Measurement News

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A well-bundled team of measurers rides the Women's Olympic Marathon Trials course in St. Louis over the weekend of January 10-11. A newspaper account of the ride appears inside; a full story, with measurement data, will appear in the next issue.

MEASUREMENT NEWS

#123 – JANUARY 2004

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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 March 2004 issue must be in the Editor's hands by February 20. Next issue will be mailed in early March.

ROAD RUNNING TECHNICAL COUNCIL

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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).					

MEASUREMENT NEWS

Issue #123 – January 2004

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Chairman's Clatter - From Mike Wickiser

Women's Olympic Trials Validation; Time to update this project again. Construction has finally been completed and the Ladies will actually be assembling to check the course the weekend of January 09-11, 2004. The weather forecast is for highs in the low 40's but little chance of rain or snow. Good luck to all. This is definitely NOT my idea of course measurement weather.

USATF Convention & RRTC Meeting; The RRTC meeting at the convention focused around recommendations for the intermediate split marking at the Men's & Women's Trials. Since some athletes may be more comfortable with miles and others kilometers, the conclusion was to recommend the Trials courses be marked in miles and at least each 5k point. Other issues were rules changes regarding validations and the 30/50 percent allowable separation for records consideration. Both being proposed to match the IAAF guidelines. Both were not recommended. A copy of the meeting minutes is included in this issue of MN.

Just WHEN IS a course certified; the answer is; A course is considered certified once the final signatory certifier is satisfied that adequate information regarding any given course supports the advertised length. Sounds like lawyer talk doesn't it. Actually, it is pretty simple. It's certified when the certifier says it's certified. The effective date is most often the date of original submission unless the measurer screwed up and the race has been run before the distance was right. For the case of a certifier who measurers a course this means the date he or she forwards the certificate to their vice-chair. When a course is measured and the map and data are sent to a certifier the date of original submission is usually considered the certification date.

This issue has come up recently in the form of concern that certificates were reviewed after a certifier had distributed them. Every so often a certificate will need to be corrected or amended after it has actually been distributed. Duplicate numbers, corrections, and every so often map changes or clarifications are required. The Vice-Chairs each review every certificate for accuracy and check the map to see if the course is properly depicted. Certificates are again given a quick review by me, as they are being included on the course list, scanned and filed. These additional checks help to maintain a truly high standard for certified courses. A request for correction or additional information is sometimes necessary. When this happens the certifier is contacted. It is the certifier who issued the certificate because they were satisfied the course was measured and documented properly. He or she worked with the measurer to get the map and data complete. So it stands to reason the certifier is the individual to be contacted when something appears inaccurate. (Note: **appears** - we make mistakes too!) In such cases certificates are held awaiting info and an email is usually sent asking for that info. Overwhelmingly most measurement certificates are fine from the get go. For the occasional amended certificate, the certifier supplies correct data and makes changes or issues a new document. No big deal! Mistakes happen, fix'em and go on. The important thing to remember is that the certificate and map are all that exist to document a certified course for ten vears down the road, when the measurer may or may not be around and the race director has probably changed a few times. So if asked for additional information from time to time it is only because we are doing our jobs an trying to assure that the course list and maps are at least capable of supporting a reproducible course exactly as it was measured up to 10 years later.

I know from experience it isn't pleasant to reissue a certificate. It made me feel bad that I screwed up the first time. My ego survived the blow in the knowledge that the result was a better, more accurate improved certificate.

Happy New Year!!

Mike Suchases

Road Running Technical Council Meeting USATF Annual Convention Greensboro, North Carolina December 05, 2003

Attending: Mike Wickiser, Ron Pate, Jim Kaiser, David Katz, Don Shepan, Carol McLatchie, Dave Rogers, Phil Stewart, Norm Brand, A.C. Linnerud, Marlene Atwood

The meeting was called to order by RRTC Chairman Mike Wickiser with explanation that the RRTC had previously met in Akron over Labor Day weekend. Copies of the minutes of that meeting were distributed to all in attendance.

Officers' Reports

Chairman, Mike Wickiser: Mike updated the registrar's report noting that the certified course listing currently contained 23,564 certified courses with approximately 1200 to date this year. These numbers reflect a continual growth in certified courses.

The project of digitizing all certified course maps has been completed with all active certified course maps being available on line. From this point only renewed courses older than 1993 and newly certified courses require scanning and forwarding to Keith Lively in the national office for inclusion on the USATF certified course search engine.

Olympic Marathon Trials: Mike reported that the Men's Trials course had been changed. The new course now has a net drop of 0.69 meters per kilometer, which meets the criteria for records consideration. Pete Riegel has worked with Ric Melanson to re-certify the changed course and based on the Validation Team data the new course will be considered as pre-validated. Carol McLatchie asked about the Trials course being marked in miles or kilometers. After open discussion it was agreed that marking the Trials courses in both kilometers and miles would be the most beneficial for athletes and the RRTC would make that recommendation to both men's & Women's Trials organizations.

Rules Committee Update: David Katz informed the group that changes to 185.5 regarding course validations and a change in the allowable start-finish separation from 30 to 50 percent of race distance were not passed.

Future RRTC Meetings: Don Shepan asked if the RRTC would continue to conduct meetings outside of the USATF convention and if so would these meetings be executive or open attendance. Mike replied that the Labor Day meeting was a huge success in that it provided a format in that a majority of the RRTC officers were able to meet at a cost effective venue. While the 2003 Akron RRTC meeting had been executive in nature, it was not closed session and future meetings would be announced well in advance through MNForum and Measurement News so that anyone willing could attend.

Adjournment: With no further discussion the meeting was adjourned.

Minutes prepared by Mike Wickiser, RRTC Chairman

Volunteers brave the cold to bring the course to life Pete Wickham

St. Louis Post-Dispatch Sunday, Jan. 11 2004

In the pale January chill, seven hearty volunteers from St. Louis and around the nation brought the Olympic flame back to life Sunday, nearly a century after it was extinguished here.

But about two miles into their task of validating the course for the U.S. Olympic Women's Marathon Trials on April 3 in Forest Park, group members wished they had brought some real fire with them.

"I've got a circulation problem in my hands, and when it gets like this I can't feel my fingers," said Carol Kane of Connecticut, who huddled near a heater vent inside a support car during an early break. "But I'm glad I'm here. This is a pleasure. No, it's a privilege."

Seems an easy enough task: Map a course in and around Forest Park, drive your car until it shows 26.2 miles on the odometer and tell the best 150 women marathoners in the country to come on down. But cars can't hug the corners around turns the way runners do, looking for the quickest routes. No, the only way to accurately do it is to go on bicycles with specially built distance calibrators that measure in four-inch increments.

That's where the group from the St. Louis Track Club and U.S. Track & Field came in.

"You've got to ride thinking of how the runners will take the course in order to get the right distance," said voluteer rider Kathy Vierzba of Waco, Texas.

The group had planned to do this last summer, but had to wait until infrastructure improvements in the park were completed. "It would have made it easier, but we're glad to be here," Kane said. "Besides, it's below zero back home in Connecticut."

Ray Irwin of the St. Louis Track Club and the USTF's Bill Glausz of Kansas City went out at 5 a.m. and put down mile marks and signal cones.

It was up to St. Louis Track Club's Tom Eckelman, who chairs the Spirit of St. Louis Marathon and certifies 20 race courses a year on average, to lead USTF Validation Chair Carol McClatchie, Kane, Vierzba and Mary Edwards of Kansas City on a "bracing" morning ride that started before sunrise.

The course begins with nearly four laps around the track at Washington University's Francis Field, heads up to Lindell Boulevard, then enters Forest Park at Union Boulevard. There it will make three laps of a circuit through the park, and wind up with a final sprint from The Muny to the World's Fair Pavilion.

