Application of an Improved Handicap System by Rowing Canada Aviron

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Carlo Zezza (USA) and I proposed a revised handicap system for Masters rowers. The full discussion is attached as an appendix.

Key points for applying this system by RCA:

- The current RCA handicap formula (1second/ years age difference/ km) is unique in not recognizing that the speed difference between a 47 year old and 27 year old is much less than the speed difference between a 77 year old and a 57 year old. All other handicapping systems recognize this. The current RCA system is grossly unfair to both younger and older masters rowers.
- The proposed revised system is based on actual performance in major Master's regattas plus consultation with rowing organization in the USA, the UK and Australia.
- In the revised system handicaps are proportional (a ratio) to a "standard time" for a given boat type.
- These "standard times" are nominally the best time in that boat class in the regatta in question and can be adjusted to suit conditions such as winds, currents, or course length. A set of suggested standard times is provided for "normal" conditions.
- The ratios are based on the fastest finish times of men's and women's singles at 6 US Masters National Championships and two FISA World Masters Championships. Applied to these data the proposed handicaps practically eliminate the effect of age: the corrected times of 70-year olds are competitive with the corrected times of rowers of any other age.
- The ratios for other boat types are based on these data – no actual observed finish times for other boat classes were used.
- The biggest change from other handicapping systems is to reduce the compensation for older rowers in the 27-49 age range. Experience with the rowers who compete in the FISA World Masters and US National regattas is that in this range age is not an important indicator of performance. If younger rowers are faster they do not appear to compete in Masters events.
- The compensation for age in the 50 -64 range is slightly greater than other handicapping systems and for ages 65 and up the compensation is similar to, or slightly greater than, other systems.
- The recommended 1k ratios are based on three straight lines, with bends at 50 and 65. The incremental difference per year of age is shown here:

	Men	**Women**	**Mixed**
	increase/year in ratio to standard time	increase/year in ratio to standard time	increase/year in ratio to standard time
handicap 27-49	0.0008	0.0012	0.0010
handicap 50-64	0.0065	0.0096	0.0080
handicap 65+	0.0140	0.0096	0.0120

- 1k standard times are suggested as follows, (but regatta organizers should adjust to fit conditions or experience):

Nominal best time (seconds) in regatta to race 1 km			
Boat type	Men	Women	Mixed
1x	210	235	n.a.
2-	210	235	225
2x	190	220	205
4+	190	220	205
4-	180	210	195
4x	170	195	185
8+	170	195	185

- Wirh these standard times the incremental difference in seconds is as follows:

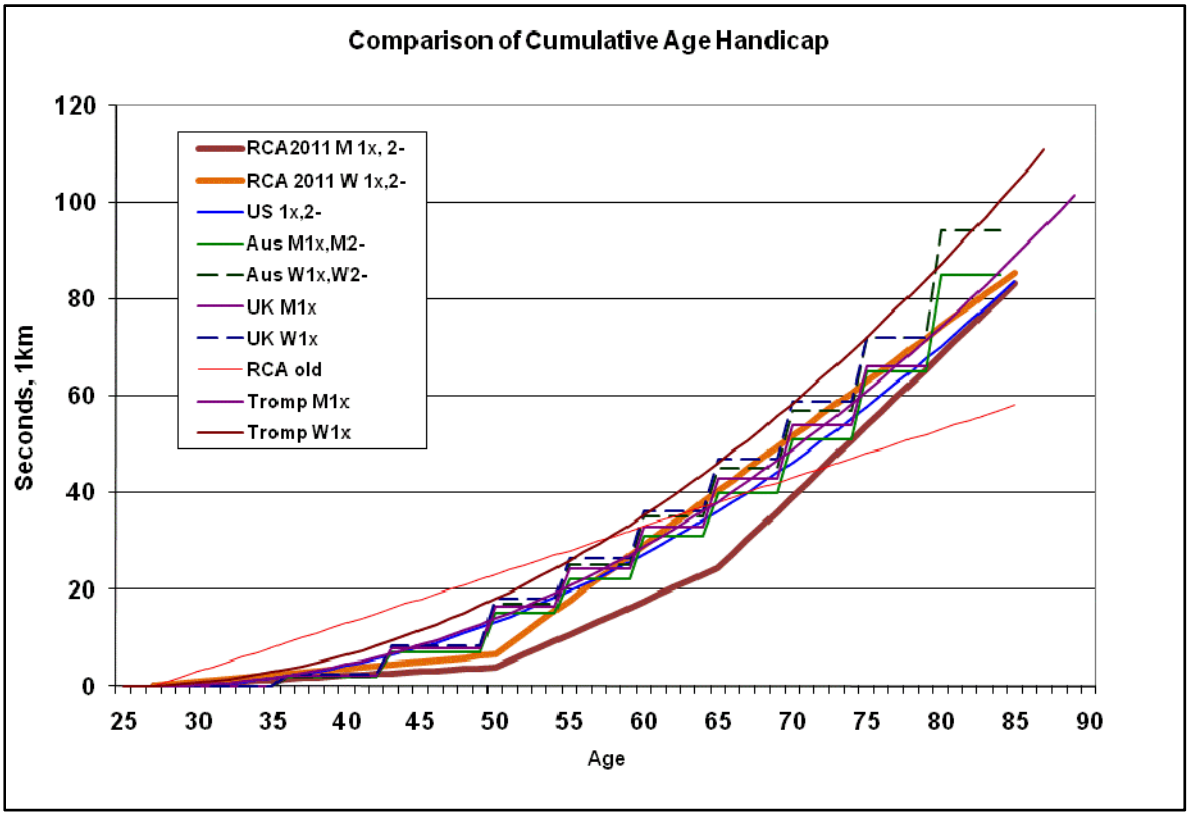
	Men 1x, 2-	**Women 1x, 2-**	**Mixed 2-**
Standard Time, seconds for 1 km (1x, 2-)	210	235	225
	increase/year in seconds	increase/year in seconds	increase/year in seconds
handicap 27-49	0.168	0.282	0.225
handicap 50-64	1.365	2.256	1.8
handicap 65+	2.94	2.256	3.15

