Belkoned

Marine Service b.v.

Additional speed trials

Ship's name	:	Filia Ariea
Date	:	June 12th, 2008
Report nr.	:	973-A / 08

By order of : Holland Shipyards

Ship's speed and manoeuvring measurements have been carried out by Belkoned Marine Service b.v. on board of :

m/v : Filia Ariea
On : June 12th, 2008

Belkoned Marine Service b.v., P.O. Box 391, 5680 AJ Best, the Netherlands, Tel: +31 (0)499-332064, E-mail: info@belkoned.nl

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REPORT NO. : 973-A / 08

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General Remarks

Method of speed, manoeuvring and power measurement.

A. Procedure of speed measurements.

In the DGPS method of speed determination, the ground speed is derived from an intelligent use of all DGPS positions fixes in each run (every 2 seconds).
Like in any other method the drift is eliminated by combining two or more, preferable four runs on opposite true courses. A double run consists of the following procedures:

1. During both runs, current is assumed to be constant (velocity and direction). The runs are scheduled in a steady stage of the tide. Therefore there are no corrections for current.

2. The ship is to be kept steady for at least 5 minutes to stabilize her on course and speed.

3. For a period of at least 4 minutes, latitude and longitude are recorded every DGPS interval. Control settings of the propulsion engine(s) are kept constant during this period. As well the rudder angle will be as less as possible to keep her on course.

4. After this run the ship is turned exactly 180 degrees, with the rudder angle at a maximum of 5 degrees to minimize loss of speed.

B. Equipment

Ship's position are recorded by the means of a DGPS Navigator (Furuno). The DGPS navigator is interfaced with a notebook computer. To produce a track plot, as well the evaluation is special written by ing. R.F. Zandbergen for Belkoned Marine Service b.v.

C. Ultra Fine Micro Bubble Drag Reduction System

In this report the speed/power performance of m/s Filia Ariea is given.
The ship is equipped with an ultra fine micro bubble system according the WAIP principle.
(Winged Air Induction Pipe)
At the tested draught 34 of the total 52 WAIP-units were in submerged position.
In a previous report the speed/power performance of the identical sistership Filia Nettie is reported, (Belkoned report nr. 952-08) for which trials were performed at the same draught and trim.
On page 9 of this report the speed/power performance of both vessels is compared.
This shows a power saving of the ship with WAIP, the m/s Filia Ariea,
of 9.4 % at a speed of at 14 knots, 7.3 % at 13 knots and 5.6 % at 12 knots.

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GENERAL DATA SHEET IMO : 1.1

Ship's name :	Filia Ariea	Call sign	: PIET
Year of built	: 2008	Port of Reg.	: Werkendam
IMO Nr. :	: 94.88.815	Class	: BV
Shipyard :	: Holland Shipyards	Flag :	: Dutch
Owners	: Filia Shipping Company		

HULL AND LIGHT SHIP

Length o.a.	: 89.99 m	Length Lpp.	: 84.95 m
Breadth moulded	: 13.75 m	Depth moulded	: 5.55 m
Gross Tonnage	: 2191	Netto Tonnage	: 1161
Deadweight at summer draught	: 2932 t	Extreme height (at sea condition)	: 24.58 m
Block coëfficient summer load	: 0.77		
Block coëfficient ballast condition	: 0.74		
Projected areas above-water profiles		BALLAST:	LOADED:
Transverse	:	:	
Lateral	:	:	

MAIN ENGINE

Type/nr.	: Wartsila 8L20C	Number of units	: 1
Power output	: 1440 kW		

PROPELLER

Type/nr.	: 1	No. of blades	: 4
Diameter	: 2800 mm	Pitch	: cpp
Rotation	: c.c.w.	Prop. immersion at	: 1300 mm

RUDDER

Rudder type/nr.	: Flap	Rudder area	: 6.4 m²
Rudder area ratio ballast	:	Rudder area ratio loaded	:

LOAD CONDITION

Normal ballast condition:	Draught fore	: 2.43 m
	aft	: 3.82 m
	mean	: 3.12 m
	Displacement	: 2783 t
Normal loaded condition:	Draught fore	: 4.06 m
	aft	: 4.65 m
	mean	: 4.35 m
	Displacement	: 4030 t

BOW AND STERN THRUSTERS

Type and nr.	: Promac FP300 / 1	Power	: 205 kW
Distance from fore ship	: 8.50 m	Pitch	: fixed

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SPEED TRIALS

Ship's name	: Filia Ariea	Date	: June 12th, 2008
Report nr.	: 973-A / 08	Trial area	: Oosterschelde
Draught fore	: 1.88 m	Time high water	: n.a.
aft	: 3.12 m	Place	: n.a.
mean	: 2.50 m		
Displacement on trial	: 2150 t	Wave / swell direction	: E'ly
AM	: 42 m²	Hs.	: 0.10 m
Wind direction	: ENE	Power and thrust	
force	: 3.0 Bft.	measurement system	: by JVS
Current direction	: 290 / 110 deg.	Position and speed	
speed	: var	measurement system	: Furuno-DGPS

A. The following speedtrials have been carried out by the main propulsion installation at a a mean draft of: 2.50 m

3 runs in opposite direction with 735 kW shaft-power.
3 runs in opposite direction with 1036 kW shaft-power.
3 runs in opposite direction with 1364 kW shaft-power.
3 runs in opposite direction with 1367 kW shaft-power (w/o blower).
6 runs in opposite direction with 1358 kW shaft-power (blower @ 50%).

B. Shallow water correction: See appendix C.

C. Wind correction (to Bft. 2): See appendix C.

Conclusion

1. The final speed during the trials at 1364 kW shaft-power was:

14.14 knots

2. The final corrected speed (for wind, Bft 2.) at 1306 kW shaft-power is:

14.14 knots

2. The final corrected speed (for wind, Bft. 2) at 1364 kW shaft-power is:

14.3 knots

**** Measured on propeller shaft by JVS**

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RESUME

Run number		1	2	3	4	5	6
Local time	hrs.	10.49	11.04	11.18	11.31	11.45	11.59
Heading	deg.	112	292	112	292	112	292
Course made good	deg.	112	292	111	293	113	292
Time for measured distance	sec.	360	360	360	360	360	360

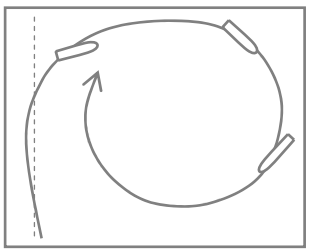
RUDDER							
mean amplitude	deg.	1	1	1	1	1	1
mean period	sec.	30	30	30	30	30	30

Ground speed measured single run	kn.	12.54	10.94	12.48	12.82	13.19	13.00
Apperent influence current & weather	kn.		-0.80	0.77		0.18	-0.09
Means of means	kn.		**11.73**			**13.05**	
Mean water depth	m.	29	29	29	29	29	29
Shallow water corr.	%	0.00	0.00	0.00	0.00	0.00	0.00
Gnd. speed corr.	**kn.**	**12.54**	**10.94**	**12.48**	**12.82**	**13.19**	**13.00**
First mean			11.74	11.71		13.01	13.10
Corr. gnd. speed means of means	**kn.**		**11.73**			**13.05**	

Pitch setting		74	74	74	87	87	87
Engine rotation **	rpm	999	999	998	999	999	999
Shaft generator	kW	on	on	on	on	on	on
Shaft power **	kW	745	723	747	1031	1057	999
Means of means	kW		735			1036	

WIND							
speed	m/s	4	4	4	4	4	4
direction	deg.	ENE	ENE	ENE	ENE	ENE	ENE
Weather correction	%	4.3	4.3	4.3	4.3	4.3	4.3
Weather correction	kW	32	31	32	44	45	43
Power corrected for weather	**kW**	713	692	715	987	1012	956
First mean	kW		703	704		1000	984
Corrected power means of means	**kW**		**703**			**992**	

**** Measured on propeller shaft by JVS**



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RESUME

Run number		7	8	9			
Local time	hrs.	12.22	12.37	12.51			
Heading	deg.	292	112	292			
Course made good	deg.	293	112	292			
Time for measured distance	sec.	360	360	360			

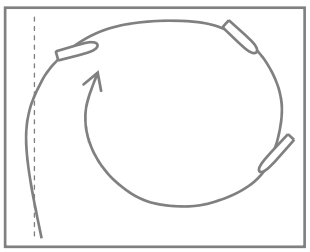
RUDDER							
mean amplitude	deg.	1	1	1			
mean period	sec.	30	30	30			

Ground speed measured single run	kn.	14.47	13.53	15.03			
Apperent influence current & weather	kn.		-0.47	0.75			
Means of means	kn.		**14.14**				
Mean water depth	m.	26	26	26			
Shallow water corr.	%	0.16	0.15	0.17			
Gnd. speed corr.	**kn.**	**14.50**	**13.55**	**15.05**			
First mean			14.02	14.30			
Corr. gnd. speed means of means	**kn.**		**14.16**				

Pitch setting		100	100	100			
Engine rotation **	rpm	1002	1003	1003			
Shaft generator	kW	on	on	on			
Shaft power **	kW	1359	1368	1360			
Means of means	kW		1364				

WIND							
speed	m/s	4	4	4			
direction	deg.	ENE	ENE	ENE			
Weather correction	%	4.3	4.3	4.3			
Weather correction	kW	58	58	58			
Power corrected for weather	**kW**	1301	1310	1302			
First mean	kW		1305	1306			
Corrected power means of means	**kW**		**1306**				

**** Measured on propeller shaft by JVS**



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RESUME **without blower**

Run number		10	11	12			
Local time	hrs.	13.03	13.15	13.28			
Heading	deg.	112	292	112			
Course made good	deg.	113	295	112			
Time for measured distance	sec.	360	360	360			

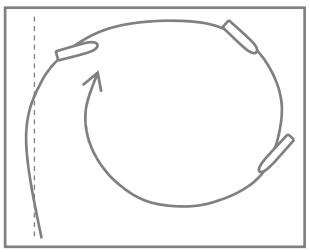
RUDDER							
mean amplitude	deg.	1	1	1			
mean period	sec.	30	30	30			

Ground speed measured single run	kn.	13.15	15.27	12.87			
Apperent influence current & weather	kn.		1.06	-1.20			
Means of means	kn.		**14.14**				
Mean water depth	m.	29	29	29			
Shallow water corr.	%	0.00	0.01	0.00			
Gnd. speed corr.	**kn.**	**13.15**	**15.27**	**12.87**			
First mean			14.21	14.07			
Corr. gnd. speed means of means	**kn.**		**14.14**				

Pitch setting		100	100	100			
Engine rotation **	rpm	1003	1003	1102			
Shaft generator	kW	off	off	off			
Shaft power **	kW	1385	1352	1377			
Means of means	kW		1367				

WIND							
speed	m/s	4	4	4			
direction	deg.	ENE	ENE	ENE			
Weather correction	%	4.3	4.3	4.3			
Weather correction	kW	59	58	59			
Power corrected for weather	**kW**	1326	1294	1318			
First mean	kW		1310	1306			
Corrected power means of means	**kW**		**1308**				

**** Measured on propeller shaft by JVS**



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RESUME **Blower @ 50%**

Run number		13	14	15	16	17	18
Local time	hrs.	13.55	14.10	14.23	14.34	14.45	14.57
Heading	deg.	112	292	112	292	112	292
Course made good	deg.	114	292	113	293	113	292
Time for measured distance	sec.	360	360	360	360	360	360

