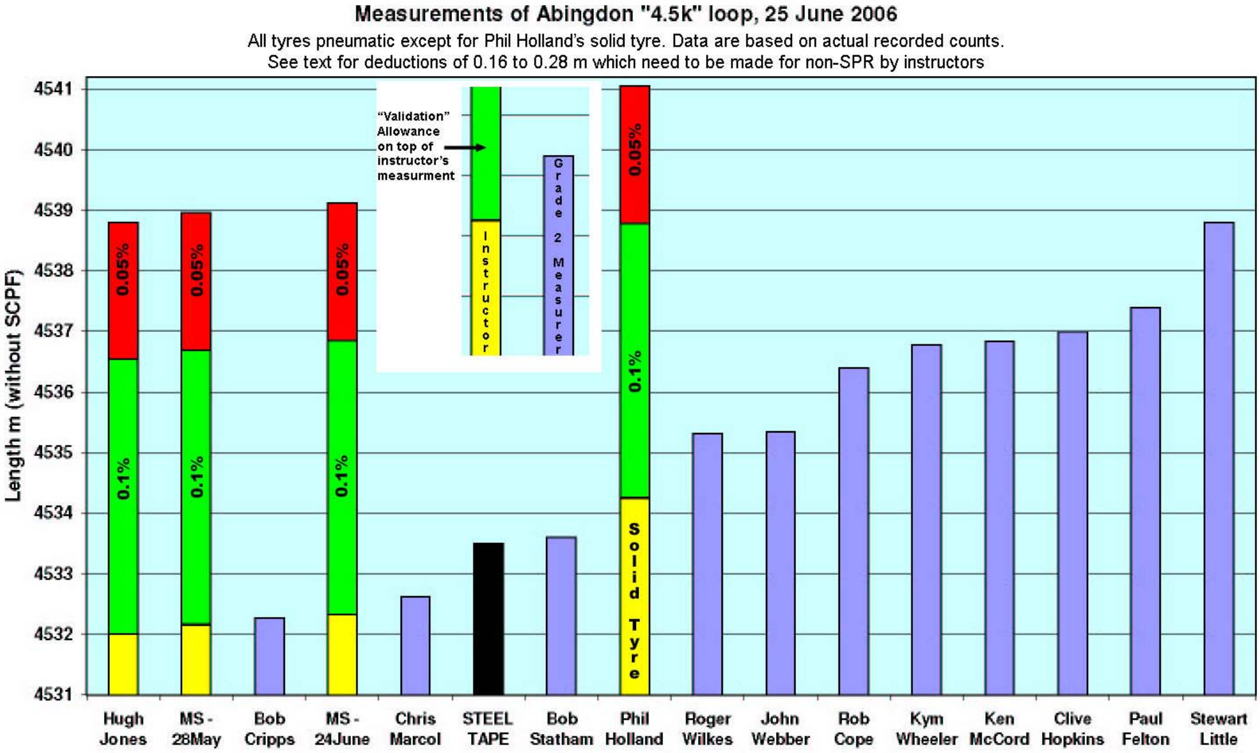
Report On UKA-MCAA-SEAA Course Measurement Seminar
held at Abingdon 25 June 2006 to Upgrade Measurers from Grade 2 to Grade 1.
Instructors: Mike Sandford, Phil Holland and Hugh Jones.

Eleven experienced grade 2 measurers in the Midlands and the South of England attended this seminar. Hugh Jones had arranged for some support from the UKA. The proceedings opened at 1100 with an explanation of course validation by Phil. This was followed by a practical exercise planned by Mike to validate previous measurements of a 4.5km loop in Abingdon obtained in 1997 and 1998 (see data in Annex 1). The results obtained are shown in Table 1, and are plotted in the following figure.