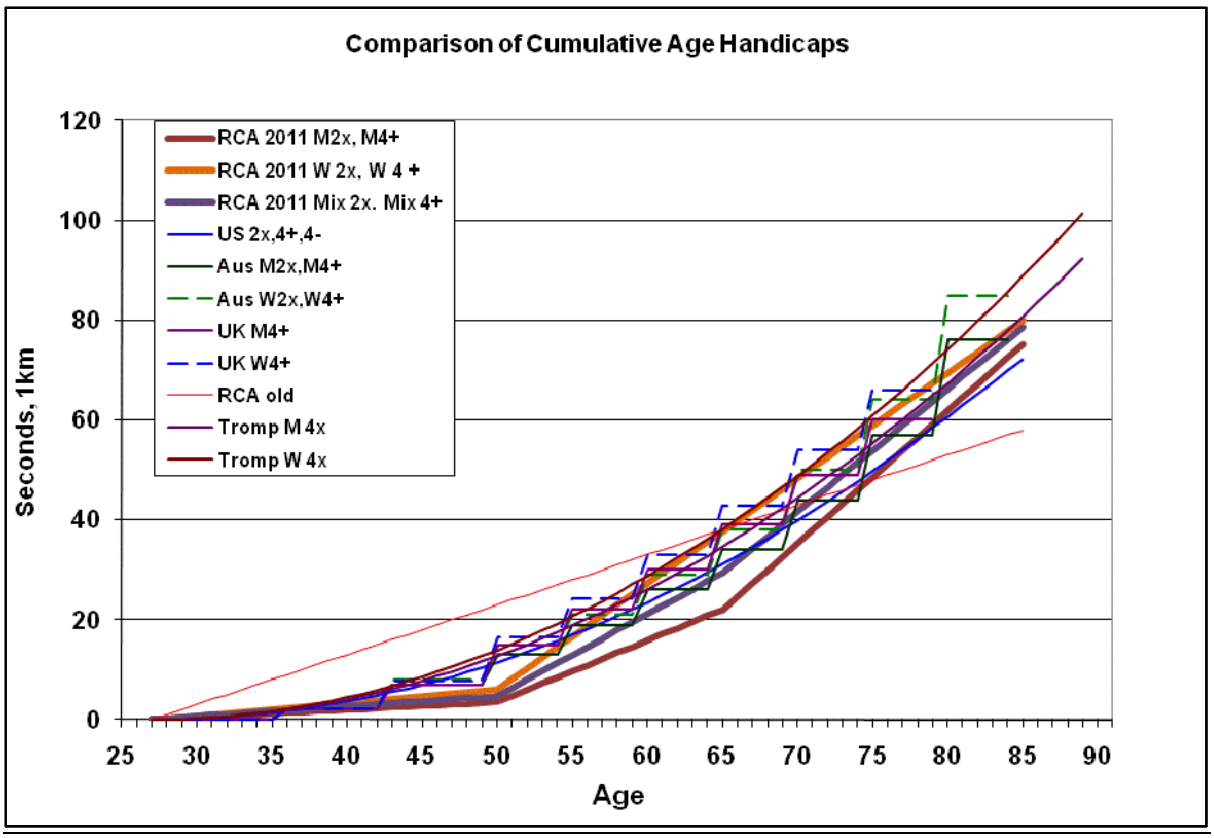
	Men 2x, 4+	**Women 2x, 4+**	**Mixed 2x, 4+**
Standard Time, seconds for 1 km (1x, 2-)	210	235	225
	increase/year in seconds	increase/year in seconds	increase/year in seconds
handicap 27-49	0.152	0.264	0.205
handicap 50-64	1.235	2.112	1.64
handicap 65+	2.66	2.112	2.46

