

MEASUREMENT NEWS

7 - DECEMBER 28, 1983

Measurement News is a completely unofficial newaletter that the Editor sends out to those listed on the back page of NRDC News as regional representatives, plus selected others. Nothing you see here is official. It represents only the opinions of the Editor, and some contributions from some of you.

I put out this newaletter because I want to get smarter about measuring and because I like to change wrong things into right things. Often I get them mixed up, so if you see something that's off base write to:

Peter S. Riegel, 3354 Kirkham Road, Columbus, OH 43221
614/451-5617 (home, not after 10)
614/424-4009 (work, 8 to 4:30)

In Measurement News I try to present at least a summary of everything that's sent to me. I want to keep this thing balanced, and not just a one-man soapbox. Occasionally I will print things with which I disagree.

If you, in reading this, feel that I have shortchanged your views or misrepresented your position, please let me know and the situation will be corrected.

Some people write and some people don't. I really treasure the letters I get from those of you in the former category. I did consider dropping from the MN circulation all those who haven't corresponded, because I want this thing to be a communication medium for all of us. I have decided to retain everybody, because I've been told that they do read it, even though all of them may not write. So if you haven't written, don't sweat it. You will stay on the list as long as you're a regional certifier.

This issue presents my view of how the new certification process might work. I have talked with several of you about this. Nobody has yet presented an overall view of the whole process. You will find a rough cut at it in these pages.

TED CORBITT - on the next page you will find some questions that would benefit from your thought and attention. I hope that you will clarify your position on these matters.

Tom Knight and Bob Baumel sent some interesting stuff showing how several measurers agreed when measuring the same course. This is valuable dope. I hope that others who have such information will share it. The more we know about our measurement process, the better it will be.

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If you can't read the next pages I'm sorry. I reduced the print a little to save copying and postage costs. Let me know if it's too wee to see.

Questions for Ted Corbitt

During the past year several technical questions have arisen that can only be answered by Ted, because he is the final authority. This is addressed to you, Ted, because nobody else can give the final word.

1) Short calibration courses - Letson, Baumel, Knight have all done experiments that show that short calibration courses will produce very slightly longer race courses. I have, in informal experiments, noted the same effect. The difference is small, but always in the direction of very slightly longer race courses.

As I understand it, a meeting was held last year with yourself, Allan Steinfeld and Tom Knight in which the subject was discussed. Short courses were not permitted. I heard of no technical reason given.

If short cal courses are allowed, this will encourage people to lay out cal courses close to the race course itself. This allows calibration and measurement to be done within a short time span, which promotes accuracy. It is legal, if not desirable, to transport the bike by car between cal course and race course. It would be better to have the cal course close by the race course, but because of the time involved in laying out a full-length course this is often not done.

Studies have convincingly shown that a course of 300 meters or 1000 feet would be of adequate length. Bob Baumel pointed out that a short course, in the hands of a sloppy measurer, will lead to error. This is true. But error will always result from sloppy measurement.

I think that short cal courses are a good idea, and that they will promote better measurement. I would like to see what you have to say on the matter. It may be that you have access to some technical data that we have missed. If the problem is political it should be remembered that we do not necessarily have to follow the lead of others in this matter, especially when we have something to gain (more accurate measurement, fewer short courses).

Please send me your thoughts on this matter and I will pass them on to the measurement brethren, or do it through NRDC News.

A Standard Measurement Tool

When courses are measured by different methods, different lengths result. EDM, steel tape, bike, measuring wheel will all produce slightly different results. There is often contention because a steel-tape measurement may not agree with a bike measurement.

This ambiguity can be eliminated if the calibrated bicycle is made our official measurement tool for courses. Courses can continue to be laid out by other methods, but it should be made clear that a check of course length (as in a validation measurement) will be done using a calibrated bicycle only.

The Governor's Cup marathon, in Montana, is a certified point-to-point course which has six miles of dirt road in it. I have no idea whether this six miles was steel-taped (twice!) but I do know that I would be unwilling to perform such a feat on a validation measurement. Following the SPR with a steel tape is extremely difficult, much harder than using a bike.

