



VPP PROPOSED CHANGES FOR 2026 FROM THE ITC ANALYSIS OF THE XR41

Background

The ORC VPP is updated yearly based on the submissions from the ORC Nominating Bodies, feedback from the events and data from the performance database. Anything incorrect found during the season can trigger an investigation to understand if a boat is performing better or worse than her polar curves. The ORC's goal through the ITC work is to provide equitable ratings for the fleet, without any typeforming to any boat or design feature.

How did the issue of XR-41 arise?

During the ORC Worlds 2025 in Tallinn it was noted that rating differences (time allowances in different wind speeds and directions) between XR-41 and X-41 were unusual. The following tables of time allowances show the handicap polars for both boats, the lower table shows the difference between the two, the 'deltas'.

X-41

Time Allowances in secs/NM

Wind Velocity	4 kt	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt	24 kt
Beat Angles	43.1	43.1	41.0	39.1	37.9	37.7	37.4	37.4	38.5
Beat VMG	1289.8	930.8	763.4	683.6	652.3	636.8	627.4	618.6	626.6
52	821.7	610.2	517.7	478.5	463.0	456.0	451.3	446.1	445.8
60	767.4	579.5	500.5	467.0	451.6	444.2	439.1	432.8	432.3
75	733.9	560.4	490.1	459.4	441.1	428.7	421.0	410.8	406.1
90	774.7	572.1	485.7	457.8	439.7	423.0	409.3	391.2	380.7
110	743.8	553.1	470.9	437.1	415.8	402.0	390.1	369.6	352.2
120	766.3	563.7	474.9	438.5	412.1	390.3	374.1	347.7	323.6
135	884.1	626.4	507.3	457.2	427.7	401.3	375.8	320.7	273.9
150	1054.2	745.0	593.6	506.2	459.4	433.3	410.7	365.1	292.8
Run VMG	1218.1	860.3	685.4	584.5	527.0	495.4	470.2	421.5	338.1

XR-41

Time Allowances in secs/NM

Wind Velocity	4 kt	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt	24 kt
Beat Angles	42.9	42.9	40.7	39.1	38.6	38.5	38.4	38.5	39.9
Beat VMG	1256.2	914.9	759.8	692.3	664.4	648.9	639.7	632.4	646.0
52	802.2	602.9	517.3	478.3	460.5	451.3	445.6	439.7	440.8
60	755.2	574.2	498.6	462.4	444.6	436.0	430.0	422.8	423.4
75	726.8	555.8	485.6	450.6	430.3	416.0	406.8	394.7	389.9
90	722.1	546.3	472.1	437.8	419.9	407.3	391.4	371.5	361.3
110	745.0	551.8	466.4	426.8	401.4	381.9	364.3	341.6	326.7
120	763.9	560.3	469.1	427.0	396.2	371.5	355.1	322.4	294.8
135	885.1	623.6	501.1	445.9	412.3	382.4	355.0	303.6	261.1
150	1050.7	741.6	589.8	500.2	447.8	417.8	391.3	340.9	269.0
Run VMG	1213.7	856.3	681.0	577.6	515.3	480.8	451.5	393.6	310.7

Rating differences between X-41 and XR-41

Wind Velocity	4 kt	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt	24 kt
Beat Angles	0.2	0.2	0.3	0.0	-0.7	-0.8	-1.0	-1.1	-1.4
Beat VMG	33.6	15.9	3.6	-8.7	-12.1	-12.1	-12.3	-13.8	-19.4
52	19.5	7.3	0.4	0.2	2.5	4.7	5.7	6.4	5.0
60	12.2	5.3	1.9	4.6	7.0	8.2	9.1	10.0	8.9
75	7.1	4.6	4.5	8.8	10.8	12.7	14.2	16.1	16.2
90	52.6	25.8	13.6	20.0	19.8	15.7	17.9	19.7	19.4
110	-1.2	1.3	4.5	10.3	14.4	20.1	25.8	28.0	25.5
120	2.4	3.4	5.8	11.5	15.9	18.8	19.0	25.3	28.8
135	-1.0	2.8	6.2	11.3	15.4	18.9	20.8	17.1	12.8
150	3.5	3.4	3.8	6.0	11.6	15.5	19.4	24.2	23.8
Run VMG	4.4	4.0	4.4	6.9	11.7	14.6	18.7	27.9	27.4

Red shows where X-41 is rated faster, while green is where XR-41 is rated faster. The XR-41 is rated faster in almost all points of sail, she is rated slower in VMG upwind over 10 kts of wind. Competitors inevitably asked the question why the XR-41 is predicted to sail slower upwind while she is faster in all other conditions. Only the VMG upwind and downwind ratings affect the handicaps for the windward/leeward races.