RUDDER							
mean amplitude	deg.	1	1	1	1	1	1
mean period	sec.	30	30	30	30	30	30

Ground speed measured single run	kn.	12.68	15.33	12.93	15.15	12.84	15.02
Apperent influence current & weather	kn.		1.33	-1.20	1.11	-1.15	1.09
Means of means	kn.			14.04			
Mean water depth	m.	29	29	29	29	29	29
Shallow water corr.	%	0.00	0.01	0.00	0.01	0.00	0.01
Gnd. speed corr.	**kn.**	**12.68**	**15.33**	**12.93**	**15.15**	**12.84**	**15.03**
First mean			14.01	14.13	14.04	14.00	13.93
Corr. gnd. speed means of means	**kn.**			**14.04**			

Pitch setting		100	100	100	100	100	100
Engine rotation **	rpm	1002	1002	1002	1001	1001	1001
Shaft generator	kW	off	off	off	off	off	off
Shaft power **	kW	1365	1370	1338	1360	1386	1334
Means of means	kW			**1358**			

WIND							
speed	m/s	4	4	4	4	4	4
direction	deg.	ENE	ENE	ENE	ENE	ENE	ENE
Weather correction	%	4.3	4.3	4.3	4.3	4.3	4.3
Weather correction	kW	58	58	57	58	59	57
Power corrected for weather	**kW**	1307	1312	1281	1302	1327	1277
First mean	kW		1309	1296	1292	1315	1302
Corrected power means of means	**kW**			**1300**			

**** Measured on propeller shaft by JVS**

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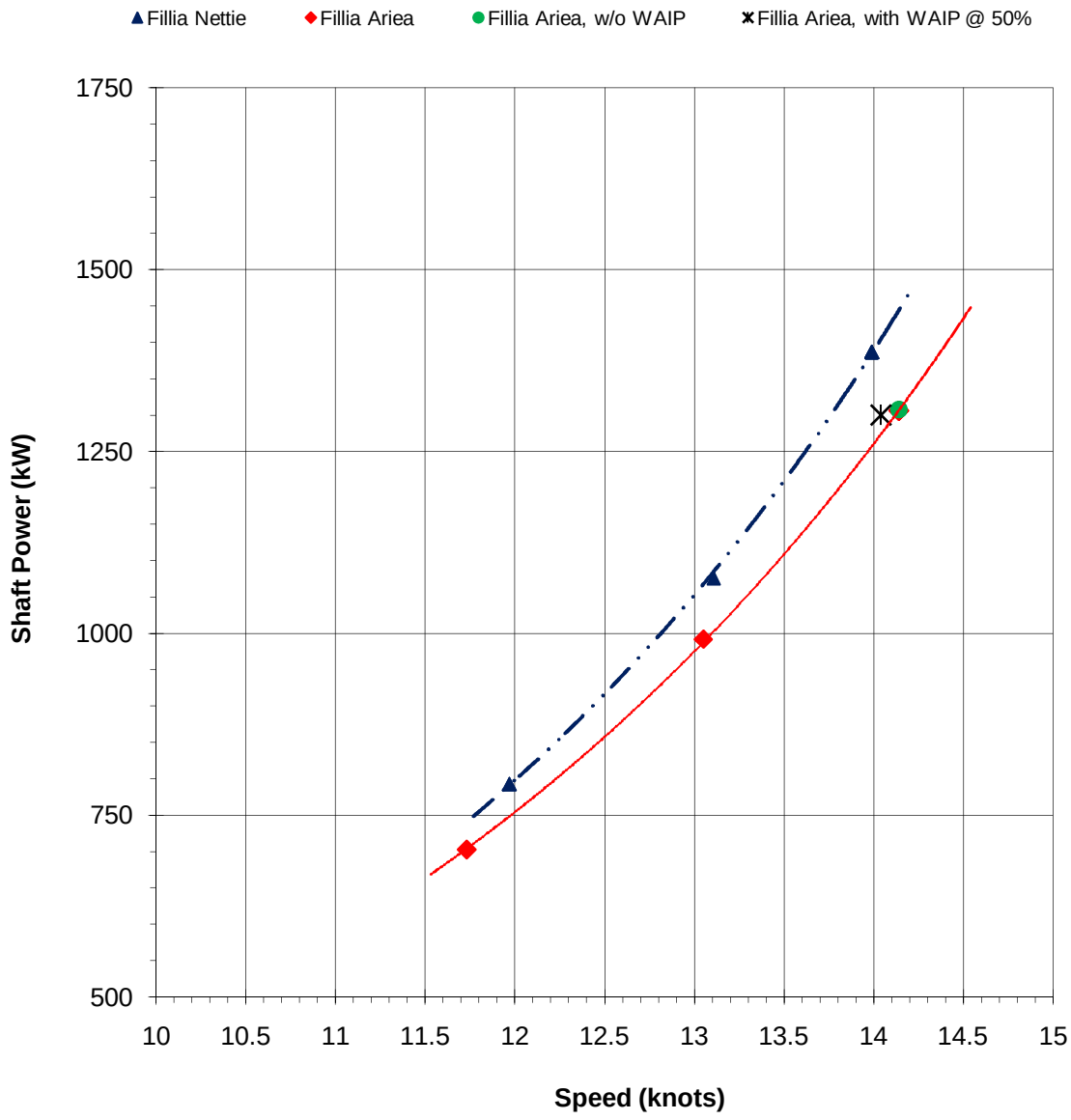
Speed - power graphic

Ship's name	:	Filia Ariea	Draught	fore	:	1.88 m
Report nr.	:	973-A / 08		aft	:	3.12 m
Date	:	June 12th, 2008		mean	:	2.50 m
Displacement	:	2150 t	Trial condition		:	Ballast
Corrected for shallow water and wind						



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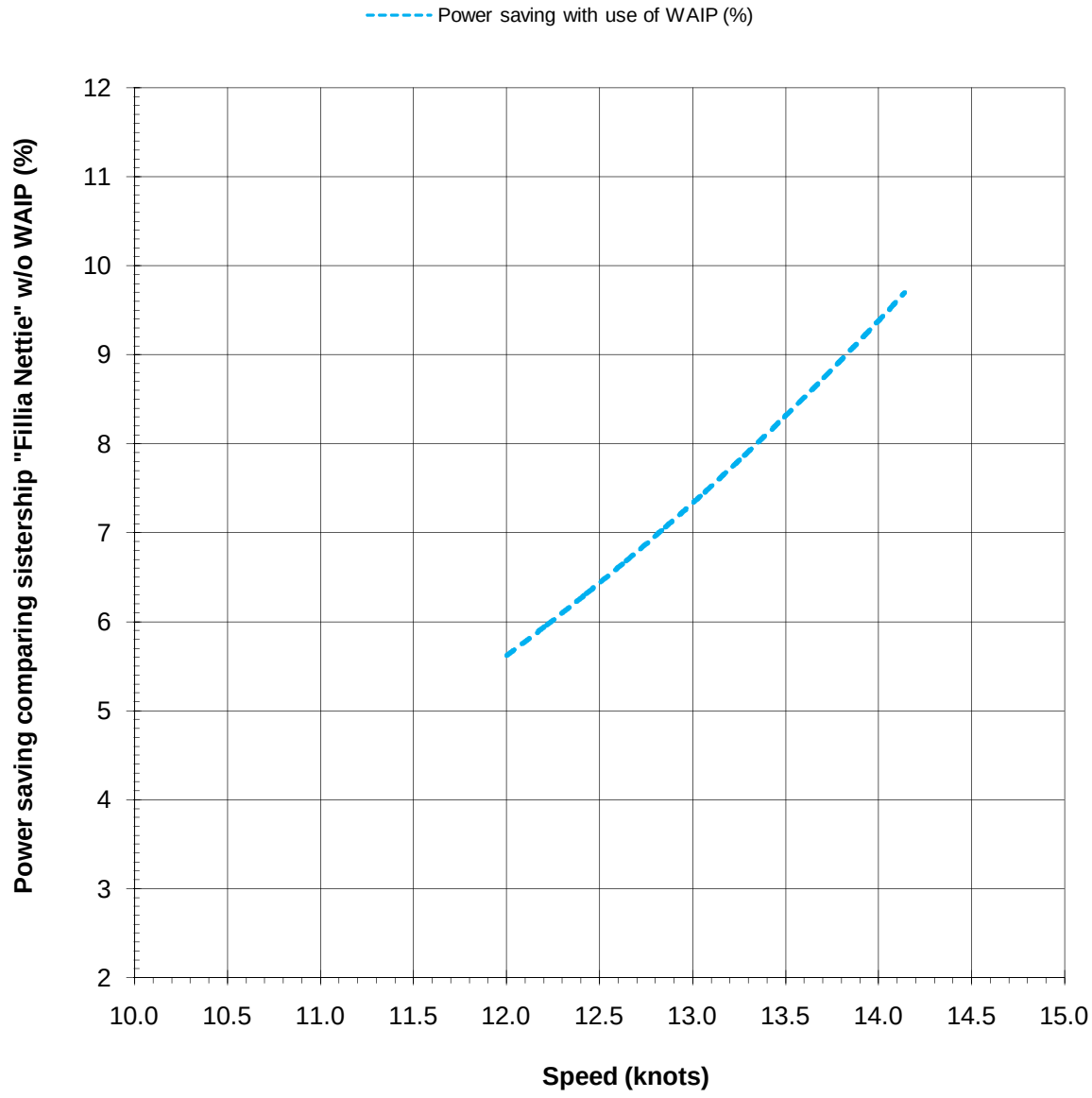
Speed - power graphic

Ship's name	:	Filia Ariea	Draught	fore	:	1.88 m
Report nr.	:	973-A / 08		aft	:	3.12 m
Date	:	June 12th, 2008		mean	:	2.50 m
Displacement	:	2150 t	Trial condition		:	Ballast
Corrected for shallow water and wind						



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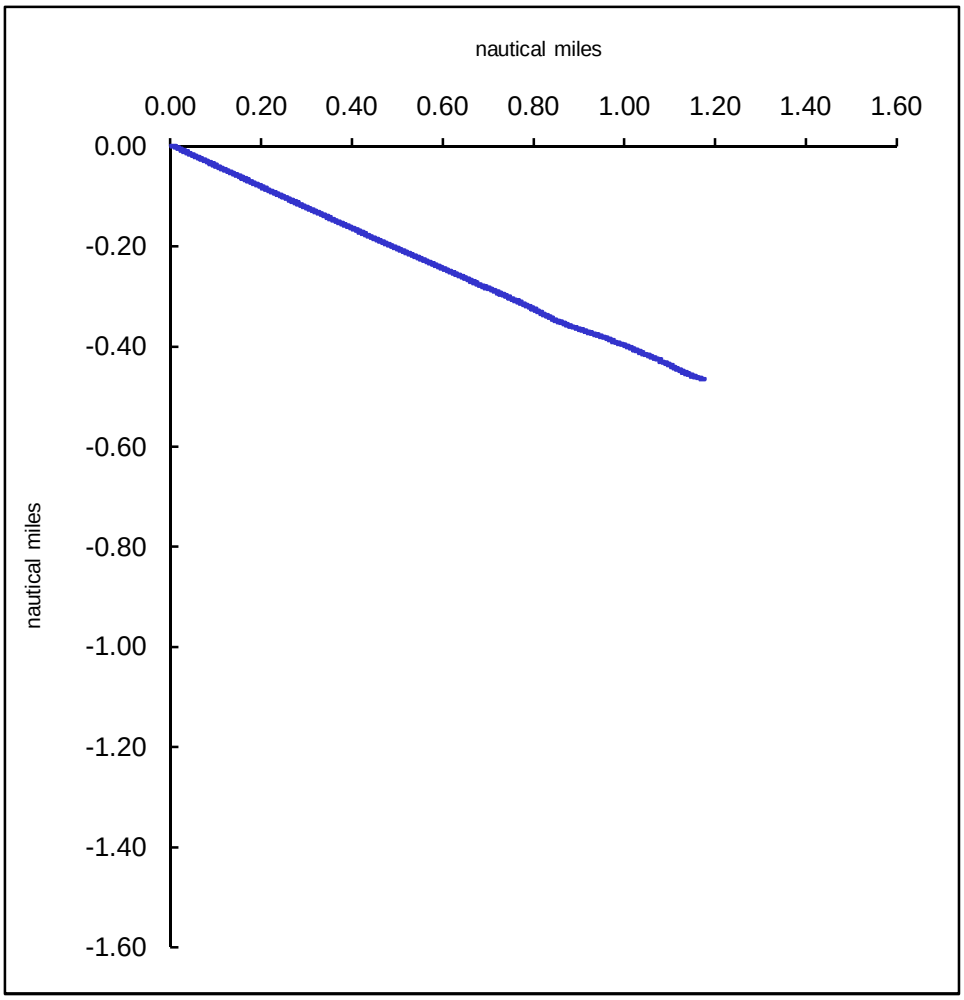
Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 112 deg.
		Ground speed	: 12.54 knots