If the calibrated bike is adopted as the official measurement standard, then the remeasurer or validator will be able to do his job in a reasonable period of time, and will likely get the same results as the original measurer, as long as both measurers followed the SPR.

In other words, course length should be defined as that length which is obtained using the calibrated bicycle method and following the shortest possible route.

The issue of dirt sections of a course would then go away, because steel-taping of dirt would no longer be required. The validator will use a bike, and thus so can the original measurer.

Please think this over, Ted. It is not good to have several measurement techniques competing with one another. The steel tape and EDM should be reserved for layout of straight cal courses. The calibrated bike should be the official measurement technique for the courses themselves.

Remember, if somebody wants to use a steel tape or measuring wheel to lay out a course, he still can, but this does not require a validator to use anything but the calibrated bike to do an official check.

A Scenario to Imagine - A competent surveyor lays out a course using EDM on the tangents and standard, accurate surveying methods on the curves. He gets the course certified. A record is set. Tom Knight does a validation, and gets a different length for the course. Which is correct? The EDM procedure is certainly more accurate, given the errors inherent in both methods. But if we define course length in terms of bicycle measurement, we eliminate arguments about which is more accurate. It doesn't matter. In our system of measurement, the calibrated bike governs.

Ted - this question needs an answer. What is the standard of measurement against which we must compare?

DECENTRALIZATION OF CERTIFICATION

At the December annual TAC meeting, the possibility of decentralization of certification was discussed. See your last NFDC News. The reason for this is that courses will be coming in by the thousands this year. There is no way that Ted Corbitt, or anyone else, can examine all those measurements and certify them as accurate. Some of the work must be passed down the pyramid.

The following is a personal suggestion for how the new system might work:

People - There will be four basic kinds of people working within the new system. They are:

Registrar of Courses - This would be Ted Corbitt or his trusted help. The registrar will receive course summary data sheets from regional certifiers. He will sign them, assign each course a number. One copy of the course summary will go to NRDC, and one copy will go back to the regional certifier. The registrar will not be sent any course measurement information. That reviewing will be the responsibility of the regional certifier. If the registrar so desires, he can have the measurement information for any course upon request. In this way he can keep the regional people operating in accordance with the national standard.

Regional Certifier - These are the people listed on the back page of NRDC News. They will, in addition to measuring courses themselves, review measurements by other measurers in their areas. Good measurements they will approve. Bad ones will be sent back to the measurer for corrective action. Regional certifier will be responsible for the files and records relating to each course. If a validation measurement is required, it is to be expected that the regional certifier will have the records for the course in question. Approval of a course by the regional certifier will mean that the course is certified, although I think that certification notification should wait until the course has been approved by the registrar, and the certificate returned to the regional certifier.

Measurer - This is anybody who measures a course. Data from a measurer must be thoroughly checked by the regional certifier and not approved until it is right. In the communication between regional certifier and measurer education takes place. Anybody can be a measurer.

Trusted Measurer - This is a measurer who has demonstrated that he knows what he is doing. Once a regional certifier gets to know his measurers, some will be seen as better than others. The ones who consistently send in OK data will soon become trusted, and review of their data may become only cursory.

Decentralization - Cont.

Changing over to the new system will undoubtedly have its problems. Some of the regional people have loads they can handle, while others may fall under an avalanche of mail. There is much work to be done, and there are few of us.

