

## ReVerie & Cundy Wind Tunnel Testing Session Results 30/11/07

### Overview

A standard Noble M12 was wind tunnel tested at MIRA and data was recorded to create a comparison to the ReVerie modified Noble M400. The modifications improve down force and give a better aerodynamic balance.

### Modifications:

**Front Duct Blanks, Front Radiator Gurney, Front Canards, Front Wheel Arch Venting, Rear Spoiler & Rear Diffuser.**

Front end down force is achieved by the front splitter with end fences and the front canards. While the positive louvres reduce lift and drag the duct blanks also reduce drag and vent air and heat through the separate intakes behind the front grille allowing cool air to flow to the brakes and AVAC system. The rear down force comes from the rear spoiler, the rear diffuser, rear arch venting, rear gurney flap and a longer rear wing with end plates fitted.

### Car Setup

Both the standard Noble and the ReVerie modified Noble have the same frontal area of  $1.870\text{m}^2$ . The ride heights are both adjusted equally for the comparisons.

### Testing

**The total extra down force applied to the car is more than 50%. A total of over 435 KG down force.** Various different setups were tested to achieve higher down force with more balance around the centre of gravity and still achieve very good lift over drag performance

### Aerodynamics

Modifications have been designed with minimal drag. The overall extra drag only adds up to 10% which is very much outweighed by the extra overall down force and balance.

### Ride Heights

For the majority of the tests the ride heights remained unchanged. Only in step 13 of the ReVerie modified Noble and the proceeding steps the rear ride height was raised by 5mm to give more floor rake.



## Conclusion

When they ReVerie modified Noble was delivered to the wind tunnel it was equipped with a front splitter, front canards, front duct blanks, front radiator gurney, rear gurney, rear spoiler and a rear diffuser. At step 13 the ride height was raised by 5mm at the rear to give the car more floor rake.



**Our last test yielded the best results with only a 10% increase in drag but gaining 56% extra overall down force. We also moved the down force distribution (overall balance) from 9% on the front to 38.5% on the front giving a 38.5% - 61.5% front to rear distribution.**

**This improves the down force over the front end of the car by 418%.**

We achieved this astonishing figure by using a combination of front wheel arch venting to release under arch pressure, front canards to provide front down force and the front splitter to create the rest of the front down force.



**Table Of Coefficients**

<b>Car</b>	<b>Configuration</b>	<b>CD</b>	<b>CL</b>	<b>CLf</b>	<b>CLr</b>	<b>%Front Aero</b>	<b>Lift/Drag</b>	<b>Frontal Area</b>
<b>Standard Noble M400</b>	Standard	0.470	-0.348	-0.032	-0.317	9.20%	-0.74	1.870 (m <sup>2</sup> )
	With fast back panel fitted	0.469	-0.351	-0.025	-0.326	7.12%	-0.75	1.870 (m <sup>2</sup> )
<b>Reverie Race Modified Noble M400</b>	1. Baseline as delivered	0.502	-0.504	-0.109	-0.394	21.63%	-1.00	1.870 (m <sup>2</sup> )
	3. As 1 plus 30x150mm upturns on the splitter ends.	0.503	-0.509	-0.115	-0.393	22.59%	-1.01	1.870 (m <sup>2</sup> )
	5. As 4 plus gap under splitter taped over	0.504	-0.525	-0.138	-0.387	26.29%	-1.04	1.870 (m <sup>2</sup> )
	8. As 7 plus small forward facing front triangular fill in end panels for splitter	0.510	-0.549	-0.177	-0.373	32.24%	-1.08	1.870 (m <sup>2</sup> )
	11. As 10 plus front radiator duct exit gurney	0.513	-0.521	-0.194	-0.327	37.24%	-1.02	1.870 (m <sup>2</sup> )
	12. As 11 with front splitter planes removed	0.502	-0.527	-0.128	-0.400	24.29%	-1.05	1.870 (m <sup>2</sup> )
	13. As 12 with rear ride height raised by 5mm	0.506	-0.538	-0.139	-0.401	25.84%	-1.06	1.870 (m <sup>2</sup> )
	14. As 13 with front splitter planes re attached	0.518	-0.543	-0.209	-0.334	38.49%	-1.05	1.870 (m <sup>2</sup> )

84.1 MPH

Wind Speed (MPS): 37.62			Drag	Total Df	Front Df	Rear Df	O/A balance^	FrontalArea	AdditionalDrag	Additional D/Force
<b>Standard</b>	Standard	Newtons	761.874	564.111	-51.872	513.860	9.20%	1.87m^2	0.00%	0%
		Kilograms	77.663	-57.504	-5.288	-52.381				
<b>Fastback panel fitted</b>	With fast back panel fitted	Newtons	760.253	568.974	-40.525	513.860	7.12%	1.87m^2	0.00%	0%
		Kilograms	77.498	-57.999	-4.131	-52.381				

