MEASUREMENT NEWS

March 1990 Issue #40

Finn Hansen is RRTC's Utah certifier, and a Final Signatory. Read more about Finn inside this issue.

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#40 - March 1990

NEW APPOINTMENTS

Alaska's Frederic Wilson and Oregon's Lee Barrett have been appointed Final Signatory, in recognition of the superior work they have done as certifiers.

THE INDIANAPOLIS 500

Did you ever wonder how they measured the Indianapolis Motor Speedway, on which speeds are recorded to a precision of 1/200,000? Last month I measured the course of the 500 Festival Mini-Marathon, a HMar that starts in downtown Indianapolis, winds around the city, and has the last two miles on the Speedway track. During the measurement I got a chance to ride a whole lap. Result? A runner's path, using shortest route and staying off the grass and ignoring the painted inside line, came out to 2.475 miles. The painted line is 4 or 5 meters out from the grass, and the race cars must not get both sets of wheels across the line. It would appear that there is indeed a 2.5 mile lap somewhere on the Speedway track.

The bike measurement was carried on at a speed of 12.413 mph.

INDEPENDENT CONFIRMATION OF BAUMEL'S WORK

Like many of us, I had a hard time following the mathematics in Bob Baumel's article Hill Effect to Second Order, which appeared in MN, January, 1989. Then, when Physiological Model of Distance Running Performance (Including Hil & Wind Effects) appeared in the November, 1989 issue, I was even more befuddled.

Because I know Bob is a bright guy I was inclined to believe he knew what he was doing, and take it on faith. But it still nagged at me.

I took an independent look at the original data, and applied my own thought processes to the job, and came up with an equation which describes how runners' speed varies on hills:

$$V = V_0 \ / \ (\ 1 + 5S + 9S^2 \ )$$

where

- V = Runner's speed on a grade (m/s, mi/hr or any units of speed)
- V_0 = Runner's speed on level ground
- S = Amount of grade, meters per meter (note that 1 m/km slope is equivalent to S = .001 m/m)

Alan Jones went to the trouble to obtain Boston area topographical maps, and to go over the marathon route with a ruler, recording every single contour line along the route, and its distance from the start. When he was done he had 210 data pairs. This work was further refined by additional information from Wayne Nicoll, who measured last year's course and was able to pinpoint the exact start and finish. Bob Baumel provided a mathematical smoothing technique that reduced the small errors in recording elevations from the topographical maps. The result was probably the most accurate profile of a running course ever made.

I used the above equation, coupled with Alan's Boston profile, to estimate the effect of Boston's hills. My answers were substantially the same as Baumel's and Jones'.

As a result of this exercise, I am confident in the validity of Baumel's work. In addition, as I went through it, with some hints from Bob, I finally understood the reasoning behind Bob's articles. Bob's work is sound.

NEWS FROM AIMS:

At the Chicago board meeting, October, 1989, the Oslo Marathon was deleted from membership. The 1989 Oslo Marathon was conducted on September 10th with the Half Marathon, won by Douglas Wakiihuri of Kenya in 1 hour 12 seconds, a world's best time.

The course was not measured by an AIMS / IAAF measurer prior to the event. The week following the event Lennart Bresky, an approved AIMS / IAAF measurer, from Stockholm was asked to measure the course. The Half Marathon, which forms part of the marathon course, was found to be 220 metres short. Mr. Wakiihuri was to receive a cash bonus for breaking the record. The marathon course was also short, according to Bresky

The Oslo Marathon had failed to have their course measured despite repeated requests from AIMS. The board, therfore, agreed to delete the Oslo Marathon from AIMS membership. If any AIMS member in your country has altered their course please advise me for according to our rules it must be re-certified.

I will issue a newsletter once a year to all measurers and would appreciate any material for consideration.

Warm regards,

Ted Paulin

TED PAULIN
CHAIRMAN
AIMS TECHNICAL DIRECTOR

Finn S. Hansen
7018 Ponderosa Drive
Salt Lake City, Utah 84121
(801) 943-4680

Pete Riegel
3354 Kirkham Rd.
Columbus, OH 43221

Dear Pete:

I am honored that you would think me "worthy" of appearing on the cover of Measurement News. I am certainly not in the same league as you, Bob Baumel, Wayne Nichol, Tom Knight, my mentor, or many others in RRTC. I am honored to be able to associate with you and the many other dedicated individuals in RRTC.

How did I come to be where I am today? It probably started in my senior year of high school when I was cut from the football team. Not wanting to give up that "jock" image of being in the last period "athletics" class I transferred to the cross country team. I didn't do too bad that fall, but was much better in the spring when I ran the mile on the track team. I wasn't great here either mind you. I was the third best, but the other two finished second and third in the state meet. I was a "member" of the University of Utah track team as a two miler. I was not good enough to compete in any meets.

For the next 17 years I did not run or have anything to do with running. In 1975, just before the big running boom I started running road races. My first race was a 7 1/2 miler. I think that there were nine of us in the race. I ran for a couple of years until my work schedule got so heavy that I didn't have time to train. In the mean time, my oldest son had started to run with me and he was starting to beat me. That was not the reason I quit running! I started going to races to watch him run. I would inevitably be asked if I would help time the race. I eventually became "The" timer in Utah. I have since timed over 200 road races.

By 1980 I decided that if I was going to be a timer that I ought to be the best timer and that I ought to get "certified", does that sound familiar? I did become a certified track and field official in 1981. I worked most of the BYU track meets. I would come early to a meet and because the hammer throw was always finished before the running events could start I became involved with that event. I was notified just recently that I have been selected to be a hammer throw official at the Goodwill Games in Seattle this going July. I am currently serving as the president of the Utah Track & Field Officials Association.

Meanwhile back on the "road racing" scene, I was involved in the organization and operation of the Salt Lake City Track Club. This club after eleven years still has a membership of over 500. I believe it is still the largest club in Utah. There was always concerns about the length of the various courses that we were running. To my knowledge there were probably only two course that were really "certified" in those early days. They were The Deseret News Marathon and the St. George Marathon. I believe it was in 1984 or 1985 that there needed to be some course changes made to the Deseret News course. Somehow I became involved. I recall that after corresponding with Ted Corbitt and talking to Tom Knight on the phone for I don't know how many hours I managed to get the course re-certified. I can say with a great deal of authority that marathons are definitely not the place to start as a measurer.

After working on some more reasonable length courses I was appointed the certifier for the state of Utah. There doesn't appear to be anyone who wants to challenge me for the honor. I have worked with quite a few people on measurements but they don't seem to come begging to do any more than the race they are interested in.

By the time the Young's (Ken and Jen) were shutting down NRDC I was just getting my first PC so I thought I might get involved in record keeping side of the house. That can be a time consumer. I don't know how many times I have entered over the past few years but it must be well over 10,000. It was a lot of long nights. It is interesting to see how runners compare on different courses. I have found that most runners don't really seem to care about records. I say that after publishing several books of Utah records. I could loose my shirt if I keep that up.

As you are well aware I have be involved in the course drop discussions over that past four years. I was converted by Bob Baumel's analysis of the data. Although, I might add, I don't understand most of his "higher" math. Since the convention I have been asked to write two article for local running publications about the rule change. I was also interviewed by one of our local papers about it. There sure seems to be a great deal of misunderstanding out there about records.

This is beginning to sound like an obituary. I am sorry if it comes across like that, what I would like others out there to know where I am coming from. I do wear a lot of hats. It is because I have a diverse background. I love the sport and I always want to be involved one way or another.

Yours in measuring,

Jean

WORD FOR WORD

by ATCHISON

MEMO TO: All Measurers

FROM : Joan Riegel, RRTC Course Registrar

DATE : February 20, 1990

RE : Courses without maps

Please be assured that old courses without maps have not been "de-certified." These courses have merely been moved to a "no map" list. They are still in the computer. Physically, they are still filed in a file drawer and can be retrieved.

A decision was made by the committee at the 1988 convention in Phoenix to segregate these courses from the 6000+ course list. This assures a complete certificate (including a map) for all courses on the current list.

To move an old course from the "no map" list to the "current" list, it is only required that you send me a map.

I hope this clears up any misunderstanding.

No More FLATS!

If you ride in a battle zone of broken glass, metal shards and other debris, consider the PolyAir tubeless tire ($25–$30). It's incorrect to call the PolyAir an "airless" or "solid" tire because it's made of closed-cell polyurethane foam. It still relies on air to cushion the ride, but the air is encapsulated in millions of tiny foam bubbles. It can't go flat.

Earlier versions of tubeless tires were plagued with problems. They would roll off the rim during cornering or braking. Some models were made of a rubber compound that provided little traction. Others stretched with use. All were heavy.

The PolyAir remedies these problems but presents some of its own. The first is mounting. It requires several times the force and patience of mounting a tight-fitting clincher tire. The PolyAir is started on the rim, then held in place with a pair of toe straps as more tire is pried on. The last third requires a substantial tool for leverage, such as a large screwdriver, and extraordinary muscle power. Our alloy rim suffered some damage from the prying.

Once mounted, the PolyAir does stay firmly seated. This is due in part to a molded-in bead (see photo) and the stretch-resistance of the polyurethane.

We enlisted the help of a daring young BMX racer who lives near our Soquel, California, editorial office to test the limits of the PolyAir. The tires stayed firmly on the rim despite jumps, skids, and other extreme maneuvers.

The 26x1.5-inch PolyAir we tried weighs 1.9 pounds, which is about 10 ounces heavier than an equivalent conventional tire and tube. This extra weight noticeably slows acceleration, sprinting, and climbing. The tire felt almost normal on smooth pavement but couldn't absorb larger bumps, transmitting them to the rider as a jolt. (Spoke loosening due to jolts is a common problem with solid tires.) This product, which also comes in 27x1¼-, 27x1⅛- and 26x1.75-inch sizes, isn't designed for the enthusiast as much as the commuter or recreational rider who needs extreme measures to prevent flats.

The No-Mor Flats inner tube offers another airless solution. The mountain bike version is made of closed-cell foam, similar to the PolyAir, while the road version is a hollow rubber tube. These are inserted into standard tires. They're available in 20-, 24-, 26-, and 27-inch versions in a range of widths. They must be matched closely to the tire size since they do not expand like conventional inner tubes. The 26x1.75-inch tube ($22) we tried weighed 2.4 pounds, making it the heaviest product of the group. The 27x1¼-inch tube ($17) weighs 2 pounds. The added weight detracts from acceleration and climbing performance, while the solid nature of the tubes makes for a harsh ride. These also did not feel as secure on the rim as the PolyAir.

A very good level of flat protection can be attained with careful riding technique and products such as Kevlar-belted tires that add little weight, rolling resistance, and expense. More extreme measures detract from performance and are best reserved for glass- or thorn-strewn problem roads. ■

SOURCE LIST

AC International (Mr. Tuffy, Mr. Husky, PolyAir)—11911 Hamden Pl., Santa Fe Springs, CA 90670

Cyclo Mfg. (No-Mor Flats)—1438 S. Cherokee St., Denver, CO 80223

Kool Stop Int'l (Tire Gard)—Box 1304, Lake Oswego, OR 97043

Madison USA (Mr. Softee)—179 Tosca Dr., Stoughton, MA 02072

Specialized (thorn-proof tube)—15130 Concord Circle, Morgan Hill, CA 95037

The Third Hand (Tire Saver)—Box 212, Mt. Shasta, CA 96067

Western States Imports (Panaracer Poly-Lite)—4030 Via Pescador, Camarillo, CA 93010

FROM BICYCLING, SEPT '84

COURTESY OF FINN HANSEN

THE NEW RULE 185.5 - SOME COMMENTS RECEIVED

From James Hunter:

My interest in the technical side of the sport goes back to 1979 when I inquired about information to certify a 10k race. I've watched the technical aspects grow more important with each passing year and I think it is great for the sport. It gives it credibility. It still grieves me that Robert DeCastella didn't get the credit (publicity) due him rather than Alberto Salazar for holding the world record (due to the 1981 New York Marathon short course).

Anyway, there are lots of silent people out here who appreciate the work you people do, even if we don't tell you often enough. As a race director for 5 years, I know I really appreciated good comments, so be assured people like me appreciate your dedication to the sport. Thanks again.

From Norman Green:

I am certainly pleased with the final result in Washington, DC concerning rule 185.5. Thanks for all you did to assist in getting U.S. into synch with IAAF on this matter.

From Bob Bartling:

My hat is off to the RRTC for the brave stand they took in amending Rule 185.5. Now we will have records that have true meaning. Many thanks to all of you.

Not everybody was as pleased as the above. The Boston press produced a series of highly critical articles which, in turn, spread briefly to the national media. After this media flurry, TAC received many angry letters from Boston area runners.