Run : 1



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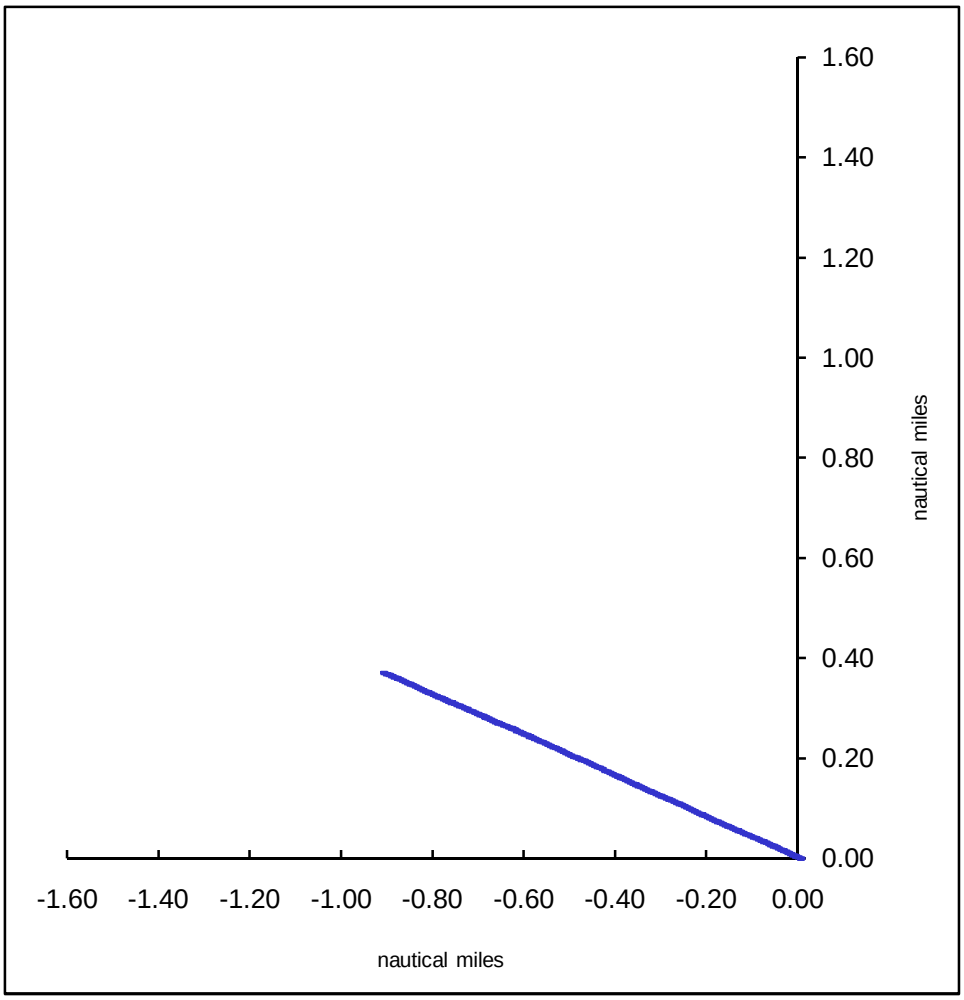
Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 292 deg.
		Ground speed	: 10.94 knots

Run : 2



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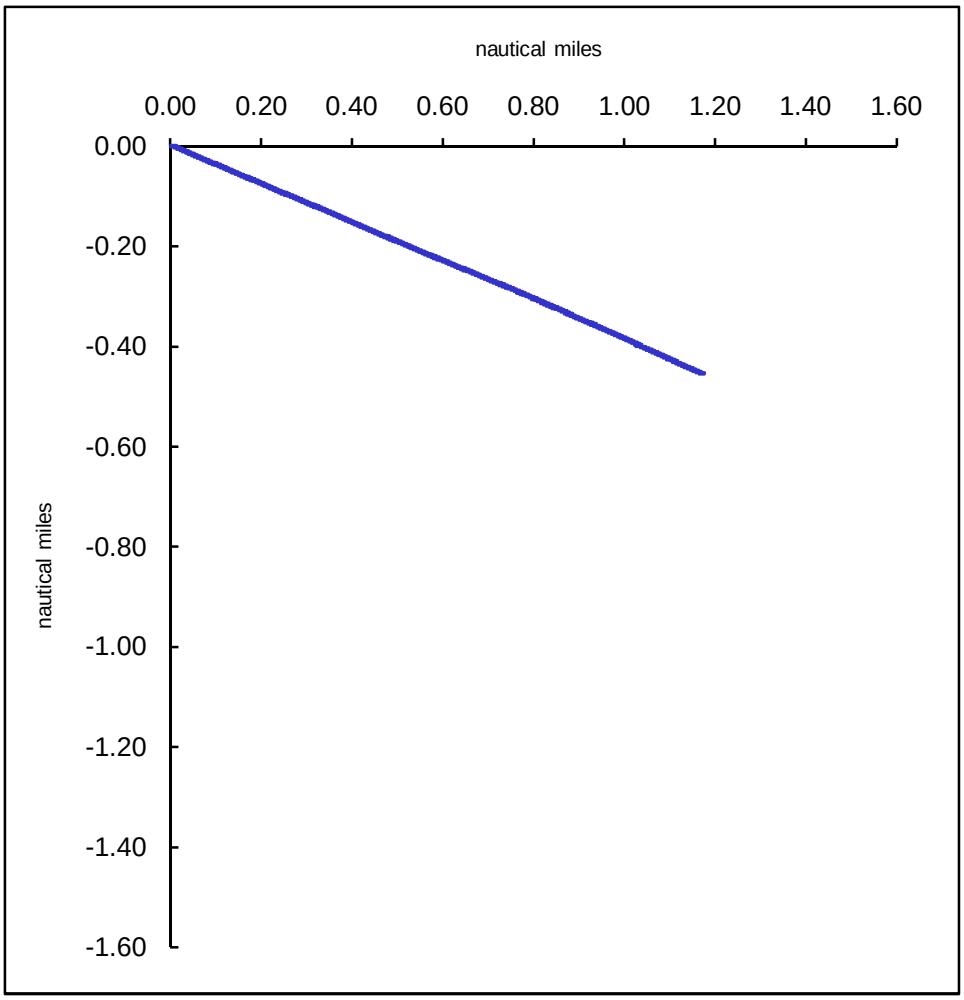
Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 111 deg.
		Ground speed	: 12.48 knots

Run : 3



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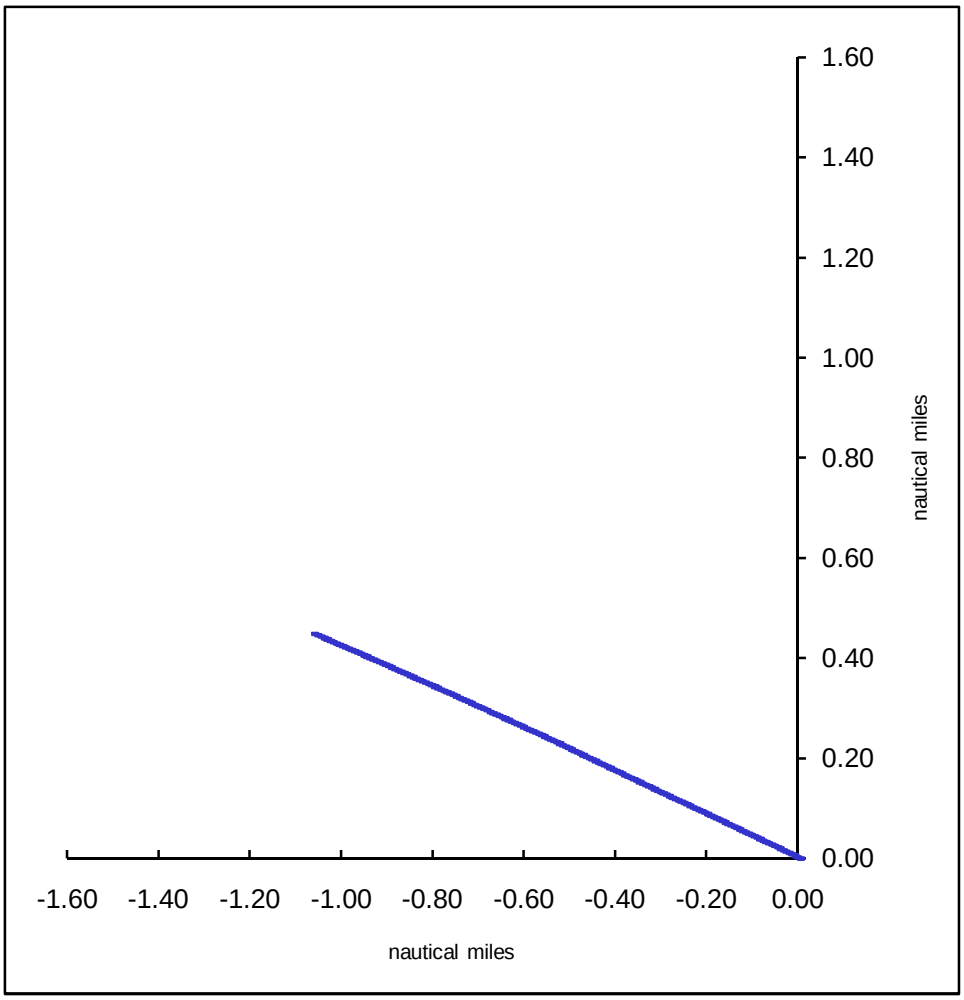
Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 293 deg.
		Ground speed	: 12.82 knots

