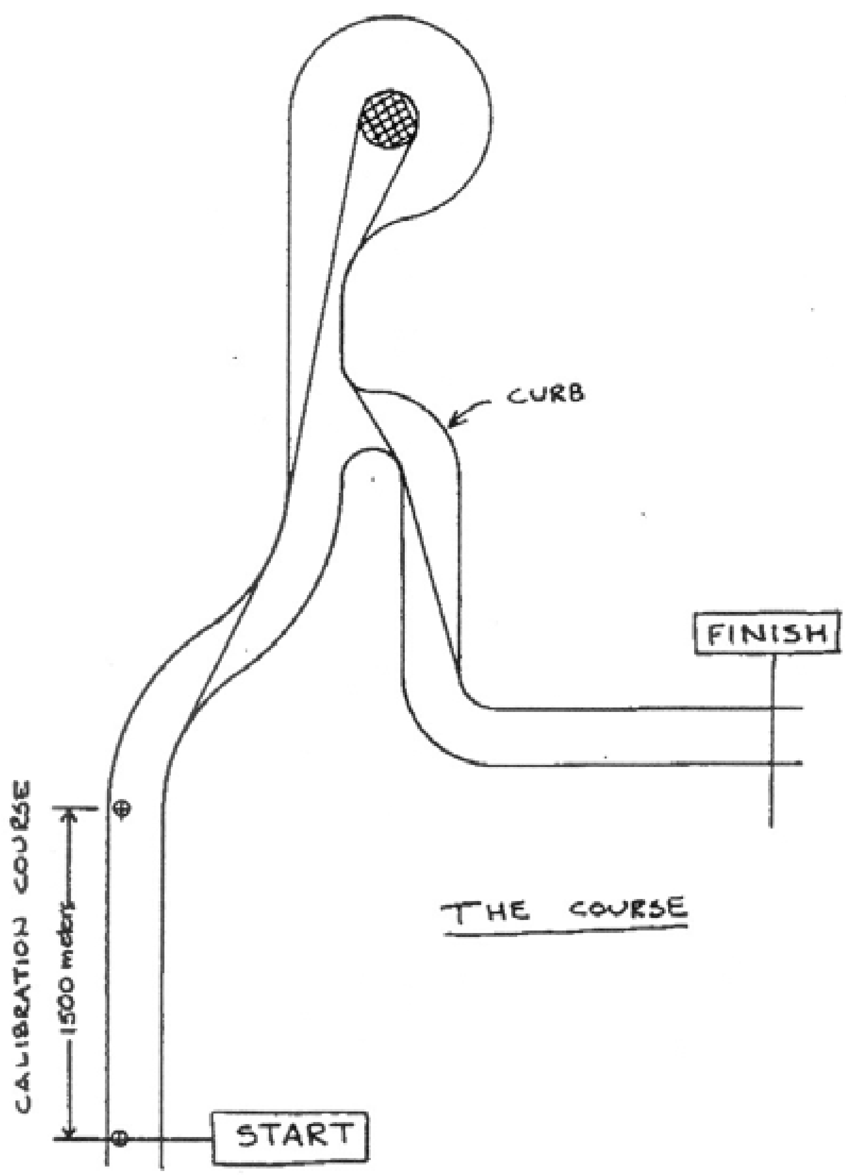
For my actual "measurement" of the course, I decided to try both "low tech" and "high tech" approaches. My low tech approach involved measuring the length of the calibration course with a ruler (about 47 mm as noted above), and measuring the length of the race course SPR using a map-scaling technique described 15 years ago by Ben Buckner ("Taking the Measure of Courses," *Runner's World*, Sept 1974, p. 28). Buckner's technique consists of transcribing the map distance to the edge of a sheet of paper. When negotiating curves, you insert a sharp pin a fraction of a millimeter from the edge of the paper, and use that as the pivot point. (You must choose sufficiently many pivot points around the curve so that the polygonal line you actually measure is a good approximation to the desired curved path.)

In two trials with Buckner's map-scaling method, I obtained distances of 294 mm and 295 mm for the race course SPR. Given the calibration course measurement (47 mm = 1500 ant meters), this translates to a length of about 9380 to 9415 ant meters for the race course.