Representatives of TAC's major committees met in Indianapolis on February 15 with Boston representatives to seek an accommodation. Boston's position was that they would prefer to see the rule as it used to be, with two sets of records being kept, or to expand the range of permissible aid to a point that would include Boston. They did not wish to be grandfathered as an exception to the rule.

TAC stuck by the new rule, pointing out that it had not happened overnight, but had been the culmination of a four year technical and political process. Any change to the rule will have to take the same course.

TADEUSZ DZIEKOŃSKI
ul. Chrobrego 4 m. 8
15-057 Białystok
POLAND

Bialystok, December 4, 1989

Dear Mr Riegel,

Thank you very much for your "Measurement News" issue 37.

Drop and separation problem is the biggest if AIMS try to establish road records. I think separation is not needed. Here are two very different examples:

- drop 3 m/km and separation 5 %,
- drop 0,5 m/km and separation 90 %

The question is: which course is agreed with conditions of 1 m/km and separation 50 % ? Neither of them ? I think 2nd is OK. If not, AIMS will have to establish two records: on a loop courses and on a point to point courses. I think one condition is sufficient - drop 1 m/km.

Wind measurement is very difficult problem. Two marathons in Poland are hold on courses where wind is/each along seaside/:

- Puck/head wind/,
- Swinoujście/back wind/

I ran both. Back wind of Swinoujście blows on different intervals and it needs much work to measure how wind is strong on each interval. Your and Baumel's articles of wind effects are very interesting but it is incredible that 10 km runner of 30.00 can run this distance in 28.59 if wind blow with a speed of 2 m/s.

You wrote - "MNews" no 37 page 6 - that 0,14 pound force saves 7 seconds. How do you enumerate it ?

What time can I receive on a marathon course where speed of wind will be 2 m/s and if I'm 2:45.00 marathoner ?

Do you know any big marathon courses where tail wind exists and blows on a long intervals ?

Do you know exact drop/and eventually separation/ of the following marathon courses: Rotterdam, Beijing, Port Elizabeth /probably 141 m totaly/, Tokyo, London, Fukuoka, Oita, Arusha and New York ?

Youngstone 10 K/in November 1989/ Antoni Niemczak ran in a time under 29.00 and it is the best Polish result. Is it the same race as on page no 31 of November '89 "MNews", which has a drop of 5,8 m/km and separation of 40 % ?

Best wishes

THE ATHLETICS CONGRESS
OF THE USA

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December 27, 1989

Tadeusz Dziekonski - ul. Chrobrego 4 m. 8 - 15-057 Bialystok - POLAND

Dear Tadeusz,

Your next Measurement News will be mailed in a few days. In the USA we have settled on one kind of course for records. The course must have a drop less than 1 m/km, and a separation less than 30 percent.

We have the separation limit because wind can be a big help when there is a great separation. Our new rule also allows wind measurement to be made when the course is flat, but has large separation. If there is no measured tail wind, a record may be allowed. Wind is not measured on loop courses.

We will now keep records for loop courses, but will no longer keep point-to-point records. About 90 percent of US courses are loops.

Boston is downhill in the early miles, but is a hard course because of the hills late in the race. It has a drop of 3.5 m/km and separation of 90 percent. When there is a strong wind from the west (tail wind) the times are faster. In 1980 the Mardi Gras Marathon was held in New Orleans. It was held on a long bridge (38 km in a straight line) across a lake. There was a very strong tailwind. Although no record was set, several people qualified for the US Olympic Trials with sub 2:20 times they had never before approached.

0.14 lb = 7 seconds came from treadmill studies. If the treadmill is inclined, part of the runner's weight is transferred into a retarding force. The runner must also slow down, because he cannot run so fast going uphill.

The numbers that came out of the study are only approximate. You should not take them as true. They are only estimates, and will vary a lot between different people. However, for a 2:45 marathoner, a 2 m/s tail wind would push him to 2:39:13, if the numbers are to be believed. I think they are reasonable. Remember, it is very rare to get a strong tail wind every step of the way.

Here is some information on courses you asked about:

Course	Drop, m/km	Separation, percent	
Rotterdam (88)	0	1	
Fukuoka (88)	0	1	
Tokyo (88)	0	1	(93 m short in 1988 - OK for 1989)
Beppu-Oita (88)	0	1	
London (89)	0.8	23	
New York	0.1	47	

Rotterdam finish is very close to start. Both are on public roads. The course is very flat.

Fukuoka, Tokyo, and Beppu-Oita have start and finish in the same stadium.

Beijing - No information available, but I think it was a flat course with little separation. John Disley measured it the first time it was held. Conditions were perfect for racing, says John, who was there.

Port Elizabeth - No information available.

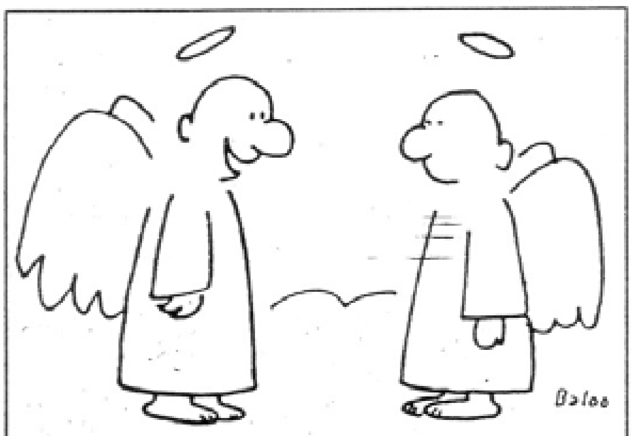
Arusha - Measured by John Disley several years ago, but no information available. John says it is all on bad roads, and very hard to describe, since no road signs are there. The course may have changed since John measured it.

International Peace Race - Youngstown, Ohio, USA - The course is accurate, but it has a drop of nearly 6 m/km and separation of 40 percent. No wonder Niemczak ran a fast time!

I hope this information has been a help to you.

Best regards,

Pete



"Of course I look healthy — I died jogging."

NATIONAL ENQUIRER

10k	AK	89001	FW	Anchorage	Anchorage RC-Ft Richardson	0	0	J Herring
05M	AL	89001	JD	Montgomery	Tortoise and Hare	0	1	B Harrison
05k	AR	89001	DLP	Little Rock	Little Rock IndustrialDist	0	2	T Mattingly
Mar	AZ	89001	FC	Tempe-Mesa	East Valley Marathon	-0.4	20	F Cichocki
Cal	CA	89001	CW	San Anselmo	San Anselmo Half Mile	0	100	C Wisser
05k	CA	89001	RS	San Diego	Feelin Fit 5k	0	2	R Vandertie
08k	CA	89001	TK	Stanford	Fifty Plus Runners Assoc	0	1	D Carpenter
05M	CO	89001	DP	Denver	Cherry Creek Sneak	0	2	D Poppers
Mar	CT	89001	DK	Stamford	Stamford Classic Marathon	3.1	38	D Katz
05M	CT	89001	DR	W Hartford	Hartford Track Club	0.1	2	D Reik
05M	DE	89001	WN	Wilmington	Cherry Blossom Run III	3.4	8	D White
08k	FL	89001	BH	Naples	ICI Masters 8km	0	1	L Allshouse
10k	FL	89001	DL	Ft Lauderdale	The Heart Run	0	1	D Loeffler
Trck	FL	89001	PR	Pensacola	Pensacola 48 Hr (203.30m)	0	0	K VanBlarico
15k	FL	89001	WN	Tampa	Gasparilla DistanceClassic	0	7	W Nicoll
2.5k	GA	89001	WN	Atlanta	PiedmontPk RestrictedLoop	0	3	W Nicoll
10k	HI	89001	TF	Mililani	Running Room 10 Kilometer	0.6	5	R Pate
25k	IA	89001	JL	Mechanicsvlle	Jim Lyle Memorial 25k RR	1.1	[illegible]	K Ungurean
10k	IA	89001	MF	Windsor Hts	WHAMM	0	[illegible]	M Franke
08k	IL	89001	JW	Chicago	Shamrock Shuffle	[illegible]	[illegible]	[illegible] Hinde
10k	IN	89001	MW	Indianapolis	Kidney Found. Gift of [illegible]	[illegible]	[illegible]	[illegible] Pierce
02M	KS	89001	BG	Wichita	River Run '89	[illegible]	[illegible]	[illegible]nsz
Mar	LA	89001	DL	New Orleans	Bud Light Mardi [illegible]	[illegible]	[illegible]	[illegible]orge
30k	MA	89001	WN	Boylston	NEAC 30k Cha[illegible]	[illegible]	[illegible]	[illegible]son
08k	MD	89001	JS	Gaithersburg	Key Club [illegible]	[illegible]	[illegible]	[illegible]ala
10k	MD	89001	RT	Rockville	Fritz[illegible]	[illegible]	[illegible]	[illegible]issala
10M	ME	89001	GN	Hancock	Ha[illegible]	[illegible]	[illegible]	M Carter
10k	MI	89001	SH	Berkley	[illegible]	[illegible]	4	S Hubbard
25k	MN	89001	RR	Minneapol[illegible]	[illegible]	[illegible]	5	R Recker
05k	MS	89001	DL	Jackson	[illegible]s	0.1	8	M Wann
05k	MT	89001	GT	Bozeman	[illegible]	0	2	M Carignan
05k	NC	89001	ACL	Raleigh	[illegible]nforcemt	0	2	A Linnerud
08k	NH	89001	WN	Hooksett	[illegible]ct 8km	0.8	2	W Nicoll
15k	NJ	89001	DB	Far Hills	[illegible] 15km 1989	0	1	D Brannen
05k	NM	89001	FC	Los Alamos	[illegible]000 Meter Run	0	6	A Acevedo
Mar	NV	89001	BC	Las Vegas	1[illegible] Las Vegas Marathon	6	92	B Callanan
02M	NY	89001	AM	RichfieldSpgs	Lion's Day 2 Mile	0	0	E Buckley
10k	NY	89001	BN	New York	Northwind 10k-Central Park	0	3	B Noel
10k	NY	89001	DB	Pearl River	Pearl River Elks 10km	0	1	D Brannen
10k	NY	89001	RE	Clymer	Peak'n Peak 10k	0	0	B Edwards
05M	NY	89001	WN	Perinton	Citibank/MDA 5 Mile Race	0	1	A Calabrese
05k	OH	89001	RE	NewMiddletown	Jaycee Shuffle	0	0	S Courtney
05k	OK	89001	BB	Tulsa	Glen's Lafortune Pk 5000	0.2	1	G Lafarlette
08k	OR	89001	LB	Portland	Shamrock Run	0	1	L Barrett
10k	PA	89001	RE	N.Phildelphia	North PhiladelphiaUnityRun	0	1	B Belleville
Mar	RI	89001	WN	Newport	Rhode Island Marathon	0	0	R Nelson
08k	SC	89001	BS	N Charleston	Run For Your Red Cross	0	1	M Anderson
06M	SC	89001	WN	Aiken	Tommy's Birthday Run	0	0	W Nicoll
05M	TN	89001	WN	Kingsport	Firecracker Five	0	1	F Oglesby
05k	TX	89001	ETM	Silsbee	B'rer Rabbit	0	1	B Boecher
05k	UT	89001	FH	Salt LakeCity	Spring Tip Off 5k	1	1	F Hansen
05k	VT	89001	BT	Northfield	Northfield Observances 5km	0	1	R Murphy
Mar	VT	89001	WN	Burlington	Vermont City Marathon	-0.1	2	B Everett
05M	WA	89001	MR	Seattle	Resolution Run	0	1	G Greise
08k	WI	89001	WG	Brookfield	Hog Jog	0	1	D Risch

When you order a course, specify the whole course number. Include the letters before and after the numbers. All the courses on this page are 89001, and even within some states you will see several 89001's. So please use the entire course ID when you order.

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February 5, 1990

Mike Wickiser - 2939 Vincent Rd - Silver Lake, OH 44224

Dear Mike,

Saturday I had the "Olentangy Commons 5k Run for Kids" to lay out. It was located less than half a mile from the calibration course we laid out for your validation of the Wolfpack course in Whetstone Park. Since you had stuck those big fat nails in place, I decided to use it to calibrate for the 5k.

I drove to the cal course and started to look for the south nail. Naturally, the paint was gone, but after some scouting I managed to find it. It had rusted some, but there it was. I put some yellow crayon marks near it so I could relocate it as I rode. The north end was easy to find, being just south of the tree, with a bit of your white paint still on the nailhead. I crayoned it too, and then calibrated my bike. I did no calculating, since I was only after some reference points on the 5k. Once I had the reference distances tied down, I intended to put the pieces together to make the course come out right, and use a second ride, done next week, to tie down the course and lay down the splits.