In summary, the new XR 41 is about one foot longer, has some 12 square meters more of upwind sail area, and has a 20 to 25 percent higher righting moment at a 20 degrees heel. Despite these numbers, the XR 41 is predicted to sail slower than the X-41 upwind from 10 knots TWS in the ORC rating. The deltas in the table above reflect the more powerful characteristics of the XR41 everywhere **except** for the upwind VMG, which is **half** of the windward leeward time allowance.



What was done by the ITC?

Whilst no formal submission was made, the Chief Measurer and some ORC Congress members asked the ITC to evaluate this discrepancy between the upwind VMG and all other points of sail. The ITC discussed the matter during the ITC meeting in Malta on the 10th of October. The meeting was attended virtually by several observers and the minutes are published on the ORC website.

The ORC Residuary resistance model uses a set of ANNs (Artificial Neural Networks) as part of its calculations. The ANNs were trained using CFD (Computational Fluid Dynamics) data points with a range of various input parameters. In analysing these input parameters, it was noted:

- There is a lack of CFD data for heavy boats going fast, i.e. low LVR (short L or high volume) at higher Froude Numbers (non-dimensional speed/length ratio). This was a deliberate choice when setting up the test program to avoid running data points that were not likely to happen. Now at the highest speeds, some boats are falling outside the available data and the ANNs with a resulting drop in residuary resistance prediction accuracy.
- Looking along the row of plots of CWPA vs other parameters (e.g. Froude number, LVR, BTR, etc.) the XR-41 parameters lie well above the cloud of test data points on which the model is trained. The same is true for the Class 40 but to a lesser extent. Again, this means the predictive accuracy of the ANNs is reduced.
- For all the other parameters, the XR-41 data lies comfortably inside the CFD data.
- Overall, this means that the ANNs used to calculate the residuary resistance have no data to work out the interactions between CWPA and the other parameters. This makes the ANN unreliable, and as found by the designers; the R_r is unrealistically high.

What is the solution proposed?

To correct this uncertainty in the calculation of the residuary resistance for boats whose parameters lie outside the reliable range, the ITC has proposed the following solution:

- Introducing hard limits on the input parameters to the R_r force model that prevent the use of values that lie outside the appropriate range.
- In the few instances where the LVR and F_n approaches or lies outside the test data, the R_r prediction will be smoothly blended to match the 2013 model (without use of the ANNs).



What is the effect of the proposed VPP changes?

A new comparison was made with proposed VPP resulting as follows:

X-41

Time Allowances in secs/NM									
Wind Velocity	4 kt	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt	24 kt
Beat Angles	43.1	43.1	41.0	39.1	37.9	37.7	37.4	37.4	38.5
Beat VMG	1289.8	930.8	763.4	683.6	652.3	636.8	627.4	618.6	626.6
52	821.7	610.2	517.7	478.5	463.0	456.0	451.3	446.1	445.8
60	767.4	579.5	500.5	467.0	451.6	444.2	439.1	432.8	432.3
75	733.9	560.4	490.1	459.4	441.1	428.7	421.0	410.8	406.3
90	774.7	572.1	485.7	457.8	439.7	423.0	409.4	391.7	381.3
110	743.8	553.1	470.9	437.1	415.8	402.3	390.5	369.9	352.7
120	766.2	563.7	474.9	438.5	412.2	390.6	374.4	348.3	325.2
135	884.1	626.4	507.3	457.2	427.7	401.4	375.5	321.8	277.8
150	1054.2	745.0	593.6	506.2	459.4	433.3	410.8	365.1	297.5
Run VMG	1218.1	860.3	685.4	584.5	527.0	495.4	470.2	421.6	343.5

XR-41

Time Allowances in secs/NM									
Wind Velocity	4 kt	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt	24 kt
Beat Angles	43.0	43.0	40.6	39.1	38.5	38.2	38.0	38.9	40.5
Beat VMG	1239.9	899.8	744.7	677.5	650.5	635.7	627.0	619.5	632.5
52	790.3	592.2	506.7	469.3	453.8	445.6	440.5	435.1	436.1
60	742.0	563.6	489.2	455.2	439.5	431.7	425.9	419.1	418.2
75	712.2	545.4	477.6	445.3	426.0	412.6	404.2	393.0	388.4
90	710.5	537.6	465.2	433.4	416.7	404.5	389.7	370.1	359.0
110	734.7	544.6	461.1	423.4	399.5	380.7	362.6	336.7	318.2
120	754.1	553.4	464.0	424.0	394.5	370.1	352.8	313.3	283.7
135	876.4	615.7	494.4	442.5	410.4	381.4	351.7	293.6	254.6
150	1040.3	733.3	582.5	494.5	444.6	415.9	390.6	330.7	262.7
Run VMG	1201.9	846.7	672.6	571.0	510.9	478.1	450.4	381.8	303.3