Run : 4



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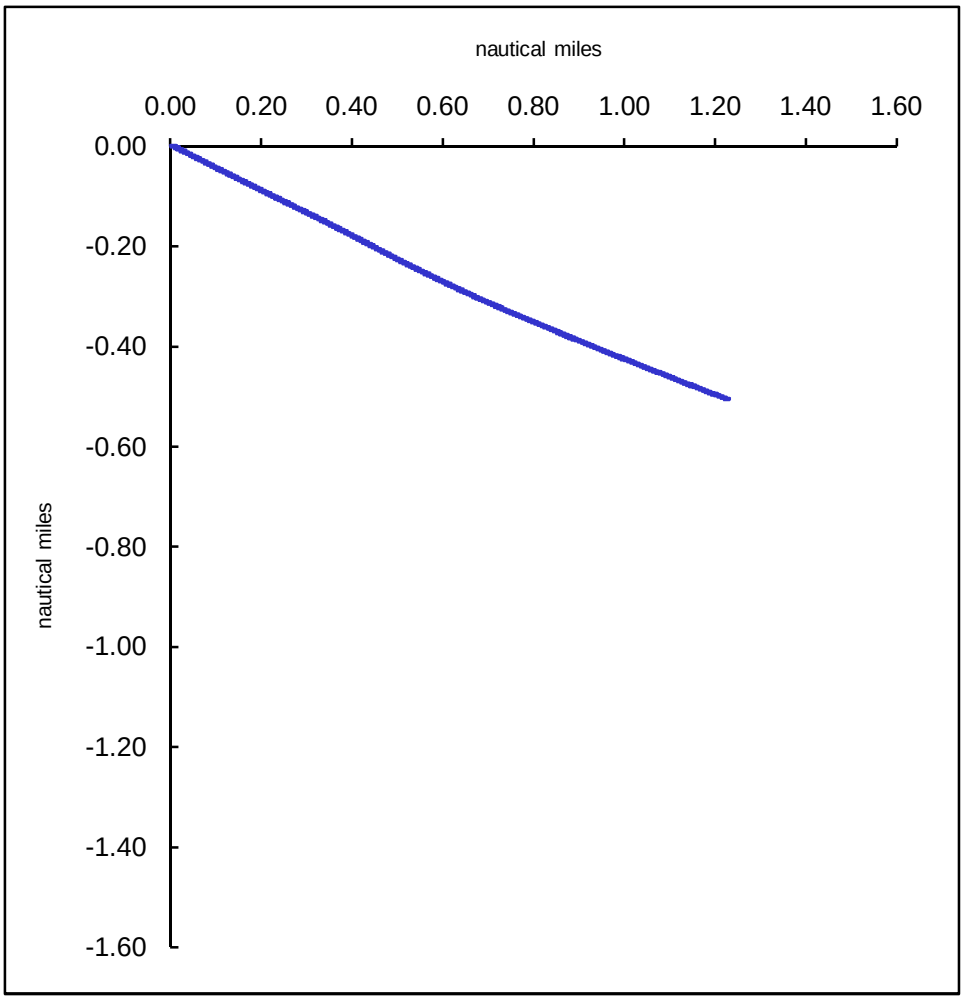
Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 113 deg.
		Ground speed	: 13.19 knots

Run : 5



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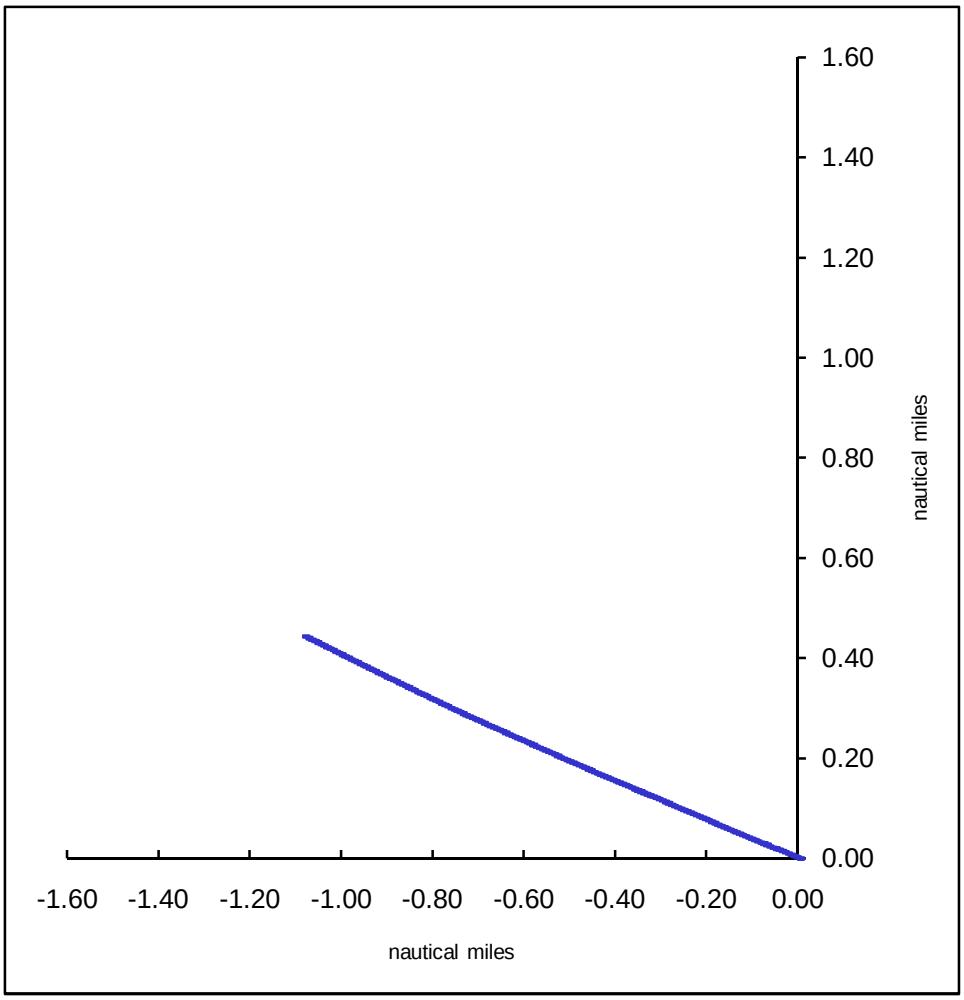
Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 292 deg.
		Ground speed	: 13.00 knots

Run : 6



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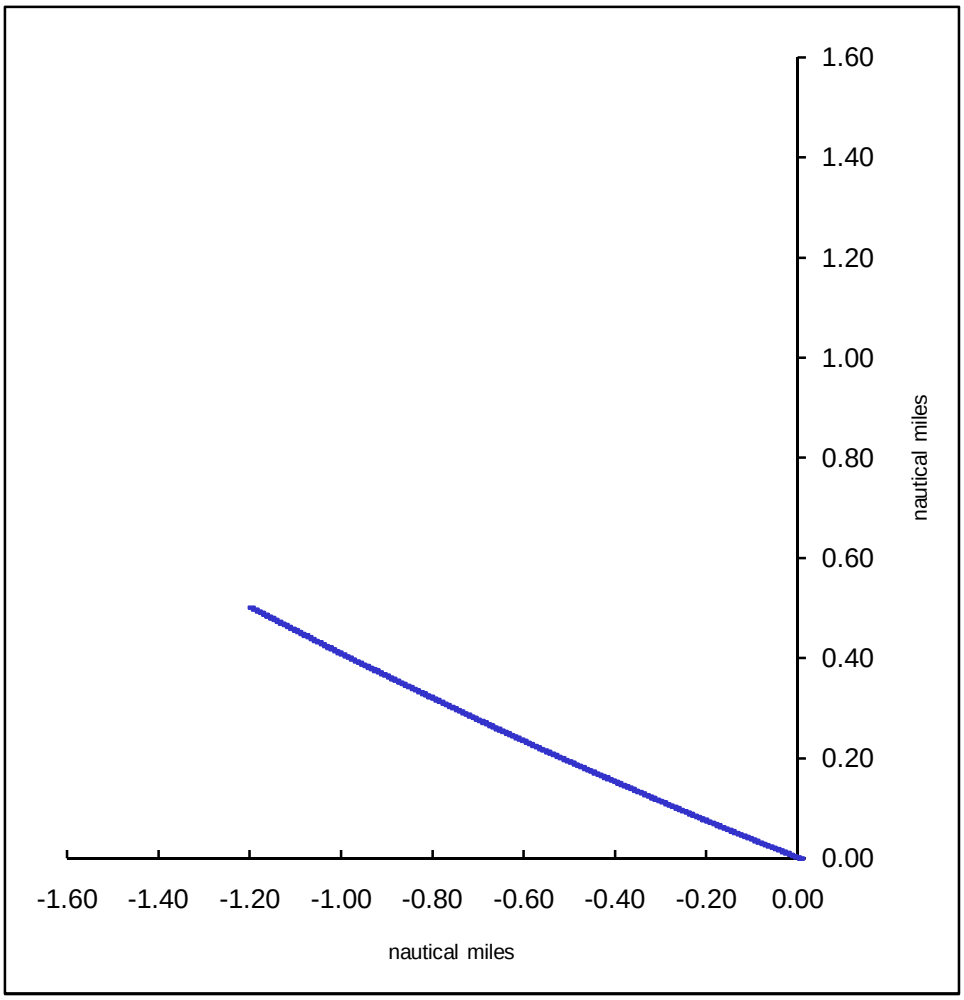
Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 293 deg.
		Ground speed	: 14.47 knots

Run : 7



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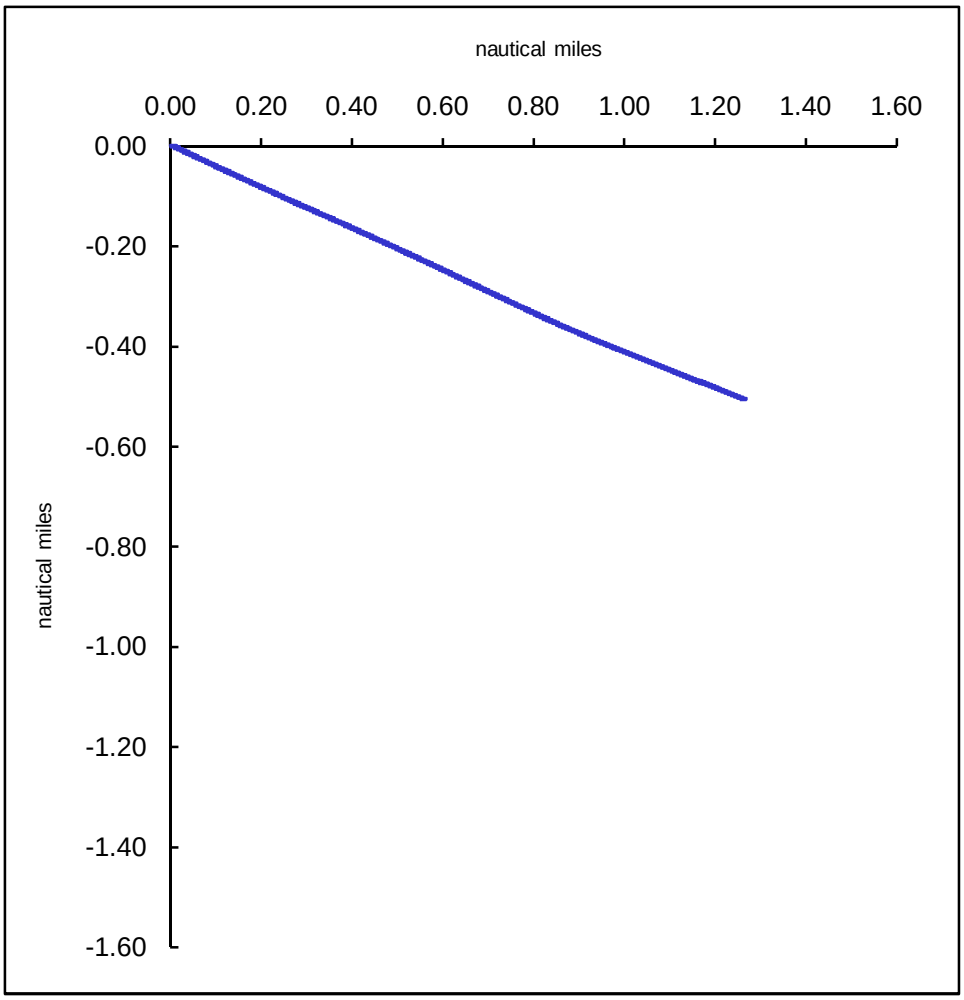
Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 112 deg.
		Ground speed	: 13.53 knots