When I got home and started to calculate, I saw something was dreadfully wrong. My constant was way too big. The only thing that could explain it was that the cal course was about 110 feet too long. I couldn't see how we could have made such an error. The only explanation I could think of was that I had used a wrong nail. I went back to the cal course, and sure enough, there was a second nail, located 109.48 feet north of the one I had used. The nail still had traces of the white paint you put on it.

So I had used the wrong calibration course. It's a good thing the difference was as great as it was. I might not have noticed a smaller error, and could well have laid out the race course at an erroneous distance. As it was, I just had to use 1109.48 feet as the calibration distance.

Since the cal course had nails, and I had time, I documented the calibration course and certified it. When we laid it out you were on a tight schedule and we decided not to bother, and just considered it a one-use cal course. Here is a copy of the certificate for you, in case you measure around here again. I may get some more use out of the course, since it is near Whetstone Park, where race courses abound.

There may be a lesson in this. Memory plays tricks, and a temporary calibration course should not be used again unless one is <u>certain</u> of the end points. I don't know who put in that third nail - it looked like it had been there a lot longer than the ones you used.

Best regards,

Pete

"Drop Rule" Explained
Finn S. Hansen

A wire service story carried by the Deseret News, Saturday, January 20, 1990 dealt with a rule change made a the last TAC (The Athletics Congress) convention. The rule deals with the criteria for what conditions shall be acceptable for record keeping purposes. Up until this time records were kept for "loop courses", that is, those courses that either start and finish at or near the same place (not more than 10 percent of the race distance apart). All real "records" had to be run on courses that met that criteria. If there was a time that was faster than one run on a "loop course" then that "record was shown on another list. These were course that were point-to-point or exceeded the 10 percent separation rule. If one of these "point-to-point" course had a drop for more than 2 meters per kilometer any "records" would be noted as being "possibly aided by wind or slope". It was becoming more and more difficult to maintain these so called "records" as courses with greater drops would eventually have all the point-to-point "records". These course began to be referred to in the Road Running Technical Committee (RRTC) as "Joke Courses".

It should be noted that the proposed changes in the rule have been discussed and studied for at least the last four conventions. I have personally been in attendance at all the meetings and for three of those years I opposed the rule change. I was defending our right to run on any course we could lay out and have certified to be the proper distance. The Boston Marathon had not had anyone represent them until the very last meeting of this most recent convention when all the discussion was over. Please note that Boston did not qualify for true records because it is a point-to-point course and exceeded the 2 meter per kilometer drop. It drops almost 3.5 meters per kilometer.

I changed my position this year because the overwhelming data showing the amount of aid that is obtained by a drop in a race course. The final change to the rules to allow only one meter drop per kilometer and allows a separation of 30 percent, came about after much study of existing certified courses (over 90 percent would still fall within the new rule.) The starting point for calculating the allowable drop was the amount of aid gained by wind on a track. The allowable wind aid is less the 2 meter per second. This turns out to be quite a bit. But, nonetheless, it was used as a starting point. The intent was to come up with an equivalent amount of allowable aid on a road course. This resulted in the one meter per kilometer drop.

Some side notes, there is not really a World Record for a marathon. The International Amateur Athletic Federation (IAAF), the international governing body for track & field and road racing, does not recognize it as such. They state it as a "noteworthy performance". In fact they do not recognize any "records" run on the road. This is because no two courses are alike. Tightening the criteria for road race course will lead to uniformity and I believe that then we can have real records that can be recognized as such.

What does all this mean to runners in Utah? I do not feel that it will change anything. With a few exceptions such as Gail Ladage-Scott's time at the St. George Marathon, Ed Eyestone's time at The Deseret News 10K, and Steve Lester's time at Ouelessebougou 5K there have not been anything close to American Records which is what is being discussed. Note also the Gail and Steve's times were as Masters and not Open records. One of the reasons is that we are running at altitude which greatly impacts our ability to obtain record quality times. This is the one area I have indicated that I would fight for. If for some reason someone would propose to exclude any of our races because of excessive drop, I would fight to have and alternate qualifying time which is based on altitude. No race director who understands how many different places races are run would want to consider this. The NCAA rule book has had to add a section at the back of their rule book to show the qualifying standards at the various universities that are located over 1000 meters altitude. That is a fixed number. There could be any number of road races run and numerous locations in every state and what elevation do you use the start or the finis or the average. This is one can of worms I don't think anyone wants to open.

The list below shows the drop in meters per kilometer for some of the major point-to-point races in Utah. You can judge for yourself if time at St. George Marathon is really better than your time at The Deseret News Marathon. I hope this article has helped the runners of Utah to better understand this rule change.

Dixie 15K Tune-Up	29.3
Demetrio Cabanillas Magna Classic 10K	27.1
Ouelessebougou 5K	26.2
St. George Marathon	18.7
Midvale Harvest Days Half Marathon	16.3
Young Alumni 5K	15.5
Deseret News 10K	15.2
Magna's Finest 5K	14.6
Golden Spoon 10K	13.7
Deseret News Marathon	11.6

Uphills, Downhills and the Boston Marathon

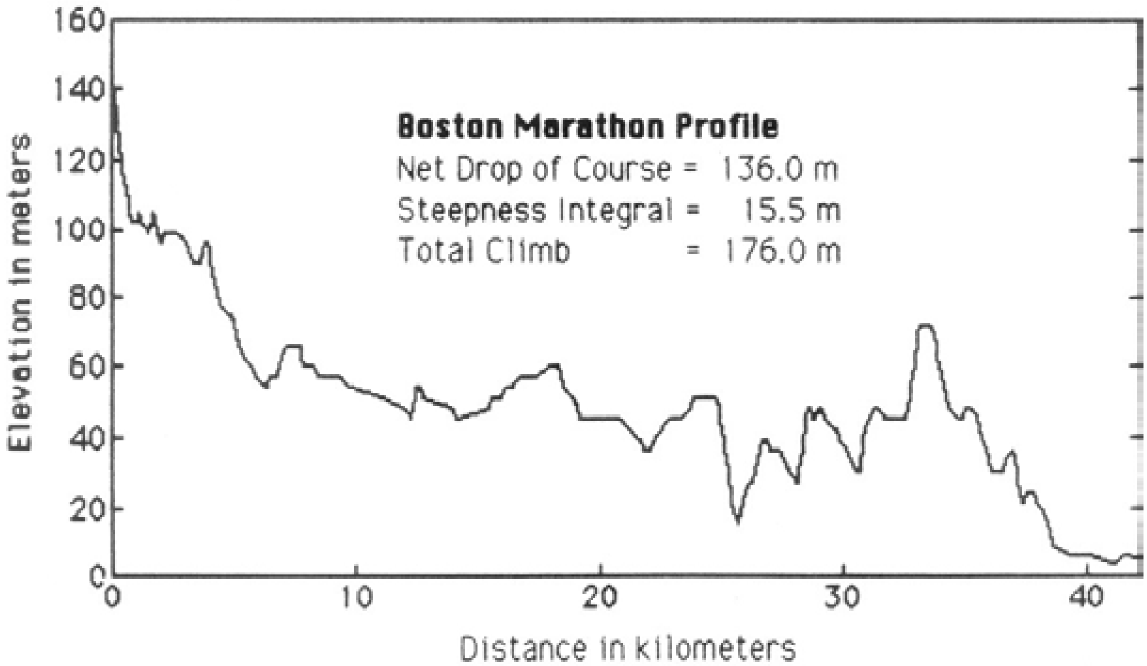
by Bob Baumel and Alan Jones

Some critics of TAC's new Drop/Separation rule assert that although the Boston Marathon course drops 3.2 meters per kilometer, which exceeds the 2 m/km limit of the old rule as well as the 1 m/km limit in the new rule, the uphills on this course (especially "Heartbreak Hill") are so devastating as to completely wipe out any aid provided by the drop. We attempt here to evaluate this argument quantitatively. We conclude that by any reasonable analysis, Boston is substantially aided in spite of its hills.

The mathematical framework for discussing this type of question was provided in an article by one of us (BB) in Jan '89 *Measurement News* entitled "Hill Effect to Second Order" [1]. The concept was further elaborated in a follow-up article by the other current author (AJ) in July '89 MN [2], which found that the predictions of the equations agreed well with AJ's own racing time on a local hilly 20 km course.

The July '89 article also promised an analysis of the Boston Marathon course (an arduous exercise in view of the detailed data collection from topographic maps needed to apply the equations). That analysis has now been completed.

As some of you may have seen earlier analyses distributed by either of us separately within the past month or so, we note that for the present jointly-authored article, we have obtained improved estimates of the coefficients in the equations, and have refined our topographic data for the Boston course. For example, with the help of Wayne Nicoll who recertified the course in 1989, we determined quite accurately that Boston starts 141 meters above sea level, and finishes 5 meters above sea level, for a net drop of 136 m (3.22 m/km).



The data for the above profile diagram was obtained (by AJ) from recent (1987) 1:25,000 metric topographic maps covering the route from Hopkinton to Boston. Fred Bostrom, who has run the race many times, helped locate the course on the maps, and Wayne Nicoll provided the 1986 and 1989 certification maps so we could pinpoint it exactly (especially the start and finish). The profile was digitized by measuring distances along the map to each point where a contour line intersects the course (3-meter contour intervals).

A small amount of "smoothing" was applied to the raw profile obtained this way, because map distances were initially measured in whole millimeters, yielding insufficiently accurate slopes in the steepest regions where spacing of contour lines was only 1-2 mm. Thus, the initial raw digitization indicated some unrealistically steep grades as high as ±12%. After fixing this problem, we found that Boston's steepest grade is in the first few hundred meters, where it careens downhill with a slope of about 7-8%. Heartbreak Hill rises at about 5%, and descends at about 4%.

The legend on the profile diagram indicates the course's "Net Drop" and its calculated "Steepness Integral," which are quantities needed in the equation from the Jan '89 MN article. (The diagram's legend also displays the course's "Total Climb," which is *not* used in the equation, but is easily calculated from the profile data.) We now review the equation for the "Second Order Hill Effect":

$$L_{eff} = L - A \times ND + B \times SI \qquad (1)$$

where

- L is the course's actual length.
- L_{eff} is the course's "effective" length; i.e., the length of the perfectly flat course that would produce times identical to those run on the actual race course.
- ND is the course's Net Drop; i.e., the net decrease in elevation from Start to Finish (negative in case of net rise).
- SI is the quantity we call the "Steepness Integral," which measures the extent to which the course contains steep grades. (See Appendix for more precise definition.)
- A and B are numerical coefficients whose values may be derived from exercise physiology experiments involving oxygen uptake measurements on inclined treadmills (see appendix).

What does Equation (1) mean? The three terms on the right-hand-side of this equation can be thought of as "zeroth order", "first order", and "second order" terms respectively. Let us try to explain these three successive levels of approximation:

The "zeroth order" approximation consists of neglecting both the "A" and "B" terms from the right-hand-side of the equation, so that we have only:

$$L_{eff} = L$$

which says that race times depend only on the course length; i.e., the hills have no effect at all! In a certain sense, this isn't too bad an approximation:

In the old days when most race courses were still being measured by car odometer, runners knew that they couldn't compare times between different courses. We now know that *most* of the variation between those courses was the result of inaccurate distance measurement, even though runners often blamed it on differences in terrain.

The effect of terrain *can* be seen when the race distance has been measured accurately enough. But to "first order", the effect of terrain depends only on length and net drop; i.e.,

$$L_{eff} \;=\; L \;-\; A \times ND$$

At this level of approximation, equal uphills and downhills always exactly cancel each other; thus, any course that starts and finishes at the same altitude is just as fast as a flat course, no matter how many hills it has between its start and finish. This is actually a good approximation if the course contains only *gentle* slopes, since in this case, the extra energy used in each meter of climb is almost exactly balanced by the energy saved in each meter of descent.

But when a course has sufficiently steep grades, the effect of terrain *cannot* be adequately described by just the length and net drop. We then need *all three* terms from equation (1). This is the "second order" approximation. Whereas the first-order "A" term expresses the notion that equal uphills and downhills exactly cancel each other, the second-order "B" term indicates the residual amount by which the uphills and downhills *don't* cancel each other.

A course's Steepness Integral "SI" measures the degree to which it has steep grades. If a course has many uphills and downhills, then even if it has a net drop, the $B \times SI$ term *might* be big enough to overwhelm the $A \times ND$ term, in which case the course would be slower than an equal-length flat course.