My "high tech" method bears some similarity to that used by Norm Brand in the measuring contests at the last two TAC Conventions, as both are **optical** approaches. I started by scanning Pete's drawing with an optical scanner. Then I read the file into the Macintosh graphics program *Canvas* (by Deneba Software) for further analysis. In Canvas, I drew a polygonal line along the course's SPR. At this point, I tried using a built-in feature of Canvas that displays the perimeter of a polygonal line. Unfortunately, this did not agree well with the "low tech" method. A little experimentation then revealed that Canvas's perimeter calculation is grossly innacurate (In the worst case, its displayed value for the perimeter of a polygonal line is only $1/\sqrt{2}$ times the correct value)!

Given that Canvas's built-in perimeter calculation was not usable, I chose a somewhat more pedestrian method of finding the length of the SPR. Still using Canvas, I determined the (x,y) positions of all the vertices of the polygonal line I had drawn. I made a list of these (x,y) coordinates and, from there, calculated the distance by Pythagorean Theorem. (First, I did this by writing a BASIC program, but then realizing this could be done more readily with a spreadsheet, I also checked the calculation using Microsoft *Excel*.)

This method determined the length of the SPR as 295.14 mm, in excellent agreement with the "low tech" method. As the length of the calibration course (from coordinates in the optically scanned image) was 47.16 mm, my final answer for the course length is **9387 ant meters**.



July 28, 1989

Dear Nicolls and Riegels:

We used to use a point-to-point course for this two-mile race, but, partly because of the discussion in Measurement News, and partly for logistical reasons, I changed it to an out-and-back course, as the enclosed certificate illustrates. I hope runners can handle that turnaround with its 15′ radius. I should re-examine Bob Letson's discussion of how sharp a runner can turn at different speeds. You remember his article that involved a discussion of pulling weighted running shoes with a fish scale.

Also partly because of the discussions in Measurement News, I instituted awards to the ten runners, of either sex and any age, who run the lowest percentages of the "theoretical world records" for their age/sex groups. I figured the "theoretical world records" by examining the American records for the more popular distances for the five-year age groups, determining what percentage the record was of the overall male record for that distance, and multiplying the lowest percentage by what I guessed the overall male record should be for two miles on the road. I used the world track record for 3000m, and the average difference between track and road records for the same distances, to guess at what the overall male record for two miles on the road should be if two miles on the road were a popular road distance. Because I used American records, and not world bests, my age group times are a little soft.

Sincerely yours,

David Reik
930 W. Blvd.
Hartford, CT 06105

Here is a pertinent excerpt from the race entry form:

Cash Awards for the Ten Highest Quality Times: $100 each to the ten runners age 20 and over who run the lowest percentages of the theoretical world records for two miles on the road (listed below), for their age groups. These awards will be mailed to the winners when the results have been verified.

Theoretical World Records for Two Miles on the Road:

Ages:	20-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
Male:	8:14	8:24	8:54	9:14	9:29	9:53	10:13	10:33
Female:	9:09	9:34	10:19	10:53	11:08	11:52	12:02	14:16

Ages:	70-74	75+
Male:	11:47	12:56
Female:	15:10	16:20

Course: New, out-and-back course (not aided by wind or drop), TAC-certified as accurate, course #CT-89010-DR.

TABLE OF EQUIVALENT TIME RATIOS

	5 km	5 mi	10 km	15 km	10 mi	20 km	25 km	30 km	Mara
5 km	1	1.664	2.099	3.240	3.493	4.408	5.596	6.802	9.798
5 mi	0.601	1	1.262	1.947	2.099	2.649	3.363	4.088	5.889
10 km	0.476	0.793	1	1.543	1.664	2.099	2.666	3.240	4.667
15 km	0.309	0.514	0.648	1	1.078	1.360	1.727	2.099	3.024
10 mi	0.286	0.476	0.601	0.927	1	1.262	1.602	1.947	2.805
20 km	0.227	0.377	0.476	0.735	0.793	1	1.270	1.543	2.223
25 km	0.179	0.297	0.375	0.579	0.624	0.788	1	1.215	1.751
30 km	0.147	0.245	0.309	0.476	0.514	0.648	0.823	1	1.440
Mara	0.102	0.170	0.214	0.331	0.357	0.450	0.571	0.694	1

This table can be used to calculate potential running time for one distance from a known time at another distance.