"For spectators it's going to be phenomenal," Irwin said.

The aim of the Trials will be to get one to three women who break the 2-hour, 37-minute qualifying standard to send to the Summer Games in Athens.

ORIGINS OF THE 1000 FOOT (300 m) CALIBRATION COURSE

In the early 1980's a USA calibration course had a minimum required length of 800 m or 1/2 mile. Because of the layout labor involved, and the scarcity of handy straight roads of that length, few wanted to or could lay out a calibration course near the race course. It was not uncommon for people to travel 50 miles or more between an existing calibration course and the course to be measured.

The problem was discussed in *Measurement News* #2, 4, 7, 8, 13, 15. *MN* #21 contained a new policy. 300 m or 100 feet was allowed in limited cases. The limitations shortly disappeared, and 300 m or 1000 feet became the new US standard.

A strong part of the justification arose from a calibration experiment outlined in MN # 13. Data were presented in MN # 15. 9 responses were received from various measurers.

It was found that if a respondent had 10,000 counts per kilometre on an 800 m (1/2 mile) or 1 km calibration course, they would have about 9998 to 10,002 counts per kilometre on a 300 m calibration course.

On average, counts obtained at the various lengths were:

130 m to 200 m - 10000.26 counts per km 400 to 500 m - 10000.26 800 m to 900 m - 9999.97 10000 m - 10000

While this introduced an undesirable inaccuracy, it was small, and it was felt that the convenience of a nearby calibration course, although shorter than the former standard, balanced well with the slight difference in accuracy.

There was no clear trend as to whether people would obtain more or fewer counts on the shorter courses. The results were evenly balanced. This contrasted with our initial assumption that, because of "startup wobble," a person would get more counts per kilometre on a shorter course than on a longer one. This did not prove to be the case.

Data and calculations in support of the above are contained in an Excel file. Contact Pete Riegel if you want to do your own analysis.

Pete Riegel - riegelpete@aol.com



By the book

A marathon is an obscure definition of distance that course measurers strive to pin down to the tarmac. The re-publication of the IAAF handbook **The Measurement of Road Race Courses*** aims to help.

How do you know when you have just run a marathon?

Chances are, because the race organisers have told you so. But who told them? That's the job of the course measurer, a rare species of official seen mainly in the dead of night, mounted on a bicycle. On a bike, because that's the easiest way for them to cover the ground; at night, because it's a lot easier to do so when fewer cars are around to flatten them.

Back in 1924 it was accepted that a marathon is 26 miles 385 yards, later 42,195m. It made sense to fix it as some known distance, rather than allow it to remain an unspecified long distance of about 40km, but which had already been anything between 36km and 48km. But how to fix that distance on the Earth's surface?

In 240BC distance in Egypt was customarily measured as a number of days' journey. To convert to linear distance it was assumed that each day the caravan would travel 100 stadia (about 18.5km). The same principle has been applied in most measurement since.

A proxy measure is made, and then converted to distance on the ground by applying a known factor representing the relation between the two. Many people pace off distance by assuming the relation of one stride to one metre. The reliability of the assumption is crucially important.

If our stride length was consistent, we could very accurately tape-measure a piece of road between two fixed points and then count how many strides it took us to cover that same distance. We would then have an average measurement of one stride length. If we multiply this constant by the number of strides we take to cover any chosen route, the result will be the distance of that route.

This method was actually used by the 19th Century Indian 'pundits' in clandestine surveying of forbidden Himalayan lands, despite the difficulties of maintaining a standard stride in such mountainous terrain. There was also the difficulty of keeping count of the strides taken.



Winding roads use of full width of road



PK nail or permanent landmark —

Provided we are on roads and not in the Himalaya, a bicycle can be used to more accurately and easily achieve the same result. If we count the number of revolutions of the wheel from one end of our accurately measured 'baseline' to the other, we can convert revolutions of the wheel into linear distance.

This was the method used by the Road Time Trials Council of the British Federation of Cyclists to determine standard length courses over which they held time trials, and it was later adopted for official road race measurement.

A mechanical counter inserted between the front fork and wheel records numbers which, depending on the internal gearing of the counter, may amount to 20 or 23.6363 'counts' per revolution.

All that a has to be done is to ride the known, accurately-measured length of road to 'calibrate' the bike's wheel with counter readings, and then ride the road race course from start to finish. As the 'calibration' gives a number of counts per metre, the total counts for the road race course can easily be converted into metres to determine its length.

Using a bike has two other distinct advantages. Provided we sit steady in the saddle, we have a constant weight on the front (see illustration from book, right) wheel which maintains good road contact. It is almost impossible to do this with a surveyor's wheel. Secondly, a bike can be ridden along the "shortest possible route" that a runner can take along the course. Runners are free to cut tangents across the road to avoid running further than necessary; they can hug the kerbs at corners.

A bike can reproduce this ideal running line [see picture, above,

and illustration from book, bottom of page 30] so that it is impossible for any runner to have run a shorter course than that measured. Even the 'blue line' used for many marathons is only an indication of this shortest possible route – the equipment used to paint it on the road can't take the corners as close as a runner might, or a bike-borne measurer certainly will.

Using a mechanical counter also has two great advantages. As the normal wheel circumference is about 2.2m each 'count' registers about 9cm to 11 cm of road length. Electronic counters are 100 times less sensitive, registering only every 10m. Secondly, mechanical counters retract when the bike is wheeled backwards while electronic counters do not distinguish between forwards and backwards movement.

Despite the existence of this highly accurate and convenient 'calibrated bicycle' method of measurement, other inferior methods long continued in use. Derek Clayton's world marathon record in 1969 was set on a course officially measured using a car odometer, and subject to dispute ever since.

But if you ask the question point-blank: "How long was that course I just ran?", no one can give you an exact answer. There is no such thing as a perfect measurement. All measurement is subject to some error.

If we know what the error is, we can say that the distance measured is within a definite range: not less than x metres and not more than y metres. The error of the calibrated bicycle method is 1 in 1000, or 1m for every kilometre.

It is the x value that is of



Tracking you down from space

Adventure events have become increasingly popular, but until recently they were impossible to measure with any great accuracy.

Technological advances in GPS ('global positioning by satellite') equipment now allow constantly updated distance and pace measurement in cumulative and lap/split formats.

The GPS system makes use of two lightweight modules, one to talk to the satellites and one, a wristwatch, to store and display the information recorded.

Up to 10km, distance readings are given to 1m. Compared against short but accurately steel tape-measured distances, readings are reliably within 1-2m.

This system was used to measure each daily stage in the Augrabies Extreme marathon in South Africa (see Results section, p.7). Due to the rugged terrain over which this event is held [see picture] it had previously only been possible to estimate distances from large-scale maps. There seems real potential to use this equipment in measuring offroad events.

Moreover, it can be used while running, cycling or driving over a potential road race route to determine a preliminary layout.

Although only shower proof the system is also ideal for the measurement of triathlon and open water swim events, kayak, surf, ski and raft courses. It could become the standard for multidisciplinary sports, as it offers a single credible method of measurement.

Norrie Williamson

interest to us as runners. We don't want anyone to be able to suggest that our time could be unduly flattering because we didn't actually run quite as far as advertised. So 42,195m should be the minimum we could have run. Yet if our error is on the side of under-estimation of what is measured, we could have only run 42,153m - 0.1% less than 42,195m. To avoid this we factor in the error, effectively measuring out each kilometre as 1001m.

This way, by the time you get to the finish line, you know that you have just run at least a marathon.

