Screwpile 2020 ORA-1 Analysis

Norm Dawley introduced the concept of Fun Races for our community to allow competitive activity to continue locally in this Covid-19 environment. The idea was to get boats out sailing in a fun way while recognizing the limitations of today's social distancing requirements on sailboat racing. The format is a staggered pursuit style start over a fixed course. Competitors report their rounding times. All racing stops at a fixed time, and the event is scored for the last mark that all competitors round. For Screwpile 2020, the Cruiser circle will use a similar format.

In parallel with this effort, I have been working with our PRO for the Screwpile 2020 Cruising circle to understand the impact of the handicapping system that will be used. The PRO for the event, Jay Tyson, wants to make the event safe and fun for cruisers and cruiser racers. Part of that effort will be the introduction of a multi number, VPP based handicap scoring approach for the event. This will provide support for a diverse fleet and sailing conditions. The traditional PHRF handicapping system does not really allow for this situation. We would also like to include/support special limitations.

To begin the education process on this approach locally, I have been doing analysis of some of our current race results utilizing PHRF and the multi number scoring system that will be used for Screwpile. I have used the normal scoring that Norm introduced with these Fun Races and the alternate scoring approach that will be used for Screwpile.

I am attaching a description of the major handicapping systems in Appendix A of this document.

Let me begin with a brief comparison of single number handicapping systems like PHRF versus the multiple number systems being promoted by the sailing community today.

A single number handicapping system only rates boats for a specific set of race conditions and course selections. The multi number systems consider the effects of wind and course selection on race results. The system selected for Screwpile 2020 is ORA-1 which is a derivative of ORRez as implemented by the Chesapeake Racer Cruiser Association (CRCA)

All participants in the Cruiser Course will have the option of a complimentary ORA-1 certificate for the event, based on a best fit with existing ratings for comparable boats, or applying for an official certificate. Official ORR certs are available in a several levels. An individual event level custom certificate would run $35, to a full ORRez certificate for $100.

ORRez supports five standard course selection across 4 wind strengths. The definitions are:

ORREz Standard Course definitions:

1. Random Leg – Equal Distance on all points of Sail, sailing in a circle
2. W 50/ L 50 -- 50% UpWind VMG, 50% DnWind VMG
3. W 60/ L 40 -- 60% UpWind VMG, 40% DnWind VMG
4. MOSTLY WW -- 80% UpWind VMG, 15% Reach, 5% DnWind VMG
5. MOSTLY LW -- 50% DnWind VMG, 40% 120, 10% UpWind VMG

ORRez Wind Conditions:

1. V. Light -- Avg. wind less than 6 knots…..(appx. 100% 4 kts)
2. Light -- Avg. wind between 6 & 10 kts…(appx. 50% 6 kts, 25% 8 kts, 25% 10 kts)
3. Medium – Avg. wind between 10 & 16kts…(appx. 25% 10 kts, 50% 12 kts, 25% 16 kt)
4. Heavy – Avg. wind over 16kts ……(appx. 25% 16kts, 50% 20kts, 25% 24 kts

For Screwpile 2020, the handicaps will be ORR VPP based, but a single course definition will be created across the 4 wind ranges supported. The Course definition will be: 50% W/L and 50% Random Leg (RL). The PRO has committed to developing event courses to meet this approach. This blended environment is referred to as ORA-1 (ORA One). The intent is to create a product for local racing organizations to use that provides the full potential of the ORR VPP without requiring every boat to buy an ORRez certificate. The ratings will still include a Spin and Non-Spin performance view. It also simplifies the RC race management job.

