



On the weekend of August 21-22, the RRTC Annual Meeting, the second one separate from the main USATF convention, was held in Stamford, CT.

Attendees at the afternoon session were (kneeling) Paul Hronjak, Kevin Lucas, and Jim Gerweck. Standing are Mike Wickiser, Gene Newman, Tom McBrayer, Mary Anne McBrayer, Bernie Conway, Bob Baumel, Karl Ungurean, Bill Grass, Carol McLatchie, Pete Volkmar, and Pete Riegel.

MEASUREMENT NEWS

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ABOUT MEASUREMENT NEWS

Measurement News (MN) is the newsletter of the Road Running Technical Council (RRTC) of USA Track & Field (USATF). MN is our way to talk to one another, so that we all know what's going on.

MN is also sent to many foreign measurers associated with AIMS and IAAF, who are also invited to participate in the dialogue.

MN is published bimonthly beginning in January (six issues per year). MN is sent free to RRTC officers and certifiers, and AIMS/IAAF measurers. Others may obtain MN by sending \$20 (for a one year subscription - six issues) to the editor.

If you wish to reproduce or report on anything in MN, go ahead, but an attribution would be appreciated.

MN wants to make road course measurement as good as it can be. All opinions and grievances are solicited. No cows are sacred. If you have a new measurement technique, or if you think things should be done differently, send in your contribution to MN. Your opinion will be given space. Nothing changes until somebody tries!

Electronic copy or clean typed material is most welcome, but send what you can.

Deadlines: Material intended to be included in the November 2004 issue must be in the Editor's hands by October 20. Next issue will be mailed in early November.

ROAD RUNNING TECHNICAL COUNCIL

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Visit the RRTC website at:	ONLINE MEASUREMENT FORUM
http://www.rrtc.net	All it takes to become a subscriber is access to email. Simply send to mnforum-request@rrtc.net with "subscribe" as the subject (to unsubscribe, use "unsubscribe" as the subject).
A complete list of certified courses may be downloaded from this site.	To post messages to the list, send email to mnforum@rrtc.net . Please keep your comments in the body of the email (no
A complete USATF measurement book can be downloaded from this site.	avoid formatted (HTML) messages (If you use HTML format- ting, the formatting will be removed).

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Chairman's Clatter - From Mike Wickiser

New Western Vice Chairman: Tom McBrayer has chosen to retire from his position as Vice Chairman West. Gene Newman succeeds him. Tom got into course certification in1984. Since that time he has measured over 534 courses, issued 1854 measurement certificates and since taking on the position of VC reviewed more certificates and maps than I would try to count. During that time Tom also produced two measurement videos to assist beginning measurers. Tom will remain the Texas certifier.

Gene Newman began course measurement one year after Tom in 1985. He has in excess of 121 course measured and 414 certificates. Much of his activity was on the East Coast in his pre-retirement days when he was certifier for New Jersey and Delaware. In 2002 Gene moved to Arizona where he has taken an active part in road running and serves as Arizona state certifier.

Many, many thanks are due to Tom for his tireless contributions.

Welcome and congratulations go to Gene.

Annual RRTC Meeting: The RRTC meeting in Stamford, CT is now history. Jim Gerweck did plenty of legwork on hosting the meeting and his efforts helped make it a success. My thanks go to Jim for a job well done.

Some of the meeting items discussed were:

•Bernie Conway, the IAAF International Measurement Administrator for the Americas reviewed certification procedures for IAAF purposes.

• Calibration Course expiration and renewal was discussed and although cal. courses differ from race courses it was agreed that the best way to handle them was to expire and renew in the same manner as racecourses. Part of the reasoning was to maintain consistency with policy and procedure.

•Measurement certificate changes; Altitude will be replaced by elevation. One distance per certificate whenever possible. Certified splits along the route of a course are OK to list on one certificate but certifiers please avoid listing two distances together. Remember if one route changes the whole certificate is void.

•Length of Race names; The course list allows for 28 characters including spaces. Race names longer than that get abbreviated to what looks good on the course list.

Calibration course names always go onto the course list with the total length as part of the name and the street or road whenever possible.

• Certified race course distances should be shown as either kilometers or miles. A marathon goes on the list as 42.195 km. And a 5-mile course is not 8046 meters. Tracks and cal courses though need to be defined exactly in their name.

• Cyclometers for course measurement. It appears that a bike computer can be made to work for course certification measurement. Early results have pointed out a few items to be addressed. Pete Riegel and Neville wood are working together on a procedure for allowing this type of measurement.

Mike Dictores

SOME MUSINGS ON ELECTRONIC COUNTERS

By Pete Riegel

1) The electronic cyclocomputer has recently been investigated by Neville Wood. He has designed various ways in which it can be used for course measurement.

Pete Riegel has set up and used the Wood method, with success. Total setup time was about one hour, including marking the wheel. Rick Recker has measured for decades with a mechanical revolution counter, with success.

- 2) The principal advantages are:
 - A: It is cheap and readily available worldwide, and likely to remain so.

B: Obtained readings are slightly more accurate than those obtained using a Jones counter. C: The counter can be reset to zero if desired.

Recker and Riegel reset their counter at each reading, and have found this to make the measurement process simpler and easier.

3) Perceived disadvantages are:

A: Backwards movement of the bicycle wheel will add counts when they should be subtracted. Moving back to a missed mark is thus made more complicated.

B: Magnetic impulses may be missed.

C: Setup and use are not as simple as with the Jones Counter.

D: Care must be taken on readings near the zero point, to be sure that the full count has registered.

If the counter is reset at each reading missed impulses will be detected. So far Wood and Riegel and have not detected any.

The mechanical counter as used by Recker has the same characteristic at the zero point. By moving forward a bit, registry of the count is assured. The electronic counter works in the same way.

SOME ELECTRONIC COUNTER ITEMS FOR DISCUSSION AT THE RRTC AUGUST MEETING

- 1) Should measurements based on use of the electronic counter be accepted for certification?
- 2) Should the method be given provisional acceptance by RRTC? To what degree?

3) If accepted, should instructions for use be put on the RRTC web page?

Neville's present paper on the counter has served its purpose, which was to bring it to our attention. Future instructions should be far briefer, and need not cover measurement methods, as they are amply covered by <u>Course Measurement Procedures</u>.

Cyclocomputers, like all things electronic, are changing rapidly, and today's models will not be available tomorrow. As almost any cyclocomputer will do the job, instructions would need only to say "set it up as the manufactures specifies." The cyclocomputer must be programmable to a wheel circumference of 2500 mm, and four magnets must be used.