The 3 instructors deliberately diverted around cars parked in Berrycroft, but measured the extra added by their diversions. Mike measured an addition on 24 June of 0.16 m (an SUV at 12m distance - move out 2.1m to clear), Phil Measured 0.28m addition (a VW Golf at 8 m distance - move out 2.1m to clear). When Hugh and the grade 2s measured only the SUV at 12 m was present, and the addition then is estimated to be 0.16m. These small amounts need subtracting from their lengths shown in the figure above. For the grade 2s, some diverted and some offset. The choice between diversion and offset is discussed in the Annex 2. The above corrections are very small and so the results will be discussed here without applying them.

The previous 1997/8 results to be validated are shown in table 1 of annex 1. The largest result from 1997/8 set is 4535.1 m, but this value is without the SCPF, so if used to layout a course with the SCPF, the course would have been 4531.6 m. There is a second adjustment that needs to be made to the 1997/8 measurements – they include a diversion of 0.3m around parked cars. Subtracting this, the largest 1997/8 result becomes 4531.3 m. We can see from the figure above that all the 2006 measurements without the SCPF were longer than all of the 1997/8 measurements including SCPF. Therefore none of the 1997/8 courses were proved short. All passed validation by all the 2006 measurers.

The next test of the 2006 grade 2 measurers was to assess how their results compared with the grade 1 instructors. In the figure above we have shown a green bar 0.1% long on top of the instructors' results. A grade 2 getting a result smaller than the top of the green bar would clearly have had their measurement pass validation if they had laid out a course and included the SCPF. There are some differing views between the instructors about whether it would be appropriate to include a further 0.05% - the red bar - to allow for errors in the instructors' measurements. This point is discussed further in Annex 2, but it is clear that, while all the grade 2 measurements would pass validation by some or all of the instructors, about 6 of the grade 2 had results which were quite near the limit for validation. It was surprising that so many experienced grade 2 measurers should get such large values. There was some lively discussion about possible reasons: the favourite explanation being failure to follow the prescribed 30cm from the kerb on bends. But it also quite likely that there was some contribution from variation calibration constant on surfaces of different roughness. Technical aspects of these matters are discussed in Annex 2.

During the seminar Mike mentioned that he had measured most of the loop with a steel tape. Since the seminar this steel taping has been completed and a value has been obtained for the length of the course of 4533.2 m (if it had been measured with the same tape which had been used in 1991 to layout the 695.254 m calibration course on Long Tow). This steel tape value is for a measurement exactly along the SPR. The steel tape gives a result with in the range measured by the instructors, and confirms the conclusions in the paragraph above.

The seminar continued with an account by Hugh of his work in representing course measurement at the UKA's road running group. Hugh's view is that as the regions are reorganised, course measurement should look to have more activities centrally funded by the UKA, e.g. provision of counters on loan, and funding of joint regional seminars such as the present one. Hugh also mentioned his plans for a meeting of regional measurement secretaries in November, and encouraged all measurers to make their views known on any matter that they feel should receive national attention.

Mike mentioned the revamped website, and passed out a flier describing its contents. It presently serves mainly the South with course lists and course maps, but also has items of national use such as an on-line theory seminar for training new measurers.

The meeting concluded with a general discussion of topics brought up by the grade 2s. These included: measurement fees, legality of paint marks on the road, guidelines for allowable amount off road, wobbles on hills, steel tape accuracy.

The grade 2s dispersed at 1530, leaving the instructors to consider the outcome. It was concluded that this seminar was a more rigorous test than the simple validation of a routinely measured and certified course which had previously been applied for upgrading. Factors making this test challenging were:

1. A twisty course with the equivalent of 13 right angle corners in only 4.5km.
2. No opportunity for an initial familiarisation with more than part of the loop.
3. A single measurement rather than the best of two, which would apply for a real measurement.
4. Distracting presence of other riders.

A factor outside the control of the measurers is that there is still a slight variation in roughness across the Long Tow calibration course which still produces effects as described in Annex 1.