* The Measurement of Road Race Courses is an instructional manual. If you are interested in becoming a course measurer, please contact the Editor.

From MNForum

OUT AND (ALMOST) BACK

I love measuring out and back courses - Pete Riegel tipped me off to the ease and beauty of such layouts. The split points generally line up in the same spot in both directions, a time can use one set of Chip mats for both the start and finish to produce net times, but best, one ride of the course satisfies the two ride requirement for certification.

However, I've always been a bit less sure about out and back routes that don't have a coincident start and finish. I measured one of these for a Thanksgiving Day 5 km race a few weeks ago.

The race organizers wanted to be able to set up the finish chutes before the race, and thus wanted the start line located 75 feet or so away, onto the course.

Determining the finish line I rode the course to the turnaround, noting splits (in reverse order) along the way. When I got to where the start should be, I put down a mark, took a reading, then rode to the finish, taking another reading. Then I turned around and rode back to the start, and took a final reading.

Even though I'd ridden every part of the course twice, it seems like I'm cheating somewhat, since in effect I rode the longer distance, then substracted the lesser of the two values for the distance from there to the start. Or am I just feeling unnecessarily guilty?

Jim Gerweck zgerweck@optonline.net

When you rode to the turnaround was it half of 75 ft passed the 2.5 km point? If it was then riding from the finish to the turnaround then from the turnaround to the start and then beyond the start to the finish line, making sure you recorded the number of counts, then you did ride the course correctly. I also assumed that you marked the splits from the finish to the start as you were riding. You do not have to check the splits twice but when you were 75 ft (why not use 25 m and keep everything in metric?) you could then start measuring up from 0 km as well as down from 5 km. When you turned around just record the splits again as you ride back to the start and on to the finish.

Bernie Conway measurer@rogers.com

I think I am beginning to see what the problem is: When you try to compute what distances your two discrete, measurements yield, it becomes unclear if you do, in fact, have two, discrete measurements. It would have been cleaner if you had done just what you did, except established the tentative start when you first came to it, 75 feet from the finish, and taken a reading there. Then your first measurement would have been the finish to the start, plus the start to the turnaround times two. Your second measurement would have been the turnaround to the start times two, plus the start to the finish.

Then again, maybe I'm confused.

David Reik davidreik@comcast.net

HOW FAR DID I RUN?

I ran the inaugural Big Sur Half Marathon yesterday (beautiful day, exceptional course). The out-and-back part of the course was closed to traffic in both directions, so as far as I could I ran the tangents, crossing lanes. The road was coned down the middle, which I assumed was for "facing traffic" runner control (which is exactly how it worked). Was I right to run the tangents, or should I have run in the lanes? As it happened, runners were in the opposite lanes from those we'd drive in, so if I'd have gone out in the right, I would have come back in the same lane. Please advise.

Jim Kornell jkornell@ucsbalum.net

The last 12 miles of the Philadelphia Marathon are similarly an out and back layout on Kelly Drive along the east bank of the Schuylkill River. If the road is coned doen the center line, I would assume it is measured to that point, and you should run that way.

On the other hand, I have a small 4 miler on July 4 that is out and back. I measured it using full road width SPR, even though I know the "facing traffic" runners will prevent most from following that route. It's simpler than coning and monitoring.

Jim Gerweck zgerweck@optonline.net

SHORT-COURSE PREVENTION FACTOR

Apologies in advance for posting a seemingly trivial question to the group but my question is: where did the value for the SCPF come from? Why is 0.1% chosen and not, say, 0.37% (as Jewell alludes to in his 1961 paper for a marathon course)? Does 0.1% reflect the precision of the JO counter or has it evolved from an arbitrarily chosen (and agreed upon) number?

Regards, Stuart gordonsj@vesta.curtin.edu.au

OBSTACLES

I measured two courses on Friday, taking advantage of the Indian Summer weather the East Coast has enjoyed. One course had several spots where the runners went up or down a curb to get on a bike path; the other had chains across the road to keep cars out (they'll be dropped for the race).

At the curbs, I simply rolled the bike up or down the curb, walking while straddling the bike. For the chains, I dismounted and pushed the bike under the chain, lifting it with my free hand.

Is there a better way of dealing with such obstacles? I seem to recall a method in an old issue of MN that involved some sort of offset procedure to deal with chains or gates.

Jim Gerweck zgerweck@optonline.net

How about locking the front brake when that wheel just touches the obstruction. Carry the bike around or over and place the back wheel against the obstruction before releasing the brake. One has to add the distance between axles, plus the diameter of the wheel, plus the thickness of the obstruction. Or am I wrong again? grin

Brian Smith clocker@charleston.net

For the offset, roll up to the obstacle like you did, in this case a curb and chain fence, note in some fashion where the back edge of your back tire is, pick the bike up while freezing the counter and place the front edge of your front tire where the back edge of the back tire was. Roll it forward to the obstacle. Pick the bike up while freezing the counter, set it down w/the back edge of the back tire against the obstacle (or where the curb line extends upward). Then get going. That's what I do. I figured this out on my own and it was confirmed at the 1990 measuring symposium in Columbus hosted by Pete who laid out a course with obstacles.

Scott Hubbard RUNNINGSHORTS@aol.com

Keep it simple. If you can slide the bike under the chains then why look for an offset manoeuvre? If you can't get under the chain or the chain is keeping a gate locked in a fence then you can ride up to the chain, lock the front wheel so the Jones counter doesn't move and move the bike back a full bike (plus thickness of chain or gate). Then roll the bike forward to the gate. Now lock the front wheel again and go around or over the chain to the other side. On the other side place the back wheel against the gate, then continue your ride. If you have a JOL and the distance to the nearest opening to get to the other side of the fence is large just disconnect the JOL at the axle and ride to the far side of the fence. Now reconnect the JOL and continue your measurement.

Bernie Conway measurer@ican.net

I think rolling up or down the curb is fine. For the chain or any other similar obstacle, here's one I learned at the Columbus seminar a bunch of years back: roll bike up until the front of the front wheel is at the obstacle (like the gate or chain). Note where the back of the front wheel is at that point. Now clamp brakes and move front of front wheel back one wheel diameter, and roll again to the gate or chain. Clamp brake again, now move bike around the obstacle, place back of front wheel against the gate (chain), and start off again. I wouldn't bother to do this if I could simply lift up a chain and proceed, though!

Bob Thurston Thurret@aol.com

PROFESSIONAL SURVEYING OF COURSES

I had a professional surveyor use EDM to lay out two identical distance calibration courses on both sides of a busy road two blocks from my house. The road was smooth, straight, and flat (rare for hilly Vermont), without any "undulations". I set nails in the ground at two catch basins so they would be easy to locate. On the other side of the road I started at one catch basin and the other end was not at a permanent mark (since it had to be the same distance). I measured both with a measuring wheel to make sure they were close. Then the professional surveyor came in and measured both courses. The first side of the road was 1,527.01' and the other side was 1,526.91' (can't get much closer with a wheel!). I simply added an extra nail 0.1' later on the second side and now I have two identical courses, 1,527' long, which allow for safe riding on either side of the street.

The key was to set things up ahead of time so that they didn't have to do too much work. Since it was easy, they did not charge our running club and considered it "volunteer work".

There are a couple catch basins between the endpoints of the course that the bike "bounces" over during calibration, but I can't imagine them making the course appear longer than an inch or two, certainly within all the tolerances. Even if my bike is riding longer than 1,527' it just means my race courses will be a little longer, the better side to err on.

One other reason why measuring wheels aren't used for certification: My wheel has been used for 10 years and several hundred miles of measuring. I measured 1,531' with the wheel for both sides while the EDM measured 1,527' for both. I also wheeled another calibration course and found a similar % error. Between wear and the "wobble" factor, my wheel measurements appear 0.2-0.3% short.