In addition, a simple method of testing the installed cyclocomputer will be needed, as various models treat the initial magnetic impulse differently, and some future models may not be suitable at all.

There is no teacher like experience. I was boggled by the sheer mass of Neville's work, but once I installed the cyclocomputer and used it I found it quite easy and reliable to use.

The universal availability of the thing cannot be overemphasized. I once traveled to New Orleans to do a validation, back in the 1980's. While I was in Atlanta, changing planes, I discovered that I had left my counter at home. By sheer luck, and the help of the race director, I secured the only counter in New Orleans. Today I would only have to visit a local bike shop, and spend an hour setting up the rig.

The low cost of a cyclocomputer makes it attractive to those to whom the cost of a Jones/Oerth counter is prohibitive. Many cyclists already have a cyclocomputer on their bike. By obtaining three more magnets, they are all set.

July 21, 2004

Road Running Technical Council Annual Meeting Marriott Hotel - Stamford, CT - August 21, 2004

Attending: Bob Baumel, Bernie Conway, Jim Gerweck, Barbara Grass, Bill Grass, Paul Hronjak, Kevin Lucas, Mary Anne McBrayer, Tom McBrayer, Carol McLatchie, Gene Newman, David Reik, Pete Riegel, Karl Ungurean, Pete Volkmar, Mike Wickiser.

The meeting was called to order at 11:10 by RRTC Chairman Mike Wickiser. All present introduced themselves. Jim Gerweck, as local meeting organizer, discussed the facilities and invited everyone to participate in the Pacing Contest to be held at Columbus Park which was the starting point of the second marathon held in the United States.

Officers' Reports

Chairman, Mike Wickiser: Now that he has completed the bulk scanning of course maps for entry into the USATF certified course search engine, Mike reports that newly certified courses may in the future be scanned and posted right away as soon as Mike gets them from the Vice Chairmen. Thus, entry of new courses in the search engine will no longer be limited by the bimonthly publication schedule of Measurement News or the bimonthly cycle of updating the downloadable course lists on rrtc.net (Regarding those downloadable lists on rrtc.net, see additional related comments in the Webmaster's report below).

Mike has been experimenting with the method presented by Neville Wood at last year's meeting where a commercially available cyclocomputer is used instead of the Jones Counter for counting wheel revolutions. Several other measurers (e.g., Pete Riegel, Matt Studholme) have also tried Neville's method. See additional discussion on this topic below.

Course Registrar, Mike Wickiser: So far this year, 889 new courses have been certified (up from 750 at this time last year) and 57 courses have been renewed. The total number of courses on our "active" and "archive" lists now stands at 24515.

Validations Chairman, Doug Loeffler: Doug wasn't present at the meeting but had submitted a spreadsheet printout showing 22 courses with pending validations and 2 completed validations. Kevin Lucas pointed out that he had performed validations for 3 of the courses listed as pending. It was also noted that 2 of the pending courses were in limbo due to construction.

Webmaster, Bob Baumel: Our website, currently at www.rrtc.net, will undergo a major change as USATF is incorporating our site into the central USATF website at www.usatf.org. In fact, USATF webmaster Keith Lively began the process this Spring by copying some of our content to a Course Certification section on the central USATF site. For example, see pages:

http://www.usatf.org/events/courses/certification/

http://www.usatf.org/events/courses/certification/certifiers.asp

http://www.usatf.org/events/courses/certification/manual/

http://www.usatf.org/about/committees/LongDistanceRunning/RoadRunningTechnicalCouncil/

(These pages are already "live" as they're all linked from navigation menus on www.usatf.org). Unfortunately, Keith's actions came at a bad time for Bob who, aside from exchanging some e-mails with Keith, didn't have time to participate in the porting process when that was done.

Right now, the certification info on www.usatf.org contains some inappropriate language: The first two pages cited above both include "The easiest way to have your course certified is to hire a USATF Road Course Certifier to measure the course" which is not an accurate description of the way we work. We will replace this language with a more appropriate description and then complete the process of porting RRTC content to the USATF site. Ultimately, www.rrtc.net may cease to exist as a separate website so Bob will no longer be webmaster of that separate RRTC site but will become the RRTC contact authorized to post material directly to our section of the USATF site. The www.rrtc.net domain name itself won't go away but will be configured so anybody who types www.rrtc.net in a web browser will get redirected to the appropriate area on the USATF site.

Some questions that arise in porting the remaining RRTC content to usatf.org concern the downloadable text version of our course list and our e-mail discussion group (MNForum). We'll probably drop our downloadable text list because it duplicates functionality of the Search Engine at http://www.usatf.org/events/courses/search/ which can output results as a tab-delimited text file. Currently, the Search Engine covers only our active list but Keith can enhance it to also include the archive list (and perhaps also the foreign list). Meanwhile, our "historical" list compiled by Malcolm Heyworth differs in format from the other lists, so won't fit into the Search Engine and will remain as a separately downloadable file (At least, we don't need to update it every two months). Also, we agreed at this meeting that the "current" file maintained by Mike for recently certified courses that haven't been listed yet in Measurement News will remain available as a separate text file.

MNForum is currently hosted on the rrtc.net server. Keith has told Bob that USATF would be willing to host it on the usatf.org server, but details of the transition (and nature of available mailing list software on that server) remain unclear. Therefore, for the time being, MNForum continues to operate through the rrtc.net server.

In operating www.rrtc.net, we've been paying for both domain registration and web hosting. The domain registration is quite inexpensive and is currently paid to April 2007. The hosting account costs more, at around \$100 per year, and will come due in November of this year. This hosting account isn't needed if we only want to redirect rrtc.net to a selected page on www.usatf.org. However, having the hosting account allows better control over redirections (e.g., it allows redirecting individual URLs on rrtc.net to the correct corresponding pages on usatf.org). And we'll need a hosting account for as long as we want to keep any web pages on rrtc.net or operate MNForum through rrtc.net. In view of the uncertainties in timing of the website transition and MNForum transition, we decided at this meeting to renew our hosting account for another year when it comes due this November.

Vice-Chairman East, Paul Hronjak: The East has been pretty stable (no certifier changes this year). 558 new courses have been certified so far this year, compared with 431 at this time last year. Ron Fitzpatrick who had been appointed last year as certifier for several Northeastern states has undergone bypass surgery but is recovering well.

(Outgoing) Vice-Chairman West, Tom McBrayer: Two states acquired new certifiers this year: Michael Franke, who was already the Iowa certifier, replaced George Tuthill as certifier for Montana, and Len Anderson replaced Michael Renner in Idaho. The Women's Olympic Trials Marathon course in St Louis was validated by a team of women measurers led by Carol McLatchie (see Carol's report below). Also, Bill Grass, formerly certifier for Wisconsin, moved to McAllen TX and brought new life to that area.