<b>Reverie Modified Noble M400</b>	1. Baseline as delivered	Newtons	813.746	816.988	176.690	638.677	21.63%	1.870m^2	6.81%	44.83%
		Kilograms	82.951	-83.281	-18.011	-65.105				
	3. As 1 plus 30x150mm upturns on the splitter ends.	Newtons	815.367	825.093	186.416	637.056	22.59%	1.870m^2	7.02%	46.26%
		Kilograms	83.116	-84.107	-19.003	-64.939				
	5. As 4 plus gap under splitter taped over	Newtons	816.988	851.029	223.699	627.330	26.29%	1.870m^2	7.23%	50.86%
		Kilograms	83.281	-86.751	-22.803	-63.948				
	8. As 7 plus small forward facing triangular fill in end panels for splitter	Newtons	826.714	889.934	286.918	604.636	32.24%	1.870m^2	8.51%	57.76%
		Kilograms	84.273	-90.717	-29.248	-61.635				
	11. As 10 plus front radiator duct exit gurney	Newtons	831.577	844.545	314.476	530.070	37.24%	1.870m^2	9.15%	49.71%
		Kilograms	84.768	-86.090	-32.057	-54.034				
	12. As 11 with front splitter planes removed	Newtons	813.746	854.271	207.489	648.403	24.29%	1.870m^2	6.81%	51.44%
		Kilograms	82.951	-87.082	-21.151	-66.096				
	13. As 12 with rear ride height raised by 5mm	Newtons	820.230	872.103	225.320	650.024	25.84%	1.870m^2	7.66%	54.60%
		Kilograms	83.612	-88.899	-22.968	-66.261				
	14. As 13 with front splitter planes re attached	Newtons	839.682	880.208	338.791	541.417	38.49%	1.870m^2	10.21%	56.03%
		Kilograms	85.595	-89.726	-34.535	-55.190				

100 MPH

Wind Speed (MPS): 44.704

			Drag	Total Df	Front Df	Rear Df	O/A balance^	FrontalArea	AdditionalDrag	Additional D/Force
<b>Standard Noble M400</b>	Standard	Newtons	1075.817	-796.562	-73.247	725.604	9.20%	1.960m^2	0.00%	0%
		Kilograms	109.665	-81.199	-7.467	-73.966				
<b>Fastback Noble M400</b>	With fast back panel fitted	Newtons	1073.528	-803.429	-73.247	746.205	9.12%	1.960m^2	0.00%	0%
		Kilograms	109.432	-81.899	-7.467	-76.066				

<b>Reverie Modified Noble M400</b>	1. Baseline as delivered	Newtons	1149.064	1153.642	249.498	901.855	21.63%	1.960m^2	6.81%	44.83%
		Kilograms	117.132	-117.599	-25.433	-91.932				
	3. As 1 plus 30x150mm upturns on the splitter ends.	Newtons	1151.353	1165.087	263.232	899.566	22.59%	1.960m^2	7.02%	46.26%
		Kilograms	117.365	-118.765	-26.833	-91.699				
	5. As 4 plus gap under splitter taped over	Newtons	1153.642	1201.710	315.878	885.832	26.29%	1.960m^2	7.23%	50.86%
		Kilograms	117.599	-122.498	-32.200	-90.299				
	8. As 7 plus small forward facing front triangular fill in end panels for splitter	Newtons	1167.376	1256.646	405.148	853.787	32.24%	1.960m^2	8.51%	57.76%
		Kilograms	118.999	-128.098	-41.299	-87.032				
	11. As 10 plus front radiator duct exit gurney	Newtons	1174.243	1192.554	444.061	748.494	37.24%	1.960m^2	9.15%	49.71%
		Kilograms	119.699	-121.565	-45.266	-76.299				
	12. As 11 with front splitter planes removed	Newtons	1149.064	1206.288	292.988	915.589	24.29%	1.960m^2	6.81%	51.44%
		Kilograms	117.132	-122.965	-29.866	-93.332				
	13. As 12 with rear ride height raised by 5mm	Newtons	1158.220	1231.467	318.167	917.878	25.84%	1.960m^2	7.66%	54.60%
		Kilograms	118.065	-125.532	-32.433	-93.566				
	14. As 13 with front splitter planes re attached	Newtons	1185.687	1242.912	478.395	764.517	38.49%	1.960m^2	10.21%	56.03%
		Kilograms	120.865	-126.698	-48.766	-77.932				