Run : 8



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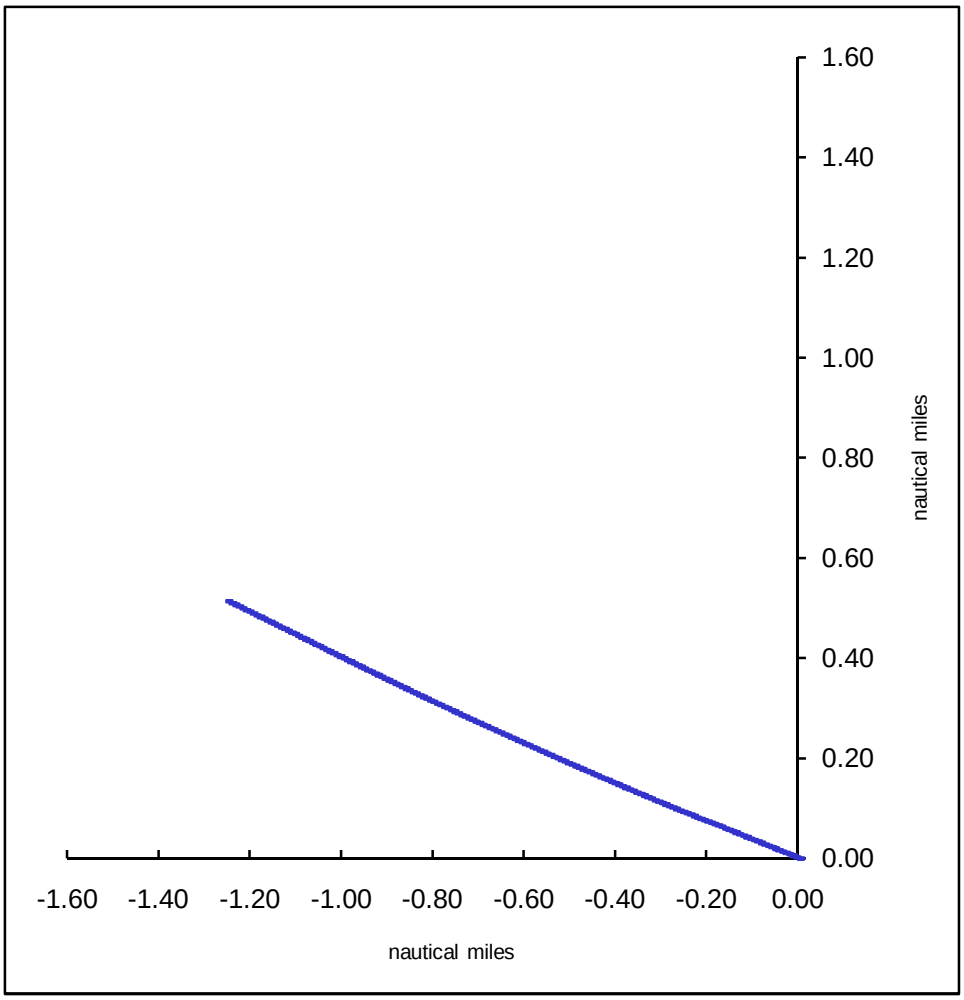
Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 292 deg.
		Ground speed	: 15.03 knots

Run : 9



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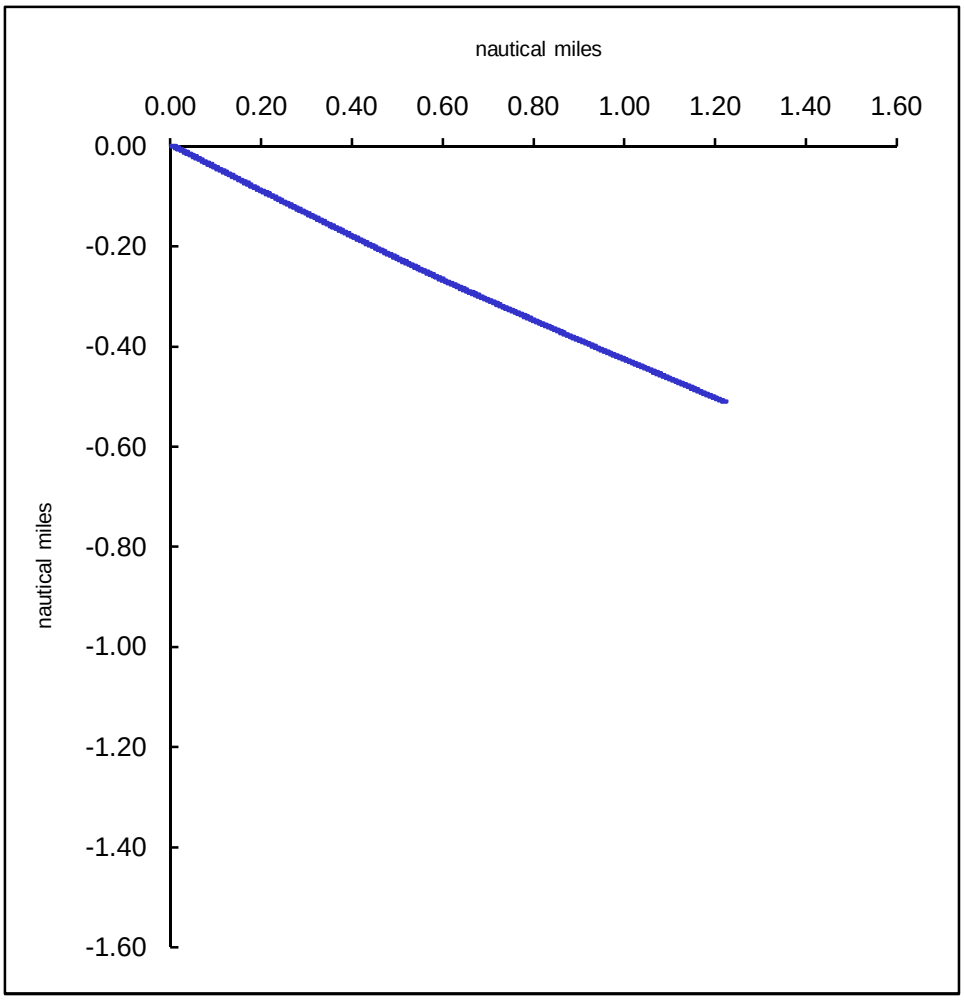
Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 113 deg.
		Ground speed	: 13.15 knots

Run : 10



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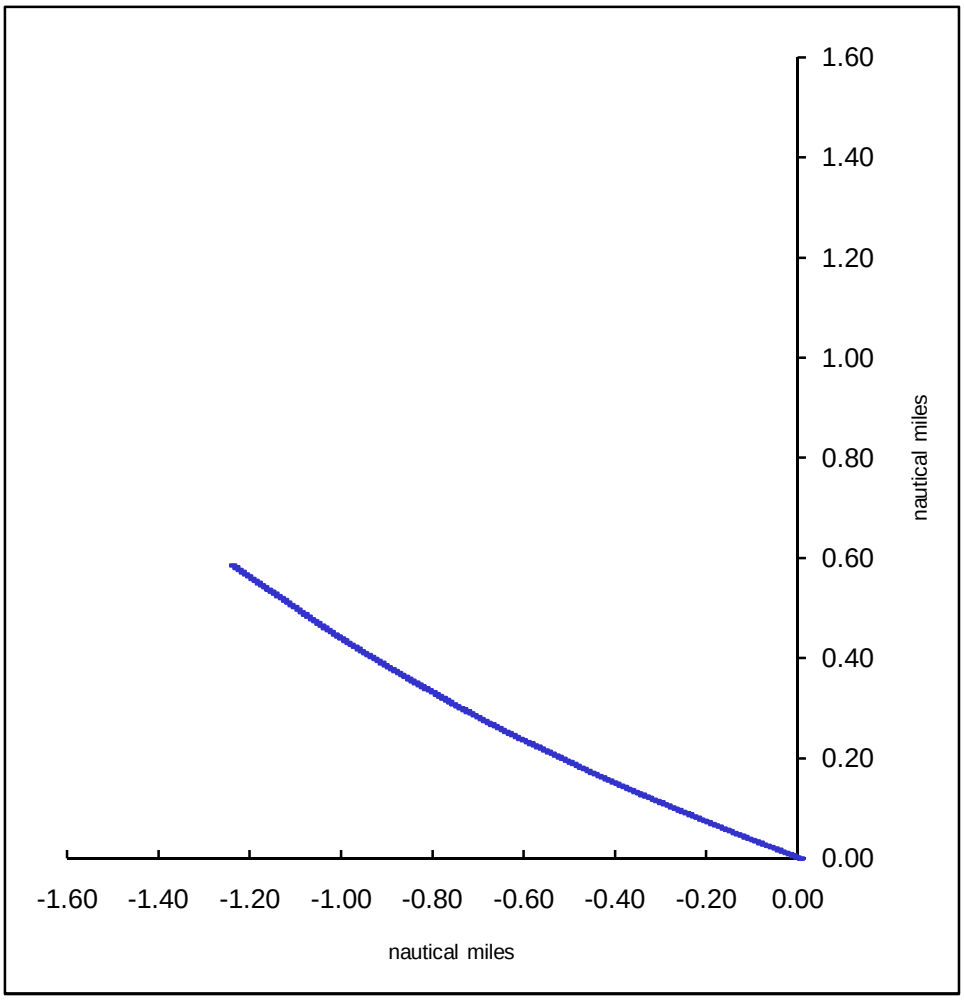
Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 295 deg.
		Ground speed	: 15.27 knots