Now that we've explained the preliminaries, let's return to the Boston Marathon. From the profile diagram presented earlier, we already know its Net Drop and Steepness Integral; namely, ND = 136 m and SI = 15.5 m. All we need now are values for the coefficients A and B. The Jan '89 MN article stated the values A = 4.5 and B = 5, obtained by analysis of physiological data of Margaria et al. [3]. BB has now re-analyzed the Margaria data, resulting in improved estimates: A = 4.6 and B = 7, as derived in the Appendix to this article. Substitution of these revised values in equation (1) yields (with all distances in meters):

$$\begin{aligned} L_{eff} &= 42195 - 626 + 109 \\ &= 42195 - 517 \\ &= 41678 \end{aligned}$$

According to this calculation, the first-order Net Drop ("A") term reduces the effective length by 626 meters, while the second-order Steepness ("B") term increases the effective length 109 m. Thus, the steepness factor cancels only about 17% of the aid provided by the net drop. The overall result is an effective shortness of 517 meters. A marathoner capable of 2:08:00 on a flat course can therefore expect to run 1 min 34 sec faster on the Boston course. Likewise, a three-hour marathoner may expect to run 2 min 12 sec faster.

The greatest uncertainty in the above analysis is in the values of the A and B coefficients. Margaria's data [3], which provides the basis for the present analysis, is a classic study of the energetics of uphill and downhill running. It is nevertheless desirable to check other (independent) data on this subject. Jack Moran has provided excerpts from Phil Henson's Ph.D. thesis (Indiana University) containing measurements of the energy cost of inclined treadmill running. From Henson's data, BB has derived the values: $A = 5.5$ and $B = 18$. Substituting these values into equation (1) for the Boston course yields:

$$\begin{aligned} L_{eff} &= 42195 - 748 + 279 \\ &= 42195 - 469 \\ &= 41726 \end{aligned}$$

which predicts an overall effective shortness of 469 meters, corresponding to a time saving of 1 min 25 sec for a 2:08:00 marathoner. It is interesting that although the calculations using A and B values derived from either Henson's or Margaria's data attribute rather different amounts to the "A" and "B" terms individually, their overall predictions for the Boston course are very similar. By either calculation, world-class runners save about 1½ minutes.

(We admit that for courses with *other* profiles—especially courses with no net drop or a net rise—the predictions based on Margaria's or Henson's data can be quite different.)

It has been said that the Boston course must be tough because no world records have been set on it. However, a look at the U.S. records shows us that 10 of the 20 best times for American runners have been set at Boston. These are:

RANK	NAME	YEAR	TIME
1	Alberto Salazar	1982	2:08:52
2	Dick Beardsley	1982	2:08:54
3	Greg Meyer	1983	2:09:00
5	Bill Rodgers	1979	2:09:28
7	Ron Tabb	1983	2:09:32
10	Bill Rodgers	1975	2:09:56
11	Benji Durden	1983	2:09:58
13	Ed Mendoza	1983	2:10:07
15	Bill Rodgers	1978	2:10:14
16	Jeff Wells	1978	2:10:16

If we add 1:34 to the above times to remove the benefit derived from the drop, Salazar's 1982 performance would rank 11th among American marathon times.

It is also interesting to compare the best Boston times and best *non*-Boston times of the runners in TACSTATS list of the top 100 American performances. (Seven men and four women have at least one Boston and one non-Boston time on this list.) Given that each runner surely had more chances to run non-Boston races than Boston races, one would tend to expect the non-Boston times to be better. Nevertheless, **all** of the men ran their fastest marathon at Boston although only one of the four women did:

From TACSTATS All-Time Rankings — Marathon Road Races — Men - 1988

Runner	Best Boston Time	Best Other Time	Where	Difference
Alberto Salazar	2:08:52 (82)	2:09:21 (83)	Japan	0:29
Dick Beardsley	2:08:54 (82)	2:09:37 (81)	MN	0:43
Greg Meyer	2:09:00 (83)	2:11:00 (82)	IL	2:00
Bill Rodgers	2:09:28 (79)	2:10:10 (76)	NY	0:42
Ron Tabb	2:09:32 (83)	2:10:46 (83)	NY	1:14
Benji Durden	2:09:58 (83)	2:10:40 (80)	NY	0:42
Jeff Wells	2:10:16 (78)	2:10:20 (79)	OR	0:04

Average difference: 0:51

From TACSTATS All-Time Rankings — Marathon Road Races — Women - 1988

Joan Benoit-Samuelson	2:22:43 (83)	2:21:21 (85)	IL	-1:22
Patti Catalano	2:27:52 (81)	2:29:33 (80)	NY	1:41
Julie Brown-Shea	2:30:55 (81)	2:26:26 (83)	CA	-4:29
Julie Isphording	2:33:40 (86)	2:31:10 (88)	OH	-2:30

Average difference: -1:40 (Boston times slower on the average)

Another argument often raised by Boston's defenders is the particular location of Heartbreak Hill at a point where many marathoners "hit the wall." It must, however, be noted that runners in top condition who are having peak performances (of the sort that set records) do *not* "hit the wall." In an optimally-paced performance, the runner speeds up on the downhills, and slows down on the uphills, just enough to maintain constant energy output, and is not fully spent until the end of the race. (See Pete Riegel's splits elsewhere in this issue showing how to run the Boston course.)

If these analyses prove to be of value in determining the difficulty of courses, one could imagine a further rule change allowing hilly courses with net drop exceeding 1 m/km to still qualify for records if it can be shown that the hills slow runners down more than the drop helps them. We suspect, however, that very few courses would fall into this category. Boston certainly doesn't.

References

1. B. Baumel, "Hill Effect to Second Order," Measurement News, Jan 1989, #33, pp. 41-43.
2. A. Jones, "Hill Effect to Second Order," Measurement News, July 1989, #36, pp. 34-35.
3. R. Margaria, P. Cerretelli, P. Aghemo, G. Sassi, "Energy cost of running," Journal of Applied Physiology, v. 18, 1963, pp. 367-370.
4. TACSTATS/USA, Marathon Rankings, 1988.

Appendix: Derivation of 2nd Order Hill Formula

The effect of uphill and downhill grades can be characterized by the extent to which they change the energy requirement for running the course. In an optimally-paced performance according to many running authorities (also according to BB's "Physiological Model" article in Nov '89 MN), the runner maintains a constant rate of energy consumption. Thus, running time varies directly with the energy cost of running the course.

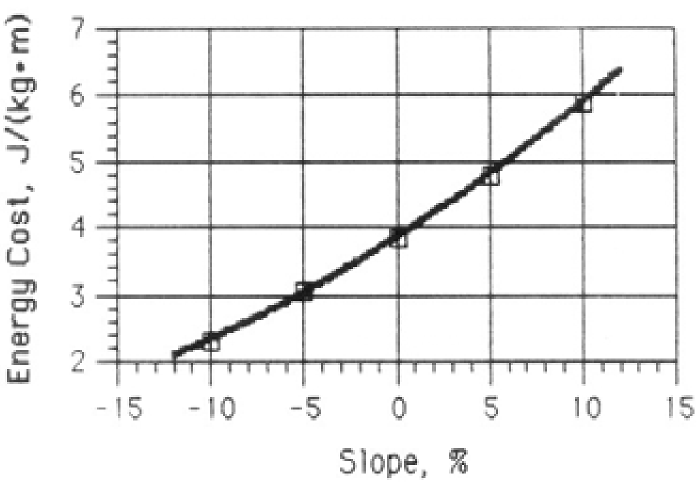
We use data of Margaria et al. [3] as our reference on the energy cost of uphill and downhill running. An interesting conclusion from that data is that although runners obviously consume energy at a faster rate when running faster, the energy consumed *per meter* is essentially constant, regardless of running speed. Naturally, the energy cost per meter does depend on the degree of uphill or downhill incline.

From one of Margaria's diagrams (Figure 2 in ref. [3]), displaying all their data for energy consumption at various speeds and inclines, we derive the following table showing how energy cost per meter varies with slope:

Slope, m/m	-0.10	-0.05	0	0.05	0.10
Energy Cost, J/(kg·m)	2.33	3.05	3.86	4.80	5.91

This table displays slope as a pure number (meters per meter), and shows the net energy cost in joules per meter per kilogram of body mass. (By *net* energy cost, we mean that resting metabolism has been subtracted out.)

Graphically, this relationship looks as follows:



In this plot, the data have been fitted with the parabola:

$$a(S) = 3.86 + 17.82\,S + 26\,S^2 \qquad \text{(A1)}$$

where a(S) denotes energy cost per meter at slope S.

Suppose more generally that the energy cost per meter can be expressed as a quadratic function of slope; i.e.:

$$a(S) = a_0 + a_1 S + a_2 S^2 \qquad (A2)$$

Suppose further that the race course consists of N intervals, where the (i)th interval has length Δx_i and elevation change Δy_i (positive if uphill, or negative if downhill). Then the energy cost *per meter* on this interval is:

$$a(S_i) = a_0 + a_1\left(\frac{\Delta y_i}{\Delta x_i}\right) + a_2\left(\frac{\Delta y_i}{\Delta x_i}\right)^2 \qquad (A3)$$

and the energy consumed in running this interval is given by:

$$\Delta E_i = a(S_i)\,\Delta x_i = a_0\,\Delta x_i + a_1\,\Delta y_i + a_2\frac{(\Delta y_i)^2}{\Delta x_i} \qquad (A4)$$

The total energy used in running the whole course is therefore:

$$E = a_0\sum_{i=1}^{N}\Delta x_i + a_1\sum_{i=1}^{N}\Delta y_i + a_2\sum_{i=1}^{N}\frac{(\Delta y_i)^2}{\Delta x_i} \qquad (A5)$$

Observe now that:

$$\sum_{i=1}^{N}\Delta x_i = L = \text{Length of the Course}$$

$$\sum_{i=1}^{N}\Delta y_i = (y_F - y_S) = -ND \qquad \text{[where ND = "Net Drop"]}$$

$$\sum_{i=1}^{N}\frac{(\Delta y_i)^2}{\Delta x_i} = SI \qquad \text{[this is the discrete "Steepness Integral"]}$$

so equation (A5) can be rewritten as:

$$E = a_0 \times L - a_1 \times ND + a_2 \times SI \qquad (A6)$$

Let's define the course's "effective length" as the length of a hypothetical flat course that requires the same energy consumption E. Then:

$$E = a_0 \times L_{eff} \qquad (A7)$$

Combining equations (A6) and (A7) yields:

$$a_0 \times L_{eff} = a_0 \times L - a_1 \times ND + a_2 \times SI \qquad (A8)$$

and if we divide equation (A8) by a_0, we get:

$$L_{eff} = L - \left(\frac{a_1}{a_0}\right)ND + \left(\frac{a_2}{a_0}\right)SI \qquad (A9)$$

which has precisely the same form as equation (1) with:

$$A = \frac{a_1}{a_0} \quad \text{and} \quad B = \frac{a_2}{a_0} \qquad (A10)$$

Given the actual numerical values in equation (A1), we obtain the following values for A and B:

$$A \approx 4.6 \quad \text{and} \quad B \approx 7 \qquad (A11)$$

It is interesting to note, by the way, that the equations presented in this Appendix also describe the runner's speed at each point along the course in an optimally-paced race. If a(S) is the energy cost *per meter* while running on slope S, then the energy cost *per unit time* is found by multiplying a(S) by the runner's speed v. Since the optimal strategy consists of a *constant* rate of energy consumption, we must have:

$$a(S)\, v = \text{Constant} = a_0 v_0 \qquad (A12)$$

which implies:

$$v = \frac{a_0 v_0}{a(S)} \qquad (A13)$$

where v_0 is the runner's speed on any flat portion of the course. Thus, the running speed v varies inversely with a(S), although the runner's "pace" (reciprocal of speed) varies directly with a(S).

THE ATHLETICS CONGRESS
OF THE USA

Road Running Technical Committee
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February 19, 1990

Amby Burfoot - Runner's World - 33 E. Minor St - Emmaus, PA 18098

Dear Amby,

As you know, we've spent a lot of time doing technical wizardry in an effort to assess the effect of Boston's hills. Our conclusion is that a 2:10 flat-course runner ought be able to do about a minute and 30 seconds faster at Boston. The reason most don't is that they waste their opportunity. A hotshoe who wants a fast time at Boston ought to try to break his flat-course PR by about a minute, if he does some hill training and maintains pace discipline.

If a fast time is to happen, the runner must attack the course hard. He ought to be almost a minute ahead of even pace by the time he hits five miles. This requires running that many runners consider suicidal. The common thing is for the lead pack to spend the first few miles running conservatively, while they scope each other out. If the runner does this he's blown his chance.

The runner must ignore the others and not get sucked into running a tactical race. If he is attempting a fast time, he should not deviate from the plan, unless it gets into hectic stuff in the last few miles. He should expect to be about 30 seconds off his pace atop Heartbreak Hill - he'll make it up as he descends it. The runner must back off on the uphills or be destroyed, just as he must hit the downhills hard or lose his chance.