The biggest news to emerge at this meeting was that Tom himself, after serving for 12 years as Western Vice-Chairman, was stepping down from that position, although he remains the certifier for Texas. Tom's replacement as Western Vice-Chair, effective September 1, is Gene Newman who is currently the certifier for Arizona after having moved from the East Coast where he had been New Jersey and Delaware certifier.

Mike Wickiser offered a tribute to Tom, who had measured his first course in 1984 and whose hard work has kept his mailbox full for the past 12 years. In recognition of this service, Mike presented Tom with a great-looking measuring jacket. Mike also noted that Gene Newman has been measuring since 1985 and praised Gene's work as NJ, DE and AZ certifier, especially his role in resolving a difficult situation in Arizona.

Measurement News / **MNForum Editor, Jim Gerweck:** It's been nearly two years since printing and mailing of Measurement News were transfered to the USATF office in Indianapolis and it's been working pretty well. The past few issues have been bound differently than before (as a simple stack of pages between heavier end pages instead of the previous booklet style) but, since USATF is doing the printing, they can change this as they see fit. Possibly, USATF will require us to reduce the number of logos displayed at the top of our front page to show just the USATF logo without the others.

Our E-mail discussion forum (MNForum) serves as a supplement to Measurement News, but Jim thinks there's still a place for the hard-copy medium and he expects it to continue. Within Measurement News, Jim has replaced the "Map of the Month" feature with a "Measurement of the Month," and he urges all measurers to send in material for this feature!

Women's Trials Validation, Carol McLatchie: Carol coordinated the pre-race validation measurement, conducted during the weekend of January 10-11, for the 2004 US Women's Olympic Trials Marathon course in St Louis. The course was ridden by a women's measuring team consisting of Carol Kane, Kathy Vierzba, Carol McLatchie and Mary Edwards, along with the original course measurer, Tom Eckelman. Kansas/Missouri certifier Bill Glauz helped with the measurement but didn't ride himself. The January weather in St Louis was very cold but the criterium-style course (which turned out to be great for spectators during the race) did reduce the distance to be measured.

This was the 5th occasion since 1988 that a team of female measurers has pre-validated the Women's Olympic Trials course. The first two such measurements were organized by Sally Nicoll, who passed the baton to Carol, who has coordinated each of the measurements since then.

IAAF Administrator, Bernie Conway: Bernie, who lives in London, Ontario, Canada, described his introduction to course measurement around 1980 when he accompanied Bob Baumel on a measurement (Bob was then living in London while a postdoctoral fellow at the University of Western Ontario). For a while, Bernie could get courses certified with the Ontario Track & Field Association, but that program ceased to exist. To get his courses recognized, Bernie began sending his data to USATF (actually, TAC at that time) to obtain US certification. In 1992, he was given USATF Final Signatory status. In 1999, Bernie helped start the current Canadian national course certification program and became Chief Certifier in that program, which now certifies around 75 courses per year. In 2003, he was appointed AIMS/IAAF Measurement Administrator for the Americas when Pete Riegel retired from that position.

As there are many AIMS races in the United States, Bernie stated that any course measured by a

USATF Final Signatory is automatically accepted as IAAF certified. For other US courses, the full data should be sent to Bernie, who can then approve it. In discussion, Bernie also noted that IAAF now accepts road running records at the 5 km distance.

Other Business

Need for USATF Senior Certifier category? Before breaking for lunch, Mike pointed out that, in view of Bernie's comments, one agenda item could be dispensed with. It had been suggested that a "Senior Certifier" category might be helpful in obtaining IAAF certification for US courses. However, as Bernie made it clear that a mechanism is already in place for obtaining such certifications, the proposed new category isn't needed. We then temporarily adjourned for about 2 hours, during which time attendees could eat lunch and/or pace the contest course.

Course Renewal Issues: After the lunch break we discussed some issues involving renewal of certified courses. There had been a question about charges for renewal. Mike pointed out that no money may be charged for renewing a course because the process is relatively automatic and doesn't require reviewing any data. For certifiers who forget the correct expiration date for renewed courses, Bob advised downloading the current renewal application from our website, as the regulations now appear at the top of that form. Specifically: Only courses certified before 2001 may be renewed; and the year of final expiration is either the original year of certification plus 20, or 2011, whichever comes first.

There had been a suggestion to exempt calibration courses from our expiration policy, as a calibration course which is maintained carefully by its original measurer may remain usable beyond 10 years. While this may be true in some cases, it was pointed out that, in general, calibration courses are more susceptible than race courses to losing validity. Considering that any error in the calibration courses gets multiplied many-fold when measuring a race course, the location of a calibration course endpoint requires greater precision than normally provided by documentation on a course map; therefore, calibration courses are generally valid only as long as the original endpoint markings remain on the ground. Also, it's very easy to tape a new 300 m calibration courses -- which will expire the same as all other courses.

Application Form and Certificate Changes: The following changes were approved:

1) Application forms will ask for the measurer's e-mail address.

2) On the Certificate, the word "Altitude" will be changed to "Elevation."

3) On the Certificate, "Difference between 2 best measurements of course" will be dropped (Such info is relevant to a certifier reviewing an application, but serves no purpose after a course has been certified).

A suggestion was also made to drop the "Configuration" field on the Certificate but this suggestion was rejected, as the course configuration info on the Certificate is sometimes a useful supplement to the map which, unfortunately, isn't always drawn as clearly as we might like.

Other Issues in Writing Certificates: There was discussion about acceptability of including more than one distance on a single certificate. The consensus is that we strongly prefer issuing a separate certificate for each distance certified. An exception may be made when certifying splits of a longer race course. It must be understood, however, that we don't certify points. We only certify courses, such as

the course running from the Start to a selected split position of a longer course. For each course we certify, Drop and Separation must be provided on the Certificate (As a special case, the Turnaround of an exactly out/back course cannot be considered certified unless Drop and Separation are provided for the course running from Start to Turnaround). Thus, when a certificate covers more than one distance, it must include Drop and Separation for every distance being certified. Moreover, in such cases, if any of the courses described on the certificate becomes unusable (e.g., due to construction), the entire certificate becomes invalid, so all other courses described on that certificate also lose certification.

Mike urged all certifiers to enter international metric distances correctly on certificates, not as translated mile distances. For example, a 5 km course is not to be entered as 3.106856 miles; instead, write "5 km" (using the correct international two-letter lower case symbol "km" and a space between the number and unit symbol). Also, the marathon distance is officially defined as 42.195 km (not 26.218757 miles).