Nevertheless, the instructors were somewhat surprised that over half these good candidates for grade 1 had results close to the limit, and therefore thought it prudent to have a further validation done for a real course laid out by the measurer getting the longest result. With the strong expectation that this course will pass validation, the instructors considered that it would acceptable to upgrade the other 10 candidates with immediate effect, and to upgrade the 11th candidate after satisfactory validation of one of his courses.

Mike Sandford

2 July 2006

Annex 2 – the detailed technical considerations – is still in preparation and will be distributed later.

Participants in the UKA Upgrading Seminar – Abingdon 25 June 2006

From L to R: Phil Holland, John Webber, Mike Sandford, Stewart Little, Hugh Jones, Bob Cripps, Bob Satham, Chris Marcol, Kym Wheeler, Roger Wilkes, Clive Hopkins, Paul Felton (back), Ken McCord (front), Rob Cope.

TABLE 1. Data from Abingdon 4.5k loop rides 2006 upgrade seminar

Kym Wheeler	precal1	precal2	precal3	precal4	loop	postcal1	postcal2	postcal3	postcal4
finish	43377	51267	59139	67016	17764	25503	33425	41348	49277
start	35637	43527	51400	59277	67257	17764	25685	33607	41534
diff	7740	7740	7739	7739	50507	7739	7740	7741	7743
	precalconst	11,131.9		loop length (av cal)=	4,536.8	postcalcnst	11,133.7		
Rob Cope	**precal1**	**precal2**	**precal3**	**precal4**	**loop**	**postcal1**	**postcal2**	**postcal3**	**postcal4**
finish	61470	68430	75381	82382	27154	33975	40912	47886	54852
start	54649	61609	68560	75562	82650	27154	34091	41066	48031
diff	6821	6821	6821	6820	44504	6821	6821	6820	6821
	precalconst	9,810.4		loop length (av cal)=	4,536.4	postcalcnst	9,810.4		
Bob Cripps	**precal1**	**precal2**	**precal3**	**precal4**	**loop**	**postcal1**	**postcal2**	**postcal3**	**postcal4**
finish	23323	31821.5	40322.5	48820.5	3250	11821.5	20322	28823	37322
start	15000	23500	32000	40500	49000	3500	12000	20500	29000
diff	8323	8321.5	8322.5	8320.5	54250	8321.5	8322	8323	8322
	precalconst	11,969.5		loop length (av cal)=	4,532.3	postcalcnst	11,969.9		
Hugh Jones	**precal1**	**precal2**	**precal3**	**precal4**	**loop**	**postcal1**	**postcal2**	**postcal3**	**postcal4**
finish	89809	97618	5427	13235.5	64898	72807	80613.5	88421.5	96230.5
start	82000	89809	97618	5427	14000	65000	72807	80613.5	88421.5
diff	7809	7809	7809	7808.5	50898	7807	7806.5	7808	7809
	precalconst	11,231.7		loop length (av cal)=	4,532.0	postcalcnst	11,229.9		
Roger Wilkes	**precal1**	**precal2**	**precal3**	**precal4**	**loop**	**postcal1**	**postcal2**	**postcal3**	**postcal4**
finish	28347	35047	41747	48447	91960	98607	5337	12067	18797
start	21700	28400	35100	41800	48600	91960	98690	5420	12150
diff	6647	6647	6647	6647	43360	6647	6647	6647	6647
	precalconst	9,560.5		loop length (av cal)=	4,535.3	postcalcnst	9,560.5		
Ken McCord	**precal1**	**precal2**	**precal3**	**precal4**	**loop**	**postcal1**	**postcal2**	**postcal3**	**postcal4**
finish	68749	75480	82278	89038	32592	39259	46019	52779	59539
start	62090	68820	75620	82380	89140	32600	39360	46120	52880
diff	6659	6660	6658	6658	43452	6659	6659	6659	6659
	precalconst	9,577.4		loop length (av cal)=	4,536.8	postcalcnst	9,577.8		
Clive Hopkins	**precal1**	**precal2**	**precal3**	**precal4**	**loop**	**postcal1**	**postcal2**	**postcal3**	**postcal4**
