



**INTERNATIONAL ORIENTEERING FEDERATION
TRAIL ORIENTEERING COMMISSION**

TECHNICAL NOTE 08/03 (Research Paper)

ANALYSIS OF TIME CONTROLS THROUGHPUT AT WTOC 2008

Background

The increasing participation in WTOC (further enhanced from 2009 with changes to the team competition) is generating concerns about competitor numbers exceeding the limit that the event can handle in its present format.

For example, with a starting interval of 2 minutes, a total of 120 starters and a course time of 3 hours (comprising a competition time of up to 2½ hours plus another ½ hour for pre-start to start, pre-finish to finish, including time control procedures) add up to a first start to last finish of about 7 hours. Given that the last finishers on the second day will include the winner and that additional time is required to confirm the results for the medals ceremony, it appears that the figure of 120 starters is a limit, if the start interval is at 2 minutes. On current trends this number limit could be realised soon.

There has been discussion about the possibility of increasing permissible competitor numbers by reducing the start interval, perhaps to 1 minute. The pinch points on the course are the time controls, which process one competitor at a time. It has been theorised that, although the maximum time a competitor has in making a choice is 1 minute, the average can be much less and, with reasonably efficient marshalling, a start interval of 1 minute might be possible.

The opportunity was taken to investigate this suggestion by recording times as competitors passed through time controls on Day 2 (the golf course) at WTOC 2008 in Olomouc.

Véska Golf Time Controls

There were three in all, the first two before the Start and the third embedded within the course. This timing exercise was conducted at the first two only.

TC1 was in a lay-by alongside the road leading past the golf course. Pre-start to TC1 was about 200m with moderate gradient (climb about 12m). The holding point, where competitors waited to be called forward, was about 15m from the tent.

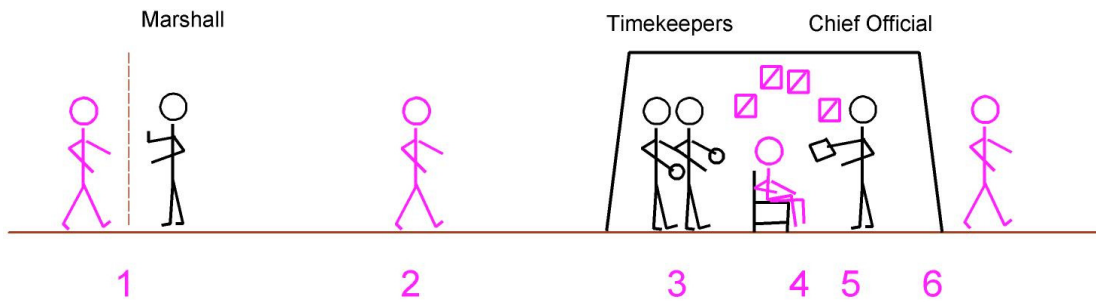
TC2 was in the golf course just below the highest point reached by the competitors. TC1 to TC2 was about 300m with reduced gradient (climb about 12m again). The holding point was about 25m from the tent.

The competitors maintained start order as they proceeded through the two time controls.

Time Control Procedure

The officials at all three time control were well practised and conducted the time control procedures with near perfect efficiency.

The procedures were as follows:



1. Competitor arrives at holding point, from which control flags cannot be seen, and waits to be called.
2. Competitor called forward to tent (~15m to TC1, ~25m to TC2).
3. Competitor hands control card to timekeepers and sits in chair (wheelchairs positioned in place of chair).
4. Chief official obscuring view of flags moves aside, points out the number of flags and hands map to competitor.
5. Competitor views flags and gives decision by voice or letter board.
6. Officials record decision and time taken, return control card, release competitor and call up next competitor.

The total time taken from call forward to release (2 – 6) was recorded, plus any waiting time (1).

Of the total time, that due to the officials (3, 4 & 6) was consistent at about 15s. Of the total time, that due to the competitors (2 & 5) was variable. One or two competitors, having found the climb difficult, took considerably longer than the average 15s and 25s to walk forward. Decision times varied considerably.

The observations are given in Table 1. The TC1 timings were of competitors in the first half of the start list. Those for TC2 were in the second half, the last timing representing the last starter.

The average total times of 1m 12s and 1m 13s show that the extra walk-in time for TC2 was offset by quicker decision making at that control.

The waiting times for TC1 were few and reasonable, being caused by ambulant competitors with mobility difficulties. The long total time, in red, was due to a competitor attempting to have his recorded decision changed.

The waiting times for TC2 were more numerous and longer, due to TC1 increasing randomness. Occasional extra delay was caused by the TC team deciding they had to adjust the fabric of the flags following wind disturbance. These extra delays are highlighted yellow.

Table 2 shows the predicted waiting times at TC1, had the start interval been 1 min.