Avoid course names longer than 30 characters when filling out certificates. If the name is longer, Mike will have to shorten it when entering it on the Course List; it's better if the certifier has already shortened it. When writing the certificate for a calibration course, choose a name that includes both the street name and course length (Note that a name like "XYZ Race Calibration Course" is useless when it comes to using the calibration course for measuring other race courses). Remember that in the course list, the column that normally contains distance displays only the code "Cal" for calibration courses; thus, you must include the distance in the course name if you want it to appear in the listing.

On course maps, certifiers must always write in the certification code. Make sure that the map includes a North arrow. If the map doesn't include a measured-path line, make sure there is a verbal description of the allowable running path; e.g., if runners are free to use the whole road or if there are restrictions.

Pacing Contest Results: At this point in the meeting, Jim Gerweck revealed results of the Pacing Contest and presented valuable prizes to the winners. The three most accurate pacers were Mike Wickiser, Bob Baumel and Kay Ungurean (wife of Nebraska certifier Karl Ungurean). The prizes were all products of Connecticut. In fact, not only the winners, but everybody in the room, received one major Connecticut product--PEZ candy. First place winner Mike Wickiser received another important Connecticut product: a Wiffleball and bat. The other winners received pewter ornaments bearing the Connecticut state seal. Full contest results can be found in in this issue Measurement News and the Late-Breaking News page on our website (currently still at www.rrtc.net).

Course Measurement by Cyclocomputer: At last year's meeting, Neville Wood proposed a variant of the Calibrated Bicycle Method using any of various commercially available bicycle computers in place of the Jones Counter, whose parts are becoming more difficult to obtain. Since then, Neville has postdetailed (often updated) description ed а of his method at: http://home.earthlink.net/~caverhall/newrevcounter/abstractcontents.htm and several measurers have been experimenting with the technique. At this year's meeting, we discussed what would be needed to accept this as one of our standard, allowable methods for course certification. (Neville himself was not present at this meeting.)

To summarize the idea of Neville's technique as presented at last year's meeting: It involves tricking a cyclocomputer (electronic bicycle odometer) to behave as a precise revolution counter. The three com-

ponents of this trickery are: First, the bike computer must nominally register distance in increments of 0.01 km. Then, you lie to the computer by telling it your wheel has a circumference of exactly 2.5 meters. Finally, you mount four magnets (instead of a single magnet) on your bike wheel. Then, every time your wheel makes a full revolution, it sends 4 impulses to the computer, which thinks you've traveled 4 x 2.5 m = 10 m = 0.01 km, so the readout on the computer (ignoring the displayed decimal point) is exactly the number of full wheel revolutions.

There are some variations on this technique. For example, one brand of cyclocomputer lets you enter a wheel circumference as great as 9.999 meters (which is much bigger than an actual bicycle wheel). With this brand, you can enter the circumference as 5.000 m and use only two magnets, or enter the circumference as 9.999 m and use only a single magnet. (In the latter case, the reading starts to deviate from the correct count after 10,000 revolutions, but that lets you go about 20 km before having to reset the counter.)

With any of these variations, the readout from the bike computer provides only whole revolutions, which the measurer must supplement by determining fractional revolutions. In fact, people who measured before the invention of the Jones Counter used mechanical counters that counted only whole revolutions, and the measurers estimated fractional revolutions by counting spokes. Neville also used spoke counting at first, but that results in messy arithmetic. Then he realized that with a little more setup effort, he could mark his wheel in decimal increments to allow direct reading in decimal form (estimated to 0.01 rev) greatly simplifying calculations.

Measurers who have tried Neville's method find that it can certainly produce reliable results. The key question is whether we can systematize this method to the extent that a certifier reviewing a measurement from a first-time measurer can trust that it was done correctly (at least to the same extent that we can trust measurements done with a Jones Counter). As an illustration of one of the possible pitfalls, one of the measurers testing Neville's method accidentally marked his wheel backwards, leading to incorrect values for fractional revolutions. The problem was caught eventually because this measurer also had a Jones Counter on his bike. But if the Jones Counter hadn't been present, he may have had an apparently self-consistent set of data leading to a very inaccurate race course.

To allow routine use of Neville's method, especially by first-time measurers, we'll need to provide instructions sufficient to avoid the pitfalls. To study this question, we formed a committee consisting of measurers who've been testing the method, and anyone else who wishes to contribute. This committee will probably have to write a supplement to our measurement manual to describe the method. Other changes may also be needed. For example, our current Course Measurement Data Sheet is based on a counter that can't be zeroed, so we assume a continuous string of counts. But in Neville's method, it may be most convenient to zero the counter between successive splits. Thus, we may need new forms for recording data.

AMB "Activ" Timing System: Our final agenda item was a presentation by Kevin Oonk about a new chip timing system called the "AMB Activ" system. In this system, the athlete wears an active (battery powered) transponder chip instead of a passive chip as used in previous systems such as ChampionChip. AMB's system also replaces the bulky mats of the passive systems with a wire loop which is taped to the road.

The AMB system has already been used for some Olympic events in a variety of sports (In fact, AMB's initial work was in timing car races). They claim improved ability to detect runners, eliminating the

need for the second set of mats routinely used with passive chip systems. They also claim better localization of the position where the runner is timed.

Mike pointed out that he is currently examining comparative data from the AMB system and will make a recommendation regarding its use in road running. An issue raised at this meeting is whether the current USATF rules regarding placement of timing mats for existing chip timing systems might need to be modified when this new kind of transponder system is used.

Adjournment: The meeting was adjourned at 17:30.

Minutes prepared by Bob Baumel, RRTC Secretary

SCENES FROM STAMFORD



The second annual RRTC Annual Meeting, in Stamford, CT, drew measurers from as far away as North Carolina, Texas, Iowa, Arizona, Oregon, Oklahoma and Ontario. Above Bernie Conway, Athletics Canada and IAAF. Bob Baumel, Secretary and Webmaster, outgoing Vice Chairman West Tom McBrayer and his wife, Mary Anne, Chairman Mike Wickiser, new Vice Chaimanr West Gene Newman, Vice Chairman East Paul Hronjak and Chairman Emeritus Pete Riegel. Right, Mike Wickiser presents Tom McBrayer with a high visibility measuring jersey in recognition of his years of service as Vice Chair West.