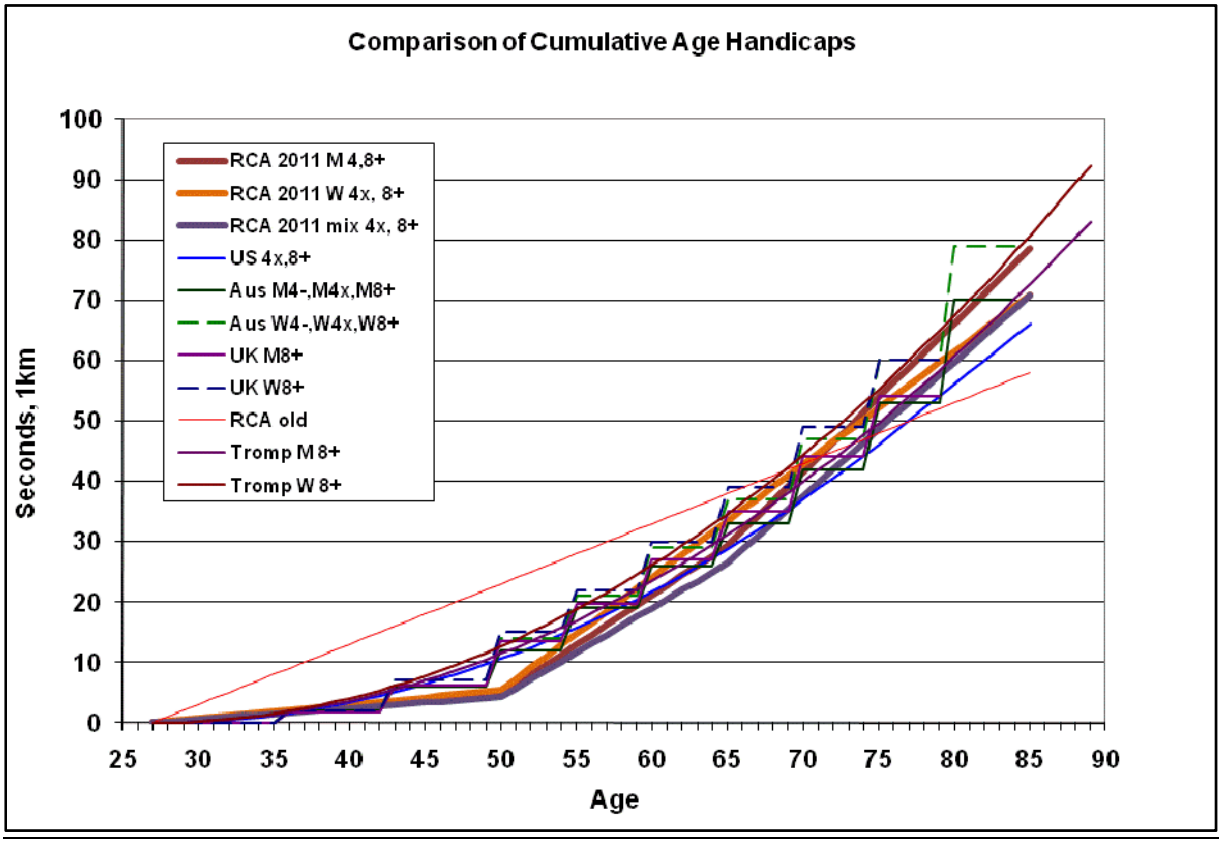
	Men 4-	**Women 4-**	**Mixed 4-**
Standard Time, seconds for 1 km (1x, 2-)	180	210	225
	increase/year in seconds	increase/year in seconds	increase/year in seconds
handicap 27-49	0.144	0.252	0.195
handicap 50-64	1.17	2.016	1.56
handicap 65+	2.52	2.016	2.34

	Men 4x, 8+	**Women 4x, 8+**	**Mixed 4x, 8+**
Standard Time, seconds for 1 km (1x, 2-)	170	195	185
	increase/year in seconds	increase/year in seconds	increase/year in seconds
handicap 27-49	0.136	0.234	0.185
handicap 50-64	1.105	1.872	1.48
handicap 65+	2.38	1.872	2.22

- The three graphs below compare the proposed RCA 2011 handicapping system with others. The total cumulative values are not as important as the slope of the line, or the rate which the time allowance changes with age.