Example: You have run a 10 km race in a time of 37:38. Based on this, how fast can you expect to run a marathon? Figure like this:

1) 37:38 is 37.63 minutes.
2) Find "10 km" in the left-hand column.
3) Move horizontally to the number in the "Mara" column (4.667).
4) Multiply 37.63 times 4.667 to get 175.62 minutes, or 2:55:37.

Thus, a person who can run a 37:38 10 km should be capable of a 2:55 marathon

The chart can also be used to reduce all your races to equivalent 10 km times TACSTATS does this, based on a similar model, to rank people. Use this table to rank your own races, and help you set your goals.

Example:

20 km in 80:00 = 80.00x.476 = 38.08 = 38:04 for 10 km

10 mi in 53:20 = 53.33x.601 = 32.05 = 32:03 for 10 km

5 km in 18:22 = 18.37x2.099 = 38.55 = 38:33 for 10 km

Marathon in 2:55:37 = 175.62x.214 = 37.58 = 37:35 for 10 km. Note this does not agree exactly with the example above, since we're using only three decimal places in the table. But let's not split hairs.

The table is based on the following relationship, which has been shown to reasonably represent the way fast runners behave across the 5 km-to-marathon range:

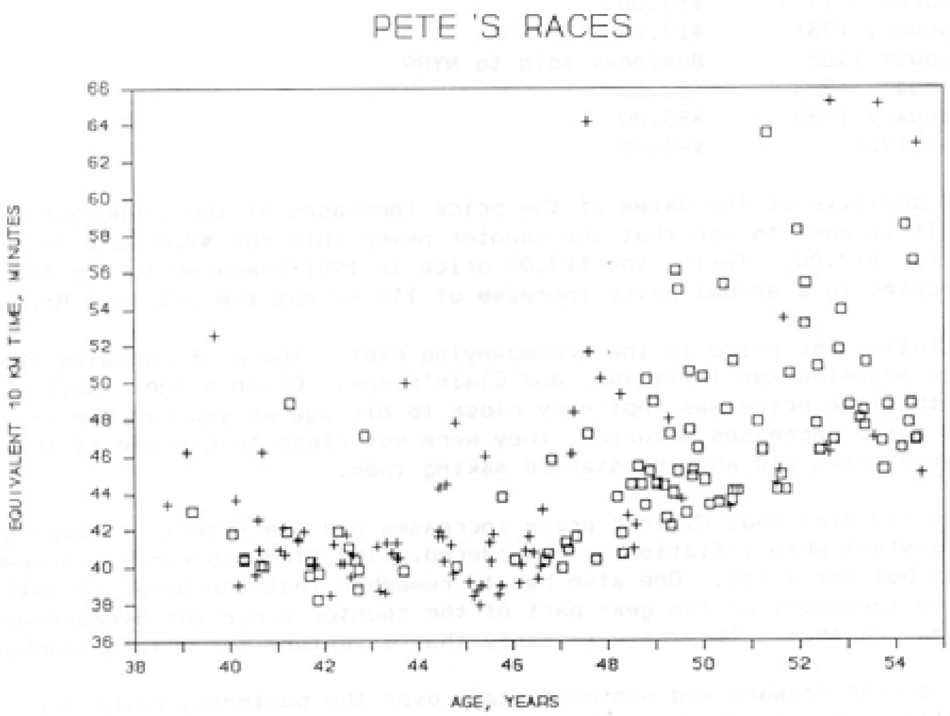
$$\frac{\text{time}_2}{\text{time}_1} = \left[\frac{\text{distance}_2}{\text{distance}_1}\right]^{1.07}$$

P. S. Riegel
August 11, 1989

EQUIVALENT 10 KM TIMES

TACSTATS has adopted the concept of equivalent 10 km times. By reducing performances to this standard, it is possible to get a rough comparison of races run at different distances, to see how a marathon by one athlete compares with a 10-miler by another.