Steve Eustis Green Mountain Athletic Association measurer eustis@sover.net

EARLY THEORETICAL RESEARCH With Possible Adaptations to Race Timing

PARABLE By Benjamin Franklin

"How to make a STRIKING SUNDIAL, by which not only a Man's own Family, but all his Neighbors for ten Miles round, may know what a Clock it is, when the Sun shines, without seeing the Dial."

Chuse an open Place in your Yard or Garden, on which the Sun may shine all Day without any Impediment from Trees or Buildings. On the Ground mark out your Hour Lines, as for a horizontal Dial, according to Art, taking Room enough for the Guns. On the Line for One o'Clock, place one Gun); on the Two o'Clock Line two Guns, and so of the rest. The Guns must all be charged with Powder, but Ball is unnecessary. Your Gnomon or Style must have twelve burning Glasses annex't to it, and be so placed that the Sun shining through the Glasses, one after the other, shall cause the Focus or burning Spot to fall on the Hour Line of One, for Example, at One o'Clock, and there kindle a Train of Gunpowder that shall fire,one Gun. At Two o'Clock, a Focus shall fall on the Hour Line of Two, and kindle another Train that shall discharge two Guns successively, and so of the rest.

Note, There must be 78 Guns in all. Thirty-two Pounders will be best for this Use; but 18 Pounders may do, and will cost less, as well as use less Powder, for nine Pounds of Powder will do for one Charge of each eighteen Pounder, whereas the Thirty-two Pounders would require for each Gun 16 Pounds.

Note also, That the chief Expense will be the Powder, for the Cannon once bought, will, with Care, last 100 Years.

Note moreover, that there will be a great Savings of Powder in Cloudy Days.

Kind Reader, Methinks I hear thee say, That is indeed a good Thing to know how the Time passes, but this Kind of Dial, notswithstanding the mentioned Savings, would be very Expensive; and the Cost greater than the Advantage, Thou art wise, my Friend, to be so considerate beforehand; some Fools would not have found out so much, till they had made the Dial and try'd it.

Let all such learn that many a private and many a publick Project, are like this Striking Dial, great Cost for little Profit.

From Poor Richard's Almanac, '757.

USATF/RRTC CERTIFIED COURSE LIST

New Entries, November - December 2003

DISTANCE	COURSE ID	STA		COURSE NAME/RACE	m/km DROP	Pct SEP	ME	EASURER	REP	LACES
42.195 km	AL 03001 DL	DV	Birmingham	2004 Trials Marathon	1.9	34.6	R	Melanson	AL	02017 JD
1 mi	AL 03023 JD	Α	Florence	1 Mile Riverbottom Burnout	0.0	0.0	D	Michael		
10 km	AL 03024 JD	Α	Florence	Tennessee River Run 10k	-0.1	1.0	D	Michael		
5 km	AL 03025 JD	A	Oneonta	Covered Bridge Run	0.0	0.0	R	Melanson		
5 km	AL 03026 JD	A	Argo	Cross Point 5k	0.0	0.0	R	Melanson		
10 KM	AL 03027 JD	A	NIODIIE	Senior Bowl 10k	0.0	7.8 0.5	J	Olive		
10 mi		A	Birmingham	Hog Jog TU Mile Raleigh Ave 1000 ft Cal. Course	-0.2	0.5	R	Melanson		
Cal	AL 03029 JD	Δ	Tuscaloosa	University of Alabama 300 meters	0.0	100.0	P	Carroll		
10 km	AL 03030 JD	Ā	Tuscaloosa	Rickey Harrison Memorial 10k	0.0	0.4	R	Carroll		
42.195 km	AL 03050 PR	AV	Birmingham	U. S. Men's Olympic Trials Marathon	0.8	30.6	R	Melanson	AL	03001 DL
0.5 km	AZ 03015 GAN	А	Litchfield Park	Nardini Manor Loop	0.0	0.0	F	Cuda		
42.195 km	AZ 03016 GAN	Α	Phoenix	Rock & Roll Arizona Marathon	0.1	36.2	J	Galope		
21.0975 km	AZ 03017 GAN	A	Phoenix	Rock & Roll Arizona H-Marathon	0.6	72.5	J	Galope		
30 km	AZ 03018 GAN	A	Scottsdale	Desert Classic 30k	0.0	0.0	I T	Lablonde	. 7	00044 044
42.195 KM	AZ 03019 GAN	А	Mesa	valley of the Sun Marathon	2.6	14.9	I	Labionde	AZ	03011 GAN
21.0975 km	CA 03014 TK	A	Monterey	Big Sur Half Marathon Monterey	0.1	1.1	T	Knight	~	00005 014