Comparison of Cumulative Age Handicaps
RCA 2011 M2x, M4+
RCA 2011 W 2x, W 4 +
RCA 2011 Mix 2x. Mix 4+
US 2x,4+,4-
Aus M2x,M4+
Aus W2x,W4+
UK M4+
UK W4+
RCA old
Tromp M 4x
Tromp W 4x
Seconds, 1km
Age
0
20
40
60
80
100
120
25
30
35
40
45
50
55
60
65
70
75
80
85
90


Comparison of Cumulative Age Handicaps
RCA 2011 M 4,8+
RCA 2011 W 4x, 8+
RCA 2011 mix 4x, 8+
US 4x,8+
Aus M4-,M4x,M8+
Aus W4-,W4x,W8+
UK M8+
UK W8+
RCA old
Tromp M 8+
Tromp W 8+
Seconds, 1km
Age
0
10
20
30
40
50
60
70
80
90
100
25
30
35
40
45
50
55
60
65
70
75
80
85
90

Spreadsheet formulas showing how allowances are calculated.

A	B	C	D
		Men, 1x, 2-	
		increase/year in ratio to standard time **These are for Men** **Women and Mixed use different ratios as in the earlier tables.**	sec/yr if standard time is **Standard time is the best time in the regatta for this boat class and gender this value is an estimate for Men 1x**
			210
handicap 27-49		0.0008	=C4*D$3
handicap 50-64		0.0065	=C5*D$3
handicap 65+		0.014	=C6*D$3
FISA	**Age**	**cumulative ratio to standard time**	**cumulative allownance, seconds**
A	27	=($B9-27)*C$4	=($B9-27)*D$4
A	28	=($B10-27)*C$4	=($B10-27)*D$4
A	29	=($B11-27)*C$4	=($B11-27)*D$4
A	30	=($B12-27)*C$4	=($B12-27)*D$4
A	31	=($B13-27)*C$4	=($B13-27)*D$4
A	32	=($B14-27)*C$4	=($B14-27)*D$4
…..	……	…repeat above….	=…… repeat above..
C	47	=($B29-27)*C$4	=($B29-27)*D$4
C	48	=($B30-27)*C$4	=($B30-27)*D$4
C	49	=($B31-27)*C$4	=($B31-27)*D$4
D	50	=((50-27)*C$4)+(($B32-50)*C$5)	=((50-27)*D$4)+(($B32-50)*D$5)
D	51	=((50-27)*C$4)+(($B33-50)*C$5)	=((50-27)*D$4)+(($B33-50)*D$5)
D	52	=((50-27)*C$4)+(($B34-50)*C$5)	=((50-27)*D$4)+(($B34-50)*D$5)
……	……..	……=…… repeat above	=…… repeat above
F	62	=((50-27)*C$4)+(($B44-50)*C$5)	=((50-27)*D$4)+(($B44-50)*D$5)
F	63	=((50-27)*C$4)+(($B45-50)*C$5)	=((50-27)*D$4)+(($B45-50)*D$5)
F	64	=((50-27)*C$4)+(($B46-50)*C$5)	=((50-27)*D$4)+(($B46-50)*D$5)
G	65	=((50-27)*C$4)+((65-50)*C$5)+(($B47-65)*C$6)	=((50-27)*D$4)+((65-50)*D$5)+(($B47-65)*D$6)
G	66	=((50-27)*C$4)+((65-50)*C$5)+(($B48-65)*C$6)	=((50-27)*D$4)+((65-50)*D$5)+(($B48-65)*D$6)
…..	……	…repeat above….	=…… repeat above..
J	84	=((50-27)*C$4)+((65-50)*C$5)+(($B66-65)*C$6)	=((50-27)*D$4)+((65-50)*D$5)+(($B66-65)*D$6)
K	85	=((50-27)*C$4)+((65-50)*C$5)+(($B67-65)*C$6)	=((50-27)*D$4)+((65-50)*D$5)+(($B67-65)*D$6)

Tables of handicap allowances using suggested standard times.