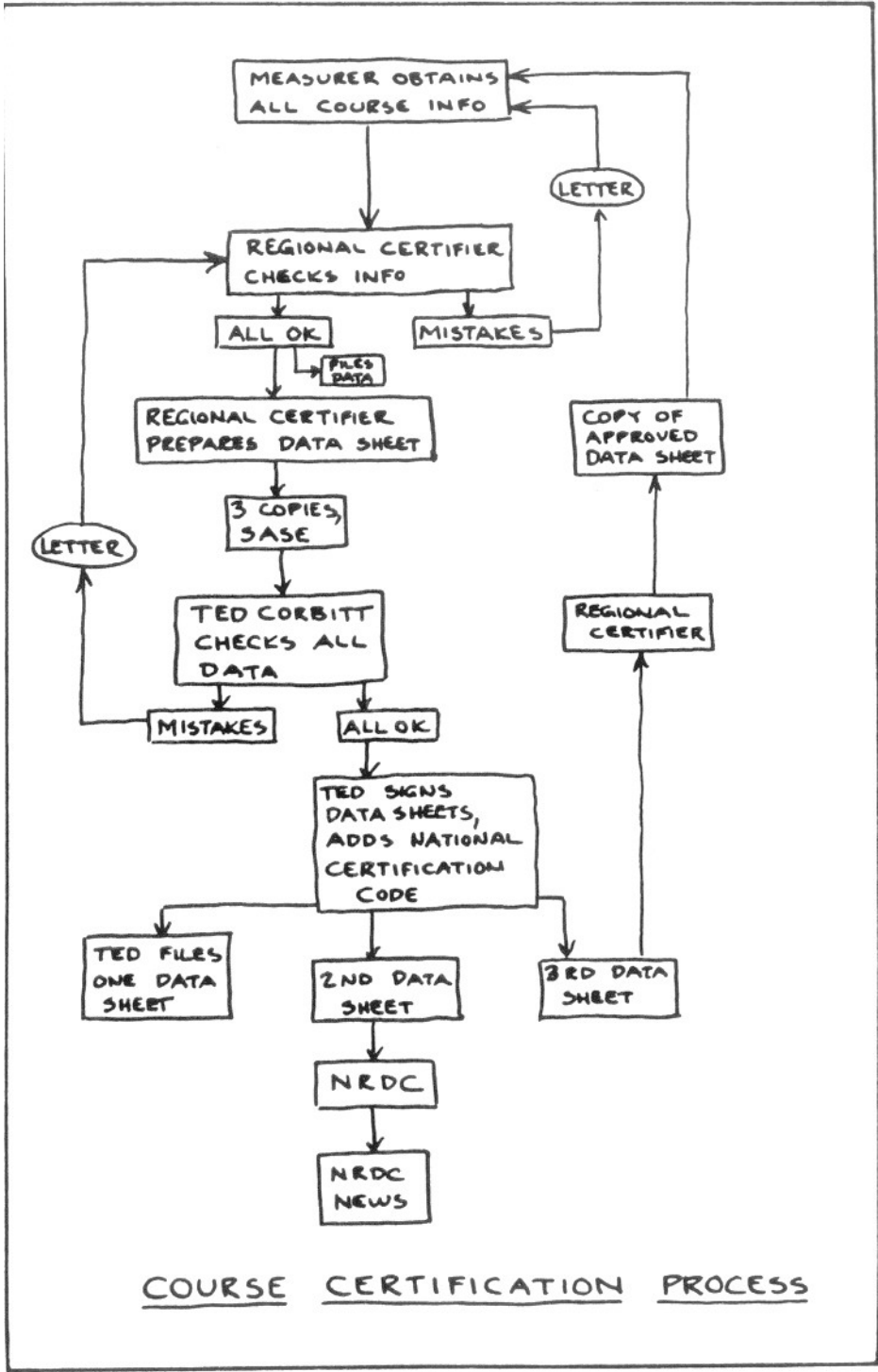
The important thing is for all of us, who may soon have the responsibility of certifying courses, to operate under the same standards, if not exactly the same methods. If we all dedicate ourselves to following the shortest possible route, and add the 0.1 percent, then we may use our own individual layout and calibration methods and still have courses that are properly measured.

David Katz points out, on this subject, that there is no difference in accuracy between the use of the "old" (two sets of marks) and the "new" (one set of marks, measured twice) methods, when they are properly executed. The difference lies in the ease with which the two methods may be put on paper for the purpose of review by a regional certifier. The new method is easier to check on paper. It is not inherently more accurate. So those regionals who are at ease with the old method, and have found some way to check their measurers' data, should not worry that the system is in some way inferior.