finish	78149	86182	94202	2292	53920	61803	69899	77901	85917
start	70272	78304	86327	94415	2514	53926	62020	70023	78038
diff	7877	7878	7875	7877	51406	7877	7879	7878	7879
	precalconst	11,329.3		loop length (av cal)=	4,537.0	postcalcnst	11,331.5		
Stewart Little	**precal1**	**precal2**	**precal3**	**precal4**	**loop**	**postcal1**	**postcal2**	**postcal3**	**postcal4**
finish	7676	14339	21103	27779	71363	78016	84668	91454	98106
start	1022	7685	14450	21126	27930	71363	78016	84801	91454
diff	6654	6654	6653	6653	43433	6653	6652	6653	6652
	precalconst	9,569.9		loop length (av cal)=	4,538.8	postcalcnst	9,568.4		
Chris Marcol	**precal1**	**precal2**	**precal3**	**precal4**	**loop**	**postcal1**	**postcal2**	**postcal3**	**postcal4**
finish	85499	78698	71899	64998	21664	15000	8199	1399	94598
start	92100	85300	78500	71600	64700	21600	14800	8000	1200
diff	6601	6602	6601	6602	43036	6600	6601	6601	6602
	precalconst	9,495.1		loop length (av cal)=	4,532.6	postcalcnst	9,494.4		
John Webber	**precal1**	**precal2**	**precal3**	**precal4**	**loop**	**postcal1**	**postcal2**	**postcal3**	**postcal4**
finish	41678	48279	54880	61479	3872	10478	16980	23480	29980
start	35200	41800	48400	55000	61606	4000	10500	17000	23500
diff	6478	6479	6480	6479	42266	6478	6480	6480	6480
	precalconst	9,318.9		loop length (av cal)=	4,535.3	postcalcnst	9,319.6		
Paul Felton	**precal1**	**precal2**	**precal3**	**precal4**	**loop**	**postcal1**	**postcal2**	**postcal3**	**postcal4**
finish	40576	47297	54016	60746	4068	11017	17748	24457	31168
start	33970	40690	47410	54140	60950	4410	11140	17850	24560
diff	6606	6607	6606	6606	43118	6607	6608	6607	6608
	precalconst	9,501.9		loop length (av cal)=	4,537.4	postcalcnst	9,503.7		
Bob Statham	**precal1**	**precal2**	**precal3**	**precal4**	**loop**	**postcal1**	**postcal2**	**postcal3**	**postcal4**
finish	58658	65660	72659	79660	23426	30659	37361	44159	50861
start	52000	59000	66000	73000	80000	24000	30700	37500	44200
diff	6658	6660	6659	6660	43426	6659	6661	6659	6661
	precalconst	9,578.2		loop length (av cal)=	4,533.6	postcalcnst	9,579.2		
Phil Holland	**precal1**	**precal2**	**precal3**	**precal4**	**loop**	**postcal1**	**postcal2**	**postcal3**	**postcal4**
finish	49207	55979.5	62761	69530	12551	19116	25873	32651	39430.5
start	42644	49415.5	56197	62966	69740	12551	19308	26086	32865.5
diff	6563	6564	6564	6564	42811	6565	6565	6565	6565
	precalconst	9,440.8		loop length (av cal)=	4,534.3	postcalcnst	9,442.6		
MS - 24 June	**precal1**	**precal2**	**precal3**	**precal4**	**loop**	**postcal1**	**postcal2**	**postcal3**	**postcal4**
finish	27497.5	35103.2	42709.2	50316	99902.6	7509.2	15117	22725	30332.3
start	19893.4	27497.5	35103.2	42709.2	50316	99902.6	7509.2	15117	22725
diff	7604.1	7605.7	7606	7606.8	49586.6	7606.6	7607.8	7608	7607.3
	precalconst	10,939.4		loop length (av cal)=	4,532.3	postcalcnst	10,941.9		
MS - 28 May	**precal1**	**precal2**	**precal3**	**precal4**	**loop**	**postcal1**	**postcal2**	**postcal3**	**postcal4**
finish	70239.5	77950.5	85530.2	93110.5	142655.5	55660.5	63240.9	70822.2	78405
start	62658.8	70369.2	77950.5	85530.2	93238	48080	55660.5	63240.9	70822.2
diff	7580.7	7581.3	7579.7	7580.3	49417.5	7580.5	7580.4	7581.3	7582.8
	precalconst	10,903.2		loop length (av cal)=	4,532.2	postcalcnst	10,904.3		