		Men, 1x, 2-		Women 1x, 2-		Mixed 2-	
		increase/year in ratio to standard time	sec/yr if standard time is	increase/year in ratio to standard time	sec/yr if standard time is	increase/year in ratio to standard time	sec/yr if standard time is
			210		235		225
handicap 27-49		0.0008	0.168	0.0012	0.282	0.001	0.225
handicap 50-64		0.0065	1.365	0.0096	2.256	0.008	1.8
handicap 65+		0.014	2.94	0.0096	2.256	0.012	2.7
FISA	Age	cumulative ratio to standard time	cumulative allownance, seconds	cumulative ratio to standard time	cumulative allownance, seconds	cumulative ratio to standard time	cumulative allownance, seconds
A	27	0.000	0.0	0.000	0.0	0.000	0.0
A	28	0.001	0.2	0.001	0.3	0.001	0.2
A	29	0.002	0.3	0.002	0.6	0.002	0.5
A	30	0.002	0.5	0.004	0.8	0.003	0.7
A	31	0.003	0.7	0.005	1.1	0.004	0.9
A	32	0.004	0.8	0.006	1.4	0.005	1.1
A	33	0.005	1.0	0.007	1.7	0.006	1.4
A	34	0.006	1.2	0.008	2.0	0.007	1.6
A	35	0.006	1.3	0.010	2.3	0.008	1.8
B	36	0.007	1.5	0.011	2.5	0.009	2.0
B	37	0.008	1.7	0.012	2.8	0.010	2.3
B	38	0.009	1.8	0.013	3.1	0.011	2.5
B	39	0.010	2.0	0.014	3.4	0.012	2.7
B	40	0.010	2.2	0.016	3.7	0.013	2.9
B	41	0.011	2.4	0.017	3.9	0.014	3.2
B	42	0.012	2.5	0.018	4.2	0.015	3.4
C	43	0.013	2.7	0.019	4.5	0.016	3.6
C	44	0.014	2.9	0.020	4.8	0.017	3.8
C	45	0.014	3.0	0.022	5.1	0.018	4.1
C	46	0.015	3.2	0.023	5.4	0.019	4.3
C	47	0.016	3.4	0.024	5.6	0.020	4.5
C	48	0.017	3.5	0.025	5.9	0.021	4.7
C	49	0.018	3.7	0.026	6.2	0.022	5.0
D	50	0.018	3.9	0.028	6.5	0.023	5.2
D	51	0.025	5.2	0.037	8.7	0.031	7.0
D	52	0.031	6.6	0.047	11.0	0.039	8.8
D	53	0.038	8.0	0.056	13.3	0.047	10.6
D	54	0.044	9.3	0.066	15.5	0.055	12.4
E	55	0.051	10.7	0.076	17.8	0.063	14.2
E	56	0.057	12.1	0.085	20.0	0.071	16.0
E	57	0.064	13.4	0.095	22.3	0.079	17.8

E	58	0.070	14.8	0.104	24.5	0.087	19.6
E	59	0.077	16.1	0.114	26.8	0.095	21.4
F	60	0.083	17.5	0.124	29.0	0.103	23.2
F	61	0.090	18.9	0.133	31.3	0.111	25.0
F	62	0.096	20.2	0.143	33.6	0.119	26.8
F	63	0.103	21.6	0.152	35.8	0.127	28.6
F	64	0.109	23.0	0.162	38.1	0.135	30.4
G	65	0.116	24.3	0.172	40.3	0.143	32.2
G	66	0.130	27.3	0.181	42.6	0.155	34.9
G	67	0.144	30.2	0.191	44.8	0.167	37.6
G	68	0.158	33.2	0.200	47.1	0.179	40.3
G	69	0.172	36.1	0.210	49.4	0.191	43.0
H	70	0.186	39.0	0.220	51.6	0.203	45.7
H	71	0.200	42.0	0.229	53.9	0.215	48.4
H	72	0.214	44.9	0.239	56.1	0.227	51.1
H	73	0.228	47.9	0.248	58.4	0.239	53.8
H	74	0.242	50.8	0.258	60.6	0.251	56.5
I	75	0.256	53.7	0.268	62.9	0.263	59.2
I	76	0.270	56.7	0.277	65.1	0.275	61.9
I	77	0.284	59.6	0.287	67.4	0.287	64.6
I	78	0.298	62.6	0.296	69.7	0.299	67.3
I	79	0.312	65.5	0.306	71.9	0.311	70.0
J	80	0.326	68.4	0.316	74.2	0.323	72.7
J	81	0.340	71.4	0.325	76.4	0.335	75.4
J	82	0.354	74.3	0.335	78.7	0.347	78.1
J	83	0.368	77.3	0.344	80.9	0.359	80.8
J	84	0.382	80.2	0.354	83.2	0.371	83.5
K	85	0.396	83.1	0.364	85.4	0.383	86.2