These charts are based on the work of Bob Baumel, Alan Jones and me. I believe they represent attainable goals. Although the downhill speeds seem fast, the runner will burn energy at a constant rate throughout the race if he follows these charts. A constant rate of work is the most efficient way to run a fast time.

Although these charts will work for the slower runners, it's likely they'll be caught in traffic and be unable to fully utilize the early downhills. But the fast guys have a chance.

I have run Boston and about 40 others (best 2:56), so I don't write from a position of total ivory-towerdom.

If you have any questions, or would like to talk about this, give me a call. If you want this on disk, let me know. I can also provide a split chart if desired.

Best regards,

Pete

PACE CHART FOR BOSTON MARATHON

The following is a pace chart for various finish times for the Boston Marathon. It is based on an extremely accurate course profile, and on the concept that the runner should exert a constant <u>effort</u> throughout the race, <u>not</u> a constant <u>pace</u>. On the uphills he should slow down, and on the downhi speed up.

Example: a runner attempting to run 2:40 should pass from mile 4 to mile 5 a 6:17 minutes per mile pace.

	Minutes per mile for expected finish time							
MILE	2:05	2:10	2:20	2:30	2:40	3:00	3:30	4:00
0								
1	4 19	4 29	4 50	5 11	5 32	6 13	7 15	8 17
2	4 42	4 53	5 15	5 38	6 0	6 46	7 53	9 1
3	4 37	4 48	5 10	5 32	5 54	6 38	7 45	8 51
4	4 33	4 44	5 6	5 28	5 50	6 33	7 39	8 44
5	4 54	5 6	5 30	5 53	6 17	7 4	8 14	9 25
6	4 45	4 57	5 19	5 42	6 5	6 51	7 59	9 7
7	4 46	4 58	5 20	5 43	6 6	6 52	8 1	9 9
8	4 51	5 2	5 26	5 49	6 12	6 59	8 8	9 18
9	4 46	4 57	5 20	5 43	6 6	6 51	8 0	9 8
10	4 57	5 9	5 33	5 57	6 20	7 8	8 19	9 31
11	4 55	5 6	5 30	5 53	6 17	7 4	8 15	9 26
12	4 38	4 49	5 11	5 33	5 55	6 40	7 46	8 53
13	4 49	5 1	5 24	5 47	6 10	6 57	8 6	9 15
14	4 47	4 59	5 22	5 45	6 8	6 54	8 3	9 12
15	4 59	5 11	5 34	5 58	6 22	7 10	8 22	9 33
16	4 21	4 31	4 52	5 13	5 34	6 15	7 18	8 20
17	5 9	5 21	5 46	6 11	6 36	7 25	8 39	9 53
18	5 2	5 14	5 38	6 2	6 26	7 14	8 27	9 39
19	4 35	4 46	5 8	5 30	5 52	6 36	7 42	8 49
20	5 4	5 17	5 41	6 5	6 30	7 18	8 31	9 44
21	5 10	5 23	5 48	6 12	6 37	7 27	8 41	9 56
22	4 33	4 44	5 6	5 28	5 49	6 33	7 39	8 44
23	4 40	4 51	5 14	5 36	5 59	6 43	7 51	8 58
24	4 29	4 40	5 2	5 23	5 45	6 28	7 32	8 37
25	4 47	4 58	5 21	5 44	6 7	6 53	8 2	9 11
26	4 50	5 1	5 24	5 47	6 11	6 57	8 6	9 16
26.2	4 47	4 59	5 22	5 45	6 7	6 53	8 2	9 11

GAUGING WIND IN ROAD RACES

If a race course has a drop of less than 1 m/km, but has a start-to-finish separation of more than 30 percent, it has a special problem. If race organization wishes for TAC record recognition, then they must show that the race had no overall tailwind. The assessment of wind is the responsibility of the Road Running Technical Committee of TAC. It is our desire that the gauging procedure should be as fair, simple, robust and foolproof as possible. What follows is one acceptable way to do the job:

Place a wind indicator at start, finish and each mile split in the race. This should be a vertical pole, about 6 to 8 feet high, with a streamer tacked to the pole near the top. The streamer should be about 3 to 4 feet long. It should be made out of lightweight tape. Plastic crowd-control tape works well for this. Be sure it's waterproof, since it may rain. Put an identification (i.e. "Mile 3") atop the pole. Mark it with an arrow to indicate the direction of running. Make it large enough so it can identify where the picture was taken. If you wish, use a lightpole that's very near the mile mark, being sure to have an ID in the photo.

Be sure the streamer is located well away from people or parked cars, to be sure it catches the wind properly. At start or finish, a small streamer can be hung from the start or finish banner, inconspicuously. Use a method to suit your particular configuration.

Take a couple of practice photos of the indicator, well before the race, so that you have confidence that the pictures will show the streamer clearly.

Put a photographer directly across the road from the indicator. When the lead runner arrives, take a picture of the wind indicator. Try to include the lead runner. If you miss, get a photo of the next runners.

This would require 28 photographers for a marathon, so here's an easier way: Put the indicators all on one side of the road. Put someone in a lead vehicle with a camera. Just before the race starts, photograph the streamer at the start. As the vehicle passes each split, photograph the indicator. At the finish, photograph the finish streamer.

Get the photos developed, and send pictures and negatives to Pete Riegel, Chairman, RRTC (3354 Kirkham Rd - Columbus, OH 43221). Also send a sample of the tape you used. A wind judgment will be made as fast as circumstances allow. If things are clear, one person will make the judgment. If it's a borderline call, a committee will assess the pictures.

If you do things perfectly, that's great. If you make a mistake somewhere, send what you've got.

The pictures will be used to determine whether the race had a net tailwind.

If you have any questions, or think you have a better way to do this, call Pete Riegel at 614-451-5617 (H) or 614-424-4009 (W).

This is obviously not the last word in wind gauging, but it's as easy as we know how to make it. We'd love to find a way that's even easier. Photos are nice because they give all interested parties permanent, concrete evidence of what actually happened at that particular instant in time.

EXTREMES IN THE COURSE LIST

The following is taken from the post-1986 course list, on which drop and separation is shown. It gives the top ten of the most extreme courses in terms of drop.

Uphill 5 km Courses

05k	PA	89030	RE	Munhall	Munhall 5k	-12	11
05k	SC	87022	BS	Columbia	Vista Freedon Run	-4.4	18
05k	NC	87031	ACL	Durham	Duke Children's Clas(Alt)	-4.3	5.8
05k	CO	89012	DP	Littleton	Summerwalk 5k	-3.2	1
05k	TX	88035	ETM	Dallas	Halloween Hustle	-3	8
05k	PA	89034	RE	Wilmerding	Wilmerding Pumpkin Chase	-2	4
05k	OK	87056	BB	Midwest City	Renaissance Run 5 km	-1.8	11
05k	OH	87042	PR	Cincinnati	Memorial Day Run	-1.8	7.3
05k	IA	89010	MF	Ames	Run for the Roses	-1.4	6
05K	CO	89006	DP	Lakewood	Federal Center 5k	-1.2	8

Downhill 5 km Courses

05k	TX	88007	KL	Austin	Easter Seals Run	11	85
05k	AR	88033	BB	Little Rock	Sportstop Firecracker 5km	12	29
05k	UT	87014	FH	Provo	Goddess of Speed	14	99
05k	GA	88018	WN	Macon	Macon Labor Day Road Race	14	89
05k	UT	88009	FH	Magna	Magna's Finest 5k	15	58
05k	UT	87003	FH	Tooele	Runner's Edge Ice Breaker	16	93
05k	UT	89002	FH	Salt LakeCity	Young Alumni 5k	16	30
05k	PA	89029	RE	Washington	Washington ACA 5k	17	90
05k	AL	88001	JD	Birmingham	Kudzu Run	18	66
05k	CO	87019	TK	Evergreen	Freedom Run 5 km	31	40

Uphill 10 km Courses

10k	UT	88010	FH	Grafton+	Butch Cassidy 10k Run	-4.1	72
10k	CA	89007	TK	Scotts Valley	Pioneer Days 10k Run	-4	35
10k	AK	87002	BH	Anchorage	Alaska Women's Run	-3	64
10k	CO	88018	TK	Boulder	Bolder Boulder	-2.5	30
10k	CA	87001	RS	Westwood (LA)	WestwoodVillage 10 km `87	-2.1	11
10k	AZ	89004	FC	Page	Lake Powell 10k	-2.1	12
10k	SC	89009	BS	Marietta	River Falls Run	-1.9	4
10k	TX	89013	ETM	San Antonio	Run for Brainpower	-1.8	60
10k	SC	87002	BS	Winnsboro	The Clock Run	-1.5	1.8

Downhill 10 km Courses

10k	GA	88005	WN	Atlanta	Women and Men on the Road	7	14
10k	UT	87010	FH	Kanab	Kanab 10 km	9.4	100
10k	PA	87074	PR	Pittsburgh	Pittsburgh Great Race	10	97
10k	CA	87043	RS	San Diego	1987 Heart of San Diego	11	68
10k	OR	87001	DK	Bend	Big Foot 10 km	13	90
10k	UT	89004	FH	Salt LakeCity	Golden Spoon Classic 10k	14	48
10k	AZ	87013	BB	Scottsdale	Foothills 10 km	16	80
10k	SD	89033	BB	Bonesteel	Whetstone Road Run 10km	19	75
10k	CA	88017	CW	Foresthill	Foresthill 10km	23	97
10k	UT	88005	FH	Magna	Demetrio Cabanillas 10k	27	77

Uphill Half-Marathons

HMar	NY	89017	AM	Ithaca	Finger Lakes HMar Split	-10	83
HMar	NM	88003	FC	Albuquerque	Duke City Half Marathon	-2.1	38
HMar	MO	88018	BG	Kansas City	Hospital Hill '88	-1	0.9
HMar	WA	89015	MR	Woodinville	47° Latitude HMar	-0.4	4
HMar	CA	87041	RS	Pasadena	Columbian Select Half Mar	-0.3	4.4
HMar	WA	88017	MR	Spokane	Troika Half Marathon	-0.3	1.7
HMar	MO	89010	BG	Kansas City	Hospital Hill 1989	-0.3	1
HMar	CA	87018	RS	SanBernardino	East Highland Ranch	-0.2	1.2

Downhill Half-Marathons

HMar	CA	87012	CW	San Francisco	'87 Nike-SF Half Marathon	1.7	11
HMar	CT	89002	DK	Stamford	Stamford Classic HMar	2.1	23
HMar	CA	88066	RS	San Diego	America's Finest City HMar	2.3	44
HMar	NV	88001	BC	Las Vegas	1988 Las Vegas Mini Mar	2.5	85
HMar	GA	88023	WN	Decatur	Atlanta Half Marathon	2.8	67
HMar	CA	88001	RS	WoodlandHills	The Boulevard Run	3.3	95
HMar	PA	88047	RE	Warren	Kinzua Dam Half Marathon	3.5	84
HMar	TX	87066	KL	Austin	Austin	12	67
HMar	UT	88004	FH	Copperton	Midvale City Harvest Days	16	84
HMar	CA	88018	CW	Foresthill	Foresthill Half Marathon	24	98

Uphill Marathons

Mar	NY	88003	BT	Hammondsport	Wineglass Marathon	-1.5	70
Mar	AZ	89005	FC	Page	Lake Powell Marathon	-1.4	70
Mar	MN	88010	RR	Twin Cities	Twin Cities Marathon	-0.9	31
Mar	MN	89019	RR	Twin Cities	Twin Cities Marathon '89	-0.9	31
Mar	PA	87001	DB	Philadelphia	Philadelphia Independence	-0.5	15
Mar	IL	88006	JW	Zion/HghlndPk	Lake County Marathon	-0.5	76
Mar	DC	87060	RT	Washington	Marine Corps Marathon	-0.4	0.9
Mar	DC	88055	RT	Washington	Marine Corps Marathon	-0.4	1
Mar	AZ	89001	FC	Tempe-Mesa	East Valley Marathon	-0.4	20
Mar	NY	89018	AM	Ithaca	Finger Lakes Marathon	-0.3	83

Downhill Marathons

Mar	CA	87034	CW	Sacramento	1987 California Int Mar	2.5	100
Mar	NY	87005	WN	Schnectady/Al	MohawkHudsonRiverMarathon	2.7	49
Mar	TX	87065	KL	Austin	The Austin Marathon II	2.8	33
Mar	CT	89001	DK	Stamford	Stamford Classic Marathon	3.1	38
Mar	MA	89002	WN	Boston	Boston Marathon	3.5	91
Mar	ME	89004	GN	Kingfield	Sugarloaf Marathon	4.1	77
Mar	NV	89001	BC	Las Vegas	1989 Las Vegas Marathon	6	92
Mar	CA	88068	RS	San Diego	1988 San Diego Marathon	6.7	1
Mar	CO	87007	TK	SteamboatSprs	Steamboat Marathon	11	88
Mar	UT	88003	FH	SaltLakeCity	Deseret News Marathon	12	36

TEN MILES, THE HARD WAY

Several thousand Bobby Crim 10 mile runners know that the first two miles in '89 were different than the past. Probably all of those same runners and more know about a course detour during the race, roughly between 5-3/4 and 6-1/4 miles. And, all of the world it seems, knows about Cathy O'Brien's scintillating new women's global best time of 51:47. Ah, the new, unexpected and extraordinary on an eventful morning.