TC1					TC2				
Arrival	Wait	Called	Depart	Time	Arrival	Wait	Called	Depart	Time
48.05	0.56	49.01	50.28	1.27	04.41		04.41	06.11	1.30
50.28		50.28	51.15	0.47	04.48	3.47	08.35	09.44	1.09
51.53		51.53	53.15	1.22	06.40	3.04	09.44	10.49	1.05
55.20		55.20	56.46	1.26	08.34	2.15	10.49	11.54	1.05
55.54	0.52	56.46	57.55	1.09	10.04	1.50	11.54	13.03	1.09
57.55		57.55	58.42	0.53	12.32	0.31	13.03	14.13	1.10
59.53	0.02	59.55	01.00	1.05	15.15		15.15	16.27	1.12
02.08		02.08	03.50	1.42	18.18		18.18	19.18	1.00
03.50		03.50	05.23	1.33	19.43		19.43	20.55	1.12
06.02		06.02	06.57	0.55	20.00	0.55	20.55	22.30	1.35
10.24		10.24	12.25	2.01	20.15	2.15	22.30	24.04	1.34
12.00	0.25	12.25	13.32	1.07	24.17		24.17	25.21	1.04
13.00	0.32	13.32	14.50	1.18	31.10		31.10	32.37	1.27
15.02		15.02	16.30	1.28	31.50	0.47	32.37	34.15	1.38
16.30		16.30	17.45	1.15	31.50		34.15	35.22	1.07
18.16		18.16	19.46	1.30	34.31	0.51	35.22	36.33	1.11
22.31		22.31	23.33	2.02	35.35	0.58	36.33	38.05	1.32
24.28		24.28	25.32	1.04	36.35	1.30	38.05	39.17	1.12
26.17		26.17	27.38	1.21	38.05	1.12	39.17	40.27	1.10
29.40		29.40	30.40	1.00	40.04	0.23	40.27	41.31	1.04
30.48		30.48	31.56	1.08	43.21		43.21	44.52	1.31
32.09		32.09	32.58	0.49	44.25	0.27	44.52	46.15	1.23
34.08		34.08	35.00	0.52	46.42	0.49	47.31	48.30	0.59
36.08		36.08	37.05	0.57	48.30	0.08	48.38	50.13	1.35
38.31		38.31	39.38	1.07	50.27		50.27	51.43	1.16
40.08		40.08	41.00	0.52	51.43		51.43	53.00	1.17
42.45		42.45	44.00	1.15	55.01		55.01	56.16	1.15
44.00		44.00	45.11	1.11	55.48	0.28	56.16	56.58	0.42
46.00		46.00	47.13	1.13	00.20	0.18	00.38	01.45	1.07
48.03		48.03	48.45	0.42	00.58	1.01	01.59	02.09	1.10
50.28		50.28	51.27	0.59	02.09	0.52	03.01	03.59	0.58
52.33		52.33	53.24	0.51	03.59		03.59	04.52	0.53
54.02		54.02	54.50	0.48	04.22	0.30	04.52	06.02	1.10
56.15		56.15	57.03	0.48	06.54		06.54	08.06	1.12
58.03		58.03	00.53	2.50	08.37		08.37	09.55	1.18
00.15	0.38	00.53	01.57	1.04	09.38	0.17	09.55	10.30	0.35
					12.16	0.09	12.25	13.19	0.54
					16.00	0.30	16.30	17.36	1.06
			Mean	1.13				Mean	1.12

Table 1. Timings **as recorded** for TC1 and TC2.

The normal type (eg. 54.50) gives clock time with the hour omitted

The bold type (eg. **1.08**) gives elapsed time

TC1						
Arrival	Minus	Corrected	Wait	Called	Depart	Time
	min	Arrival				
48.05	0	48.05	0.56	49.01	50.28	1.27
50.28	1	49.28	1.00	50.28	51.15	0.47
51.53	2	49.53	1.22	51.15	52.37	1.22
55.20	3	52.20	0.17	52.37	54.03	1.26
55.54	4	51.54	2.09	54.03	55.12	1.09
57.55	5	52.55	2.17	55.12	56.05	0.53
59.53	6	53.53	2.12	56.05	57.10	1.05
02.08	7	55.08	2.02	57.10	58.52	1.42
03.50	8	55.50	3.02	58.52	00.25	1.33
06.02	9	57.02	3.23	00.25	01.20	0.55
10.24	10	00.24	0.56	01.20	03.21	2.01
12.00	11	01.00	2.21	03.21	04.28	1.07
13.00	12	01.00	3.27	04.28	05.46	1.18
15.02	13	02.02	3.44	05.46	07.16	1.28
16.30	14	02.30	4.46	07.16	08.31	1.15
18.16	15	03.16	5.15	08.31	10.01	1.30
22.31	16	06.31	3.30	10.01	12.03	2.02
24.28	17	07.28	4.35	12.03	12.07	1.04
26.17	18	08.17	4.50	13.07	13.28	1.21
29.40	19	10.40	3.48	14.28	15.28	1.00
30.48	20	10.48	4.40	15.28	16.36	1.08
32.09	21	11.09	5.27	16.36	17.25	0.49
34.08	22	12.08	5.17	17.25	18.16	0.52
36.08	23	13.08	5.08	18.16	19.13	0.57
38.31	24	14.31	4.44	19.15	20.22	1.07
40.08	25	15.08	5.14	20.22	21.14	0.52
42.45	26	16.45	4.29	21.14	22.29	1.15
44.00	27	17.00	5.29	22.29	23.40	1.11
46.00	28	18.00	5.40	23.40	24.53	1.13
48.03	29	19.03	5.50	24.53	25.35	0.42
50.28	30	20.28	5.07	25.35	26.34	0.59
52.33	31	21.33	5.01	26.34	27.25	0.51
54.02	32	22.02	5.23	27.25	28.13	0.48
56.15	33	23.15	4.58	28.13	29.01	0.48
58.03	34	24.05	4.56	29.01	31.51	2.50
00.15	35	25.15	6.36	31.51	32.55	1.04
					Mean	1.13

Table 2. Timings **predicted** for TC1, for a start interval of 1 minute.

These assume perfect performance by the TC officials, working non-stop and with no unexpected problems. Under these assumptions the last starter would have experienced a cumulative delay of about 15 minutes.

Conclusion

The average total time in excess of 1 minute for both TCs shows that, were the start interval to be reduced to 1 minute, all competitors would experience waiting times, even at the very efficient TC1. Extra delays, as at TC2, would further increase waiting times.

Recommendation: The current start interval of 2 minutes has sufficient necessary redundancy to accommodate reasonable unexpected delays and should be retained.

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