		Men, 2x, 4+		Women 2x, 4+		Mixed 2x, 4+	
		increase/year in ratio to standard time	sec/yr if standard time is	increase/year in ratio to standard time	sec/yr if standard time is	increase/year in ratio to standard time	sec/yr if standard time is
			190		220		205
handicap 27-49		0.0008	0.152	0.0012	0.264	0.001	0.205
handicap 50-64		0.0065	1.235	0.0096	2.112	0.008	1.64
handicap 65+		0.014	2.66	0.0096	2.112	0.012	2.46
FISA	Age	cumulative ratio to standard time	cumulative allownance, seconds	cumulative ratio to standard time	cumulative allownance, seconds	cumulative ratio to standard time	cumulative allownance, seconds
A	27	0.000	0.0	0.000	0.0	0.000	0.0
A	28	0.001	0.2	0.001	0.3	0.001	0.2
A	29	0.002	0.3	0.002	0.5	0.002	0.4
A	30	0.002	0.5	0.004	0.8	0.003	0.6
A	31	0.003	0.6	0.005	1.1	0.004	0.8
A	32	0.004	0.8	0.006	1.3	0.005	1.0
A	33	0.005	0.9	0.007	1.6	0.006	1.2
A	34	0.006	1.1	0.008	1.8	0.007	1.4
A	35	0.006	1.2	0.010	2.1	0.008	1.6
B	36	0.007	1.4	0.011	2.4	0.009	1.8
B	37	0.008	1.5	0.012	2.6	0.010	2.1
B	38	0.009	1.7	0.013	2.9	0.011	2.3
B	39	0.010	1.8	0.014	3.2	0.012	2.5
B	40	0.010	2.0	0.016	3.4	0.013	2.7
B	41	0.011	2.1	0.017	3.7	0.014	2.9
B	42	0.012	2.3	0.018	4.0	0.015	3.1
C	43	0.013	2.4	0.019	4.2	0.016	3.3
C	44	0.014	2.6	0.020	4.5	0.017	3.5
C	45	0.014	2.7	0.022	4.8	0.018	3.7
C	46	0.015	2.9	0.023	5.0	0.019	3.9
C	47	0.016	3.0	0.024	5.3	0.020	4.1
C	48	0.017	3.2	0.025	5.5	0.021	4.3
C	49	0.018	3.3	0.026	5.8	0.022	4.5
D	50	0.018	3.5	0.028	6.1	0.023	4.7
D	51	0.025	4.7	0.037	8.2	0.031	6.4
D	52	0.031	6.0	0.047	10.3	0.039	8.0
D	53	0.038	7.2	0.056	12.4	0.047	9.6
D	54	0.044	8.4	0.066	14.5	0.055	11.3
E	55	0.051	9.7	0.076	16.6	0.063	12.9
E	56	0.057	10.9	0.085	18.7	0.071	14.6
E	57	0.064	12.1	0.095	20.9	0.079	16.2
E	58	0.070	13.4	0.104	23.0	0.087	17.8

E	59	0.077	14.6	0.114	25.1	0.095	19.5
F	60	0.083	15.8	0.124	27.2	0.103	21.1
F	61	0.090	17.1	0.133	29.3	0.111	22.8
F	62	0.096	18.3	0.143	31.4	0.119	24.4
F	63	0.103	19.6	0.152	33.5	0.127	26.0
F	64	0.109	20.8	0.162	35.6	0.135	27.7
G	65	0.116	22.0	0.172	37.8	0.143	29.3
G	66	0.130	24.7	0.181	39.9	0.155	31.8
G	67	0.144	27.3	0.191	42.0	0.167	34.2
G	68	0.158	30.0	0.200	44.1	0.179	36.7
G	69	0.172	32.7	0.210	46.2	0.191	39.2
H	70	0.186	35.3	0.220	48.3	0.203	41.6
H	71	0.200	38.0	0.229	50.4	0.215	44.1
H	72	0.214	40.6	0.239	52.5	0.227	46.5
H	73	0.228	43.3	0.248	54.6	0.239	49.0
H	74	0.242	46.0	0.258	56.8	0.251	51.5
I	75	0.256	48.6	0.268	58.9	0.263	53.9
I	76	0.270	51.3	0.277	61.0	0.275	56.4
I	77	0.284	53.9	0.287	63.1	0.287	58.8
I	78	0.298	56.6	0.296	65.2	0.299	61.3
I	79	0.312	59.3	0.306	67.3	0.311	63.8
J	80	0.326	61.9	0.316	69.4	0.323	66.2
J	81	0.340	64.6	0.325	71.5	0.335	68.7
J	82	0.354	67.2	0.335	73.7	0.347	71.1
J	83	0.368	69.9	0.344	75.8	0.359	73.6
J	84	0.382	72.6	0.354	77.9	0.371	76.1
K	85	0.396	75.2	0.364	80.0	0.383	78.5