An example of the ORA-1 Spin TOD ratings for a sample set of boats would be: (sec/NM)

	ORA-1 Spin			
Boat Type	VL	L	M	H
Bene 473 SD	1566	940	653	515
J 105	1362	853	626	521
J 111	1209	765	574	483
J 35 ODR	1342	836	614	519
J 70	1469	915	675	549
Melges 32	1108	717	550	442
Mumm 36	1206	763	572	483
Ranger 33	1642	1010	729	613

The ratings are expressed as the number of seconds required to cover a nautical mile of the given course definition in a given wind range. To adjust these numbers to a PHRF like base you would subtract a constant for a standard boat. PHRF uses the J/35 as one of it's base performance boats at a medium wind speed. The accepted rating for the J/35 is 72. If we apply that assumption to these numbers, the comparable comparison for ORA-1 over the wind ranges would be:

	ORA-1 Spin (adj. for J 35)			
Boat Type	VL	L	M	H
Bene 473 SD	1024	398	111	-26
J 105	821	311	84	-21
J 111	667	224	33	-59
J 35 ODR	800	294	**72**	-23
J 70	927	373	133	7
Melges 32	566	175	9	-100
Mumm 36	664	221	30	-59
Ranger 33	1100	468	187	71

The impact of wind on a boats performance relative to other boat types can be very significant as you can see. The difference between a J/35 and a Melges 32 at Medium conditions is about 63 seconds per NM, but in Very Light Conditions the difference is 234 seconds per NM.

The ORA-1 VPP analysis also compensates for Spin versus Non-Spin better than PHRF. Here is the same set of numbers for Non-Spin:

	ORA-1 Non-Spin (adj. for J 35)			
Boat Type	VL	L	M	H
Bene 473 SD	1122	434	124	-21
J 105	990	382	108	-12
J 111	853	302	59	-48
J 35 ODR	867	324	**85**	-16
J 70	1109	454	163	30
Melges 32	763	260	41	-73
Mumm 36	836	295	56	-49
Ranger 33	1185	503	200	77

In this case the J/35 is adjusted to a rating of 85 for Medium conditions when sailing Non-Spin versus a Spin J/35 at 72. Under PHRF the rating is 72 in both cases. The gap at lower wind ranges is even larger. It is not clear for a broad fleet if the VPP has a good enough gap to allow Spin and Non-Spin configurations for the same boat to be competitive, however, the numbers are a better situation than PHRF.

A more complete list of our SMSA PHRF fleet to ORA-1 rating is included in this document under Appendix B.

So, for the 3 Fun races we have had I scored the events with Norms PHRF like ratings and with the ORA-1 Non-Spin handicaps. Some Notes on adjustments I made:

NOTES:

In all scoring, the scratch boat is rated 0. Other ratings are adjusted by subtracting the scratch boat rating. So that CT for scratch boat is always equal to ET. Norm makes this adjustment in his calculations also.

Gemini, Elan, and Kindred Spirit ratings are derived from similar Boats, but not sister ships. The ORRez valid list did not have Comparable examples for these boats, so I had to choose alternates.

So here are the comparisons for the 3 Fun races run so far:

Fun Race – June 20, 2020

Saturday Fun race on Chesapeake Bay. Distance = 4.4NM (finished at HI)
Condition - Light to Very Light Breeze from the SSE

		Norm Score		ORA-1 Results	
	Elapsed Time	Corrected	Finish	Corrected	Finish
Twice Around	0:57:26	0:45:60	1	0:39:45	1
Splash	1:10:50	1:06:52	2	0:57:47	2
Bad Cat	1:17:01	1:16:48	3	1:14:03	3
Pursuit – SH	1:23:20	1:21:34	4	1:15:06	4
American Flyer	1:28:38	1:28:38	5	1:28:38	5
Caribe	1:58:22	1:55:30	6	1:42:20	6

Summary/Conclusions – This race featured a lot of dead air in the starting area for most of the boats that started after ***Splash***, so the handicaps were mostly irrelevant. Changing course config would not help. I think the best thing we could do for situations like this is to compress the start times for the fleet. Instead of a true pursuit start we would use a prescribed interval, for example 1 minute between starts. This format is usually referred to as a "Time Trial" start.