Cal	CA 03015 IK	A	San Francisco	Fulton Street 1/2 mile	0.0	100.0		Knight	CA	83005 CW
10 KM	CA 03016 TK	A	San Francisco	Run to the Far Side 10k	0.0	3.1	T T	Knight	CA	87033 CW
21.0975 Km	CA 03017 TK	A	San Francisco	Home Depot S.F. Hair Marathon	3.0	14.3		Smith	C 1	02022 88
42.195 Kill 21.0075 km	CA 03044 RS	A	Santa Clarita	2003 Santa Clarita Half Marathon	3.3 6.5	30.0	D	Smith		02033 RS
21.0975 Kill 5 km	CA 03045 RS	A A	San Diego		-0.4	10.0	G	Rahill	CA	01074 KS
3.5 mi	CA 03040 RS	Δ	San Erancisco	LP Morgan Chase Corp. Challenge	-0.4	4.5	т	Wason		
Cal	CA 03048 RS	A	Marina	CSUMB 500 meter Calibration	0.0	100.0	M	Winitz		
21.0975 km	CA 03049 RS	A	Seaside	Monterey Half Marathon	1.0	1.0	M	Winitz		
Trck	CA 03050 RS	A	San Diego	USCSD 400 Meter Track	0.0	0.0	R	Letson		
10 km	CA 03051 RS	D	Los Angeles	Arden Energy Run 10k	0.0	1.0	R	Scardera	CA	03040 RS
5 km	CA 03052 RS	Α	Los Angeles	Arden Energy Run 10k	0.0	1.1	R	Scardera	CA	03051 RS
5 km	CA 03053 RS	Α	Los Angeles	Arden Energy Run 5k	0.0	2.2	R	Scardera	CA	03041 RS
5 km	CO 03023 DP	А	Denver	Race for the Cure	-0.2	18.0	А	Mabry	СО	02019 DP
Cal	CO 03024 PD	Α	Estes Park	Hwy. 36 Causeway 1/4 mile	0.0	100.0	J	Finley		
42.195 km	CO 03025 DP	Α	Estes Park	Estes Park Marathon	-0.1	1.0	Μ	Moore		
5 km	CO 03026 PD	A	Douglas County	Kids Cure at Inverness	0.0	2.0	В	Finken		
5 km	CT 03009 DR	Α	Waterford	Great Strides for Great Neck	0.0	6.0		Guido Bros		
5 km	CT 03010 DR	Α	Columbia	Columbia Autumn Classic	-0.5	12.0	D	Bolt		
5 km	CT 03011 DR	Α	Glastonbury	Apple Harvest Festival	0.2	3.0	D	Bolt		
5 km	CT 03012 DR	A	Hartford	Huck Finn 5k	0.0	7.0	Ρ	Hawley		
10 mi	CT 03013 RD	A	East Lyme	Mystic Places 10 Mile	0.0	0.4		GuidoBros		
42.195 KM	CT 03014 DR	А	East Lyme	Mystic Places Marathon	0.0	0.2		Guido Bros		
10 mi	DC 03031 RT	A	Washington	Army Ten Mile	0.2	4.4	R	Thurston		
1 mi	DC 03034 RT	A	Washington	Pennsylvania Avenue Mile	0.0	0.0	R	Thurston		
5 km	DC 03035 RT	A	Washington	Pennsylvania Avenue 5k	0.0	0.0	R	Thurston	5.0	
42.195 km	DC 03038 RT	A	Washington	Marine Corps Marathon	-0.4	1.1	R	Inurston	DC	02040 RI
5 km	DE 03001 MW	A	Dewey	Rusty Rudder 5k	0.0	0.0	D	White		
10 km	DE 03002 MW	A	Dewey	Rusty Rudder 10k	0.0	0.0	D	White		
5 km 5 km	DE 03003 MW DE 03004 MW	A	Wilmington	Dead Presidents Pub 5k Carelinks 5k	0.0 0.6	0.0 1.6	D	White		
5 km		Δ	- Ft lauderdale	APEL Aids 5k Run/Malk	-0.2	0.0	G	Witkowski		
5 km	FL 03037 DL	Δ	St Petershura	Race for the Cure 2003	0.2	9.7	F	McDowell		
10 km	FL 03038 DL	A	seaside	Trek for the Coast 10k	0.0	0.0	в	McGuire		
21.0975 km	FL 03039 DL	A	Tampa	HOPS by Tampa Bay H'Mar	0.0	3.5	Т	Ward		
5 km	FL 03040 DL	A	Ft. Lauderdale	Rotary Scholarship 5k	0.0	5.2	G	Witkowski		
20 km	FL 03041 DL	Α	Naples	Naples on the Run 20k	0.0	0.1	Μ	Sonneborn		
5 km	FL 03042 DL	Α	Weston	Rotary 5k	0.0	3.0	G	Witkowski		
21.0975 km	FL 03043 DL	Α	Weston	Rotary Half Marathon	0.0	0.7	G	Witkowski		
5 km	FL 03044 DL	А	Miami	Run for the Cure	0.0	0.0	G	Witkowski		
5 km	FL 03045 DL	Α	South Daytona	City of South Daytona 5k	0.0	0.4	Т	Ward		
Cal	FL 03046 DL	Α	Naples	Rordon 500 meter Calibration	0.0	100.0	M	Sonneborn		
5 km	FL 03047 D	A	Orlando Naples	City of Hope 5k Walk	0.2	1.4 1 2	Г М	Ward		
4 [1]]	ГL U3U48 DL	А	Naples	venetian village Gobble Gobble 4M	0.0	1.2	IVI	Sonnebom		
5 km	GA 03010 WC	Α	Alpharetta	Alphertta Mayor's Challenge	0.9	5.3	W	Cornwell		
10 km	GA 03011 WC	A	Alpharetta	Alphertta Mayor's Challenge	0.5	2.6	W	Cornwell		
8 km	GA 03012 WC	A	Savannah	Savannan Squares	0.0	8.5	C	Stratton	~	00047 14/0
42.195 KM	GA 03013 WC	A	Chickamauga	Chicamauga Battlefield Marathon	0.0	0.2	D	Presley	GA	99017 WC
iu mi	GA 03014 WC	А	Unickamauga	Cincamauga Battlefield TUMIIe	0.0	0.0	U	riesley		