It's fun to do, and for my own pleasure I ran my own data through the mill to see what came out. The graph shows all the races I've run. Note: I turned 40 in 1975. Distances include everything from 1 mile to 108 miles, with a special adjustment thrown in for the beyond-the-marathon distances, which were not my better runs.



□ = Certified
\+ = Uncertified

I've always preferred certified courses when they were available, unless the course had some other feature that appealed to me. It's interesting to note that when I started running, there were few certified courses. In recent years there are lots more. A source of mild disappointment is that when I was at my best, my races were rarely run on certified courses. So I'll never know what my PR's might have been. Still, by using the equivalent 10 km concept, and graphing my races, I get a good sense of how I'm doing and what might be a realistic pace to attempt on my next race. If you're a numbers freak, give it a try.

PRICE OF THE JONES COUNTER

by Alan Jones

The July 1989 issue of **Measurement News** had a letter by Bill Noel concerning the price of the Jones Counter. One of his customers, Arthur Hass, had questioned the increase of price from (what he said) his club paid in 1981 ($7.00) compared to the present price of $40.00 which the New York Road Runners Club is now charging. Bill justified the price increase based on their increased costs.

I thought it might be interesting to trace the history of the price of the Jones Counter. The first thing I did was check out Mr. Hass' claim that his club bought the counter for $7.00 in 1981. He was obviously misinformed. Here is the history of the price of the counter:

September 1973	$8.25
March 1974	$10.00
February 1977	$12.00
February 1979	$14.00
January 1981	$17.00
August 1982	Business sold to NYRR
January 1983	$20.00
January 1985	$30.00
May 1989	$40.00

I am not positive of the dates of the price increases of the NYRRC but I think I'm close. It is easy to see that the counter never sold for $7.00 and in 1981 was selling for $17.00. Taking the $17.00 price in 1981 compared to the $40.00 price in 1989 computes to a annual price increase of 11% -- not the 24% that Mr. Hass claims.

I have plotted the price in the accompanying plot. The plot contains the raw price, the price adjusted for inflation, and Clain's age. Clain's age? Well, Clain noticed that the price was kept very close to his age as you can see -- or at least when the price increases occurred, they were set close to his age at the time. Clain was 9 years old when he started making them.

Notice in the plot that Clain's price increases had the effect of keeping the price rather constant when inflation is considered. The NYRRC is running somewhat above inflation but not a lot. One also has to remember that the NYRRC recently bought up the entire inventory of the gear part of the counter since the Stewart-Warner stopped making them. They have to carry that inventory for a large number of years.

If someone came forward and wanted to take over the business, maybe they could buy Bill Noel's inventory (he says, tongue in cheek).

I've been thinking of Pete Riegel's challenge to us to come up with a new counter so that day when Bill's inventory runs out we have a device. My thoughts go to electronic devices but these have real problems that the direct-drive Jones device does not. How do you back up the bike a few counts when you overshoot a mark? Would the device count correctly at the very slow speeds used at the start and finish of a measurement and at each split.