RESULTS OF RRTC MEASUREMENT-BY-PACING CONTEST

Stamford, Connecticut - August 21, 2004

Course was laid out by Jim Gerweck Official length = 384 Units

	Estimate	Error	Place
Mike Wickiser	381.81	-2.19	1
Bob Baumel	386.35	2.35	2
Kay Ungurean	387	3	3
Barb Grass	387.1674	3.1674	4
Tom McBrayer	380.625	-3.375	5
Pete Riegel	387.787	3.787	6
Mary Anne McBrayer	379.945	-4.055	7
Karl Ungurean	389	5	8
Bill Grass	389.7096	5.7096	9
Bernie Conway	377.6	-6.4	10
Paul Hronjak	373.333	-10.667	11
Gene Newman	373.05638	-10.94362	12
Carol McLatchie	396.67	12.67	13
Kevin Lucas	402.62	18.62	14

FIVE YEAR TEST OF A PNEUMATIC TIRE

In late 1999, after reading Mike Sandford's articles concerning potential problems with solid tires, I decided to go pneumatic. Part of my reason for changing was to get a more comfortable ride with less rolling resistance. I purchased a Specialized "Turbo A Armadillo Technology" 27x1 ¹/₄ tire rated at 125 psi. I also bought a pump with a good tire gauge.

Since then I have pumped the tire to 125 psi before every precalibration. The bicycle has been the same one throughout. Fifteen different calibration courses were used. After each measurement session I record the data in a log. The log shows some interesting things, some of which have been obvious for a long time.

Because rider weight, temperature, and age of the tire all act together to affect tire size, I've found no good way to unify them into a single, easy-to-understand format. Therefore I'll just discuss them separately.

Calibration vs Temperature

I was a bit surprised to see the results shown here. I expected that because I always pumped up the tire to the same pressure, it would have the same size regardless of temperature. This was not the case. Instead, the measurement constant gets smaller as temperature increases. However, it has historically remained within a narrow span.

The information is useful to me, since I know my constant within 10 counts per kilometer just by checking the temperature. This is useful when riding on a strange calibration course, as any large deviation indicates that something isn't quite right.



Counts per kilometer vs temperature are shown here. The five clear circles show conditions for the first three months. The black dots show the effect of a slow leak. The rest of the points have no obvious anomalies.

Things took a while to settle in. The tire was installed on September 15, 1999. The first 5 calibrations, occurring in September and October, are shown by small circles on the graph. They tell me that the tire was initially smaller in its on-the-shelf unstressed state, but gradually relaxed as the unaccustomed internal pressure was applied.

Recently I completed a measurement in which the postcal constant was the larger, in spite of a 15F increase in temperature. I was puzzled, but nothing registered. Next morning, going out to measure, I discovered that the tire was flat. I repaired the puncture and measured again. This time I had a much larger postcal constant. Sure enough, I had not successfully fixed the flat. A new tube brought things back to former levels. The four black dots show the slow leak calibrations.

Rider Weight

My weight has varied enough over the five years so that a picture emerges. The heavier I am, the greater the constant. This makes sense, as the tire is pressed down more as the load increases.





Elapsed time

The tire has shown an overall decline of about 2.6 counts per kilometer per year, indicating a small increase in tire size. Perhaps the tire is still very slowly expanding under the inexorable pneumatic pressure.



Counts per kilometer vs time.

Conclusions

The data here are fairly self-explanatory, and I have little to offer beyond what I have said. The data are available in an Excel file for anyone who wishes to apply more sophisticated methods of analysis.

Pete Riegel - riegelpete@aol.com

USATF/RRTC CERTIFIED COURSE LIST New Entries, July - August 2004

				,		m/km	pct			
DISTANCE	COL	JRSE ID	STA	LOCATION	COURSE NAME/RACE	DROP	SEP	MEASURER	REF	PLACES
5 km	AK	04001 FW	А	Anchorage	2004 Humpy's 5k	0.0	0	D Epstein	AK	09807 FW
5 km	AK	04002 FW	Α	Wasilla	Curt Menard Memorial 5k	0.0	90	F Wilson		
42.195 km	AK	04003 FW	А	Anchorage	Mayors Midnight Sun Marathon	1.1	26	B Dean	AK	00006 FW
21.0975 km	AK	04004 FW	Α	Anchorage	Humpy's Half Marathon	0.0	0	D Epstein	AK	98011 FW
42.195 km	AK	04005 FW	Α	Anchorage	Humpy's Marathon	0.0	0	D Epstein	AK	98011 FW
5 km	AZ	04005 GAN	А	Oro Valley	Oro Valley 5kmn	0.0	6	G Newman		
5 km	ΑZ	04006 GAN	А	Tucson	Lighthouse / City YMCA Run	0.0	0	G Newman		
10 km	CA	04023 RS	А	West Hollywood	LA Frontrunners Run 10k	0.0	0	R Scardera		
5 km	CA	04024 RS	A	West Hollywood	LA Frontrunners Run 5k	0.0	0	R Scardera		
8 km	CA	04025 RS	A	Sacramento	Shriner's Run 8km - Alternate	0.0	1	D Thurston	CA	00025 RS
5 km	CA	04026 RS	A	Irvine	Bastille Day 5km	0.0	2	R Scardera	CA	01040 RS
42.195 km	CA	04006 IK	A	San Francisco	The Chronicle Marathon	0.0	0	I Knight	CA	03007 TK
5 km	CO	04011 DP	Α	Golden	Race for the Mesas	0.0	5	P Tanui		
5 km	CO	04012 DP	A	Vail	Gore Creek Gallop	0.0	0	P Tanui		
Cal	00	04013 DP	A	Wray	Adams St 1000 ft. Calibration	0.0	100	D Poppers		
5 km	CO	04014 DP	A	Wray	Wray Wracer Canyon Run	0.0	0	D Poppers		
10 km	CO	04015 DP	A	Wray	Wray Wracer Canyon Run	0.0	0	D Poppers		
5 mi	CO	04016 DP	A	Denver	BKB 5 Mile	-0.5	3	P Tanui	~ ~	
4 mi	CO	04017 DP	A	Highlands Ranch	Miles for Miracles	0.3	1	P Tanui	CO	03015 DP
10 km	GA	04009 WC	А	Sylvania	Briar Creek 10k Run/Walk	0.0	1	T Crute		
5 km	GA	04010 WC	A	Brooklet	5k Peanut Run	0.0	6	T Crute		
4 mi	IA	04004 KU	А	Eldridge	Moonlight Chase	0.0	2	K Ungurean		
5 km	IA	04003 MF	A	Waukee	RAT Race	0.0	0	M Franke	IA	03007 MF
8 km	IA	04004 MF	A	Des Moines	Drake Relays 8k	-0.8	5	M Franke	IA	93001 MF
10 mi	IL	04049 JW	А	Chicago	Soldier Field Ten Miler	0.2	1	J Knoedel		
5 km	IL	04050 JW	A	Elmhurst	Joe Newton 5k	0.0	1	C Hinde	IL	03121 JW
5 km	IL	04051 JW	A	Bolingbrook	Run In The Brook 5k	0.0	6	C Hinde		
10 km	IL	04052 JW	A	Bolingbrook	Run In The Brook 10k	0.0	3	C Hinde		
5 km	IL	04057 JW	A	Wheaton	Run For The Animals 5k	0.0	1	J Wight		95077 JW
10 km	IL	04058 JW	A	Wheaton	Run For The Animals 10k	0.0	1	J Wight	II	95077 JW
10 km	IL	04060 JW	A	Wheaton	Marianjoy 10k	0.0	2	D Lamermayer		
5 km	IL.	04061 JW	A	Chicago	Run For Gus 5k	0.0	0	J Wight		
5 km	IL.	04062 JW	A	Wheaton	Galloping Ghost 5k	0.0	2	J Wight	IL	03028 JW
5 KM	1	04065 JW	A	vvauconda	Wauconda Fest 5k	0.0	2	J Wight	IL.	93026 JW
10 km	IL.	04066 JW	A	Wauconda	Wauconda Fest 10k	0.0	1	J Wight	IL	93025 JW
5 KM	1	04067 JW	A	Flossmoor	Flossmoor Fest	0.0	2	C Hinde	IL	03067 JVV
5 KM	1	04068 JW	A	Oak Forest	Liberty Run	0.0	1	C Hinde		
5 km	IL	04071 JW 04072 JW	A	Des Plaines	Friends of Maryville 5k	0.0	0	J Knoedel		
5 km	IN	04012 MW	Δ	Indianapolis	All Start Club 5k	0.0	3	D Schmidt		
J KII		04012 10100	А	Indianapolis		0.0	5	Discinnat		
5 km	KS	04022 BG	A	Overland Park	Corporate Woods 5km	0.0	0	L Joline	KS	04018 BG
5 KIII	кo	04023 BG	A	Snawnee		1.0	4	L Joine		
Cal	KY	04044 PR	A	Finchville	Buckcreek Rd. 1000 ft.	0.0	100	T Heady		
2 mi	KY	04045 PR	A	Louisville	Long Run Park 2 Mile	0.0	0	I Heady		
10 km	KY	04046 PR	A	Louisville	Long Run Park 10k	0.0	0	I Heady		
5 km	KY	04047 PR	A	Simpsonville	Simpsonville 5k	-0.1	0	T Heady		
5 km	ΚY	04048 PR	A	Louisville	Lake McNeely 5k	0.0	3	I Heady		
5 mi	MA	04011 RN	A	Revere	Revere Moves 5 Miler	0.0	0	J Kuo		
10 km	MA	04012 RN	A	Methuen	Whirlaway 10k	-0.2	2	S Vaitones		
5 km	MA	04013 RN	A	Hopkinton	Sharon Timlin Memorial 5k	1.8	10	S Vaitones		
8 km	MD	04005 JS	A	Somerset Village	Somerset School 8k Classic	-0.4	1	J Sissala	MD	88036 RT
10 km	MD	04007 JS	Α	Rockville	Rockville 10k	0.0	1	J Sissala	MD	02006 JS