Missing or corrected data are marked in yellow. Loop lengths in m are marked in blue, calculated from the average of the pre- and post- constants. No correction has been made for measured deviations from the SPR(see text).

ANNEX 1

Variation of Calibration Constant with Surface Texture, Part 2: Effects on Course measurements by Seven Riders using Twelve Tyres

By M.C.W.Sandford, 22 Stevenson Dr., Abingdon, OX14 1SN, UK. Email: m.sandford@lineone.net. 22 June 98.

Introduction

In Part 1 of this article which appeared in last month's ***MN*** 89 p 12, I reviewed the published data on the sensitivity of tyres to the surface texture. Here I will report measurements of a race course using different tyres. I will summarise the different behaviour of solid and pneumatic tyres. I shall also point out the circumstances which could lead to short courses.

Abingdon 4.5 km Course

Last September I needed a course for use during a measurement seminar for beginners. I chose a loop route which was moderately twisty and contained a number of features that would test adherence to the SPR. It can usually be ridden without encountering obstructions which would slow down measuring and could introduce additional error. The course is shown in figure 1. Part of the course lies along the South side of my Long Tow calibration course. This is the calibration course which I discovered gives me a calibration constant which varies according to whether I ride on the rougher surface near the edge of the road 0.3 to 0.5 m from the kerb, or where vehicles have worn a smooth track approximately 1.1 to 1.3m from the kerb, see ***MN*** 75 p36 and ***MN*** 89 p15.