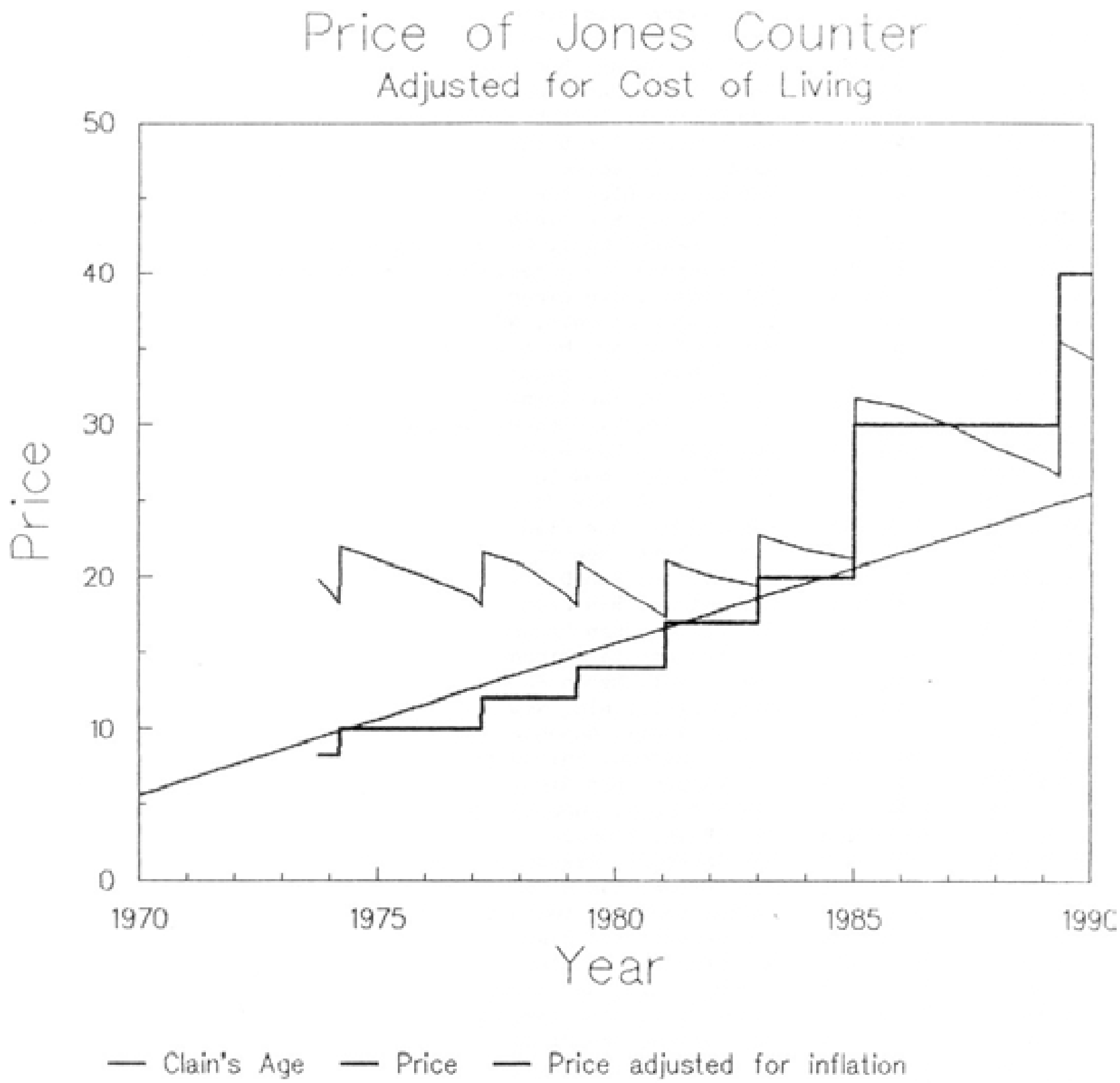
In looking through Clain's records it is interesting to see some familar names.

Date	Ctr No.	Name, City
10/07/73	1	Ted Corbitt, New York
10/18/73	4-6	Ted Corbitt, New York
10/31/73	7	Larry Berman, Boston
12/02/73	22	Bob Letson, San Diego