DISTANCE	со	JRSE ID	STA	LOCATION	COURSE NAME/RACE	m/km DROP	pct SEP	MEASURER	REF	PLACES
10 km	ME	04005 RF	А	Freeport	L.L. Bean 4th of July 10k	-0.2	1	R Fitzpatrick	ME	86005 GN
Cal	ME	04006 RF	А	Cumberland	Cumberland Falmouth 1000 ft.	0.0	100	R Fitzpatrick		
Cal	ME	04007 RF	A	Portland	East End 1000 ft Calibration	0.0	100	C Burnie		
5 km	ME	04008 RF	A	Portland	Cumberland County YMCA 5k	0.0	21	C Burnie	ME	90008 GN
1 mi	MI	04008 SH	А	Traverse City	Sunrise Rotary	0.0	10	S Hubbard		
			-							
10 km	MN	04012 RR	A	Fridley	Springbrook	0.5	1	R Recker		
	IVII N	04013 KK	~	Llandereen		2.4	3	D Wilght		
5 Km	IVIIN	04014 RR	A	Henderson	Henderson	0.0	1	R Recker		
5 KM	IVIN	04015 RR	A	St. Paul		0.2	6	D wright		
10 km	MN	04016 RR	A	St. Paul	lime to Fly	0.1	3	D Wright		
5 km	MN	04017 RR	A	Rochester	Minnesota Mile	0.0	7	T Saxman		
12 km	MN	04018 RR	Α	Spicer	Green Lake	0.0	2	T Reagan		
4 mi	MN	04019 RR	A	Minneapolis	Torchlight	1.1	18	D Wright		
5 km	МО	04024 BG	А	Jefferson City	Jefferson City Easter Seals	2.0	3	J Weghorst		
5 km	МО	04025 BG	А	Warrensburg	Freedom Run	0.0	2	L Joline		
5 km	MO	04026 BG	Α	Warrensburg	Freedom Fest	0.0	2	Luloline		
5 km	MO	04027 BG	Δ	Kansas City	Race for the Cure	0.0	4	K Raymer		
5 KIII	WIC	04027 00	~	Ransas Oity	Nace for the oute	0.0	-	it itayinei		
5 km	NJ	04030 LMB	Α	Verona	Stephen P. Gaffney 5m Mem.	0.6	2	L Baldasari		
5 km	NJ	04031 LMB	A	Somerville	HIS Race 4 Freedom 5k	0.0	3	L Baldasari		
5 km	NJ	04032 LMB	А	Demarest	Run for the Angels 5k	3.1	5	L Baldasari		
5 km	NY	04028 AM	А	Batavia	Firecracker 5k Run for the Arts	1.5	15	B Laskowski		
Cal	NY	04029 AM	Α	Canton	St Lawrence Ctv. Rt 27 1056 ft	0.0	100	D Dominie		
21 0975 km	NY	04030 AM	Δ	Madrid	Madrid Bluegrass Festival 1/2M	0.0	0	D Dominie		
10 km	NV	04031 AM	^	Madrid	Madrid Bluegrass Festival 10k	0.0	0	D Dominio		
5 km		04031 AM	~	Modrid	Madrid Bluegrass Festival Fix	0.0	0	D Dominie		
5 KIII		04032 AM	A	Dellaciat	Reline int Clinner Clease	0.0	0	D Dominie		
5 Km		04033 AM	A	Belipoint	Belipoint Clipper Classic	0.3	9			
10 km	NY	04034 AM	A	Brockport	Brockport-Army ROTC 10k	0.0	1	Gillson		
8 km	NY	04035 AM	A	Montgomery	General Montgomery Day 8k	0.0	1	B Cavanagh		
5 mi	ОН	04033 PR	А	Westerville	Run to the Rack	0.0	0	P Riegel		
4 mi	OH	04034 PR	Α	Columbus	Four on the Fourth	0.0	0	P Riegel		
4 mi	OH	04035 PR	А	Cincinnati	Hyde Park Blast	4.3	44	J Glaze		
5 mi	OH	04036 PR	А	Cincinnati	Crime Stoppers 5 Mile	0.0	3	D Connolly		
5 km	ОН	04037 PR	А	Cuvahoga Falls	Natatorium 5k	-0.6	7	J Fisch		
Cal	OH	04038 PR	A	Canton	Harvard Ave NW 1907 39 ft	0.0	100	J Wilhelm		
5 mi	ОН	04039 PR	Δ	Canton	Pro Football HOF Festival	13	3	I Wilhelm		
2 mi	ОЦ	04040 PP	^	Canton	Pro Football HOF Fostival	_/ 1	7	L Wilholm		
2 mi		04040 F K	~	North Conton	Sweethoort Dup	-4.1	1			
2.5 m		04041 FK	Ā		Sweetheart Run	0.0	1			
5 KM	OH	04042 PR	A	Columbus	Buckeye Classic 5 km	0.0	0	P Riegel		
10 km	OH	04043 PR	A	Columbus	Buckeye Classic 10 km	0.0	0	P Riegel		
5 km	OH	04049 PR	A	Mason	Eye Run for Vision 5k	0.2	1	S Prescott		
Cal	OR	04001 LB	А	Hillsboro	Butler St. 800 meter	0.0	100	J Spurgeon		
21.0975 km	OR	04002 LB	Α	Hillsboro	Helvetia Half Marathon	0.1	1	J Spurgeon		
21.0975 km	OR	04003 LB	Α	Sauvie Island	Foot Traffic Flat Half	0.0	1	J Atherton		
42.195 km	OR	04004 LB	А	Sauvie Island	Foot Traffic Flat Marathon	0.0	0	J Atherton		
5 mi	PA	04009 WB	Δ	Philadelphia	Run for the Hill of It - II	0.0	0	B Belleville	ΡA	92002 WB
5 mi	PΔ	04010 WB	Δ	Yorktown	The Bon-Ton 5 Mile Race	0.0	1	P Barner	PΔ	02013 WB
0 111	173	04010 100	~	Tonktown		0.4		i Bamer	170	02010 WB
1.25 km	RI	04003 RN	А	Lincoln	Lincoln Park 1250 meter RW	0.0	0	J Kuo		
10 km	SC	04021 BS	А	Bishopville	S.C. Cotton Trail Run	0.0	3	S Blake		
5 km	SC	04022 BS	А	Walhalla	Walhalla Elementary 5k	0.6	5	W Terry		
5 km	ΤN	04016 DJR	А	Smyrna	Sharp Springs 5k	-0.3	4	T dePaulis	ΤN	04009 DJR
5 km	ΤN	04017 DJR	А	Loretto	Sacred Heart School 5k	5.9	89	D Michael		
5 km	TN	04018 D.IR	A	Knoxville	Expo 5k	3.4	6	A Morgan		
10 km	TN	04019 D IR	Δ	Knoxville	Expo 10k	1.8	3	A Morgan		
5 km	TN	04020 D IP	Δ	Chattanooga	Blue Cross Riverbend Run 5k	0.0	ñ	P Hagan		
2 km	TN		Δ	Brentwood	Red Cross Relief Run &k	0.5	2	1 7pinlor		
0 Kill 4 mi			~	Knowville	Kingadown Mircala Mila	4.0	∠ 100	J Zeigiei		
1 1111	1 IN	U4UZZ DJR	А	NIUXVIIIE		4.0	100	A worgan		