Fun Race - July 25, 2020

Saturday Fun race on Chesapeake Bay. Distance = 4.4NM (Finished at HI)
Condition - Light to Very Light Breeze from the ENE

		Norm Score		ORRA-1Results	
	Elapsed Time	Corrected	Finish	Corrected	Finish
Bad Cat	0:53:02	0:53:02	1	0:53:02	2
Gemini	1:01:48	0:55:25	2	0:52:09	1
Pursuit SH	0:56:28	0:56:02	3	0:53:47	3
Hellcat	1:02:16	0:57:26	4	0:55:35	4
Elan	1:24:50	1:16:42	5	1:18:01	7
Kindred Spirit	1:26:18	1:17:43	6	1:16:54	6
Destiny	1:26:30	1:21:00	7	1:16:51	5
Cygnus	1:34:25	1:28:55	8	1:24:46	8

Summary/Conclusions – In this case the wind was mostly the same across the course for all competitors. The result here are more pronounced when you introduce the wind adjusted handicaps. It was also a course that had W/L and downwind components. ORA-1 flipped a few places and tightened up the results.

Fun Race – Aug 2, 2020

Sunday Fun race on Chesapeake Bay. Distance = 8.8NM -Average TWS = 13+kts, TWD = SSW. Course was a mix of off the wind on the way out and on the wind going back. Wind condition = M

		Norm Score		ORA-1 Results	
	Elapsed Time	Corrected	Finish	Corrected	Finish
Bad Cat	1:14:00	1:14:00	1	1:14:00	2
Gemini	1:32:10	1:19:24	2	1:18:14	1
Twice Around	1:56:41	1:33:48	3	1:37:47	3
Kindred Spirit	1:52:23	1:35:13	4	1:36:26	4
Hellcat	DNS				

Summary/Conclusions – In this case the wind was mostly the same across the course for all competitors. It was also a course that had W/L and downwind components. Since the conditions for this race were like the PHRF assumptions, the ORA-1 results are very similar.

Appendix A: Handicap Discussion

The two major multi number systems in use today are **ORC** (Ocean Racing Congress) and **ORR** (Offshore Racing Rule). Both are active on the Chesapeake and many clubs are evaluating and making the shift away from PHRF.

ORC

The ORC was founded in 1969 by the Royal Ocean Racing Club (RORC) and the Cruising Club of America (CCA) to develop a handicap standard for the international community. Since then, the ORC has supported several rules including the IOR, IMS, and, most recently, the ORC Rule. The ORC Rule was structured in the late 2000's to promote safe design practices and to fairly rate a broad range of designs, including cruiser/racer and modern race boats. The ORC Rule is recognized by World Sailing as an International Rating System.

The ORC Rule relies on a Velocity Prediction Program (VPP) based on standard measurements defined by the Universal Measurement System (UMS). The rating calculator outputs a multi-number rating, suitable for various scoring options and course configurations. While ORC Club and ORC International certificates differ with respect to measurement criteria, they rely on the same calculation routine. As a result, Club and International certificates may be scored consistently with each other. ORC scoring options include Time-on-Distance, Time-on-Time, Triple Number, and Performance Curve Scoring, and other custom options.

ORR

The Offshore Racing Rule (ORR) grew out of a desire by North American sailors who felt the International Measurement System (IMS) was no longer meeting their needs. The ORA was founded in 2004 by the Cruising Club of America (CCA), Chicago Yacht Club (CYC), and the Transpacific Yacht Club (TPYC).

The Velocity Prediction Program (VPP) used by ORR was developed in the mid-1990's as a refinement of the Massachusetts Institute of Technology (MIT)/Pratt Institute project that was the foundation of the IMS. Since its inception, the VPP has been heavily modified as the result of annual updates reflecting the latest technology and scientific research. The rule relies on measurements of all the speed affecting variables required to competently predict reliable handicaps. The ORR outputs multiple ratings suitable for different course configurations and wind mixes. Race organizing authorities may use any of these standard ratings or may recommended "course mixes" that represent predominant conditions for their events for a customized rating.