I have not seen measurement information from a course that was laid out using two sets of marks, other than my own early efforts before I changed over. If anybody out there has an example of a measurement (a good one) done by the "old" way I'd like to see it. I am uncertain what to ask for from a measurer who still does it that way.

Getting back to the growing pains of the decentralization, it is going to require more trust than the centralized way. As long as Ted could check every course himself he could be sure that the methods suited him. With decentralization he will not have the same certainty. He is stuck between a rock and a hard place. Some trust is bound to be abused. But the workload is more than one man can handle. Decentralization seems to provide the only reasonable answer.

If you have any thoughts on how the new system should work, send them to me. The new system is not yet set in stone, and any helpful suggestions will be welcome. There is much work, and few workers, and any way we can spread the burden while retaining high quality is the way to go.



COURSE CERTIFICATION PROCESS

PROPOSED COURSE CERTIFICATION PROCESS

The diagram on the opposite page shows how the new process might work.

All information starts with the measurer and ends with the publication, by NRDC, of the course as "certified".

The regional certifier will do all the checking, making the measurer do it until he gets it right. When it is right, the regional certifier will fill out a data sheet (see sample of data sheet, next page) and send three copies to Ted Corbitt, with an SASE for reply.

Ted will check the data sheet. If the regional certifier has done his work right there will be no mistakes. Ted will sign the data sheet and add the national certification code. He will file one data sheet, send one to NRDC, and return the third to the regional certifier.

The regional certifier will be responsible for maintaining a file of measurement data and course maps for each course he certifies. These may be needed in the event of a validation measurement.

If the workload in a given region is more than the regional can handle, he will have to figure out a way to make it bearable. Perhaps the region will have to be subdivided. Perhaps the regional will have to recruit a bright friend to help in the work. These are details to be solved.

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What you see across from this is not official. It is only one way that the problems of our present system may be solved. It may not be the best way to do the job, but it is one way that I think would work.

I am certain that Ted and TAC would welcome any other suggestions on how the certification work can be spread among those capable of doing it.

I hope that the changes that we've heard about really do happen. So far much is indefinite and vague. I am willing to help with this adjustment to our methods. I am sure others may be willing to help too. Let Ted know of your willingness, and maybe we can get things off the ground.

The Measurement Book - Ken Young is editing and coordinating a book about the proper techniques of measurement. Read your last NRDC News, then send Ken anything you've got that may help. The more he gets, the better the book will be.



NATIONAL STANDARDS COMMITTEE
TAC/RRCA



Course Certification

Name of Course: **COLUMBUS ZOO 5 MILE**
 Location: **POWELL, OH**
 Terrain: **SLIGHTLY ROLLING**
 Straight-line distance between start & finish: **1/4 MI**
 Altitude (feet above sea level) Start: **870** Finish: **870**
 Highest: **930** Lowest: **860**
 Measured by: **P. S. RIEGEL, R. B. BUCKNER, C. STARN**
 STARN: 1171 HARRISON AVE, COLUMBUS, OH 43201
 Measuring method: **CALIBRATED BICYCLE**
 Number of measurements of entire course: **THREE**
 Date of measurement: **JUNE 11, 1983**
 Exact length of course: **5 MILES PLUS 0.1 %**
 Distance between longest and shortest measurements: **6 FEET**
 Certification code: **OH 8325**
 * * * * *

Based on our examination of data provided by the above-named measurer, the course described above and in material submitted to us is hereby certified to fulfill national standards for accurate measurement. A copy of this certificate should accompany race results sent to the National Running Data Center, PO Box 42886, Tucson, AZ 85733. If any changes are made to the course, this certification is void until the change is measured and data submitted for recertification.