Run : 11



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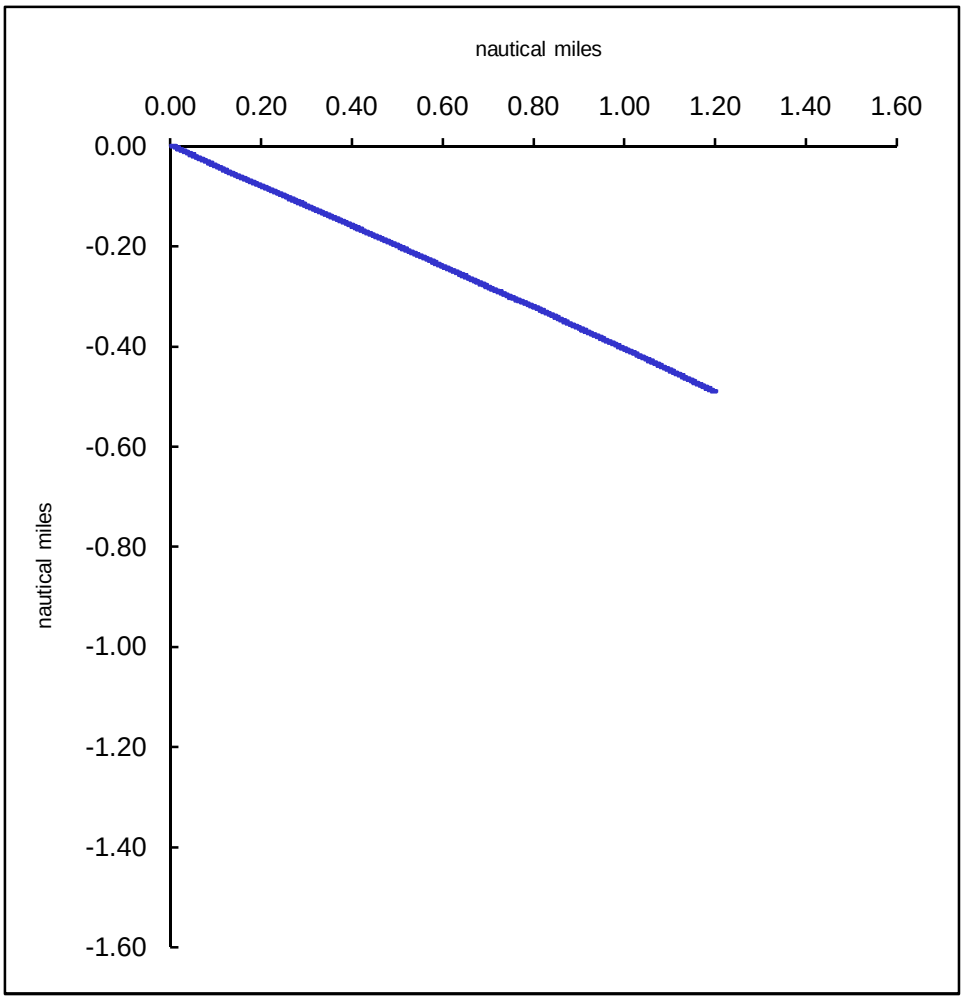
Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 112 deg.
		Ground speed	: 12.87 knots

Run : 12



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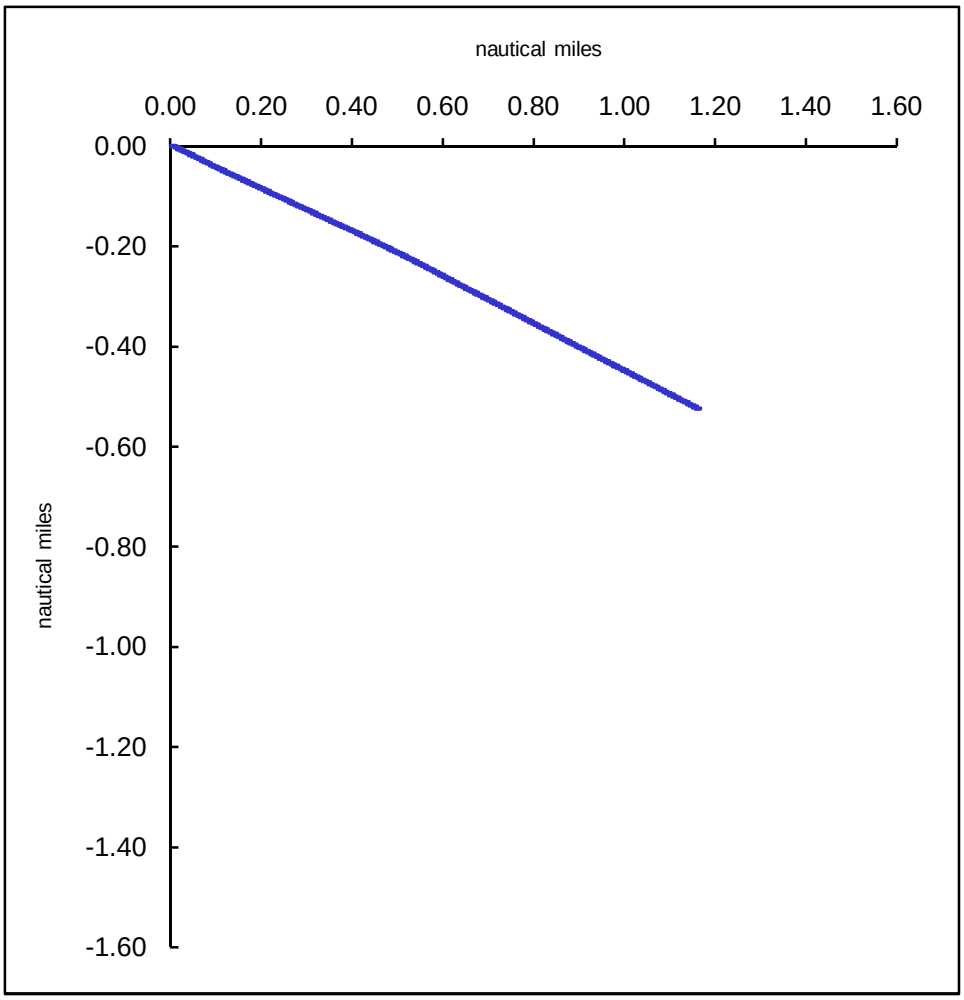
Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 114 deg.
		Ground speed	: 12.68 knots

Run : 13

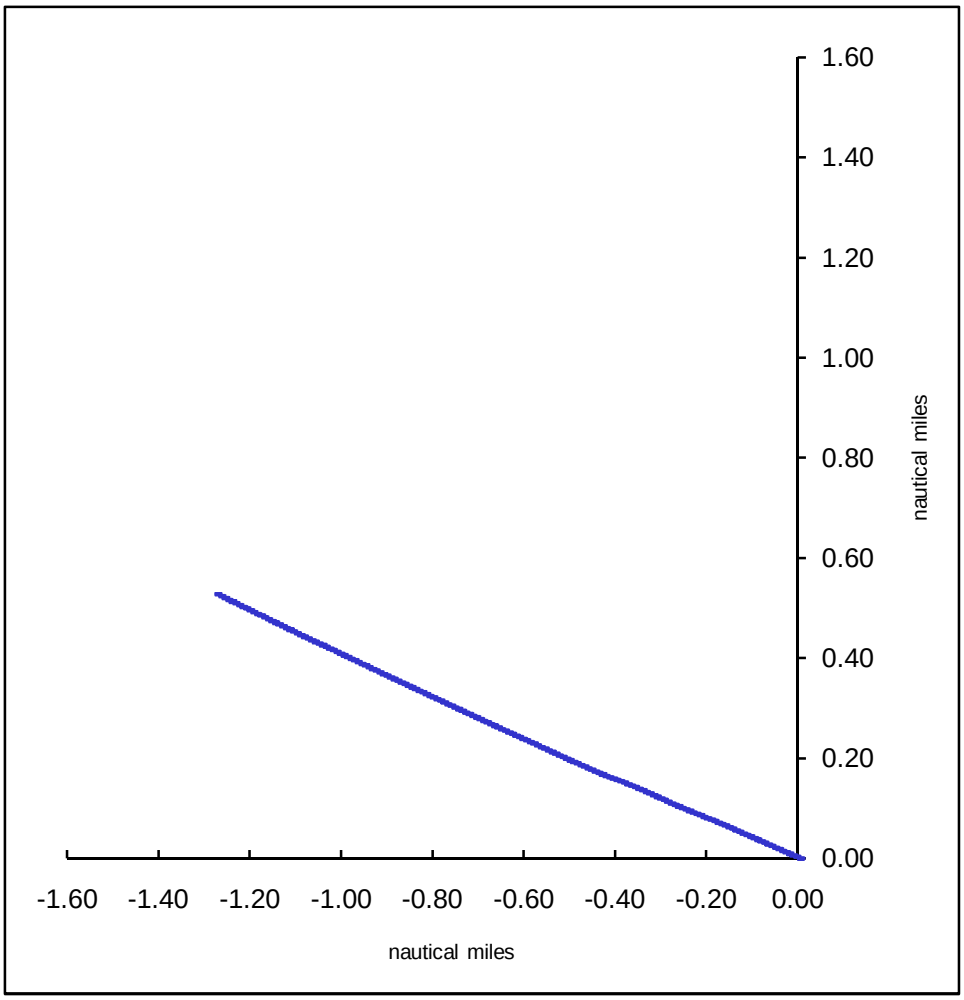


Belkoned
Marine Service b.v.

Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 292 deg.
		Ground speed	: 15.33 knots

Run : 14

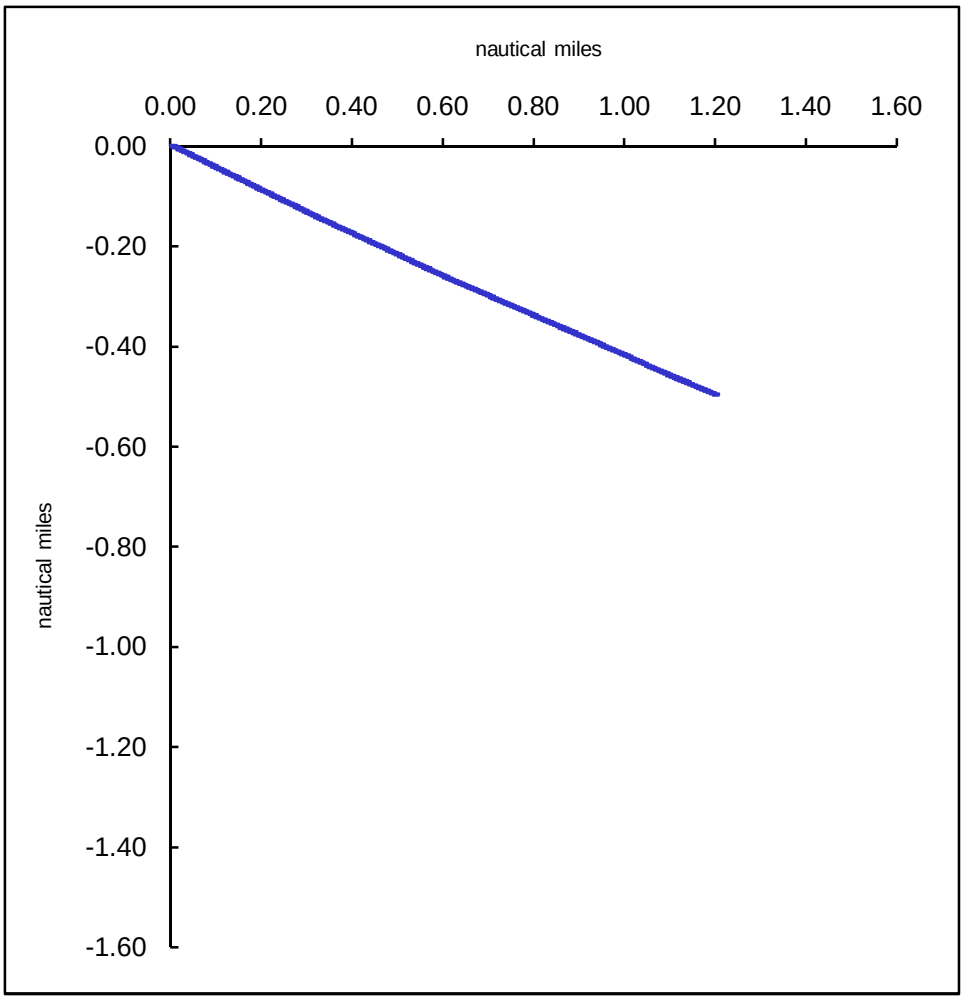


Belkoned
Marine Service b.v.

Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 113 deg.
		Ground speed	: 12.93 knots

Run : 15

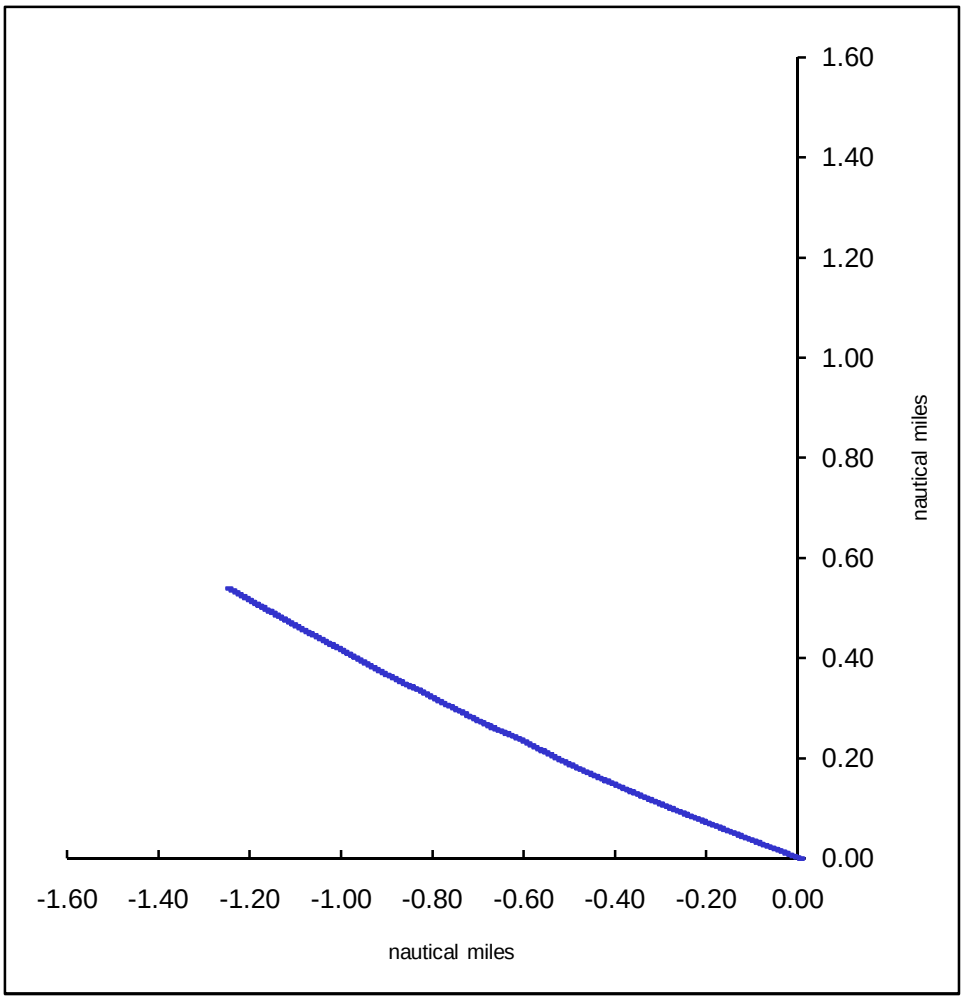


Belkoned
Marine Service b.v.

Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 293 deg.
		Ground speed	: 15.15 knots

Run : 16

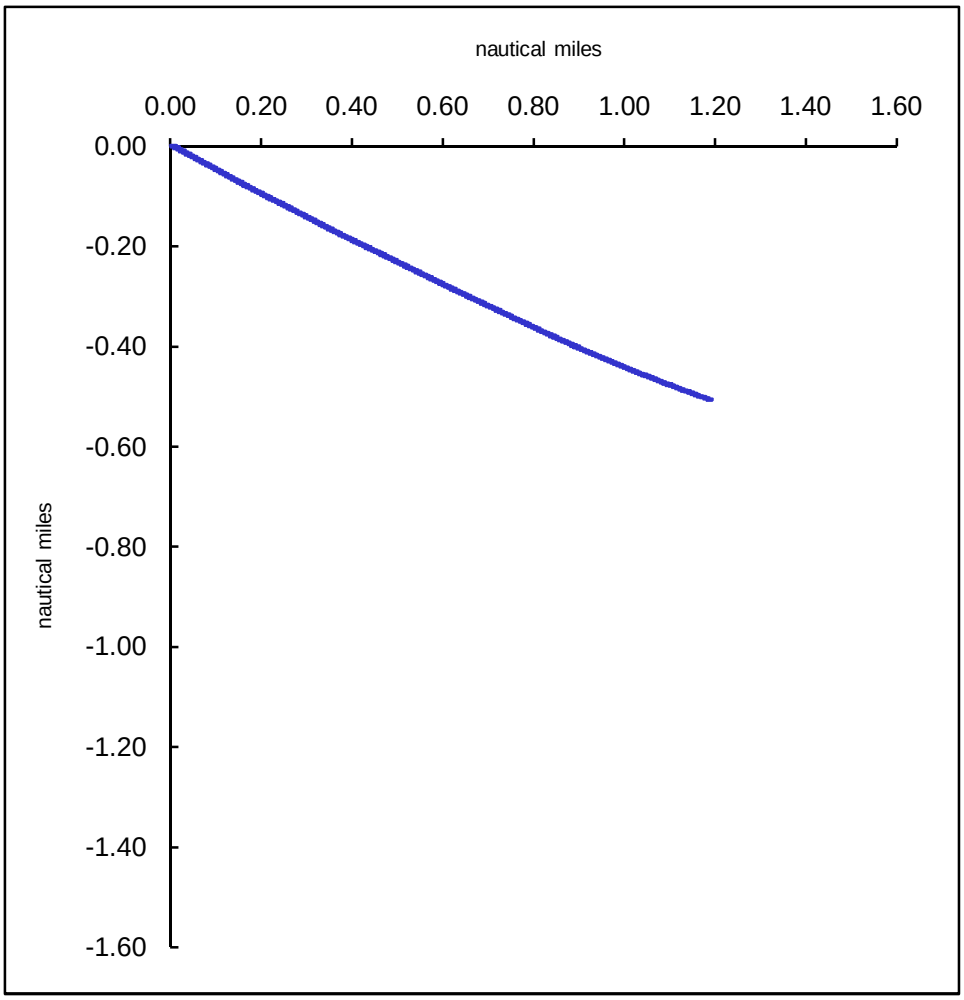


Belkoned
Marine Service b.v.

Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 113 deg.
		Ground speed	: 12.84 knots

Run : 17

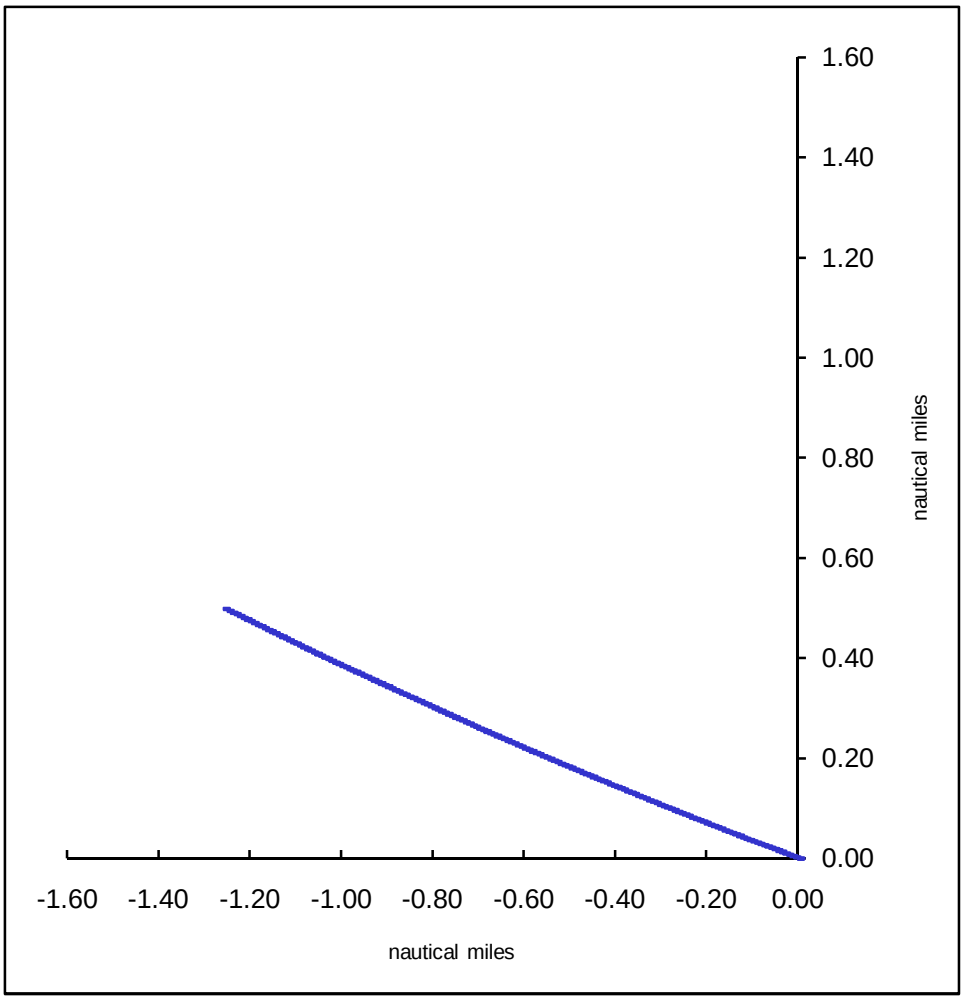


Belkoned
Marine Service b.v.

Ship's name	: Filia Ariea	Draught	fore	: 1.88 m
Report nr.	: 973-A / 08		aft	: 3.12 m
Date	: June 12th, 2008		mean	: 2.50 m

Trial condition	: Ballast	Lap time	: 360 sec.
		Course made good	: 292 deg.
		Ground speed	: 15.02 knots

Run : 18



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Appendix A

Beaufort scale with corresponding sea state codes

Beaufort	Wind speed			Seamans term	Wave height (m)
	knots	Meters per sec.	km. per hour		
0	under 1	0.0 -- 0.2	under 1	Calm	0
1	1 -- 3	0.3 -- 1.5	1 -- 5	Light air	0
2	4 -- 6	1.6 -- 3.3	6 -- 11	Light breeze	less 0.30
3	7 -- 10	3.4 -- 5.4	12 -- 19	Gentle breeze	0.30 -- 0.60
4	11 -- 16	5.5 -- 7.9	20 -- 28	Moderate breeze	0.60 -- 1.20
5	17 -- 21	8.0 -- 10.7	29 -- 38	Fresh breeze	1.20 -- 2.40
6	22 -- 27	10.8 -- 13.8	39 -- 49	Strong breeze	2.40 -- 4.00
7	28 -- 33	13.9 -- 17.1	50 --61	Moderate gale	4 -- 6
8	34 -- 40	17.2 -- 20.7	62 -- 74	Fresh gale	
9	41 -- 47	20.8 -- 24.4	75 -- 88	Strong gale	
10	48 -- 55	24.5 -- 28.4	89 -- 102	Whole gale	6 -- 9
11	56 -- 63	28.5 -- 32.6	103 -- 117	Storm	9 -- 14
12	64 -- 71	32.7 --36.9	118 -- 133	Hurricane	above 14