12/22/73	25-26	Bob Letson, San Diego
07/02/74	45-49	Bob Letson, San Diego
01/04/75	74-78	Ted Corbitt, New York
03/10/75	88-89	Gabriel Duguay, Montreal
04/19/75	91-96	Bob Letson, San Diego
08/14/75	114	Ben Buckner, Columbus, Ohio
11/01/75	141-150	Bob Letson, San Diego
05/01/76	175-178	Montreal Olympics
09/22/76	222	Tom Osler, Glassboro, NJ
12/21/76	240-244	Bob Letson, San Diego
12/21/76	245	A. J. Vander Waal, Silver Spring, MD
01/18/77	250-251	XI Commonwealth Games, Edmonton, Alberta, Canada
04/24/77	260-264	Bob Letson, San Diego
05/28/77	279	Jim Lewis, Lincoln, NE
07/02/77	287	Harold Tinsley, Huntsville
09/19/77	304	Basil Honikman, Miami
11/22/77	317-326	Bob Letson, San Diego
03/02/78	425	Dale Jones, Livermore, CA (my brother)
05/26/78	508-517	Bob Letson, San Diego
07/02/78	587-591	Ted Corbitt, New York
08/10/78	623-627	Ted Corbitt, New York
08/16/78	638-642	Bob Letson, San Diego
08/26/78	675-679	Ted Corbitt, New York
12/17/78	770-779	Bob Letson, San Diego
03/27/79	864-873	Bob Letson, San Diego
01/01/80	1215-1224	Bob Letson, San Diego
06/01/80	1365-1374	Bob Letson, San Diego
06/26/80	1408	Tom Knight, Menlo Park
06/26/80	1412-1415	Allan Steinfield, New York
06/29/80	1710	Wayne Nicoll, Augusta, GA
08/15/80	1464-1466	Chris Tatreau, Philadelphia
11/17/80	1568-1577	Bob Letson, San Diego
02/16/81	1668-1669	Wayne Nicoll, Augusta, GA
02/17/81	1670-1671	Jim Lewis, Lincoln
04/06/81	1718-1719	Bob Thurston, Washington, DC
06/19/81	1767-1771	Bob Letson, San Diego
07/31/81	1858	Henley Roughton (Gibble), Alexandria, VA
10/28/81	1964-1968	Bob Letson, San Diego
12/28/81	2009-2010	Bob Letson, San Diego
01/19/82	2034-2035	Tom Benjamin, San Francisco
03/21/82	2113	David Reik, Hartford, CT
03/28/82	2119-2124	Bob Letson, San Diego
06/11/82	2201	John Sissala, Rockville, MD
07/20/82	2275	Peter Riegel, Columbus, OH
08/09/82	2312-2315	Bill Callanan, Las Vegas
09/14/82	2342-2343	Barbara Jones, Endwell, NY*

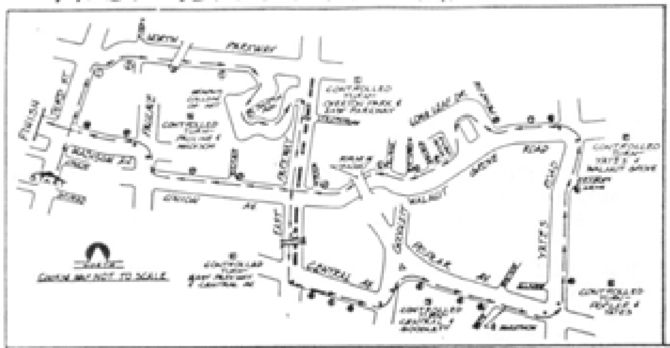
* Clain's mom wanted two for the archives.

I knew Bob Letson bought a lot of counters over the year but I didn't realize it was 116 (and I might have missed some). Bob provided these counters to measurers in Southern California in his crusade to see that every course was measured and certified.

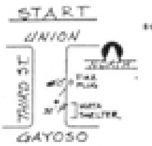


Price of Jones Counter
Adjusted for Cost of Living
Price
50
40
30
20
10
0
1970
1975
1980
1985
1990
Year
Clain's Age
Price
Price adjusted for inflation

FIRST TENNESSEE MEMPHIS MARATHON — SECOND COURSE

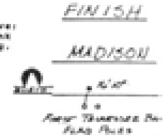


Distance between Start and Finish is 390 Yards - 1 Foot - 0 Inches.



Start: Third St., South of Union and just North of Gayoso Ave. East side of Third St., Runners going North, mark is 48'0" SW of fire plug and 32'7" NW of MATA passenger shelter.

Finish: 26.21876 Miles: South side of Madison Ave; Runners headed West; First Tennessee Bank Building; 2 flag poles front of building. 16'10" NE of West flag pole.



MAP OF THE MONTH BY FRANK HORTON TN89002WN

Start: Third St., South of Union and just North of Gayoso Ave. East side of Third St., Runners going North, mark is 48'0" SW of fire plug and 32'7" NW of MATA passenger shelter.

Mile 1: Just East of N. Third St. on South side of N. Parkway: 16'7" East of fire plug.

Mile 2: South side of N. parkway, just West of Ayers Intersection-21'3" North of fire plug.

Mile 3: South side of N. Parkway and under N. Parkway overpass: 6'10" NE of light pole, APC.