		Men, 4-		Women 4-		Mixed 4-	
		increase/year in ratio to standard time	sec/yr if standard time is	increase/year in ratio to standard time	sec/yr if standard time is	increase/year in ratio to standard time	sec/yr if standard time is
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handicap 65+		0.014	2.52	0.0096	2.016	0.012	2.34
FISA	Age	cumulative ratio to standard time	cumulative allownance, seconds	cumulative ratio to standard time	cumulative allownance, seconds	cumulative ratio to standard time	cumulative allownance, seconds
A	27	0.000	0.0	0.000	0.0	0.000	0.0
A	28	0.001	0.1	0.001	0.3	0.001	0.2
A	29	0.002	0.3	0.002	0.5	0.002	0.4
A	30	0.002	0.4	0.004	0.8	0.003	0.6
A	31	0.003	0.6	0.005	1.0	0.004	0.8
A	32	0.004	0.7	0.006	1.3	0.005	1.0
A	33	0.005	0.9	0.007	1.5	0.006	1.2
A	34	0.006	1.0	0.008	1.8	0.007	1.4
A	35	0.006	1.2	0.010	2.0	0.008	1.6
B	36	0.007	1.3	0.011	2.3	0.009	1.8
B	37	0.008	1.4	0.012	2.5	0.010	2.0
B	38	0.009	1.6	0.013	2.8	0.011	2.1
B	39	0.010	1.7	0.014	3.0	0.012	2.3
B	40	0.010	1.9	0.016	3.3	0.013	2.5
B	41	0.011	2.0	0.017	3.5	0.014	2.7
B	42	0.012	2.2	0.018	3.8	0.015	2.9
C	43	0.013	2.3	0.019	4.0	0.016	3.1
C	44	0.014	2.4	0.020	4.3	0.017	3.3
C	45	0.014	2.6	0.022	4.5	0.018	3.5
C	46	0.015	2.7	0.023	4.8	0.019	3.7
C	47	0.016	2.9	0.024	5.0	0.020	3.9
C	48	0.017	3.0	0.025	5.3	0.021	4.1
C	49	0.018	3.2	0.026	5.5	0.022	4.3
D	50	0.018	3.3	0.028	5.8	0.023	4.5
D	51	0.025	4.5	0.037	7.8	0.031	6.0
D	52	0.031	5.7	0.047	9.8	0.039	7.6
D	53	0.038	6.8	0.056	11.8	0.047	9.2
D	54	0.044	8.0	0.066	13.9	0.055	10.7
E	55	0.051	9.2	0.076	15.9	0.063	12.3
E	56	0.057	10.3	0.085	17.9	0.071	13.8
E	57	0.064	11.5	0.095	19.9	0.079	15.4
E	58	0.070	12.7	0.104	21.9	0.087	17.0