Peter S. Riegel
 Regional Certifier - Peter Riegel
 3354 Kirkham Road, Columbus, OH 43221

June 15, 1983
 Regional Certification Date

Ted Corbitt
 National Certifier - Ted Corbitt
 Apt 8H Sect 4, 150 W 225 St, NY, NY 10463

JUNE 10, 1983
 National Certification Date
FULL CERTIFICATION

Why Number a Course?

Part of the new certification procedure, as I see it, is the assignment of a unique number to each course. I see this as one way to reduce the ambiguity that exists when the 'Park City Run for Health' is run on the certified course of the 'Joe Wells Memorial 10k'. Some race directors may not even know the "official" name for their course, which is usually the name of the first race for which it was measured.

A course number may help NRDC keep the courses straight. Some of us are already issuing numbers. I've been doing it, and so have the West Coast People. If it's done on the national level, by the Registrar of Courses, no number duplication will occur. If we want we can still assign regional numbers, but the national course number will officially define the course.

It costs nothing, and it may help.

Course Upgrading - At the recent TAC convention, the consensus seemed to be that as of 1 January 1985 all courses not having full certification would have to be remeasured. A conversation with Tom Benjamin revealed that many West Coast measurers, not feeling at ease with the old one-meter rule, had, for years, been measuring a foot from turns. If this is the case, there seems to be no reason why the simple addition of 0.1 percent wouldn't make the course OK.

In cases where the one-meter rule was used, I suggested simply adding 0.2 percent. 0.1 of this would include the short course prevention factor, and the other 0.1 percent would account for one turn per kilometer of race course (the difference in course length being 1.1 meters for a 90° turn measured one foot vs one meter). Bob Letson suggests actually referring to the course map, and adding an amount that would depend on the number of turns actually in the course.

I personally do not have a lot of courses that may be a problem. However, for areas with a significant number of certified courses pre-1983, it would be nice if all of them did not have to be fully remeasured. Our resources are limited, and full remeasurement of these courses may take time that would better be spent on our current measurement and certification duties.

Looking at Measurement Data - A New Peek

A while ago Tom Knight sent a diagram showing how five measurements of the Cascade Run-Off 15k came out. I had never seen data presented in such a clear way. I sent off a copy to Bob Baumel, who was so interested that he diagrammed the measurements of the Tulsa 15k. Catching fire, I searched my own files for a race course that I could diagram. I came up with the Columbus Zoo 5 Mile, which was an example of a measurement in which the overall agreement was not good, but which was salvaged by the measurements of the course where the disagreement lay. Finally, the biggest data lode of all, the Olympic course measurement, was tapped to make a Knight diagram of 13 measurements.

Basically what Knight did was to plot how the measurement would have come out based on five different constants. All five measurements form a band within which the real length of the course probably lies. The five constants are:

- 1) the lowest constant obtained on any one calibration ride. This produces the longest course measurement.
- 2) the highest constant obtained on any calibration ride. This yields the shortest measurement.
- 3) the constant based on the first set of calibration rides
- 4) the constant based on the last set of calibration rides
- 5) the constant for the day. This produces the length that we consider "official".

Maybe some of you have seen this method of data presentation before. I haven't, so I'm passing it on. It is a fine way to look at measurement data. Everything is there.

I call your attention to Bob Letson's ride on the Olympic course. Note the extremely narrow span of his measurements compared to everybody else's. Bob used a solid tire, which does not expand very much with temperature rise, compared to pneumatic tires. *Note also the effect of underinflation, shown in Baumel's Tulsa ride.*

You will find the four Knight diagrams somewhere in these pages. If you have any examples of other courses that have been measured by several measurers you are cordially invited to diagram them and send them to me. We are always on the lookout for better ways to help us understand our measurement process.

Note that the probable length of a course lies between the lowest and highest diagrammed values only if the measurement temperature lies between the calibration temperatures. In many cases this is not so. Morning calibration at 65°, measurement at 75°, recalibration at 70° will produce a measurement value that is shorter than the real value (long course). Since measurement is usually done at a higher temperature than calibration this error, while undesirable, nonetheless leads to "safer" courses.