With the detour and record run, thoughts quickly turned to matters of course measurement. Runners familiar with the course knew that they'd been directed around the wrong sides of a rectangle. Understandably, nearly everyone assumed that if a measurement of the detour were made and showed the distance to equal the original route, all would be right. If I heard this theory once, I heard it fifty times race morning. I originally measured the course for certification and, as the day wore on, committed myself to helping resolve the route problem.

A technical hurdle had to be cleared before I did any measuring that would mean anything. The runners zigged when they should've zagged as the course was certified. There's nothing in the certification book to account for such an error. Any measurement would involve interpretation of relevant facts.

I returned home that afternoon and called TAC certification chair, Pete Riegel. I told him that about half a mile of the course was affected, and the roads were, essentially, at right angles to one another. Pete felt a comparison measurement was in order. The hurdle cleared, I told him a World Best time was on the line. Prior knowledge might've colored his view and he was glad I withheld the exciting news.

I racked my bike (which I use to measure) and drove back to Flint. I compared the original and new, detoured routes and concluded the new route was about 10' <u>longer</u> than the original. Giddy with this finding, I drove downtown in time to watch the WFUM-TV broadcast of the race. The 1-1/2 hour program revealed that runners were either led or allowed to run different than the certified course in two more places. My, my. I had good news and bad news for Crim officials.

After talking that evening with Crim director, Lois Craig, I shared the ambivalent message with Cathy O'Brien. I had spoken with O'Brien at the awards ceremony about the technical hang-up in re-measuring the course. There were equal parts elation and frustration in her voice. The glow of a World Best would now have to await measurement of two more places that weren't run as certified.

I recruited Crim board member, John Gault, to help me measure the routes exposed by TV. The affected spots were on Chevrolet, where runners ran left of the traffic islands instead of to the right and on Miller where runners ran left of the center line instead of staying to the right around the curve to Court St. Measuring in the dark and finishing about 10 p.m., our findings yielded numbers that suggested the new route on Chevrolet was a bit longer, and Miller a bit shorter than as certified. Adding up the 3 trouble spots, it appeared the course runners took was about 4 yards longer than the certified course.

O'Brien was the first to hear our results, and the AP wire service was second.

The course records and O'Brien's run heightened interest in the race distance, but, frankly, all the measuring I performed did little more than satisfy curiosity. You see, an independent validator would be sent by TAC to officially determine the course length. Driven by my curiosity, however, I measured the entire "new" course the day after the race. I was pleased for everybody to find the course appeared to be 15-25' longer than 10 miles and would barely survive the scrutiny of a validator.

Pete Riegel volunteered and was assigned by TAC to validate the course. John Gault and I assisted with the measurement on Sept. 17. In his validation report, Riegel would later write, "...the remeasurement ha(s) shown the course, as run on race day, to have been greater than 10 miles and this would permit the evaluation of the performance of Cathy O'Brien to continue." Those words were beautiful music to a lot of ears.

The post-race measuring was preceded by events that nearly rendered all the detours, record performances and validation as mere exercise. Another validator, from Ohio, measured the 10 mile course used from '84-'88, a week before the '89 race. He also measured the new, first 2 miles layed out for this year. Somehow, the new 2 miles had been measured about 40' short. The validator recommended adding the 40' to the start and marked the spot on the curb.

I was along to help during this, and had originally measured the 2 miles he found short. I was perplexed how I'd messed up, but felt satisfied the course was now at least 10 miles. I returned on Wednesday before race day, at the urging of Crim officials, to re-measure the 2 miles again. I found the same degree of shortness as the validator. I couldn't figure it out, but felt good about the new start line located on the weekend. I should've let it go at that, but returned Thursday at the further urging of Crim officials. I measured the entire new course and concluded I could slice about 40' from the course. I moved the start forward and that's where the '89 race lined up. Not a good move.

Translating the technical into layman terms, certified courses are measured oversize to help insure they're accurate. The oversize amount is about 5' a mile, or 50' in 10 miles. While validating the '89 course, the course runners were supposed to run was measured also. Oh me. It was only about 10' longer than 10 miles and should've been closer to 50' long as described above. The 40' I sliced from the course 36 hours before race day nearly sabotaged O'Brien's great run. That the 3 course detours added distance saved my skin, and all records.

Now, that's a tangle of events for you. I accept full responsibility for the ill-advised measuring in the week before the race. In the end, I'll look like a schmuck in the eyes of diligent colleagues in the measuring community. But, on the other hand, I'm glad I was there to help keep the facts in order on race day and facilitate a timely validation ride.

In sum, the '89 Crim 10 mile was validated at 10.004 miles.

Scott Hubbard

Scott Hubbard

ULTRA MARATHON FRANCE

21.01.90

Dear Pete,

You will find enclosed the tests I have done for the calibrations of bikes as well as the distances of the calibration courses. The wobbling due to repeated stops during a calibration does not seem to me to have much effect.

However, it is obvious that the shortest a calibration course is, the more it tends to increase the effect of wobbling: so I have worked out, according to the official procedure (2 measures with a steel tape and temperature correction) 5 different calibration courses on the same straight line near home (300, 500, 600, 800 and 1000 metres). The results show that the longest the distance is, the shortest the constant is.

These variations cannot be responsible for too short courses (since the short calibration courses give bigger constants) and Bob Baumel is probably right to allow calibration courses of 300 metres.

However, I think that in France, we will go on demanding a mimimum of 500 metres (and personally each time it is possible, 800 metres or 1000 metres).

In December, I organized a seminar in Amiens with 10 judges from the French Federation, over 3 weekends and 5 have been appointed for the responsability of measuring in the North region of France. I have bought 20 Jones counters and we have created an association of measurers called the AFMC, who will use the same data sheets as those used by the TAC (but translated into French).

Since our last correspondance I have measured the 100 K of Martigné (French Championship in 1990), La Baule, Fos sur Mer, Rimaucourt and Rognonas with the Jones counter.

My very best wishes to you and your family for 1990.

Jean François

Calibrate courses : Fouilley (80) FRANCE

le 09.11.89 par JF Delasalle (t°=9° C)

Calibrage successif sur les distances de 300.500.600.800.1000 m
répété 4 fois ensuite

Résultats :		aver.	Constante
300 mètres	2883.5	2883.25	9610.833
	2883.5		
	2882.5		
	2883.5		
500 mètres	4805	4804.875	9609.750
	4805		
	4805.5		
	4804		
600 mètres	5765	5765.5	9609.166
	5766		
	5766		
	5765		
800 mètres	7686	7686	9607.500
	7686		
	7686		
	7686		
1000 mètres	9607	9607.375	9607.375
	9607.5		
	9607.5		
	9607.5		

Je précise bien que j'ai fait dans l'ordre :
300.500.600.800.1000.300.500.600.800.1000.300.500.600.800.1000.300.500.600.800.1000 !

Docteur J.F. [illegible]SALLE
Demande [illegible]
B.P. 15 - [illegible]

THE ATHLETICS CONGRESS
OF THE USA

Road Running Technical Committee
Peter S. Riegel, Chairman

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Columbus, OH 43221
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February 2, 1990

Dr. J. F. Delasalle - B. P. 25 - 80800 Corbie - FRANCE

Dear Jean Francois,

Thank you for the calibration data. I enclose the data for the American measurers which we obtained in 1985. I have added your data to ours.

I set up the experiment so that everybody would start and finish the series with a standard ride. I thought this would account for calibration change due to temperature. By having different number of intermediate stops, I reasoned that this would simulate short calibration courses. For example, if I ride a 1 km course, stopping 3 times en route (4 stops total), it would be like averaging the result of four 250 m calibration rides.

I expected the results to show that shorter calibration courses would yield larger constants.

However, as you can see, there is no clear pattern of increasing or decreasing constant, if we look at the averages. Some people get increased constant, some people get decreased constant. The standard deviation does increase as the courses get shorter.

I am puzzled at the difference between your results using my experiment and yours. With my experiment, your data shows very little calibration change. Using your experiment the difference is greater. I can think of no explanation for this.

By reading your protocol, I assume that your 300, 500 and 800 m rides were in one direction, and the 600 and 1000 m rides were in the other direction. But this does still not explain the difference to me.

You seem to be making great progress in France with course measurement. You are using TAC forms, translated into French. Do you use the larger constant, as the TAC forms do, or do you use the average? It makes little difference if calibration change is small, but the larger constant adds safety if calibration change is large. Bob Baumel originated the idea of the larger constant, and he believes strongly that it is better.

Thanks for writing. I hope we will get to meet again.

Best regards,

Pete

THE ATHLETICS CONGRESS
OF THE USA

Road Running Technical Committee
Peter S. Riegel, Chairman

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January 9, 1990

Wayne, Sally, Bob -

The validations stuff I sent you a couple of days ago was seriously incomplete. I recently dug out my old NRDC News pile, and in the September 1986 issue found the complete validation list. We now have an impressive pile of validations - over 150. Here's a list for you. Some comments on the list:

1) The validations done by NRDC do not have course ID nor name of original measurer. Those done by Sally have ID and original measurer.

2) There's a clear progression of increasing length, from the predominantly short courses of the early '80's to the overwhelmingly OK courses we see today. NYC was no fluke.

3) The list gives us a tool to see who has survived the test of validation, and may serve to identify future validators on whom we might wish to take a chance, for a low-grade record perhaps near their home.

After a couple of years of perfect results, we've suffered in 1989. I hope we'll get some more 1989 courses to come out right, and get our average back up. With modern results in the 90 percent OK range, I think things are working well. We are still waiting for the first "expertly measured" (FS) course to fail.

If you see any errors on the listing, let me know. I may have missed a few. The NRDC dates don't make clear the time of original certification, so I did some guessing. But, as time passes, those errors make less and less difference.

Best regards,

Pete

THE VALIDATION PROGRAM

When a record is set on a US course, the course and the timing are checked. This is done to provide assurance that everything was done properly. Unlike a standard track, a road course may change from year to year, and it is not uncommon for mistakes in measurement and timing to occur.

The program was begun by the National Running Data Center in the early 1980's, and continued by them until 1986. Since then validations have been the responsibility of RRTC.

With regard to course length, what have validations showed us? First, it has shown that the 1.001 Short Course Prevention Factor is effective. The SCPF was phased in over the 1982-1983 period. Before it was instituted, almost all checked courses were found to be short. Since then, courses are checking out to at least the nominal distance.

Courses today check out at about 90 percent OK. This is pretty good, considering that a course may be measured by anyone at all who can submit plausible data. We are still waiting for a modern course, measured by a final signatory, to be found short. It has not yet happened.

The validation data is heartening because it shows the system works. When the 1.001 was instituted it was thought that it would provide adequate safety against shortness, but we did not know for sure. There was initial resistance to its use. Now, after 155 validation measurements across a 10 year span, we can see the effect.