The ORR is the most popular measurement rule used in North America and is the rule of choice for such events as: Chicago to Mackinac, Bayview to Mackinac , Newport-Bermuda Race, Puerto Vallarta Race, Rolex Big Boat Series, Transpacific Yacht Race, and many more. ORR also has Regional Championships for the East Coast, Great Lakes, and West Coast.

PHRF

Performance Handicap Racing Fleet (PHRF) evolved in 1973 from the Pacific Handicap Racing Fleet. This handicapping system was based on local handicapper knowledge and race results.

PHRF handicaps are assigned by individuals or committees associated with specific fleets. Handicaps are assigned to a given production class considering predominant local conditions and the handicapper's experience in handicapping similar boats. These ratings are based on observed performance and any requisite adjustments generally become evident after 5-10 races have been sailed.

The major problem with PHRF is that design characteristics of boats yield different performance characteristics in various seas and winds since PHRF has only a single rating for a boat (single number approach). These differences can have an especially large impact in races run over a distance, without variety in points of sail and occur within a period where weather and sea conditions do not change. Some would claim that this means it is possible to predict which boats will do well in certain conditions, most especially where design characteristics are extremely different. An example would be a light displacement, planing hull versus a heavy displacement non-planing hull. To mitigate this, as with other rating systems, PHRF suggests that race organizers assign boats with similar design in their fleet divisions. This reduces the planing boat vs heavy displacement variable. Typically, fleets are split into similar handicap number ranges, which exposes the wind condition/design problem. Where actual fleet performance history does not exist, fleets with similar design characteristics must be utilized and PHRF can skew to favor larger boats with longer waterlines until true historical performance is established. In many fleets workload and staffing have restricted actual performance input to the process.

Appendix B: Handicap Comparisons – Spin ratings

PHRF Ratings for current SMSA boats versus approximate ORA-1 ratings. Specific configurations available. Genoa size options in ORA are taken from those of selected sister ships in the DB. Spinnaker options are also taken from sister ship config (sym/asym and size). If different, owners can request a specific certificate with their sail configuration. As mentioned earlier, this specific ORA-1 certificate would cost $35.

			PHRF			ORA-1 (adj for J 35 offset)			
			Spin			Spin Ratings - ToD			
Boat	**Type**		**WL**	**CR**		**VL**	**L**	**M**	**H**
American Flyer	Farr 395 R		36	33		666	216	25	(61)
Arctic Tern	Luders 44		168	168		1,015	427	165	56
Audrey	Merit 25		174	177		966	421	191	98
Bad Cat	J/111		39	33		667	224	33	(59)
Barba Roja	Pearson 31-2 WK		165	165		963	411	171	80
Blue Goose	Luders 44		168	168		1,015	427	165	56
C2 (squared)	O Day 34 SD		189	189		1,187	505	196	58
Caribe	Bene First 456 **		75	75		957	369	102	(16)
Cheetah	Mumm 36		48	39		666	221	30	(60)
Cygnus	Ben Oceanis 473 SD - 144%		120	120		1,005	389	107	(28)
Destiny	Ben Oceanis 473 SD - 144%		120	120		1,005	389	107	(28)
Elan	Seidlman 34 **		156	156		909	375	142	44
Family Tradition	J/24 ODR		171	171		1,059	452	186	72
Gemini	Tartan 3700 **		132	129		1,004	409	144	33
Hellcat	X-Yachts X34		99	96		913	349	98	(3)
J 35 ODR	J/35 ODR		72	72		800	294	72	(23)
J Ray	J 70		114	111		927	373	133	7
Kindred Spirit	Raider 33 **		162	162		956	401	156	52
Lakahi	Thomas 35 **		72	72		927	373	133	7
One Trick Pony	Melges 32		24	24		566	175	9	(100)
Pursuit - Spin	Custom 48		57	48		686	230	31	(57)
Pursuit (SH NS 85%)	Custom 48		57	48		924	339	78	(38)
Rakali	J 105		90	87		821	311	84	(21)
SNUZULUZ	Ranger 33		177	168		1,100	468	187	71
Spice	J 70		114	111		927	373	133	7
Splash	J 105		90	90		821	311	84	(21)