Short Course Prevention

We presently add 0.1 percent to our courses. This is supposed to prevent courses from being found short upon remeasurement. The only large-scale experiment which compared the abilities of many measurers was the Olympic marathon. Although all the measurements agreed within 0.08 percent, there was a clear tendency for some measurers to measure shorter than others. This is not surprising. Humans differ in their abilities.

On the Olympic measurement, the grouping was such that no person's measurement would have been found short by another person, once 0.1 percent was added. The system worked. However, what of less practiced measurers? I believe that they will not do as well.

Measurement theory agrees that no measurement is exact. There is error associated with any measurement technique.

If I measure a course at 10,001 meters, am I sure that the course is not short? NO. If I measure it at 9999 meters, am I sure that it is short? No again. For me to feel sure I would want at least a difference of 0.1 percent.

I have no quarrel with the escalating tightness of our measurement standard that will permit no shortness as of 1 Jan 1985. However, I believe that shortness must be defined in terms of the zone of uncertainty. If the measurement falls within the zone of uncertainty then shortness cannot be shown. Our Olympic data shows that the zone of uncertainty is around 0.05 to 0.1 percent. On a single measurement (typical of a validation) this zone of uncertainty must be taken into account.

The effect on us as measurers of the tightening is unknown. However, TAC and NRDC will have some courses judged short wrongly if the uncertainty of measurement is not taken into account. If too many courses are shot down the system will lose credibility. I think that if all courses were measured personally by us, who have an awareness of the importance of the Shortest Possible Route, then a straight 0.1 percent might marginally do for a rejection criterion. With many measurers of unknown capability doing the work, a fair percentage of courses are bound to fall close to the bottom of the region of doubt. Some of these may have records set on them.

If remeasurement says the course is 9999 meters, the only thing we can say for sure is that it is shorter than the intended 10,010 meters. It may well be slightly longer than 10,000 meters.

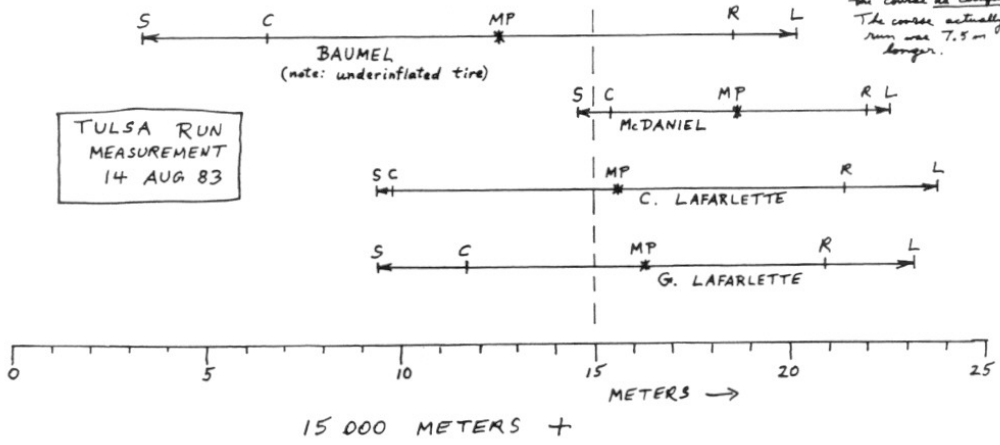
I hope that the criteria for rejection of a course is examined closely by TAC. It is certainly in their interest to do so.