E	59	0.077	13.8	0.114	23.9	0.095	18.5
F	60	0.083	15.0	0.124	26.0	0.103	20.1
F	61	0.090	16.2	0.133	28.0	0.111	21.6
F	62	0.096	17.4	0.143	30.0	0.119	23.2
F	63	0.103	18.5	0.152	32.0	0.127	24.8
F	64	0.109	19.7	0.162	34.0	0.135	26.3
G	65	0.116	20.9	0.172	36.0	0.143	27.9
G	66	0.130	23.4	0.181	38.1	0.155	30.2
G	67	0.144	25.9	0.191	40.1	0.167	32.6
G	68	0.158	28.4	0.200	42.1	0.179	34.9
G	69	0.172	30.9	0.210	44.1	0.191	37.2
H	70	0.186	33.5	0.220	46.1	0.203	39.6
H	71	0.200	36.0	0.229	48.1	0.215	41.9
H	72	0.214	38.5	0.239	50.1	0.227	44.3
H	73	0.228	41.0	0.248	52.2	0.239	46.6
H	74	0.242	43.5	0.258	54.2	0.251	48.9
I	75	0.256	46.1	0.268	56.2	0.263	51.3
I	76	0.270	48.6	0.277	58.2	0.275	53.6
I	77	0.284	51.1	0.287	60.2	0.287	56.0
I	78	0.298	53.6	0.296	62.2	0.299	58.3
I	79	0.312	56.1	0.306	64.3	0.311	60.6
J	80	0.326	58.7	0.316	66.3	0.323	63.0
J	81	0.340	61.2	0.325	68.3	0.335	65.3
J	82	0.354	63.7	0.335	70.3	0.347	67.7
J	83	0.368	66.2	0.344	72.3	0.359	70.0
J	84	0.382	68.7	0.354	74.3	0.371	72.3
K	85	0.396	71.3	0.364	76.4	0.383	74.7

		Men, 4x, 8+		Women 4x, 8+		Mixed 4x, 8+	
		increase/year in ratio to standard time	sec/yr if standard time is	increase/year in ratio to standard time	sec/yr if standard time is	increase/year in ratio to standard time	sec/yr if standard time is
			170		195		185
handicap 27-49		0.0008	0.136	0.0012	0.234	0.001	0.185
handicap 50-64		0.0065	1.105	0.0096	1.872	0.008	1.48
handicap 65+		0.014	2.38	0.0096	1.872	0.012	2.22
FISA	Age	cumulative ratio to standard time	cumulative allownance, seconds	cumulative ratio to standard time	cumulative allownance, seconds	cumulative ratio to standard time	cumulative allownance, seconds
A	27	0.000	0.0	0.000	0.0	0.000	0.0
A	28	0.001	0.1	0.001	0.2	0.001	0.2
A	29	0.002	0.3	0.002	0.5	0.002	0.4
A	30	0.002	0.4	0.004	0.7	0.003	0.6
A	31	0.003	0.5	0.005	0.9	0.004	0.7
A	32	0.004	0.7	0.006	1.2	0.005	0.9
A	33	0.005	0.8	0.007	1.4	0.006	1.1
A	34	0.006	1.0	0.008	1.6	0.007	1.3
A	35	0.006	1.1	0.010	1.9	0.008	1.5
B	36	0.007	1.2	0.011	2.1	0.009	1.7
B	37	0.008	1.4	0.012	2.3	0.010	1.9
B	38	0.009	1.5	0.013	2.6	0.011	2.0
B	39	0.010	1.6	0.014	2.8	0.012	2.2
B	40	0.010	1.8	0.016	3.0	0.013	2.4
B	41	0.011	1.9	0.017	3.3	0.014	2.6
B	42	0.012	2.0	0.018	3.5	0.015	2.8
C	43	0.013	2.2	0.019	3.7	0.016	3.0
C	44	0.014	2.3	0.020	4.0	0.017	3.1
C	45	0.014	2.4	0.022	4.2	0.018	3.3
C	46	0.015	2.6	0.023	4.4	0.019	3.5
C	47	0.016	2.7	0.024	4.7	0.020	3.7
C	48	0.017	2.9	0.025	4.9	0.021	3.9
C	49	0.018	3.0	0.026	5.1	0.022	4.1
D	50	0.018	3.1	0.028	5.4	0.023	4.3
D	51	0.025	4.2	0.037	7.3	0.031	5.7
D	52	0.031	5.3	0.047	9.1	0.039	7.2
D	53	0.038	6.4	0.056	11.0	0.047	8.7
D	54	0.044	7.5	0.066	12.9	0.055	10.2
E	55	0.051	8.7	0.076	14.7	0.063	11.7
E	56	0.057	9.8	0.085	16.6	0.071	13.1
E	57	0.064	10.9	0.095	18.5	0.079	14.6
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I	77	0.284	48.3	0.287	55.9	0.287	53.1
I	78	0.298	50.6	0.296	57.8	0.299	55.3
I	79	0.312	53.0	0.306	59.7	0.311	57.5
J	80	0.326	55.4	0.316	61.5	0.323	59.8
J	81	0.340	57.8	0.325	63.4	0.335	62.0
J	82	0.354	60.2	0.335	65.3	0.347	64.2
J	83	0.368	62.5	0.344	67.2	0.359	66.4
J	84	0.382	64.9	0.354	69.0	0.371	68.6
K	85	0.396	67.3	0.364	70.9	0.383	70.9