Rating differences between X-41 and XR-41

Wind Velocity	4 kt	6 kt	8 kt	10 kt	12 kt	14 kt	16 kt	20 kt	24 kt
Beat Angles	0.1	0.1	0.4	0.0	-0.6	-0.5	-0.6	-1.5	-2.0
Beat VMG	49.9	31.0	18.7	6.1	1.8	1.1	0.4	-0.9	-5.9
52	31.4	18.0	11.0	9.2	9.2	10.4	10.8	11.0	9.7
60	25.4	15.9	11.3	11.8	12.1	12.5	13.2	13.7	14.1
75	21.7	15.0	12.5	14.1	15.1	16.1	16.8	17.8	17.9
90	64.2	34.5	20.5	24.4	23.0	18.5	19.7	21.6	22.3
110	9.1	8.5	9.8	13.7	16.3	21.6	27.9	33.2	34.5
120	12.1	10.3	10.9	14.5	17.7	20.5	21.6	35.0	41.5
135	7.7	10.7	12.9	14.7	17.3	20.0	23.8	28.2	23.2
150	13.9	11.7	11.1	11.7	14.8	17.4	20.2	34.4	34.8
Run VMG	16.2	13.6	12.8	13.5	16.1	17.3	19.8	39.8	40.2

With these changes to the VPP, the X-41 ratings are unchanged. Those for the XR-41 are changed and the XR-41 is no longer rated slower on VMG upwind (except over 20 kts of wind).

The ITC recommends this new VPP to Congress. It corrects the oversight of not imposing parameter limits and it corrects the anomalous behaviour of the XR-41 VMG values. The change in handicaps in no way makes the XR-41 uncompetitive; rescoring the ORC Worlds 2025 with the proposed 2026 VPP still has Formula X winning the regatta, discarding a 3rd place.

Original results

Rank	Nation	Sail No.	Boat	Yacht Name	Skipper	Type	Division	R1	R2	R3	R4	R5	R6	R7	Total
1	DEN	DEN 1	26	FORMULA X	Jesper Radich	XR 41		1.00	1.00	1.00	2.00	2.00	3.00	3.00	9.00
2	DEN	DEN 4100	25	DDO 5	Erik Starow	XR 41		2.00	4.00	2.00	3.00	2.00	1.00	3.00	14.00
3	POL	POL 1044	21	WINDWISPER44-Windwisper	March Sufkowski	Grand Soleil 44P		4.00	2.00	2.00	1.00	4.00	4.00		17.00
4	GER	GER 8696	24	EXCITER	Jens Kaphal	XR 41		5.00	9.50	5.00	10.00	7.00	8.00	7.00	22.50
5	LTU	LTU 2399	41	ARABELA	Raimondas Slagdins	Italia 11.98	COR	6.00		8.00	4.00	9.00	5.00	5.00	37.00
6	EST	EST 463	27	OLYMPIC	Tiit Vihtu	X-41 mod.	COR	12.00	3.00	4.00	5.00	10.00	7.00		41.00
7	EST	EST 1198	36	FANATIC 2	Ain-Eke Jalasto	Italia 11.98	COR	9.00	14.00	6.00	8.00	13.00	8.00	4.00	48.00
8	EST	EST 475	33	FORTE	Jaak Jõgi	X-41		10.00	8.00	9.00	7.00	7.00	10.00		51.00
9	EST	EST 113	39	SHADOW	Harles Luv	J-112E	COR	8.00	15.00	13.00	6.00	20.00	6.00	6.00	59.00
10	FIN	FIN 68	28	XINI FREEDOM	Martin Estlander	X-41		5.00	18.00	11.00	14.00	11.00	11.00	10.00	62.00
11	LTU	LTU 2453	38	KETURI VĖJAI	Karolis Janulonis	J-112E		13.00	7.00	14.50	11.00	14.00	9.00	8.00	62.00
12	SWE	SWE 123	20	STORMTROOPER	Jonas Andersson	Farr 40	COR	16.00	20.00	5.00	17.00	5.00	14.00	9.00	66.00
13	LTU	LTU 2410	40	RHINO	Saulius Pejarskas	Italia 11.98	COR	7.00	5.00	12.00	9.00	12.00			68.00
14	DEN	DEN 6869	34	NEXUS	Søren Junker	X-41	COR	15.00	11.00	17.00	12.00	6.00	15.00	11.00	70.00
15	LAT	LAT 637	37	THORA	Rihards Valovs	J-112E		14.00	17.00	18.00	13.00	15.00	12.00	7.00	77.00
16	DEN	DEN 41	23	XBOX	Henrik Jørgensen	XR 41		11.00	12.00	16.00	15.00	8.00	23.00	23.00	85.00
17	GER	GER 7350	32	AJA	John Victorin	X-41	COR	19.00	13.00	10.00	16.00	19.00	16.00	12.00	89.00
18	SWE	SWE 70	29	ALMAVIVA	Roland Ljungholm	First 40	COR	18.00	6.00	19.00	20.00	18.00	13.00		94.00
19	GER	GER 29	30	STARDUST	Alf Henryk Wulf	X-41		20.00	19.00	14.00	19.00	17.00	14.00	10.00	101.00
20	SWE	SWE 4991	31	JOINT VENTURE 4.0	Fredrik Lagerström	X-41 mod.	COR	17.00	16.00	20.00	18.00	16.00			110.00
21	FIN	FIN 13004	22	RUSH	Jori Lahtonen	Sydney 40 mod.		22.00	22.00	22.00	21.00	19.00	15.00		121.00
22	EST	EST 759	35	SLEEPER-PÕHJALA	Tiit Paananen	J-11S		21.00	21.00	21.00	21.00	22.00	18.00		124.00