VALIDATION MEASUREMENTS OF TAC CERTIFIED COURSES

DIST	CERT DATE	NOMINAL METERS	MEASURED METERS	DIFF M/KM	COURSE ID	RACE NAME/COURSE	MEASURER	VALIDATOR
05M	80	8046.7	8038.0	-1.08		MOONLITE RUN		LINNERUD
100k	80	100000.0	100100.0	1.00		SANTANDER		OLIU
HMar	80	21097.5	20957.0	-6.66		OAKLAND		KNIGHT
Mar	80	42195.0	41847.0	-8.25		OAKLAND		KNIGHT
05M	81	8046.7	8022.0	-3.07		RUNNERS WORLD		KNIGHT
10M	81	16093.4	16062.0	-1.95		BOBBY CRIM		HUBBARD
15k	81	15000.0	14976.0	-1.60		GASPARILLA		KATZ
15k	81	15000.0	14994.0	-0.40		RIVER RUN		KATZ
HMar	81	21097.5	21043.0	-2.58		PHILA DIST CLASSIC		DELANEY
Mar	81	42195.0	42047.0	-3.51		NEW YORK CITY		KNIGHT
08k	82	8000.0	7940.0	-7.50		TEXTILE RUN		NICOLL
100k	82	100000.0	99140.0	-8.60		LAKE WARAMAUG		REIK
10k	82	10000.0	10010.0	1.00		ROSEMONT		EVENS
10M	82	16093.4	16077.0	-1.02		BOBBY CRIM		HUBBARD
15k	82	15000.0	14997.0	-0.20		HAINS POINT LOOP		THURSTON
15k	82	15000.0	14976.0	-1.60		CASCADE		KNIGHT
15k	82	15000.0	14998.0	-0.13		RUN AGAINST CRIME		LETSON
20k	82	20000.0	19996.0	-0.20		HAINS POINT LOOP		THURSTON
20k	82	20000.0	19914.0	-4.30		NEW HAVEN		REIK
50k	82	50000.0	49990.0	-0.20		HAINS POINT LOOP		THURSTON
50M	82	80467.2	79763.0	-8.75		LAKE WARAMAUG		REIK
Mar	82	42195.0	42136.0	-1.40		NEW YORK CITY		KNIGHT
Mar	82	42195.0	42147.0	-1.14		ST GEORGE		KNIGHT
Mar	82	42195.0	42193.0	-0.05		BOSTON		KATZ/NOEL
Mar	82	42195.0	42176.0	-0.45		NIKE-OTC		KNIGHT
05k	83	5000.0	5017.2	3.44	OH 83038 PR	WOLFPACK	RIEGEL	WICKISER
08k	83	8000.0	8002.5	0.31	NY 83006 TC	ONONDAGA PARK	N WHITE	NICOLL
08k	83	8000.0	7995.0	-0.63		MOONLITE RUN		LINNERUD
100k	83	100000.0	100147.0	1.47		ULTRADIST CLASS		RIEGEL
10k	83	10000.0	10016.0	1.60		CONTINENTAL HOMES		KATZ

10k	83	10000.0	9923.0	-7.70		ARCO (COLISEUM)		HICKEY
10k	83	10000.0	10007.0	0.70		OTC WOMENS		KNIGHT
10k	83	10000.0	9991.6	-0.84		AZALEA TRAIL		RIEGEL
10k	83	10000.0	9981.0	-1.90		FREIHOFER'S WOMEN'S		NOEL
15k	83	15000.0	15015.0	1.00		RUN AGAINST CRIME		LETSON
15k	83	15000.0	14989.6	-0.69		GASPARILLA		KATZ
2.5k	83	2500.0	2500.6	0.22	WA 83035 TD	PNAC DEC WALK	DURANTI	KNIGHT
25k	83	25000.0	24850.0	-6.00		OLD KENT RIVERBANK		HUBBARD
50k	83	50000.0	50073.0	1.46		ULTRADIST CLASS		RIEGEL
50M	83	80462.2	80667.1	2.55	OH 83030 PR	WOLFPACK	RIEGEL	WICKISER
HMar	83	21097.5	21231.0	6.33		COLONIAL		THURSTON
HMar	83	21097.5	21060.0	-1.78		RIVER CORRIDOR CLASSIC		RIEGEL
HMar	83	21097.5	21072.9	-1.17	HI 83002 TC	WINDWARD	ELLSWORTH	FERGUSON
HMar	83	21097.5	21138.0	1.92		PHILA DIST CLASSIC		DELANEY
Mar	83	42195.0	42244.0	1.16		SPORTS FEST/COLO SPGS		KNIGHT
Mar	83	42195.0	42242.0	1.11		AVON INTERNATIONAL		LETSON
08k	84	8000.0	8004.0	0.50		STROH'S RUN FOR LIBERTY		NICOLL
100k	84	100000.0	100100.0	1.00		AMJA ULTRA		RIEGEL
100k	84	100000.0	100129.0	1.29		EDMUND FITZGERALD		RECKER
100k	84	100000.0	100043.1	0.43	TX 84001 DM	JACKSON FIVE-O	LUCAS	BRANNEN
10k	84	10000.0	9985.0	-1.50		RUNNER'S DEN		CHRISTENSEN
10k	84	10000.0	9988.0	-1.20		PEACHTREE		NICOLL
10k	84	10000.0	10007.0	0.70		OTC WOMEN'S		CHRISTENSEN
10k	84	10000.0	9993.6	-0.64		SEAFAIR/PEPSI		DURANTI
10k	84	10000.0	9991.0	-0.90		CRESCENT CITY		RIEGEL
10M	84	16093.4	16081.4	-0.75	MI 84011 AP	BOBBY CRIM	HUBBARD	WICKISER
10M	84	16093.4	15944.6	-9.25	NY 84019 AS	TREVIRA	NOEL	THURSTON
10M	84	16093.4	16010.0	-5.18		GREENBELT		THURSTON
15k	84	15000.0	14911.0	-5.93		GREENBELT		THURSTON
20k	84	20000.0	20004.0	0.20		NEW HAVEN		REIK
20k	84	20000.0	20014.7	0.74	OR 84039 PC	PEAR BLOSSOM RUN	GUSTAFSON	BARRETT
20M	84	32186.9	32020.0	-5.18		GREENBELT		THURSTON
20M	84	32186.9	32233.0	1.43		TWIN CITIES		LEWIS
50k	84	50000.0	50016.5	0.33		WINTER RUN		DURANTI
50k	84	50000.0	50038.0	0.76		EDMUND FITZGERALD		RECKER
50M	84	80467.2	80547.0	0.99		AMJA ULTRA		RIEGEL
50M	84	80467.2	80502.1	0.43	TX 84001 DM	JACKSON FIVE-O	LUCAS	BRANNEN
50M	84	80467.2	80596.0	1.60		EDMUND FITZGERALD		RECKER
HMar	84	21097.5	21111.0	0.64		PHILA DIST CLASS		DELANEY
HMar	84	21097.5	21120.5	1.09	GA 84037 WN	SAVANNAH HMAR	BURKE	LOEFFLER
HMar	84	21097.5	21116.0	0.88		MAPLE LEAF		NICOLL
HMar	84	21097.5	21107.0	0.45		HAYWARD HALF		WISSER
Mar	84	42195.0	42221.0	0.62		WOMEN'S OLYMP TRIALS		DURANTI
Mar	84	42195.0	42266.0	1.68		AMERICA'S/CHICAGO		KATZ
Mar	84	42195.0	42255.0	1.42		TWIN CITIES		LEWIS
01k	85	1000.0	1002.1	2.10	MI 85010 AP	LEVAGOOD PARK RW	PHILLIPS	WICKISER
05k	85	5000.0	4979.0	-4.20		MACON RUNNING FESTIVAL		NICOLL
05k	85	5000.0	4994.6	-1.08		MIDNIGHT FLIGHT		NICOLL
05M	85	8046.7	8023.0	-2.95		SALEM SCREEN PRINTERS		REIK
05M	85	8046.7	8056.0	1.15		RIVERSIDE TWILIGHT		NICOLL
08k	85	8000.0	8009.0	1.13		RIVERSIDE TWILIGHT		NICOLL
10k	85	10000.0	10007.0	0.70		RUN FOR THE PARKS		SHANDERA
10k	85	10000.0	10005.0	0.50		ROSEMONT TURKEY TROT		RIEGEL
10k	85	10000.0	9973.0	-2.70		OKLAHOMA 10K		J SMITH
10k	85	10000.0	10000.7	0.07		CONTINENTAL HOMES		RIEGEL
10M	85	16093.4	16107.6	0.88	DC 85007 RT	NIKE CHERRY BLOS	THURSTON	NICOLL
10M	85	16093.4	16105.5	0.75	IL 85106 PR	PARK FOREST	NAIR	WIGHT
10M	85	16093.4	15998.0	-5.93		SPECIAL OLYMPICS		YOUNG
10M	85	16093.4	16111.0	1.09		PIONEER CLASSIC		REIK
12k	85	12000.0	12047.5	3.96	IL 85014 PR	OKTOBERFAST	STABACK	WIGHT
15k	85	15000.0	15004.0	0.27		RIVER RUN		NICOLL
15k	85	15000.0	14998.9	-0.07		RIVER RUN		NICOLL
20k	85	20000.0	20111.5	5.58	WV 85054 PR	ELBY'S	LEAGUE	WICKISER
20M	85	32186.9	32220.0	1.03		TWIN CITIES (SPLIT)		RECKER
25k	85	25000.0	25025.0	1.00		NIKE/OTC		CHRISTENSEN
30k	85	30000.0	30008.0	0.27		CHOPPERTHON		NICOLL
30k	85	30000.0	30026.0	0.87		TAC NATIONAL 30K		NICOLL
50k	85	50000.0	50118.5	2.37	IN 85076 PR	TAC WALK	PIERCE	NICOLL
50M	85	80467.2	80554.0	1.08		SCHOFIELD BARRACKS		FERGUSON
HMar	85	21097.5	21126.0	1.35		PHILA DIST CLASSIC		DELANEY
HMar	85	21097.5	21134.4	1.75	FL 85016 WN	FL CITRUS BOWL HMAR	NICOLL	LOEFFLER
HMar	85	21097.5	21129.5	1.52	SC 85036 WN	ISLAND HMAR	MAGERA	B SMITH
HMar	85	21097.5	21028.0	-3.29		CITRUS BOWL		NICOLL
Mar	85	42195.0	42243.0	1.14		AMERICA'S/CHICAGO		KATZ

02k	86	2000.0	2001.0	0.50	NY	86072	PR	ROBT MOSES ST PKWY	DUDZIAK	NICOLL
05k	86	5000.0	4995.4	-0.91	TX	86074	KL	LIBRARY RUN	HULL	LUCAS
05k	86	5000.0	5002.5	0.50	NY	86005	BT	BULLFEATHERS	MCPHEE	BRANNEN
05k	86	5000.0	5003.3	0.66				CARLSBAD		NICOLL
05k	86	5000.0	5003.3	0.66	CA	86068	PR	CARLSBAD	COLLIAS	NICOLL
08k	86	8000.0	8006.0	0.75				STROH'S RUN FOR LIBERTY		KNIGHT
08k	86	8000.0	7995.5	-0.56	IA	86014	JL	FIFTH SEASON	UNGUREAN	GLAUZ
08k	86	8000.0	8008.5	1.06	DC	86045	RT	NIKE WOMEN'S	THURSTON	NICOLL
08k	86	8000.0	8008.0	1.00				SHAMROCK		THURSTON
100k	86	100000.0	100176.5	1.77	TX	86004	ETW	GULF RACEWALK	DEMAREE	MCBRAYER
10k	86	10000.0	10010.0	1.00				FREIHOFER'S WOMEN'S		NICOLL
10k	86	10000.0	10020.0	2.00				ORANGE BOWL		NICOLL
10k	86	10000.0	10008.5	0.85	NC	86082	ACL	OLD RELIABLE	LINNERUD	NICOLL
12k	86	12000.0	12020.5	1.71	WA	86010	TD	BLOOMSDAY	RENNER	BAUMEL
12k	86	12000.0	12007.5	0.63	OK	86057	BB	MOHAWK	LAFARLETTE	BAUMEL
2.5k	86	2500.0	2502.5	1.00	KS	86009	BG	RACEWALK CH	M EDWARDS	GLAUZ
2.5k	86	2500.0	2502.0	0.78	WA	86025	TD	GRAND WALK	GREISZ	KNIGHT
25k	86	25000.0	25038.0	1.52				OLD KENT RIVERBANK		HUBBARD
50M	86	80467.2	80579.9	1.40	CA	86039	RS	W COAST UNIV	HICKEY	KNIGHT
HMar	86	21097.5	21103.3	0.28	MA	86003	JMC	NEW BEDFORD	NELSON	NICOLL
Mar	86	42195.0	42302.4	2.55	FL	86042	BH	ORANGE BOWL	LOEFFLER	NICOLL
Mar	86	42195.0	42279.0	1.99	AZ	86047	TK	PHOENIX CITY	KNIGHT	RIEGEL
Mar	86	42195.0	42241.0	1.09				ORANGE BOWL		NICOLL
01M	87	1609.3	1614.9	3.47	NY	87002	DB	SRI CHINMOY UNISPHERE	BRANNEN	NICOLL
01M	87	1609.3	1631.3	13.66	NY	?	?	SHEA STADIUM	GRUNDSTEIN	BAUMEL
05k	87	5000.0	5004.7	0.94	GA	87006	WN	TAC NATL MASTERS	EPPRIGHT	NICOLL
05k	87	5000.0	5005.5	1.10	RI	87010	SV	NORWOOD	NELSON	NICOLL
05k	87	5000.0	5000.8	0.16	FL	87022	BH	RUN FOR THE PIES	ALRED	NICOLL
08k	87	8000.0	8030.2	3.77	IN	87077	PR	GOVERNOR'S CUP	PIERCE	WICKISER
08k	87	8000.0	8004.5	0.56	OR	87009	PC	SPRING CLASSIC	BARRETT	KNIGHT
10k	87	10000.0	10009.2	0.92	FL	87002	WN	RED LOBSTER	NICOLL	TESCHEK
15k	87	15000.0	15007.5	0.50	FL	87037	BH	GASPARILLA	MCDOWELL	NICOLL
2.5k	87	2500.0	2500.5	0.20	NY	87008	WN	EISENHOWER PARK	WESTERFIELD	BRANNEN
2.5k	87	2500.0	2502.5	1.00	FL	87001	WN	RACEWALK LOOP	VALDEZ	NICOLL
20k	87	20000.0	20008.6	0.43	MA	87002	SV	NEW BEDFORD	NELSON	NICOLL
25k	87	25000.0	25020.5	0.82	MI	87008	SH	OLD KENT	DEWEY	WICKISER
30k	87	30000.0	30072.1	2.40	CA	87015	CW	FOUNDATION CLARKSBURG	WISSER	KNIGHT
30k	87	30000.0	30010.8	0.36	CA	87056	RS	SCATAC 30K	SCARDERA	KNIGHT
HMar	87	21097.5	21124.4	1.28	IL	87041	WG	CLUB SHORE	BASBAGILL	WIGHT
08k	88	8000.0	8002.5	0.31	CA	88057	RS	ALHAMBRA	HICKEY	KNIGHT
100k	88	100000.0	100174.0	1.74	NY	88002	DB	CROCHERON PARK	BRANNEN	NICOLL
10k	88	10000.0	10009.5	0.95	FL	88001	WN	RED LOBSTER	NICOLL	TESCHEK
10k	88	10000.0	10007.9	0.79	FL	88013	WN	RED LOBSTER	NICOLL	LOEFFLER
2.5k	88	2500.0	2504.6	1.84	OH	88012	PR	WOLFPACK	RIEGEL	WICKISER
05k	89	5000.0	5009.5	1.90	NY	89003	WN	FREIHOFER'S	NICOLL	MORSS
08k	89	8000.0	8010.8	1.35	VA	89007	RT	NISSAN SHAMROCK	GEORGE	THURSTON
08k	89	8000.0	8003.3	0.41	CA	89001	TK	FIFTY PLUS	CARPENTER	KNIGHT
08k	89	8000.0	7998.0	-0.25	FL	89001	BH	ICI MASTERS	ALLSHOUSE	LOEFFLER
10M	89	16093.4	16099.7	0.39	MI	89010	SH	BOBBY CRIM	HUBBARD	RIEGEL
15k	89	15000.0	15028.7	1.91	FL	89001	WN	GASPARILLA DIST CLASS	NICOLL	LOEFFLER
20k	89	20000.0	19979.5	-1.03	NY	89006	WN	PHELPS SAUERKRAUT	TILLSON	NICOLL