DISTANCE	col	JRSE ID	STA	LOCATION	COURSE NAME/RACE	m/km DROP	pct SEP	MEASURER	REF	PLACES
5 km	тх	04050 ETM	А	Colleyville	X Sightment 5k Run	0.0	4	M Polansky	тх	98090 ETM
5 km	ТΧ	04051 ETM	А	Keller	Mission Madness 5k	0.0	4	B Boernet		
5 km	ТΧ	04052 ETM	Α	Houston	Life Change Institute 5k	-0.2	1	R Barnhill		
10 km	ТΧ	04053 ETM	А	San Antonio	Combat Medic 10k	-0.3	2	R Soler		
5 km	ТΧ	04054 ETM	Α	San Antonio	Combat Medic 5k	-0.6	3	R Soler		
5 km	ТΧ	04055 ETM	Α	Sherman	Rescue Run	0.0	0	C Clines		
5 km	ТΧ	04056 ETM	Α	Houston	The Great Pumpkin Run 2004	0.2	2	E McBrayer		
4 mi	ТΧ	04057 ETM	Α	Fort Worth	Hot Tamale Series 4 Mile	0.0	1	C Clines		
5 km	ТΧ	04013 WG	Α	Pharr	4th of July Firecracker	0.0	3	B Grass		
Cal	ТΧ	04014 WG	А	Pharr	PSJA North HS 1000 ft.	0.0	100	B Grass		
5 km	UT	04008 DP	А	Murray	Murray Fun Days	-0.8	5	D Cabanillas	UT	97003 FH
5 km	VA	04017 RT	А	Norfolk	Women's Distance Festival 5k	0.0	1	J Price		
1 mi	VA	04018 RT	Α	Bethel	Schoolhouse Mile	0.0	0	M Studholme		
5 km	VA	04019 RT	Α	Bethel	Schoolhouse 5k	0.8	4	M Studholme	VA	93024 RT
5 km	VA	04020 RT	Α	Yorktown	Yorktown Freedom Run	0.0	3	S Bartram		
5 km	VA	04021 RT	А	Berkley Springs	Morgan County Fair 5k	-0.3	9	N Reimenschn	eider	
30 mi	VT	04001 RF	А	Essex Center	GMAA Common to Common	0.0	0	S Eustis		
10 km	WI	04055 JW	А	Green Bay	Bellin 10 kilometer Run	0.0	2	D Moore	WI	03044 JW
5 km	WI	04059 JW	Α	Milwaukee	Milwaukee Race for the Cure	-0.6	3	D Weyer	WI	01075 JW
42.195 km	WI	04063 JW	Α	Madison	Mad City Marathon	0.4	5	T Aten	WI	97006 WG
21.0975 km	WI	04064 JW	Α	Madison	Mad City Half Marathon	0.7	10	R Aten	WI	02108 JW
4 mi	WI	04069 JW	Α	Racine	Lighthouse Run	0.0	6	J McFadden	WI	94011 WG
10 mi	WI	04070 JW	А	Racine	Lighthouse Run	0.0	3	J McFadden	WI	94010 WG
RENEWED										
5 km	NY	91035 AM	A04	Springville	Bertrand Chaffee 5k Fund Run	0.0	2	J Felix		