DISTANCE	co	URSE	ID	STA	LOCATION	COURSE NAME/RACE	DROP	SEP	ME	EASURER	RI	EPI	ACES
5 km	IA	03014	MF	А	W. Des Moines	Halloween Hustle	0.0	32.0	м	Franke			
42.195 km	IA	03015	MF	A	Des Moines	2003 Des Moines Marathon	0.1	1.0	В	Lorenz	IA		03012 MF
5 mi	IA	03016	KU	A	Davenport	Scott Trot YMCA Turkey Trot	0.0	0.2	ĸ	Ungurean			
5 km	IA	03016	MF	A	Waterloo	Park to Park 5k	0.0	2.3	В	Lorenz			
21.0975 km	IA	03017	MF	А	Waterloo	Park to Park Half Marathon	0.0	0.5	в	Lorenz			
									_				
5 km	IL	03109	JW	A	Algonquin	Bear Run 5k	0.0	0.0	C	Hinde			02000 114/
5 KM	1	03110	JVV	A	Lincolnwood	Lincolnwood Turkey Trot 5k	0.0	1.2	J	Wight	IL		02098 JW
	1	03111	JVV	A	Lincolnwood	Lincolnwood Turkey Trot Tuk	0.0	0.6	J	wight	١L		01102 JW
Cal 5 km	1	03114		A	Clopyiow	Columbus Dr. 300 meter Calibration	0.0	100.0	J	Vignt			
5 KIII	IL.	03113	3.44	~	Gienniew	Tail Hees Turkey Hot	0.0	0.0	J	KIIDEUEI			
2 mi	KS	03055	BG	А	Wichita	River Run 2-Mile	0.0	0.1	С	Ensz			
10 km	KS	03056	BG	А	Wichita	River Run 10-k	0.0	3.0	С	Ensz			
40.405 lum		00047	00			Levieville Merethen	0.0	0.4		Mahaman		,	00040 00
42.195 KIII	R I	03047	PK	А	Louisville		0.0	0.1	Р	wanoney	R.	r	00049 PR
5 km	MA	03020	RN	А	Brockton	Fitness Forum 5k	0.0	2.8	R	Nelson			
8 km	MA	03021	RN	Α	Newton	Race to Stop Global Warming 8k	0.0	2.8	J	Kuo			
5 mi	MA	03022	RN	А	Boston	Ollie Road Race 2003	0.0	9.1	S	Vaitones	M	A	02020 RN
E km		02004	N 41 A /	^	Coorgotown	Due For Vour Llooth Fk	0.0	0.0	Б	\A/bita			
5 KIII Col		020001		A	Georgetown	Contonnial Lana 1000 ft Calibration	0.0	100.0		Ville	M		00010 18
Cai 5 km		03000	10	A	Columbia	Lehifoet Ek Bun	0.0	100.0		Lake	IVI	U	00019 33
12 105 km		03009	10	Δ	Baltimore	Linder Armour's Baltimore M'thon	0.0	0.3	к I	Lake Sissala	М		02015 19
21 0075 km		03010	10	Δ	Baltimore	Care First Half Marathon	0.0	3.4	J	Sissala	IVI	U	02013 33
5 km	MD	03012	JS	Â	Baltimore	Baltimore Marathon 5k	1.8	14.2	w	Diegel	м	D	02009 JS
5 km	MI	03019	SH	Α	Grandville	Rotary Race	-0.2	5.0	R	Dewey			
42.195 km	MI	03020	SH	Α	Detroit	Free Press/Flagstar Bank	0.2	1.0	S	Hubbard	Μ	I	02038 SH
5 km	MI	03021	SH	Α	Detroit	Compuware	1.6	5.0	S	Hubbard	М		02037 SH
5 km	MI	03022	SH	Α	Jenison	Reformation Run	0.0	1.0	R	Dewey			
5 km	MI	03023	SH	Α	Auburn Hills	Pace Race NY 5k	0.0	1.0	С	Rundell			
10 km	MI	03024	SH	A	Roseville	Big Bird	0.0	1.0	S	Hubbard			
5 km	MN	03030	RR	Δ	Minneanolis	Calboun Run	0.0	0.1	R	Recker			
5 km	MN	03033	RR	Δ	St Paul	Human Race	0.0	1.8	R	Recker			
8 km	MN	03040	RR	A	St Paul	Human Race	0.0	5.1	R	Recker			
5 km	MN	03041	RR	A	Falcon Heights	Fairgrounds	0.0	1.4	R	Recker			
5 km	MN	03042	RR	A	Minneapolis	Veteran's	0.0	6.0	R	Recker			
5 km	MN	03043	RR	Α	Moorhead	Jingle Bell Run	0.0	0.0	D	Summers			
								~ ~	_	<u>.</u>			
5 km	MO	03044	BG	A	Randolph	Ground Hog Run	0.0	2.0	В	Glauz			
TU KM	NO	03045	BG	A	Randolph	Ground Hog Run	0.0	1.0	в	Glauz			
5 KIII	MO	03047	BG	A	Kaylown Kapaga City	HISTORIC TTAIL	0.0	3.0	L .	Joline	N.4	\sim	02022 BC
21 0075 km	MO	03040	BG	~	Kansas City	Humana River Crown Plaza	0.0	0.5	1	Joline	M		02032 BG
12 105 km	MO	03049	BG	Δ	Kansas City	Humana River Crown Plaza	0.3	0.1	i	Joline	M		02043 BG
	MO	03050	BG	Δ	Springfield	Run for the Ranch 5k	0.0	0.0	P	Johnson	IVI.	0	02044 DO
21 0975 km	MO	03053	BG	A	Springfield	Run for the Ranch Half Marathon	0.0	0.0	R	Johnson			
42.195 km	MO	03054	BG	A	Springfield	Run for the Ranch Marathon	0.0	0.0	R	Johnson			
					5								
5 km	NC	03042	PH	Α	Cary	Inside-Out Sports Classic10k	-6.8	30.0	Ν	Wood			
8 km	NC	03042	PH	A	Cary	Inside-Out Sports Classic10k	-0.3	2.5	N	Wood			
10 km	NC	03042	PH	A	Cary	Inside-Out Sports Classic10k	-0.2	0.6	N	Wood			
5 KM	NC	03043	PH	A	Cary	Inside-Out Sports Classic Hillar	-6.8	30.0	N	VVOOd			
8 Km	NC	03043	PH	A	Cary	Inside-Out Sports Classic H Mar	-0.3	2.5	IN N	VVOOd			
10 Kili 10 mi	NC	03043	РП DU	A	Cary	Inside-Out Sports Classic H Mar	-3.1 1.6	9.0	IN N	Wood			
10 mi	NC	03043	гп	A	Cary	Inside Out Sports Classic H Mar	-1.0	12.0	N	Wood			
12 KIII 15 km	NC	03043	гп	A 	Cary	Inside Out Sports Classic H'Mar	-2.0	0.7	N	Wood			
20 km	NC	03043	DH	Δ	Carv	Inside-Out Sports Classic H'Mar	-0.1	4.5	N	Wood			
21 0975 km	NC	03043	PH	Ā	Carv	Inside-Out Sports Classic H'Mar	-0.1	0.3	N	Wood			
5 km	NC	03044	PH	A	Wilson	Imagination Y	-0.2	1.0	P	Hroniak			
5 km	NC	03045	PH	A	Greensboro	Women's Only 5k Walk/Run	-0.6	0.7	D	Forbis			
5 km	NC	03048	PH	A	Hickory	Catawba Valley Medical 5k	0.0	0.0	D	Joffe			
5 km	NC	03049	PH	A	Hickory	Hickory Race For the Cure	0.0	0.0	D	Joffe			
5 km	NC	03050	PH	A	Durham	Duke 5k Run	1.2	1.0	D	Forbis			
10 km	NC	03051	PH	Α	Greenville	East Carolina Road race	0.0	0.8	Ρ	Hronjak	N	С	01059 PH
5 mi	NC	03052	PH	А	Charlotte	Hit the Brixx Uptown	0.0	1.5	Т	Rhodes			
10 km	NC	03054	PH	А	Raleigh	Old Reliable Run	0.0	0.0	Ρ	Hronjak	N	С	01058 {H
42.195 km	ND	03053	PR	A	Bismarck	Bismarck Marathon	0.0	1.2	В	Bauman	N	C	91002 TB
5 km	N.I	03002	WB	А	Pine Hill	Pine Hill Education Foundation 5k	0 1	21	в	Belleville			
20 km	NJ	03002	LMB	A	Highland Park	Equinox 20k	0.0	1.8	D	Hoch			
5 km	NJ	03003	WB	A	Berlin	Berlin Parade 5k	0.0	0.0	в	Belleville			
21.0975 km	NJ	03004	DB	А	Jersey City	Liberty Waterfront Half-Marathon	0.0	0.0	D	Brannen			