FROM BOB BAUMEL

	S SHORTEST ¹	C USING CAL	MP MOST PROBABLE ²	R USING RE-CAL	L LONGEST ³	$\Delta = \frac{MP-15015}{15015}$
B BAUMEL	15003.4	15006.6	15012.6	15018.6	15020.2	- 0.016 %
J MCDANIEL	15014.6	15015.4	15018.7	15022.0	15022.6	+ 0.025 %
C LAFARLETTE	15009.4	15009.8	15015.6	15021.4	15023.8	+ 0.004 %
G LAFARLETTE	15009.4	15011.7	15016.3	15020.9	15023.2	+ 0.009 %

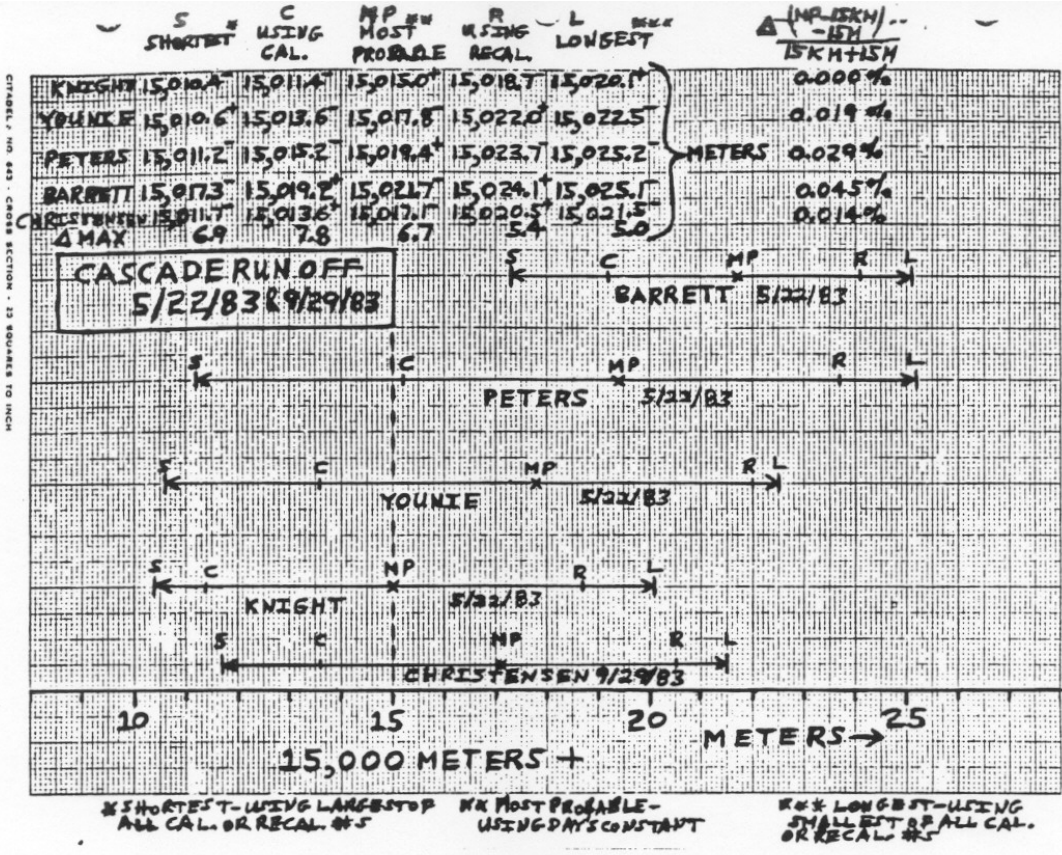
MEASURED DISTANCES IN METERS — INCLUDING TAPED ADJUSTMENTS FOR FINAL RACE COURSE (NOTE: COURSE ACTUALLY USED FOR RACE OF 29 OCT. 83 WAS ABOUT 7.5m LONGER THAN OUR FINAL ADJUSTED COURSE). ←

i.e. the measurements shown here are for the course as certified. The course actually run was 7.5m longer.



¹ SHORTEST - USING LARGEST OF ALL CAL. OR RECAL #'s.
² MOST PROBABLE - USING DAY'S CONSTANT.
³ LONGEST - USING SMALLEST OF ALL CAL. OR RECAL #'s.