VPP 2026 rescoring

Rank	Nation	Sail No.	Boat	Yacht Name	Skipper	Type	Division	R1	R2	R3	R4	R5	R6	R7	Total
1	DEN	DEN 1	26	FORMULA X	Jesper Radich	XR 41		1.00	1.00	2.00	3.00	3.00	2.00	3.00	12.00
2	POL	POL 1044	21	WINDWISPER44-Windwisper	March Sufkowski	Grand Soleil 44P		2.00	4.00	2.00	1.00	4.00	4.00		13.00
3	DEN	DEN 4100	25	DDO 5	Erik Starow	XR 41		6.00	8.00	10.00	4.00	1.00	1.00	6.00	26.00
4	LTU	LTU 2399	41	ARABELA	Raimondas Slagdins	Italia 11.98	COR	4.00	9.00	7.00	7.00	8.00	5.00	10.00	29.00
5	GER	GER 8696	24	EXCITER	Jens Kaphal	XR 41		8.00	14.00	14.00	2.00	3.00	5.00		35.00
6	EST	EST 463	27	OLYMPIC	Tiit Vihtu	X-41 mod.	COR	11.00	2.00	4.00	5.00	9.00	7.00	10.00	38.00
7	EST	EST 1198	36	FANATIC 2	Ain-Eke Jalasto	Italia 11.98	COR	9.00	11.00	6.00	8.00	13.00	8.00	7.00	46.00
8	EST	EST 475	33	FORTE	Jaak Jõgi	X-41		10.00	7.00	8.00	7.00	7.00	10.00		49.00
9	EST	EST 113	39	SHADOW	Harles Luv	J-112E	COR	7.00	13.00	13.00	6.00	20.00	6.00	4.00	56.00
10	FIN	FIN 68	28	XINI FREEDOM	Martin Estlander	X-41		5.00	18.00	10.00	13.00	11.00	11.00	10.00	58.00
11	LTU	LTU 2453	38	KETURI VĖJAI	Karolis Janulonis	J-112E		12.00	6.00	15.00	10.00	14.00	9.00	8.00	59.00
12	LTU	LTU 2410	40	RHINO	Saulius Pejarskas	Italia 11.98	COR	5.00	4.00	11.00	9.00	12.00			64.00
13	SWE	SWE 123	20	STORMTROOPER	Jonas Andersson	Farr 40	COR	16.00	20.00	5.00	16.00	5.00	14.00	9.00	65.00
14	DEN	DEN 6869	34	NEXUS	Søren Junker	X-41	COR	15.00	10.00	16.00	11.00	6.00	15.00	11.00	68.00
15	LAT	LAT 637	37	THORA	Rihards Valovs	J-112E		14.00	17.00	18.00	12.00	15.00	12.00	7.00	77.00
16	GER	GER 7350	32	AJA	John Victorin	X-41	COR	19.00	12.00	9.00	15.00	19.00	16.00	12.00	86.00
17	SWE	SWE 70	29	ALMAVIVA	Roland Ljungholm	First 40	COR	18.00	5.00	16.00	20.00	18.00	13.00		90.50
18	DEN	DEN 41	23	XBOX	Henrik Jørgensen	XR 41		13.00	15.00	19.00	18.00	10.00			98.50
19	GER	GER 29	30	STARDUST	Alf Henryk Wulf	X-41	COR	20.00	19.00	14.00	19.00	17.00	17.00	10.00	101.00
20	SWE	SWE 4991	31	JOINT VENTURE 4.0	Fredrik Lagerström	X-41 mod.	COR	17.00	15.00	20.00	17.00	16.00			109.00
21	FIN	FIN 13004	22	RUSH	Jori Lahtonen	Sydney 40 mod.		22.00	22.00	22.00	21.00	19.00	15.00		121.00
22	EST	EST 759	35	SLEEPER-PÕHJALA	Tiit Paananen	J-11S		21.00	21.00	20.50	21.00	22.00	18.00		123.50