DISTANCE	COURSE ID	STA		COURSE NAME/RACE	DROP	SEP	M	EASURER	REP	LACES
3 km	NJ 03005 DB	А	Jersev Citv	Liberty Waterfront 3k	0.0	0.0	D	Brannen		
5 km	NJ 03026 LMB	A	Toms River	Downtown Toms River 5k	0.0	1.9	L	Baldasari		
5 km	N.L 03027 LMB	A	Hoboken	Hoboken Pier A 5k 2003	0.3	7.6	P	Hess		
4 mi	NJ 03028 LMB	A	Kenilworth	The October Run	0.0	1.5	i	Baldasari		
4 mi	NJ 03031 LMB	A	Bernards Twp.	Bernards 4 Mile '03	-0.3	2.1	P	Hess		
5 km	NY 02045 AM	^	Now York	Page Page NV 5k	0.0	0.0	Б	Plomauist		
10 km	NY 03046 AM	A A	Amborst	2nd Brigado 10k Pup & Polay	0.0	1.9	B	Lackowski		
10 Kill	NV 02047 AM	~	Ningara Falla	Loff Costorling Ek Bun/Wolk	0.0	0.7	L L	Crondito	NV	07005 AM
3 KIII	NY 03047 AM	A	Niagara Falis	Jen Casternine Sk Run/Walk	0.0	0.7	J	Gianuits	INT	97005 AW
21.0975 Km	NY 03048 AM	A	Colonie	USING Toys for Tots 1/2 Marathon	1.9	/8.0	J	Gilmer		
5 KIII	NY 03049 AM	A	Binghamion	St. Gathenine's Church Sk	-0.4	3.3	v	Kelley		
5 Km	NY 03050 AM	A	Rivernead	Run for the Ridley 5km	0.0	0.0	G	Vvesterneid		
5 KM	NY 03052 AM	A	Buffalo	Olmstead-GBTC Parkway 5k	0.0	3.2	J	Felix		
10 km	NY 03053 AM	A	Buffalo	Olmstead-GBTC Parkway 10k	0.0	3.2	J	Felix		
10 km	NY 03054 AM	A	New York	NYRRC Run for Liberty 10k	-0.1	2.4	P	Hess	NY	02054 AM
2.5 KIII	NT 03055 AM	A	Hauppauge	Walter Harvey's 2.5K	0.0	0.0	G	westerneid		
5 km	OK 03029 BB	A	Tulsa	Veteran's Park Rental	0.0	0.8	G	Lafarlette		
1 mi	OK 03030 BB	A	Tulsa		-0.3	10.6	G	Latariette		
8 KM	OK 03031 BB	A	Tuisa	Run for Your Life - Tuisa	-1.9	3.8	J	Smith		
5 KM	OK 03032 BB	A	Bartiesville	vvoolaroc 5 km	2.0	8.0	G	Lafariette		
8 km	OK 03033 BB	A	lulsa	Hurricane Run	0.1	1.0	G	Lafarlette		
5 km	OK 03034 BB	A	Oklahoma City	GEICO Race for Freedom	0.0	0.0	J	Smith		
10 km	OK 03035 Bb	A	Oklahoma City	GEICO Race for Freedom	0.0	0.0	J	Smith		
5 km	OK 03036 BB	A	Sand Springs	Run 2 Remember	0.0	0.7	G	Lafarlette		
10 km	OK 03037 BB	Α	Claremore	Autumn Lake 10 km Run	-0.3	1.5	G	Lafarlette		
5 km	OK 03038 BB	Α	Claremore	Autumn Lake 5 km Run	-0.6	3.0	G	Lafarlette		
5 km	OK 03039 BB	А	Talihina	Walk This Weigh	0.0	0.7	G	Lafarlette		
5 km	OK 03040 BB	А	Sand Springs	Run 2 Remember (Alternate)	-0.2	1.2	G	Lafarlette		
5 km	OK 03041 BB	Α	Norman	KATTS Making Tracks - 2003	0.0	0.0	Κ	Hardwick		
5 km	OK 03042 BB	Α	Tulsa	Brookside Jingle Bell Run	0.0	2.5	G	Lafarlette		
8 km	OK 03043 BB	Α	Bridge Creek	May Day Run	0.0	0.0	J	Smith		
5 km	OK 03044 BB	Α	Oklahoma City	Race for the Cure - OKC	-0.2	3.3	J	Smith	OK	01030 BB
15 km	OK 03045 BB	Α	Ponca City	Groundhog Run	0.7	2.3	В	Baumel	OK	01025 BB
5 km	OK 03046 BB	Α	Tulsa	Brookside Jingle Bell Alternate	0.0	1.4	G	Lafarlette		
8 km	OK 03047 BB	Α	Tulsa	Tulsa Hurricane Run	0.1	1.0	G	Lafarlette		
Cal	OR 03006 LB	А	Mount Angel	Dream of Roses Marguam St 1000ft	0.0	100.0	в	Schmidt		
5 km	OR 03007 LB	А	Mount Angel	Dream of Roses5km	0.0	0.0	В	Schmidt		
10 km	OR 03008 LB	Α	Mount Angel	Dream of Roses 10km	0.0	0.0	В	Schmidt		
5 km	PA 03002 I MB	А	Philadelphia	The Great Fastern State Breakout	0.0	18	G	Hoopes	PA	00001 GAN
42 195 km	PA 03023 W/B	Δ	Philadelphia	Citizens Bank Philadelphia M'thon	0.0	0.3	R	Relleville	PΔ	01031 WB
-72.135 km	PA 03024 WB	Δ	Philadelphia	PDR 5k Classic - 2003	0.0	0.0	B	Bellovillo		02015 WB
5 km	PA 03025 W/B	Δ	Pitteburgh	Great Replacement Race 5k	_0.0	0.0	м	Courtney	17	02013 110
10 km	PA 03026 WB	A	Pittsburgh	Great Replacement Race 10k	-0.1	0.4	M	Courtney		
21 0975 km	RI 03005 RN	Δ	Providence	Ocean State Half Marathon	0 0	33	P	Nelson		
21.0375 KII		~	Trovidence		0.5	0.0	IX.	Neison		
5 km	SC 03021 BS	Α	Blythewood	Blythe Fest 5k	0.0	0.2	S	Blake		
10 km	SC 03022 BS	Α	Bluffton	Low Country Classic 10k	0.0	0.0	Μ	Desrosiers		
21.0975 km	SC 03023 BS	Α	Bluffton	Low Country Classic Half Marathon	0.0	0.0	Μ	Desrosiers		
42.195 km	SC 03024 BS	Α	Bluffton	Low Country Classic Marathon	0.0	0.0	Μ	Desrosiers		
42.195 km	SD 03051 PR	А	Brookings	Brookings Marathon	0.0	4.3	А	Stockholm		
21.0975 km	SD 03052 PR	А	Brookings	Brookings Half Marathon	0.0	8.7	А	Stockholm		
5 km	TN 03006 DJR	А	Smvrna	Sharp Springs 5k	0.0	10.8	т	DePaulis		
Cal	TN 03008 DJR	A	Nashville	Centennial Park 1000 ft. Calibration	0.0	100.0	Ĵ	Zeigler	ΤN	95018 RH
5 km	TN 03009 D IR	Δ	Nashville	Oktoberfest 5k Beer Run	_1 1	12.2	ŭ	Zeigler		
5 km	TN 03010 D IR	Δ	Chattanooga	Race for the Cure - LITC Course	-0.3	21	п	Preslev	TN	02026 RH
8 km	TN 03011 D IR	Δ	Johnson City	Fastern Fight 8k	-0.2	2.1	P	Young		02020 111
5 km	TN 03012 DJR	A	Cosby	Moonshiner 5k	0.2	2.7	Å	Morgan		
5 I	TV 00040 IF		A					-	T 1	00004
5 KM	TX 03016 JF	A	Austin	Komen Austin Race for the Cure	0.0	0.0	J	Ferguson		02021 JF
21.09/5 KM	1A U3U22 JF	A	Austin	Motorolo Austin Marathon/HMAR	0.0	00.00	J	Ferguson		
42.195 KIN	IA USUZZ JE	A ^	Ausuil Bound Darts	Resolution Pure 54	J.∠	41.4	J	Forguson	IX	03002 JF
5 KM	IA U3U23 JF	A		RESULUUT KUN 5K	0.0	0.0	J	reiguson	τv	
15 KM		A		Autumn Equinox 2003 15K	0.0	0.4	ĸ	ASIDY	IX	01042 EIM
8.4 km		A	Houston		0.0	1.2	E	NoDrayer	T V	
5 KM		A		IVIES OK Delleen Cheese E Mile Dure	0.0	2.0		NCDIayer	IX	02003 EIM
Im c		A	Dallas		0.4	2.0 0.5	ĸ	Ashby	τv	
		A	Dallas		0.2	0.5	r v	Ashby		
15 KM		D	Dallas		0.0	0.0	ĸ	Ashby		
30 KM		ں ^	Dallas	Dig D 2003 - SUK & ISK	0.0	0.0	r v	Ashby		
5 KII)	TX 02004 ETM	A ^	Dallas	Waterworks 25K/5K	-0.2	0.0	r ⊮	Ashby		01004 ETM
25 KIN	TX 02005 CTM	A ^	Dallas	The Long Pup	0.0	0.1	r v	Ashby	IX	01094 ETM
n mi	IV 02032 FIM	А	Dallas	THE LONG RUN	1.3	0.9	r	лышу		