Stormy Petrel	Luders 44		168	168		1,015	427	165	56
The Doghouse	J 29 OB MH		111	111		861	338	112	17
Triton's Fury	O'DAY 34 SD		252	252		1,187	505	196	58
Twice Around	Catalina 30		198	198		993	422	174	81
Whirlaway	Frers 33		114	114		834	320	98	7
Wicked Good	Tarttan P270 **		132	132		908	361	124	19
Wild Horses	Melges 32		24	24		566	175	9	(100)

Mapping Notes:

Seidelman 34 mapped to C&C 34
Tartan Pride 270 mapped to J/27
Tartan 3700 SD WK mapped to Tartan 3500 SD WK
Thomas 35 mapped to J/35
Tartan Pride 270 mapped to J/27

Appendix B: Handicap Comparisons – Non-Spin ratings

PHRF Ratings for current SMSA boats versus approximate ORA-1 ratings. Specific configurations available. Genoa size options in ORA are taken from those of selected sister ships in the DB. If different owners can request a specific certificate with sail limitations.

			PHRF			ORA-1 (adj for J 35 offset)			
			Non Spin			Non Spin Ratings - ToD			
Boat	**Type**		**WL**	**CR**		**VL**	**L**	**M**	**H**
American Flyer	Farr 395 R		42	42		812	283	50	(51)
Arctic Tern	Luders 44		168	168		1,015	427	165	56
Audrey	Merit 25		174	177		1,052	455	202	106
Bad Cat	J/111		45	45		853	302	59	(48)
Barba Roja	Pearson 31-2 WK		165	165		1,032	440	182	86
Blue Goose	Luders 44		168	168		1,015	427	165	56
C2 (squared)	O Day 34 SD		189	189		1,251	532	207	64
Caribe	Bene First 456 **		81	81		1,093	429	126	(7)
Cheetah	Mumm 36		57	57		811	284	52	(50)
Cygnus	Bene Oceanis 473 SD - 144%		120	120		1,093	425	118	(23)
Destiny	Bene Oceanis 473 SD - 144%		120	120		1,093	425	118	(23)
Elan	Seidlman 34 **		156	156		1,012	415	154	50
Family Tradition	J/24 ODR		171	171		1,108	474	197	81
Gemini	Tartan 3700 **		132	132		1,061	434	154	38
Hellcat	X-Yachts X34		108	111		1,005	393	120	7
J 35 ODR	J/35 ODR		72	72		867	324	85	(16)
J Ray	J 70		120	120		1,109	454	163	30
Kindred Spirit	Raider 33 **		162	162		1,027	430	167	58
Lakahi	Thomas 35 **		72	72		1,109	454	163	30
One Trick Pony	Melges 32		30	30		763	260	41	(73)
Pursuit - Spin	Custom 48		66	66		796	277	49	(50)
Pursuit (SH NS 85%)	Custom 48		66	66		924	339	78	(38)
Rakali	J 105		96	96		990	382	108	(12)
SNUZULUZ	Ranger 33		180	180		1,185	503	200	77
Spice	J 70		120	120		1,109	454	163	30
Splash	J 105		96	96		990	382	108	(12)
Stormy Petrel	Luders 44		168	168		1,015	427	165	56

The Doghouse	J 29 OB MH		111	111		924	366	124	25
Triton's Fury	O'DAY 34 SD		252	252		1,251	532	207	64
Twice Around	Catalina 30		198	198		1,055	451	187	88
Whirlaway	Frers 33		114	114		898	349	110	13
Wicked Good	Tarttan P270 **		132	132		965	386	134	26
Wild Horses	Melges 32		30	30		763	260	41	(73)

Mapping Notes:

Seidelman 34 mapped to C&C 34
Tartan Pride 270 mapped to J/27
Tartan 3700 SD WK mapped to Tartan 3500 SD WK
Thomas 35 mapped to J/35
Tartan Pride 270 mapped to J/27