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Appendix B

Explanation of used abbreviations			
m.	metres	kn.	knots
nm.	nautical miles	Bft.	Beaufort
t.	tons	h.p.	horse-power
kW.	kiloWatt	kN.	kiloNewton
deg.	degrees	rpm.	revolutions per minute
sec.	seconds	kgf.	kilogramm force

To convert from	To obtain	Multiply by
KiloWatt	Horsepower	1.36
Horsepower	KiloWatt	0.736
Metres	Feet	3.2808
Feet	Metres	0.3048
Newton	Kilogramm force	0.10204
Kilogramm force	Newton	9.8
Ton (force)	Kilogramm force	1000
Kilogramm force	Ton (force)	0.0001
Knots	Metres/sec.	0.5144
Metres/sec.	Knots	1.944
Metric tonnes	Tons	0.9842
Tons	Metric tonnes	1.016

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Appendix C

Speed Trials:

De Jong, H.J., & Fransen, H.P.
" N.S.P. proeftochttoeslagen 1976 , Marin publ. 524 "
Lackenby, H
" Note on the effect of shallow water on ship resistance "
Walshe, D.E.
" A method for calcultion of wind resistance "

Windmoment and forces:

Isherwood, R.M.
" Wind resistance of merchant ships. "
Holtrop, J., & Mennen, G.G.J.
" A statistic power prediction method. "
Holtrop, J., & Mennen, G.G.J.
" An approximate power prediction method. "

Crashstop and stoptest:

Harvald, Sv. Aa.
" Factors affecting the stopping ability of ships. "
Holtrop, J., & Mennen, G.G.J.
" A statistical re-analysis of resistance and propulsion data "
Mamamoto, M., & Honda, K., & Iida, T.
" On the directional stability of a ship during stopping manoeuver. "
Hooft, J.P., & Drinoczy, A.J.A.M.
" Design information on the ship manoeuvrability , part 1 and 2. "

Turning circles:

Inoue, S., & Hirano, M., & Kijima, K., & Takashina, J.
" A practical calculation method of ship manoeuvring motion. "
Norrbin, N.H.
" The turning circle test-analysis and pre-trial prediction. "
Quadvlieg, F.H.H.A. & Hubregste, A.H.
" The simulation of the manoeuvrability of ships. "

Squat:

Barrass, Dr. C.B.
" Ship squat. "

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SPEED TRIALS

Ship's name	: Filia Nettie	Date	: April 9th, 2008
Report nr.	: 952 / 08	Trial area	: Oosterschelde
Draught fore	: 1.90 m	Time high water	: n.a.
aft	: 3.10 m	Place	: n.a.
mean	: 2.50 m		
Displacement on trial	: 2150 t	Wave / swell direction	: None
AM	: 42 m²	Hs.	: None
Wind direction	: E'ly	Power and thrust	
force	: 2.0 Bft.	measurement system	: by JVS
Current direction	: 290 / 110 deg.	Position and speed	
speed	: 0.5 kn.	measurement system	: Furuno-DGPS

A. The following speedtrials have been carried out by the main propulsion installation at a a mean draft of: 2.50 m

3 runs in opposite direction with 793 kW shaft-power. **
3 runs in opposite direction with 1076 kW shaft-power. **
3 runs in opposite direction with 1387 kW shaft-power. **

B. Shallow water correction: See appendix C.

C. Wind correction: None.

Conclusion

1. The final speed during the trials at 1387 kW shaft-power was:

13.96 knots

2. The final corrected speed (for shallow water) at 1387 kW engine-power is:

13.98 knots

**** Measured on propeller shaft by JVS**

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RESUME

Run number		1	2	3	4	5	6
Local time	hrs.	12.17	12.27	12.38	12.50	13.01	13.13
Heading	deg.	109	289	109	289	109	289
Course made good	deg.	108	290	109	290	109	288
Time for measured distance	sec.	360	360	360	360	360	360

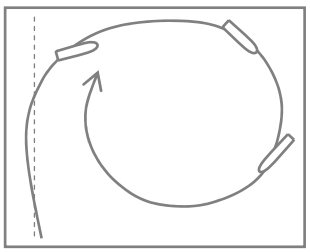
RUDDER							
mean amplitude	deg.	2	2	2	2	2	2
mean period	sec.	10	10	10	10	10	10

Ground speed measured single run	kn.	11.67	12.18	11.79	13.07	13.23	12.89
Apperent influence current & weather	kn.		0.26	-0.19		0.08	-0.17
Means of means	kn.		**11.96**			**13.10**	
Mean water depth	m.	26	26	26	26	26	26
Shallow water corr.	%	0.15	0.15	0.15	0.15	0.15	0.15
Gnd. speed corr.	**kn.**	**11.69**	**12.20**	**11.81**	**13.09**	**13.25**	**12.91**
First mean			11.94	12.01		13.17	13.08
Corr. gnd. speed means of means	**kn.**		**11.97**			**13.12**	

Pitch setting		74	74	74	87	87	87
Engine rotation **	rpm	1006	1006	1006	1005	1004	1005
Shaft generator	kW	-	-	-	-	-	-
Shaft power **	kW	766	789	827	1036	1109	1051
Means of means	kW		793			1076	

WIND							
speed	m/s	3	3	3	3	3	3
direction	deg.	E'ly	E'ly	E'ly	E'ly	E'ly	E'ly
Weather correction	%	0.0	0.0	0.0	0.0	0.0	0.0
Weather correction	kW	0	0	0	0	0	0
Power corrected for weather	**kW**	766	789	827	1036	1109	1051
First mean	kW		778	808		1073	1080
Corrected power means of means	**kW**		**793**			**1076**	

**** Measured on propeller shaft by JVS**



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RESUME

Run number		7	8	9			
Local time	hrs.	13.56	14.06	14.19			
Heading	deg.	109	289	109			
Course made good	deg.	108	290	109			
Time for measured distance	sec.	360	360	360			
RUDDER							
mean amplitude	deg.	2	2	2			
mean period	sec.	10	10	10			
Ground speed measured single run	kn.	14.74	13.29	14.52			
Apperent influence current & weather	kn.		-0.72	0.61			
Means of means	kn.		**13.96**				
Mean water depth	m.	26	26	26			
Shallow water corr.	%	0.16	0.15	0.16			
Gnd. speed corr.	**kn.**	**14.76**	**13.31**	**14.54**			
First mean			14.04	13.93			
Corr. gnd. speed means of means	**kn.**		**13.98**				
Pitch setting		74	74	74			
Engine rotation **	rpm	1003	1003	1003			
Shaft generator	kW	-	-	-			
Shaft power **	kW	1383	1387	1390			
Means of means	kW		1387				
WIND							
speed	m/s	3	3	3			
direction	deg.	E'ly	E'ly	E'ly			
Weather correction	%	0.0	0.0	0.0			
Weather correction	kW	0	0	0			
Power corrected for weather	**kW**	1383	1387	1390			
First mean	kW		1385	1389			
Corrected power means of means	**kW**		**1387**				

**** Measured on propeller shaft by JVS**

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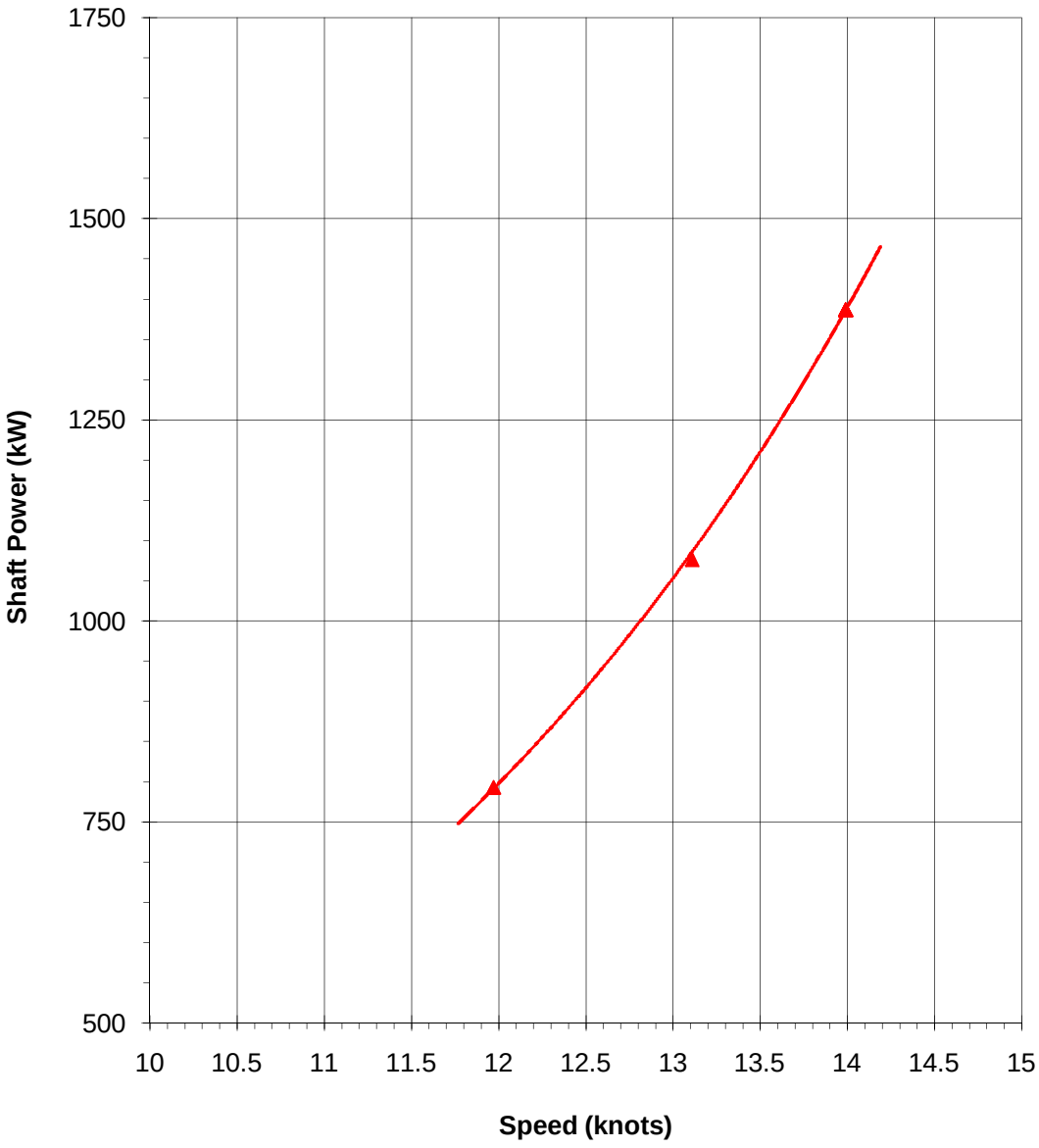
Speed - power graphic

Ship's name	:	Filia Nettie	Draught fore	:	1.90 m
Report nr.	:	952 / 08	aft	:	3.10 m
Date	:	April 9th, 2008	mean	:	2.50 m
Displacement	:	2150 t	Trial condition	:	Ballast
Corrected for shallow water and wind					



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Best, June 12th, 2008

All measurements and details have been worked out with the most accuracy.
Belkoned Marine Service b.v. quarantees all details and graphics.

WARNING

The response of m/v Filia Ariea
may be different from the details in this report if any of the following conditions upon which this information is based are varied.

1. Calm weather, calm sea,
2. No current,
3. Deep water,
4. Clean hull and
5. Intermediate drafts or unusual trim.

Test trials executed by

Ing. R.F. Zandbergen

Test trials reported by

Ing. R.F. Zandbergen