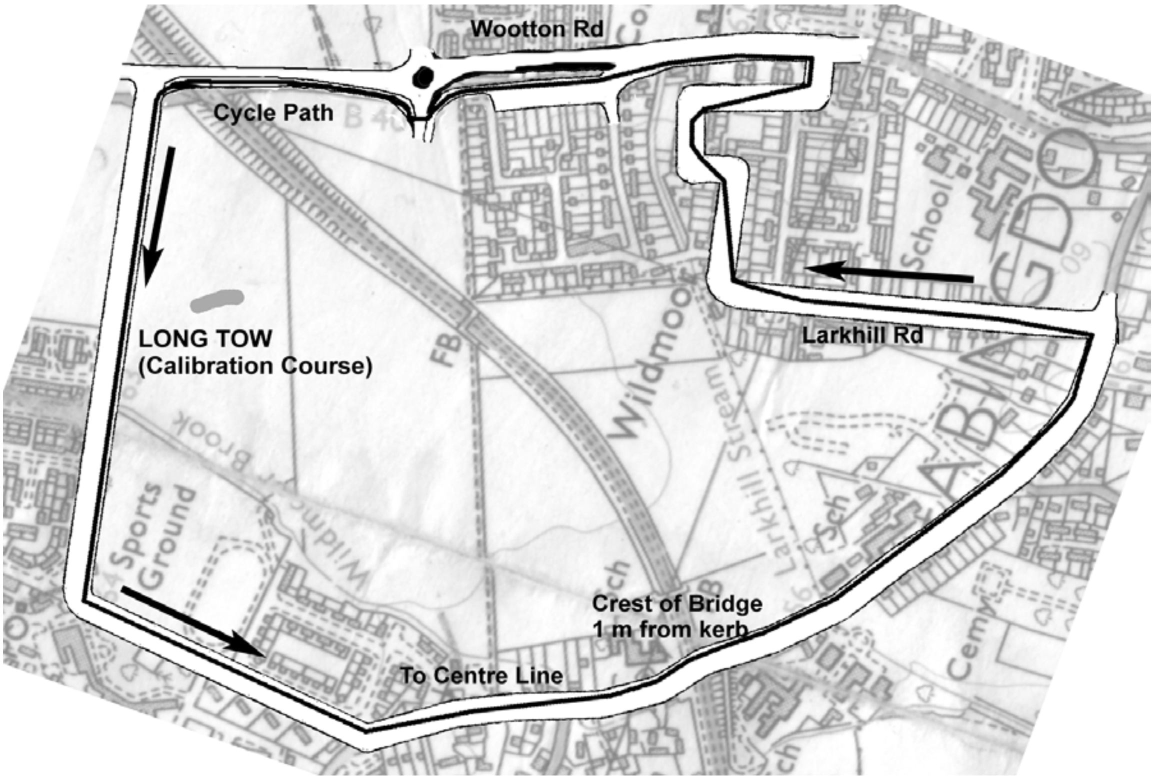


Figure 1. Abingdon 4.5k Course. The route is mostly 30 cm from the left hand kerb, except the full width is used along minor residential roads. A diversion round permanently parked cars is marked with white paint on the road.

My initial aim was to have a well defined course so that I could readily identify faults with beginners' measurements. But I then realised it could be used for a practical test of the importance of surface texture, since I could choose either the rough or smooth surface of Long Tow carry to out calibration and then ride the loop which has various surface changes throughout its length. I have the impression that the average roughness of the course is probably intermediate between the two Long Tow surfaces, but this is a hard judgment to make even qualitatively, since I have no way other than bike measurements of checking and so calibrating my eyeball judgments.