**150MPH**

**Wind Speed (MPS):** 67.056

			<b>Drag</b>	<b>Total Df</b>	<b>Front Df</b>	<b>Rear Df</b>	<b>O/A balance^</b>	<b>FrontalArea</b>	<b>AdditionalDrag</b>	<b>Additional D/Force</b>
<b>Standard Noble M400</b>	Standard	Newtons	2420.588	-	-164.806	1632.609	9.20%	1.960m^2	0.00%	0%
		Kilograms	246.747	-182.698	-16.800	-166.423				
<b>Fastback Noble M400</b>	With fast back panel fitted	Newtons	2415.438	-	-128.755	1678.961	7.12%	1.960m^2	0.00%	0%
		Kilograms	246.222	-184.273	-13.125	-171.148				

<b>Reverie Modified Noble M400</b>	1. Baseline as delivered	Newtons	2585.394	-	-561.370	2029.174	21.63%	1.960m^2	6.81%	44.83%
		Kilograms	263.547	-264.597	-57.224	-206.847				
	3. As 1 plus 30x150mm upturns on the splitter ends.	Newtons	2590.544	-	-592.271	2024.023	22.59%	1.960m^2	7.02%	46.26%
		Kilograms	264.072	-267.222	-60.374	-206.322				
	5. As 4 plus gap under splitter taped over	Newtons	2595.694	-	-710.726	1993.122	26.29%	1.960m^2	7.23%	50.86%
		Kilograms	264.597	-275.622	-72.449	-203.173				
	8. As 7 plus small forward facing front triangular fill in end panels for splitter	Newtons	2626.595	-	-911.583	1921.020	32.24%	1.960m^2	8.51%	57.76%
		Kilograms	267.747	-288.221	-92.924	-195.823				
	11. As 10 plus front radiator duct exit gurney	Newtons	2642.046	-	-999.136	1684.111	37.24%	1.960m^2	9.15%	49.71%
		Kilograms	269.322	-273.522	-101.849	-171.673				
	12. As 11 with front splitter planes removed	Newtons	2585.394	-	-659.224	2060.075	24.29%	1.960m^2	6.81%	51.44%
		Kilograms	263.547	-276.672	-67.199	-209.997				
	13. As 12 with rear ride height raised by 5mm	Newtons	2605.995	-	-715.876	2065.225	25.84%	1.960m^2	7.66%	54.60%
		Kilograms	265.647	-282.447	-72.974	-210.522				
	14. As 13 with front splitter planes re attached	Newtons	2667.797	-	1076.389	1720.162	38.49%	1.960m^2	10.21%	56.03%
		Kilograms	271.947	-285.072	-109.724	-175.348				

186 MPH

Wind Speed  
(MPS): 83.149

Drag Total Df Front Df Rear Df O/A balance^ FrontalArea AdditionalDrag Additional D/Force

<b>Standard Noble M400</b>	Standard	Newton	3721.856	2755.758	-253.403	2510.273	9.20%	1.960m^2	0.00%	0%
		Kilograms	379.394	-280.913	-25.831	-255.889				
<b>Fastback Noble M400</b>	With fast back panel fitted	Newton	3713.938	2779.514	-197.971	2581.543	7.12%	1.960m^2	0.00%	0%
		Kilograms	378.587	-283.335	-20.181	-263.154				

<b>Reverie Modified Noble M400</b>	1. Baseline as delivered	Newton	3975.259	3991.097	-863.154	3120.024	21.63%	1.960m^2	6.81%	44.83%
		Kilograms	405.225	-406.840	-87.987	-318.045				
	3. As 1 plus 30x150mm upturns on the splitter ends.	Newton	3983.178	4030.691	-910.667	3112.105	22.59%	1.960m^2	7.02%	46.26%
		Kilograms	406.032	-410.876	-92.830	-317.238				
	5. As 4 plus gap under splitter taped over	Newton	3991.097	4157.393	1092.800	3064.592	26.29%	1.960m^2	7.23%	50.86%
		Kilograms	406.840	-423.791	-111.397	-312.395				
	8. As 7 plus small forward facing front triangular fill in end panels for splitter	Newton	4038.610	4347.445	1401.635	2953.729	32.24%	1.960m^2	8.51%	57.76%
		Kilograms	411.683	-443.165	-142.878	-301.094				
	11. As 10 plus front radiator duct exit gurney	Newton	4062.367	4125.717	1536.256	2589.462	37.24%	1.960m^2	9.15%	49.71%
		Kilograms	414.105	-420.562	-156.601	-263.961				
	12. As 11 with front splitter planes removed	Newton	3975.259	4173.231	1013.612	3167.537	24.29%	1.960m^2	6.81%	51.44%
		Kilograms	405.225	-425.406	-103.324	-322.889				
	13. As 12 with rear ride height raised by 5mm	Newton	4006.935	4260.338	1100.719	3175.456	25.84%	1.960m^2	7.66%	54.60%
		Kilograms	408.454	-434.285	-112.204	-323.696				
	14. As 13 with front splitter planes re attached	Newton	4101.961	4299.932	1655.038	2644.894	38.49%	1.960m^2	10.21%	56.03%
		Kilograms	418.141	-438.321	-168.709	-269.612				