Editor's Note: The validation information which appeared in MN, November 1989, was incomplete. This list is believed to be complete. It includes additional validation information gleaned from back issues of NRDC News.

VALIDATION RESULTS - MEASURED M/KM OVERSIZE

Year of Original Certification

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
-8.25	-3.51	-8.75	-7.70	-9.25	-5.93	-0.91	0.16	0.31	-1.03
-6.66	-3.07	-8.60	-6.00	-5.93	-4.20	-0.56	0.20	0.79	-0.25
-1.08	-2.58	-7.50	-1.90	-5.18	-3.29	0.28	0.36	0.95	0.39
1.00	-1.95	-4.30	-1.78	-5.18	-2.95	0.50	0.43	1.74	0.41
	-1.60	-1.60	-1.17	-1.50	-2.70	0.50	0.50	1.84	1.35
	-0.40	-1.40	-0.84	-1.20	-1.08	0.63	0.56		1.90
		-1.14	-0.69	-0.90	-0.07	0.66	0.82		1.91
		-1.02	-0.63	-0.75	0.07	0.66	0.92		
		-0.45	0.22	-0.64	0.27	0.75	0.94		
		-0.20	0.31	0.20	0.27	0.78	1.00		
		-0.20	0.70	0.33	0.50	0.85	1.10		
		-0.20	1.00	0.43	0.70	1.00	1.28		
		-0.13	1.11	0.43	0.75	1.00	2.40		
		-0.05	1.16	0.45	0.87	1.00	3.47		
		1.00	1.46	0.50	0.88	1.06	3.77		
			1.47	0.62	1.00	1.09	13.66		
			1.60	0.64	1.03	1.40			
			1.92	0.70	1.08	1.52			
			2.55	0.74	1.09	1.71			
			3.44	0.76	1.13	1.77			
			6.33	0.88	1.14	1.99			
				0.99	1.15	2.00			
				1.00	1.35	2.55			
				1.09	1.52				
				1.29	1.75				
				1.42	2.10				
				1.43	2.37				
				1.60	3.96				
				1.68	5.58				

Averages

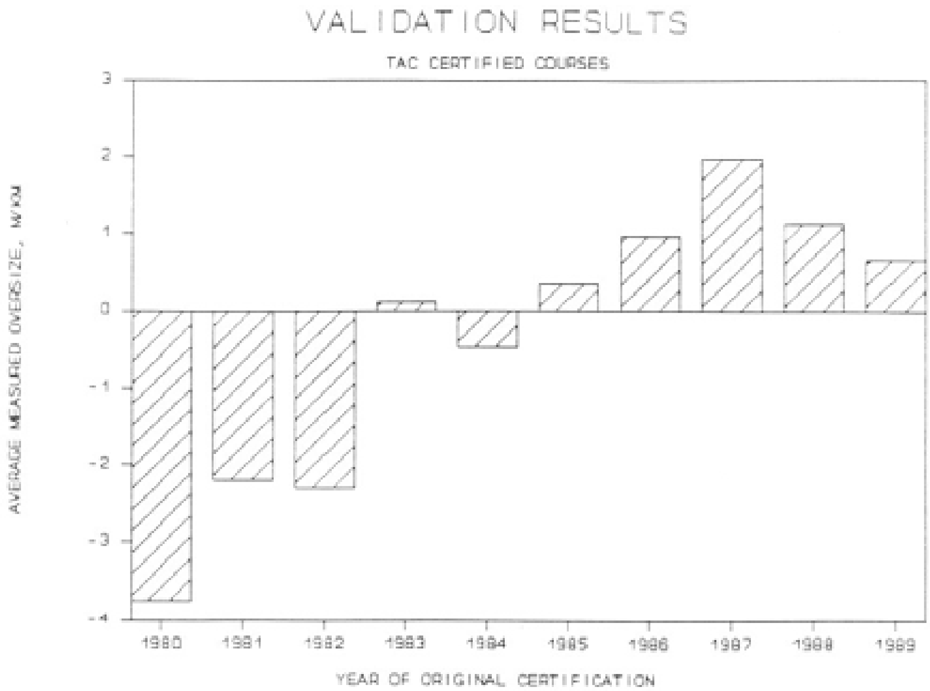
1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
-3.75	-2.19	-2.30	0.12	-0.46	0.36	0.97	1.97	1.13	0.67

Fraction of courses that measured at least the nominal distance

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1/4	0/6	1/15	13/21	20/29	22/29	21/23	16/16	5/5	5/7

Percent of courses that measured at least the nominal distance

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
25	0	7	62	69	76	91	100	100	71



Dear Pete,

The measurements for the two enclosed Oklahoma courses took a heavy toll in equipment. The 50 meter steel tape I'd been using for the past seven years got run over and destroyed as we were setting up to measure the calibration course. Fortunately, I also had a 30 m tape with me, so we could complete the cal course measurement. (And this time we were careful never to leave the tape lying in the street untended, even for a few seconds.)

Also, the Jones counter I was using quit working during the race course measurement. I didn't have a backup Jones counter, but fortunately we had a second cyclist (Ivan Decker), so we got enough data for certification. And although I personally didn't get any official measurements of the course (because I couldn't recalibrate), I did get in one ride of the loop before my counter failed, and my measurement agreed to within 0.1 meter with Ivan's result.

This was the first time I've seen a Jones counter fail, although I recall Alan Jones saying at the convention that others have been known to fail. The part that actually broke is the digital counter, while the odometer drive gear remains in good condition. Considering that it's the odometer gear portion of the assembly that is no longer being manufactured, I may send this counter to the NYRRC to see if they can restore it by replacing the digital counter.

This was my only 6-digit counter. Six-digit counters were a rare breed (now rarer still). I had purchased it from Clain Jones just before he sold the business to the New York Road Runners. And it was the counter I had used in the 1984 Olympic Marathon measurement.

Bob

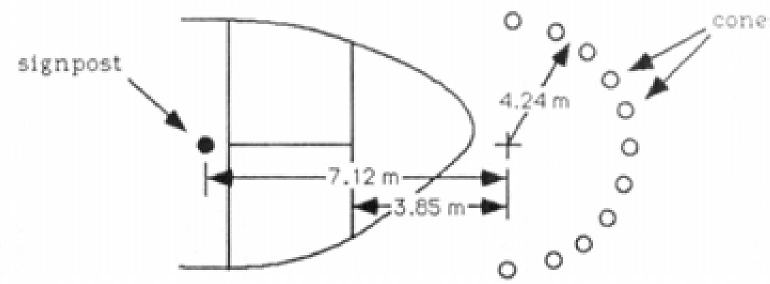
TAC National 5 km Racewalk Championship

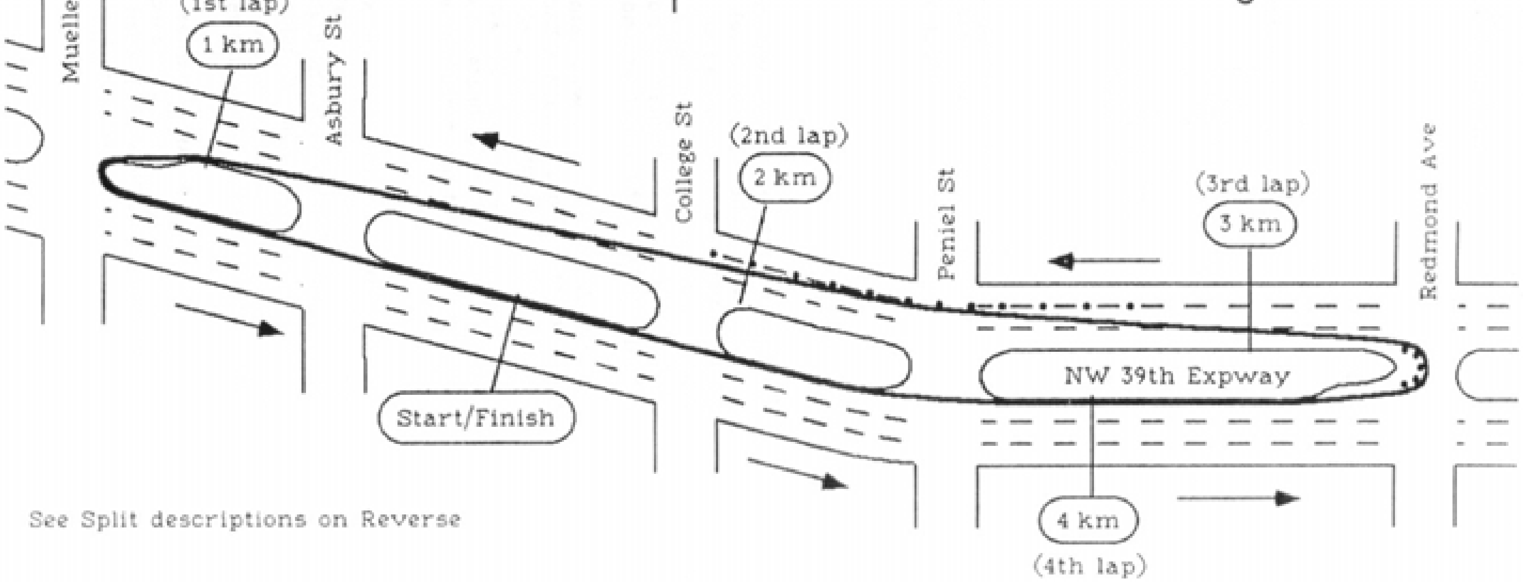
1250 meter Loop
Bethany, Oklahoma

MAP OF THE MONTH FROM BOB BAUMEL
IT'S COMPUTER-DRAWN

Restriction: Walkers may use all of road EXCEPT for the outermost lane in each direction, which must be coned to keep walkers out. In particular, walkers must be kept out of the northernmost lane in vicinity of intersection with Peniel.

Turn Detail at East End





See Split descriptions on Reverse