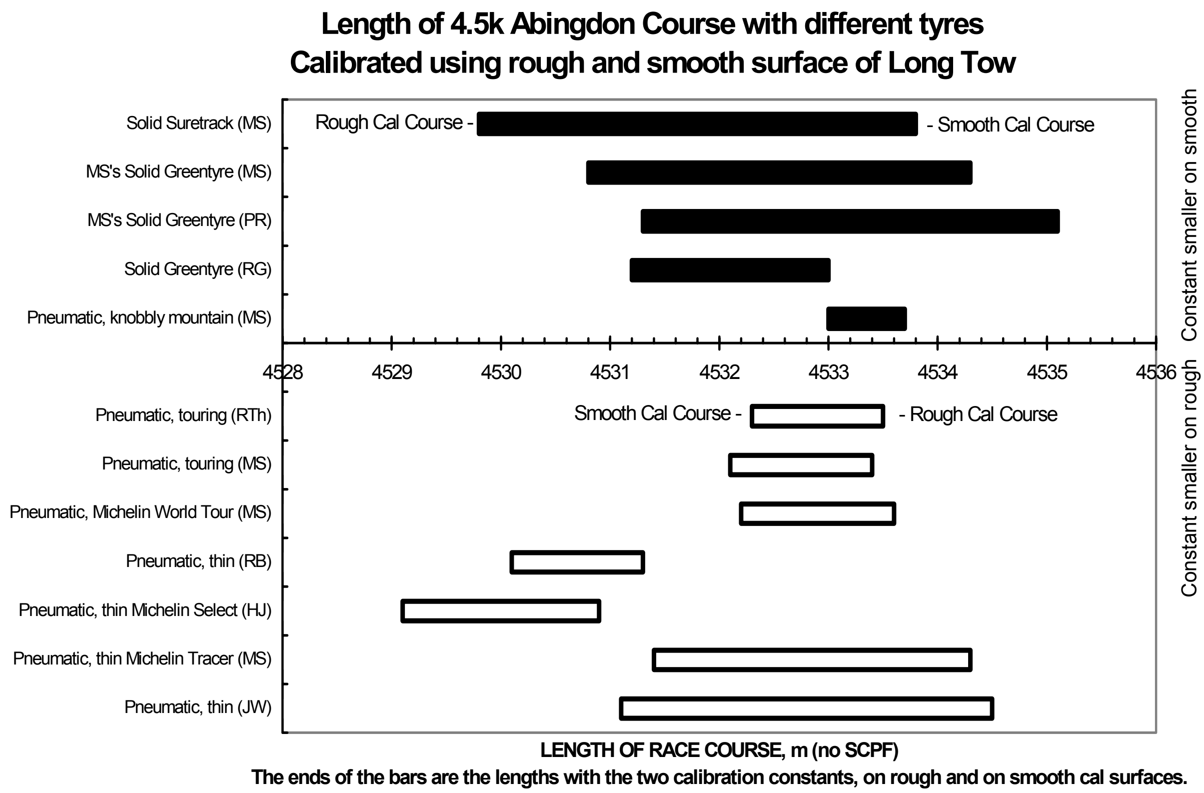
Since I wanted to study how different tyres behaved I carried out rides with six of different tyres. With each tyre my ideal full measurement sequence was as follows, 4 ride calibration on rough Long Tow, 4 ride calibration on smooth Long Tow, 2 rides of loop, repeat both calibrations. This sequence takes approximately 90 minutes to carry out. Sometimes I was only able to carry out one loop ride between the two pairs of calibrations variations. In these cases I always ensured I repeated the whole sequence on another occasion so getting a second completely independent loop measurement. For all my own rides I thus obtained with each tyre at least two and sometimes three rides of the loop with pre and post calibration on both Long Tow surfaces. The agreement between identical rides was typically better than 0.5 m, even for rides weeks apart. The average values are given in table 1.

In order to widen the range of tyres and to see if different riders would produce the same results, I had measurements made by the 5 experienced measurers who were attending an in-service training seminar on 13 September 1997, we carried out the sequence, 4 ride calibration on one surface of Long Tow, one ride of loop, a pair of 4 ride calibrations on both rough and smooth Long Tow surfaces.

Finally when Pete visited in April he and I both carried out a single ride of the loop sandwiched between two pairs of calibrations. On this occasion Pete used my bike and my solid Greentyre, thus providing a test to see to what extent the effects would be reproducible when only the rider was changed.

	RIDER	ROUGH	SMOOTH	DIFFERENCE
RG's Solid Suretrack	M.Sandford	4529.8	4533.8	4.0
MS's Solid Greentyre	M.Sandford	4530.8	4534.3	3.5
MS's Solid Greentyre	P.Riegel	4531.3	4535.1	3.8
RG's Solid Greentyre	R.Gibbons	4531.2	4533.0	1.8
MS's Pneumatic, knobby mountain	M.Sandford	4533.0	4533.7	0.7
RTh's Pneumatic, touring	R.Thornhill	4533.5	4532.3	-1.2
MS's Pneumatic, touring	M.Sandford	4533.4	4532.1	-1.3
MS's Pneumatic, Michelin World Tour	M.Sandford	4533.6	4532.2	-1.4
RB's Pneumatic, thin	R.Bright	4531.3	4530.1	-1.2
HJ's Pneumatic, thin Michelin Select	H.Jones	4530.9	4529.1	-1.8
MS's Pneumatic, thin Michelin Tracer	M.Sandford	4534.3	4531.4	-2.9
JW's Pneumatic, thin	J.Webber	4534.5	4531.1	-3.4

Table 1. Length m of Abingdon 4.5k course using the rough or the smooth part of Long Tow for calibration. The difference is the smooth calibration - the rough calibration.