Mile 4: South side of N. Parkway at ~~[illegible]~~ [illegible] N. Parkway Apt. Bldg; and Zoo fence. South of fire plug and 42'3" West of light pole.

Mile 5: Overton Park: East side of drive; Just East of Memphis College of Arts and West of 2nd. green on golf course. 33'4" North of CPI light pole.

Controlled Turn #1:
Overton Park Pavilion Road - Right Turn to East Parkway. Runners will cross East Parkway to left lane, South bound, next to median. Turn mark is 17' 4" Southwest of concrete light pole at North end of median cut-through. Pole # is 15, located on light fixture cover.

Mile 6: West side of East Parkway at median of Strathmore Intersection: 34'8" South of street light pole.

Mile 7: West side of East Parkway at median, just North of railroad track overpass. 49'8" South of street light pole-CPI pole.

Controlled Turn #2:
East Parkway - Left Turn to Central. Runners will go straight through intersection to mark on South side of Central, 34' 8" NE of iron grate drain cover on West side, end of median in East Parkway. Turn into right lane on Central.

Mile 8: South side of Central Ave., near 2681 Central Terrace and just West of Hilton St. 64'5" West of street light pole.

Mile 9: South side of Central Ave. near Greer Intersection- 3'10" North MLGW water main cover.

Mile 10: South side of Central Ave, West side corner of Memphis State Univ. Music building on campus. 4'8" NW of Power pole holding traffic light.

Controlled Turn #3:
Central - Left Turn to Goodlett. South Side of Central, marker is 15' 9" North of fire hydrant. East side of Goodlett, marker is 13' 11" West of power pole # 133268.

Mile 11: South side of Poplar Ave; near intersection of Woodmere Ln. touching South side of sewer cover in street.

Mile 12: South side Poplar ave., near 4717 Poplar ave- UPMS. Federal Express, Maternity stores. 7'8" NE of LGW Meter water Division at West sidewalk.

Mile 13: South side of Poplar, just West of White Station Intersection at Panchos Taco- 31'4" East of power pole #69894.

~~[illegible]~~: South side of Poplar near Outdoors Inc. 28'8" East of power pole # 37304.

Controlled Turn #4:
Poplar - Left Turn to Yates. South side of Poplar, marker is 28' 8" North of steel/concrete power pole with transformer and traffic light. East side of Yates, marker is 21' 8" West of wood power pole #38480.

Mile 14: North side of ~~[illegible]~~ 765 Yates. 55'6" South of power pole # 33308.

Mile 15: East side of Yates near Sycamore Cove intersection; 84'6" East of fire hydrant.

Controlled Turn #5:
Yates - Left Turn to Walnut Grove. East side of Yates, marker is 26' 4" NW of fire hydrant. North side of Walnut Grove, marker is 28' 3" South of steel power pole with traffic lights and street signs.

Mile 16: North side of Walnut Grove, near 5332 and 5340 Walnut Grove: 6'8" SW Power pole.

Mile 17: North side Walnut Grove, near St. Agnes school; near 4792 Walnut Grove- 30'10" West Power Pole # 1341.

Mile 18: East side Heatherwood Ln- Pidgeon Rd. 6'10" SW Power pole # 28973.

Mile 19: North side of Walnut grove near Graham intersection. 11'0" West of middle of West MLGW Gas meter cover.

Mile 20: North side of Walnut grove, near intersection of Northwood. 31'4" NW of fire hydrant.

Mile 21: North side of Walnut grove, near J O Patterson Mortuary, Just West of Tillman. 37'8" South of Mortuary front door.

Mile 22: North side of Union Ave; 3450 Union; East of Patricia; 9'8" SW center of water meter cover.

Mile 23: North side of Union; near Tucker Ave. intersection; 4'0" West of center of MLGW Water cover.

Mile 24: North side of Union Ave; across from 1407 Union; Near Shoney's restaurant; 5'1" NW of MLGW water meter cover in sidewalk.

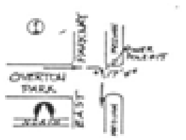
Controlled Turn #6:
Pauline - Left Turn to Madison. East side of Pauline, marker is 18' 0" West of concrete light pole. North side of Madison, marker is 18' 8" South of pole with yellow traffic control lights and sign "Push Button to Cross

Mile 25: North side of Madison Ave: 54'1" NE of metal rail on steps into Baptist Hospital entrance.