From Tom Knight



CITADEL, NO. 43 - CROSS SECTION - 13 SQUARES TO INCH

COLUMBUS ZOO 5 MILE
11 JUNE 1983

S - BASED ON DAY'S LARGEST CAL COUNT
C - BASED ON AM CONSTANT
MP - "MOST PROBABLE" - BASED ON
CONSTANT FOR THE DAY
R - BASED ON PM CONSTANT
L - BASED ON DAY'S ~~SMALLEST~~ ^{SMALLEST} CAL COUNT



BUCKNER (INCL. BETTER OF 2 SIDES ON LAST 1.17 MI)



RIEGEL

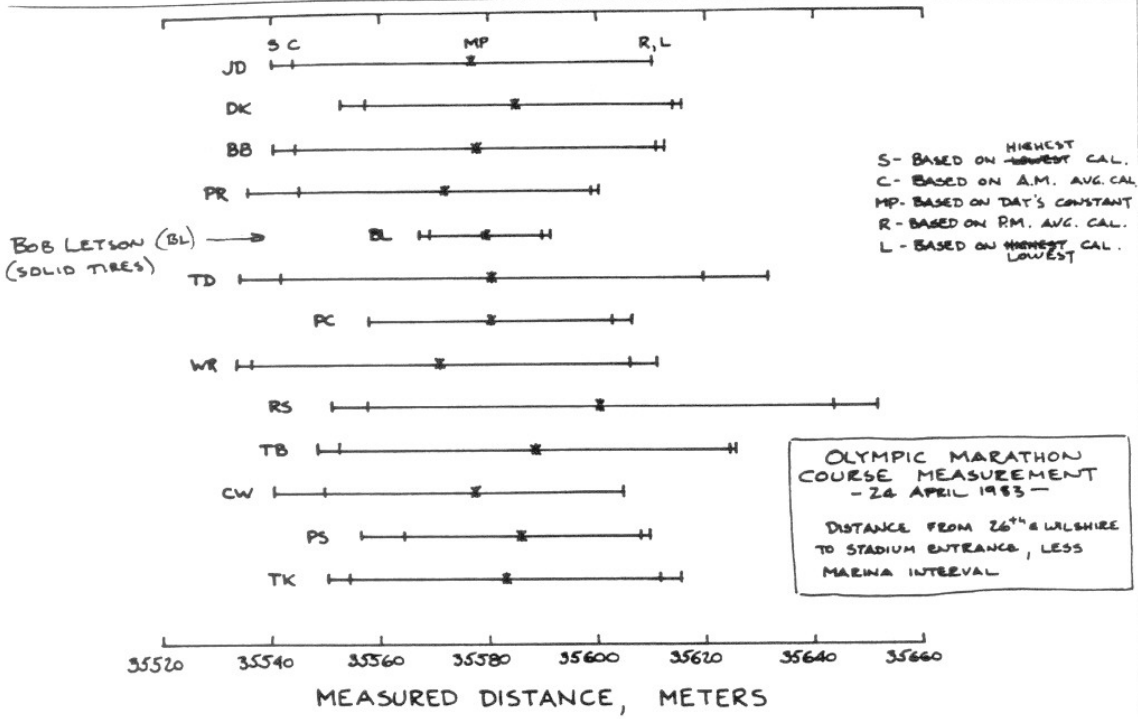


STARN (INCL. BETTER OF 2 SIDES ON LAST 1.17 MI)



MEASURED DISTANCE, METERS (LESS 5 MILES - 8046.7 METERS)

- ALL "MP" MEASUREMENTS OF FIRST 3.83 MILES AGreed WITHIN 2 METERS
- LAST 1.17 WAS MEASURED AGAIN. RIEGEL'S TWO MEASUREMENTS OF THIS INTERVAL ~~WERE~~ ^{WERE} USED, BECAUSE STARN & BUCKNER, WHILE IMPROVING ON THEIR FIRST MEASUREMENTS, STILL DISAGreed WITH RIEGEL BY 5-6 METERS, WHILE RIEGEL'S SECOND MEASUREMENT WAS IDENTICAL TO HIS FIRST.
- STARN'S MEASUREMENT OF THE FIRST 3.83 MILES, BEING THE MEDIAN, WAS USED.



PSC 12-22-83