DISTANCE	COURSE ID	STA	LOCATION	COURSE NAME/RACE	DROP	SEP	ME	EASURER	REP	LACES
5 km	TX 03095 ETM	А	Dallas	The Long Run	-0.6	2.9	к	Ashby		
5 km	TX 03096 ETM	А	Woodway	Leatherneck Run	0.0	2.0	Ρ	Vierzba		
10 km	TX 03097 ETM	А	Houston	Conoco Phillips Rodeo Run	-0.4	13.0	Е	McBraver	ΤХ	02099 ETM
5 km	TX 03098 ETM	Α	Houston	Down Town 5k	-0.9	26.0	Е	McBrayer		
1 mi	TX 03099 ETM	А	Irving	Runnin' Scared 5k & 1M	0.0	0.0	Κ	Ashby		
5 km	TX 03099 ETM	А	Irving	Runnin' Scared 5k & 1M	0.0	0.8	Κ	Ashby		
5 km	TX 03100 ETM	А	Arlington	You Go Girl 5k	0.0	0.1	Μ	Polansky		
21.0975 km	TX 03101 ETM	А	Dallas	White Rock Half-Marathon	0.5	2.8	Κ	Ashby		
1 mi	TX 03102 ETM	А	Dallas	Trek For Tech 5k & 1 Mile	0.0	0.4	Κ	Ashby	ΤХ	02095 ETM
5 km	TX 03102 ETM	А	Dallas	Trek For Tech 5k & 1 Mile	0.4	1.8	Κ	Ashby	ΤХ	02095 ETM
1 km	TX 03103 ETM	Α	Dallas	Back the Blue 5k & 1k	0.0	0.0	Κ	Ashby		
5 km	TX 03103 ETM	Α	Dallas	Back the Blue 5k & 1k	0.0	0.0	Κ	Ashby		
5 km	TX 03104 ETM	Α	Dallas	Big D (30k & 5K) Revision 2	0.0	0.0	Κ	Ashby	ТΧ	03089 ETM
30 km	TX 03104 ETM	Α	Dallas	Big D (30k & 5K) Revision 2	0.0	0.0	Κ	Ashby	ΤХ	03089 ETM
30 km	TX 03105 ETM	Α	Sugar Land	Houstonian Lite 30k	0.0	0.7	Е	McBrayer	ТΧ	97104 ETM
21.0975 km	TX 03106 ETM	Α	Dallas	Dallas White Rock H-Marathon	0.0	0.0	А	Beach		
5 mi	TX 03107 ETM	Α	Houston	Park to Park 5 Mile Run	0.3	64.0	Е	McBrayer		
Cal	TX 03108 ETM	Α	Brooks City-Base	Brooks City-Base 301.87meter	0.0	100.0	D	Blick		
10 mi	TX 03109 ETM	Α	Brooks City-Base	San Antonio RoadRunners 10 Miler	0.6	0.5	D	Blick	ТΧ	93087 ETM
Trck	TX 03110 ETM	Α	Hedwig Village	Memorial HS Track 399.667 meter	0.0	0.0	Е	McBrayer		
5 km	VA 03032 RT	Α	Fair Lakes center	Goblin Gallop 5k	0.6	7.8	R	Thurston	VA	94023 RT
5 km	VA 03033 RT	Α	Fairfax	PVI Runfest 5k	0.4	2.0	R	Thurston	VA	02020 RT
5 km	VA 03036 RT	Α	Fairfax County	Champions for Children 5k	0.2	2.0	R	Thurston		
5 km	VA 03037 RT	Α	Boyce	Blue Ridge Hospice 5k	3.1	48.0	Ν	Riemenschneider		
5 km	VA 03039 RT	А	Stafford	Park Ridge III 5k	0.0	0.6	V	Culp		
5 km	VA 03040 RT	Α	Arlington	Special Olympics 5k	-3.6	8.6	R	Thurston		
10.04048 km	VA 03041 RT	Α	Richmond	American Family Fitness 10k	0.0	0.0	Μ	George		
				-				Ū		
5 km	VT 03004 RF	Α	Winoski	St. Francis Stampede 5k	0.0	0.3	S	Eustis		
Cal	VT 03005 RF	Α	Essex Junction	West St. North 1527 ft. Calibration	0.0	100.0	D	Hamlin		
Cal	VT 03006 RF	Α	Essex Junction	West St. South 1527 ft. Calibration	0.0	100.0	D	Hamlin		
Cal	VT 03007 RF	Α	Essex Center	Chapin Rd. 1627.7 ft. Calibration	0.0	100.0	D	Hamlin		
42.195 km	WA 03008 BL	А	Richland	Welch's Tri-Cities Marathon	0.0	0.3	А	Dausman	WA	02015 BL
Cal	WA 03009 BL	Α	Steilacoom	Elmwood Dr. SW 451.05 meter Cal.	0.0	100.0	Т	Cotner		
21.0975 km	WA 03010 BL	Α	Tacoma	Pacific Rim Half Marathon	0.5	1.8	Т	Cotner		
12 km	WA 03011 BL	Α	Kirkland	The 12k's of Christmas	0.0	0.0	Т	Cotner		
Cal	WA 03012 BL	Α	Woodinville	168th Ave. N.E. 1320 foot Calibration	0.0	100.0	L	Albertson		
5 km	WA 03013 BL	Α	Woodinville	Woodinville Country Slough 5k	0.0	3.2	Т	Cotner		
10 km	WA 03014 BL	Α	Woodinville	Woodinville Country Slough 10k	0.0	1.6	Т	Cotner		
5 km	WA 03015 BL	Α	Redmond	FootZone 5k	0.0	7.4	Т	Cotner		
5 km	WA 03016 BL	Α	Seattle	Tom Wales Memorial 5 k	0.0	1.5	Т	Cotner	WA	02017 BL
21.0975 km	WA 03017 BL	А	Woodinville	Super Jock 'n Jill Half Marathon	0.0	0.4	Т	Cotner	WA	02016 BL
5 km	WA 03018 BL	А	Seattle	Seafair 5k 9 Seattle)	0.0	0.0	Т	Cotner		
5 km	WA 03019 BL	А	Vashon	Bill Burby Inspirational Run 5k	0.0	0.0	Т	Cotner		
10 km	WA 03020 BL	А	Vashon	Bill Burby Inspirational Run 10k	0.0	0.0	Т	Cotner		
5 km	WA 03021 BL	Α	Bellevue	Seafair 5k (Bellevue)	0.2	2.8	Т	Cotner		
21.0975 km	WA 03022 BL	А	Bellevue	Seafair Half Marathon	0.0	0.0	Т	Cotner		
42.195 km	WI 03112 JW	Α	Menasha	Fox Cities Marathon	-0.3	15.0	D	Moore	WI	01081 JW
21.0975 km	WI 03113 JW	Α	Menasha	Fox Cities Half Marathon	-0.6	30.0	D	Moore	WI	01085 JW
5 km	WV 03038 RT	A	Martinsburg	Fun In the Sun 5k	0.0	0.4	N	Riemenschneider		
5 km	WV 03042 RI	A	Parkersburg	Tony Cottrell Memorial 5k	0.0	0.0	J	Corra		
Banawad										
Keneweu										
5 km	CA 92027 RS	<u>۵</u> 03	Anahoim Hills	Anabeim Hills 5 km	-12	3.0	P	Scardera		
10 km	CA 03010 RS	A03	Anahoim Hills	Anaheim Hills 10 km	-0.6	1.5	P	Scardera		
	GA 92007 W/N	A03	Savannah	Foreyth Park Cal	-0.0	100.0		Stratton		
8 km	IA 03001 ME	A03	Des Moines	Drake Relays 8k	-0.8	6.6	M	Franko		
5 km	MN 89014 PP	ΔU3	Le Suer	Le Suer	0.0	3.0	R	Recker		
10 km	MN 80015 PP	202 202	Le Suer	Le Suer	0.0	21	R	Recker		
5 km		Δ03	Wrightsville Reach	Sea Side Shuffle	0.0	86	Δ	Linnerud		
5 km	NY 92027 AM	703 703	Ruffalo	Shea's 5k Run for the Arte	0.0	1.9	i.	Grandits		
5 km	OK 91034 RP	202 202	Porter	Peach Classic	0.0	1.0 ⊿ Ջ	Ģ	l afarlette		
Cal	SC 87002 W/N	203 203	Marion	Fast Northside Ave 2640 ft Cal	0.0	100 0		White		
Cai	00 07 002 WIN	, .00	manon		0.0	100.0		· · · · · · ·		
Mike	Wickiser - Course	Reais	strar							
2939	9 Vincent Road	egit								
Silve	er Lake, OH 44224	-2916								
Pho	ne 330-929-1605									

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A complete listing of USATF Certified courses is available at - www.RRTC.Net

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.

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ROAD RUNNING TECHNICAL COUNCIL

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