Shortest Possible Route

I estimate the course has 3 full 360 degree of turns. So if every corner is ridden an *average* of 5 cm inside the SPR the course will be measured short by 1 m. Conversely, if the rider is on average 5 cm outside the SPR, the course will be measured long by 1 m. This total range of +/- 5 cm from the SPR may seem rather small, particularly in relation to the tyre width of 3 cm, but I believe it is realistic for the following reasons:

It is the average kerb clearance which causes an error in length. Superimposed on the average kerb clearance may be larger 'wobbles' of up to +/- 15 cm which will have little effect provided they are also present in the calibration course riding.

The course mainly had sharp corners. The experienced measurers took great care round these corners. At other places since the total curvature was less, errors in kerb clearance were less important.

On most corners the 30 cm distance from the kerb could be judged by reference to a 25 cm wide concrete gully. The bikes were ridden just outside this concrete. On some corners where there was no gully I marked the line with a lumber crayon. Although the experienced measurers had only one measurement ride round the loop. I showed them the critical points before their ride, and accompanied them to provide guidance and observe their performance which appeared very good.

My own rides were reproducible with a standard deviation of less than 0.3 m. While this does not by itself prove that I ride the correct SPR, it shows the variation of my route is insignificant.

My overall conclusion is that when comparing my rides, one with another, SPR errors are significantly less than 1 m. When comparing rides of different experienced measurers, errors of 1 m are possible and 2 m is probably the upper limit. This is confirmed by the rides of PR and MS, which agreed within 0.8 m when using the same solid Greentyre. Most of the differences which were seen between pneumatic and solid tyres were undoubtedly due to surface texture affecting the calibration constant.

Conclusions about Tyres

In Table 1 the tyres are ordered by the difference of course length with smooth surface calibration - course length with rough surface calibration. All the solid tyres have a positive value of 1.8 to 4 m for this difference. Only one pneumatic tyre has a positive value, the knobbly mountain tyre which has a value of 0.7 m. I note that the thick tread of this tyre may have some of the characteristics of a solid tyre.

By contrast all the pneumatic tyres have a smaller value for the difference than any of the solid tyres. In fact except for the thick tread mountain bike tyre they all have negative differences between - 1.2 and - 3.4 m. Further data is needed to identify the reason for the slightly different behaviour of the different pneumatics. It is possible that thickness of the tread on the pneumatic, which could give it properties like a solid tyre may be balanced against properties of the pneumatic which arise from the tyre casing being stretched by internal air pressure. I hypothesise that the stretched casing will give a negative value for the difference in my experiment. But when a pneumatic tyre is has thick tread the effect of the solid rubber just outweighs that of the pneumatic casing giving a difference of + 0.7 m. But for the two touring tryes which have a tread a few mm thick the pneumatic effect is dominant giving a difference of - 1.3 m. Perhaps a tyre with intermediate tread thickness would be independent of surface roughness.

Of the pneumatic racing tyres which do not have much tread, two give large negative values which fits the hypothesis. The other two give smaller differences also the overall lengths are 2 to 3 m shorter than the other pneumatic tyres. This is not explained by my hypothesis and needs further study.

Conclusions about Courses

The most serious problem which this work shows is that with the modest but noticeable difference in roughness of the Long Tow calibration surface 0.9 m further towards the centre of the road, the length that an experienced measurer gets for a course can vary depending on tyre and surface from 4529.1 m to 4534.5 m a range of 5.4 m when the SCPF is 4.5 m.

We should minimise the consequences of these effects by always using a calibration course that is representative of the average surface of the course to be measured. Sometimes this might best be done by laying a calibration course out on the actual race course. Secondly we should pick a tyre which is not sensitive to surface. Some pneumatic tyres appear to be superior in this respect to solid tyres and other pneumatic tyres. Thirdly, until we can fully quantify these effects, validation is probably better done using the same calibration course surface as for the original layout. It would be unfortunate if surface texture contributed to a course failing validation.