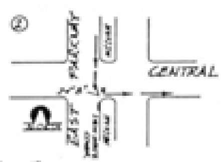
Mile 26: North side of Madison Ave; at 378 Madison; 8'1" SW of center of MWS Manhole cover.

Finish: 26.21876 Miles: South side of Madison Ave; Runners headed West; First Tennessee Bank Building; 2 flag poles front of building. 16'10" NE of West flag pole.

Controlled Turns
Marked by cones and monitored by Course Officials and Police.



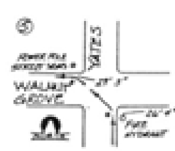
Controlled Turn #1:
Overton Park Pavilion Road - Right Turn to East Parkway. Runners will cross East Parkway to left lane, South bound, next to median. Turn mark is 17' 4" Southwest of concrete light pole at North end of median cut-through. Pole # is 15, located on light fixture cover.



Controlled Turn #2:
East Parkway - Left Turn to Central. Runners will go straight through intersection to mark on South side of Central, 34' 8" NE of iron grate drain cover on West side, end of median in East Parkway. Turn into right lane on Central.

Controlled Turn #3:
Central - Left Turn to Goodlett. South Side of Central, marker is 15' 9" North of fire hydrant. East side of Goodlett, marker is 13' 11" West of power pole # 133268.

Controlled Turn #4:
Poplar - Left Turn to Yates. South side of Poplar, marker is 28' 8" North of steel/concrete power pole with transformer and traffic light. East side of Yates, marker is 21' 8" West of wood power pole #38480.



Controlled Turn #5:
Yates - Left Turn to Walnut Grove. East side of Yates, marker is 26' 4" NW of fire hydrant. North side of Walnut Grove, marker is 28' 3" South of steel power pole with traffic lights and street signs.

Controlled Turn #6:
Pauline - Left Turn to Madison. East side of Pauline, marker is 18' 0" West of concrete light pole. North side of Madison, marker is 18' 8" South of pole with yellow traffic control lights and sign "Push Button to Cross

Dear Pete,

It's great that Alan Jones has now got my Calculation program converted for IBM PC. I agree with Alan that you should put an announcement in the next Measurement News publicizing this. But more importantly, I think the availability of this program should appear *every* month in your listing of "PUBLICATIONS AVAILABLE FROM RRTC." The item can be listed as follows:

> Measurement Calculation Computer Program by Bob Baumel. For Macintosh version, send 800 kB floppy and return mailer to Bob Baumel, 129 Warwick Road, Ponca City, OK 74601. For IBM version, send 5.25" or 3.5" diskette and return mailer to Alan Jones, 3717 Wildwood Drive, Endwell, NY 13870.

As you have seen fit to give Ben Buckner's race planning booklet some free advertising every month, it would certainly seem appropriate to provide similar publicity for this program—which is surely more relevant to our primary mission (measuring and certifying courses). Note also that I'm not asking for any money for the program. I just want to disseminate it to everybody who might find it useful.

Best regards,

Bob

Bob Baumel

cc: Alan Jones

Subject: Baumel program for course measurement computations

Dear Bob,

I have successfully converted your CALCULAT program for use on IBM PCs. At first I tried to just use the BASIC which comes with DOS but, as you note in your comments file, you use the capibilities of Microsoft's QuickBASIC. I then got a copy of QuickBASIC and, with changes to only three lines of code, got it running. Nice program. I used it for the first time the day after (dumb -- should have done it the day before) submitting a course certification application to Amy Morss. Your program detected an error where I had copied a figure down wrong and it had the effect of changing the final length of the course by several meters.

I have also made the appropriate changes to your documentation file. I'm sending you the source code (CALCULATE.BAS), compiled code (CALCULAT.EXE), and documentation (CALCULAT.DOC).

I am copying Pete on this letter so he can notify readers of Measurement News that they can obtain the program by sending me a diskette and a self-addressed mailer. I can handle 5.25" or 3.5" diskettes. Or would you rather be the distributor?

Sincerely,

Alan Jones

Alan Jones