Mike Wickiser - Course Registrar 2939 Vincent Road Silver Lake, OH 44224-2916 Phone 330-929-1605 FAX 509-351-5383 Mikewickiser@neo.rr.com

PUBLICATIONS AVAILABLE FROM RRTC

Printed Course Lists - A list of certified courses for any state is \$2.00. (Free to RRTC certifiers). You will receive a list that is current as of the last published Measurement News. Courses can be sorted in a special way; otherwise it will be sorted by distance as it appears in MN. Other specially-sorted lists can be done - for instance, you might want to have all the 5k's in IL, IN, and MO. If you are online, lists can be sent that way. Contact Mike Wickiser at MikeWickiser@neo.rr.com

Web Page Access to Course Lists: The complete list can be downloaded from the RRTC website at www.rrtc.net/download/ Also, try the new USATF Search Engine linked from www.rrtc.net or directly at www.usatf.org/events/courses/search/

Individual Certificates - These may be obtained by sending the course number and \$2.00 per course desired. **SEND THE COM-PLETE ID, INCLUDING PREFIX AND SUFFIX LETTERS**, i.e: CA 92057 RS. Send course name, length and location as well. If you are thinking of hiring a measurer, this is an excellent way to see the sort of work you can expect. In addition, you may wish to check out a course you intend to run. Bring the map to the course and see if the race director got it right!

Above material may be obtained from: Mike Wickiser - 2939 Vincent Rd. - Silver Lake, OH 44224-2906

Measurement Calculation Computer Program by Bob Baumel, version 1.2 for Macintosh or IBM PC. This software can be downloaded for free from the RRTC website at

www.rrtc.net/download/ or Bob will distribute it by email attachment (send requests to webmaster@rrtc.net) or on floppy disks (send blank, formatted diskette and stamped return mailer to Bob at: 129 Warwick Road, Ponca City OK 74601-7424). Be sure to specify Mac or PC version.

Electronic Certificate Templates (available to Certifiers only), in Adobe Acrobat forma. Requires Acrobat or Acrobat Reader 4.0 or greater (Current Acrobat Reader may be downloaded for free from **www.adobe.com**). The template allows you to fill in certificates on the computer and print them. Available in both FS and non-FS version. Distributed by Bob Baumel by email or diskette [same addresses as for Measurement software]. Bob can customize the template with certifier's personal info at the bottom to avoid re-typing it every time (Be sure to specify exact ID text desired when requesting a template).

Online course measurement book, edited by Bob Baumel. It's a revision of the one you can buy from USATF, but the basic procedures have not changed. Available at: **www.rrtc.net**

Course Measurement Procedures - the Bible of course measurement. Complete instructions for measuring courses for USATF certification. The same procedures are now used for IAAF and AIMS courses. \$9.00 postpaid. Available from: USATF - Book Order Dept. - PO Box 120 Indianapolis, IN 46206

Course Measurement Video - a concise 17 minute introduction to course measurement, intended as a supplement to Course Measurement Procedures. See how it's done! Version 2 sells for \$10 but there are still a few copies of the original version available for \$7.50. Send to: Tom McBrayer - 4021 Montrose - Houston, TX 77006-4956.

Historical/Technical Material Available on CD Measurement News Archive - Every issue of Measurement News from #1 (1982) to #115 (2002). Full of material describing measurement techniques, technical articles, and history, written by numerous people worldwide. Set of 2 CD's in pdf (Adobe Acrobat 5.0) format. Cost \$10.00, postpaid.

Historical Archive - A collection of technical articles, measurement reports, seminars spanning the period 1963 to present. Includes detailed full reports of several group rides of Olympic Marathon courses. All on one CD in pdf format. Cost \$5.00, postpaid.

The above two items are available from: Pete Riegel, 3354 Kirkham Road, Columbus, OH 43221 email: riegelpete@aol.com

OTHER PUBLICATIONS AND EQUIPMENT

Road Race Management is a monthly newsletter providing race organizing ideas and news for race directors. \$97 per year from: Road Race Management - 4904 Glen Cove Pkwy - Bethesda, MD 20816 Phone: 301-320-6865 Fax: 301-320-9164 Jones/Oerth Counters - Paul Oerth - 2455 Union St - Apt 412 -San Francisco, CA 94123. Phone: 415-346-4165 Fax 415 346 0621. Email: Poerth@aol.com. US Price is \$70 for the 5 digit model, \$80 for the 6 digit model, postpaid. Foreign price is \$75/\$85 plus postage. Foreign orders shipped by airmail. Visa, MasterCard, American Express cards accepted. Advance payment is required. RunScore - The flagship of IBM-style finish line programs. For information contact: Alan Jones - 3717 Wildwood Dr - Endwell, NY 13760. Online at: www.runscore.com

Apple Raceberry JaM - Race management software for Macintosh and Windows. Online at **www.raceberryjam.com** or call Jack Moran at (952) 920-0558.

TOPOGRAPHIC MAPS

USA topographic maps are available from:

U. S. Geological Survey 303-202-4200 USGS Map Sales PO Box 25286, Bldg 810 Denver Federal Center Denver, CO 80225 Delivery will be made in approx. 4 weeks. Ask for latest price. Maps can be located and ordered online at: **www.usgs.gov** Maps can be obtained in just a few days from: Map Express – PO Box 280445 – Lakewood, CO 80228-0445 1-800-MAP-00EX (1-800-627-0039) Maps can be located and ordered online at: **www.mapexp.com**

Topo Maps on CD-ROM - 3-D TopoQuads includes authentic USGS 7.5-minute quadrangle maps, assembled into one seamless database

See an interactive online demo at **www.delorme.com** Also - check out Street Atlas USA from the above – it's a seamless street map of the whole USA at a decent price.

USGS TOPOGRAPHIC MAPS ONLINE - FREE

Maps.Com has a section where you can click on to all USGS maps, free. This can be very handy for obtaining accurate elevation information.

18 Check out: www.maps.com

ROAD RUNNING TECHNICAL COUNCIL

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ОГРТ	TELEPS - Plagas shock this listing to be sure we have your data correct		Mov 6, 2004

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