



GOBIERNO
DE ESPAÑA

MINISTERIO
DE CIENCIA
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INSTITUTO
ESPAÑOL DE
OCEANOGRAFÍA

IEO new regional vessels under construction

José I. Díaz

Instituto Español de Oceanografía (IEO)

2 Regional RVs

- Oceanography & fishery research
- Multipurpose platform: 2 20' containers
- Endurance 10 days; 330 days/yr.
- Diesel-electric
- 11 scientist & technicians + 12 crew
- Atlantic & Mediterranean waters
- **Noise and vibration abatement**
- DP1: **Dynapos AM/AT**
- **Cleanship**

2.000 m WD

twin vessels

Dec. 2009

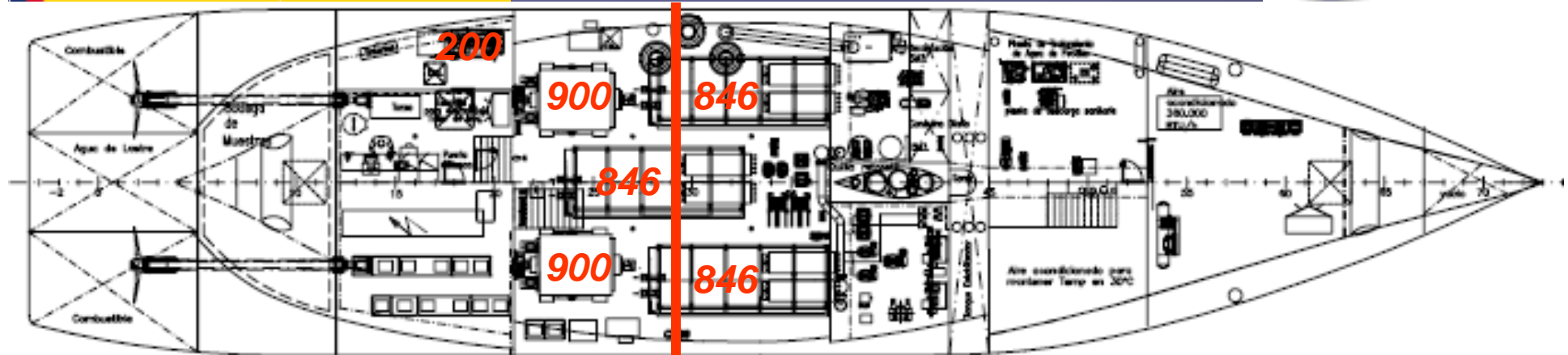
Dec. 2010

ICES 2009

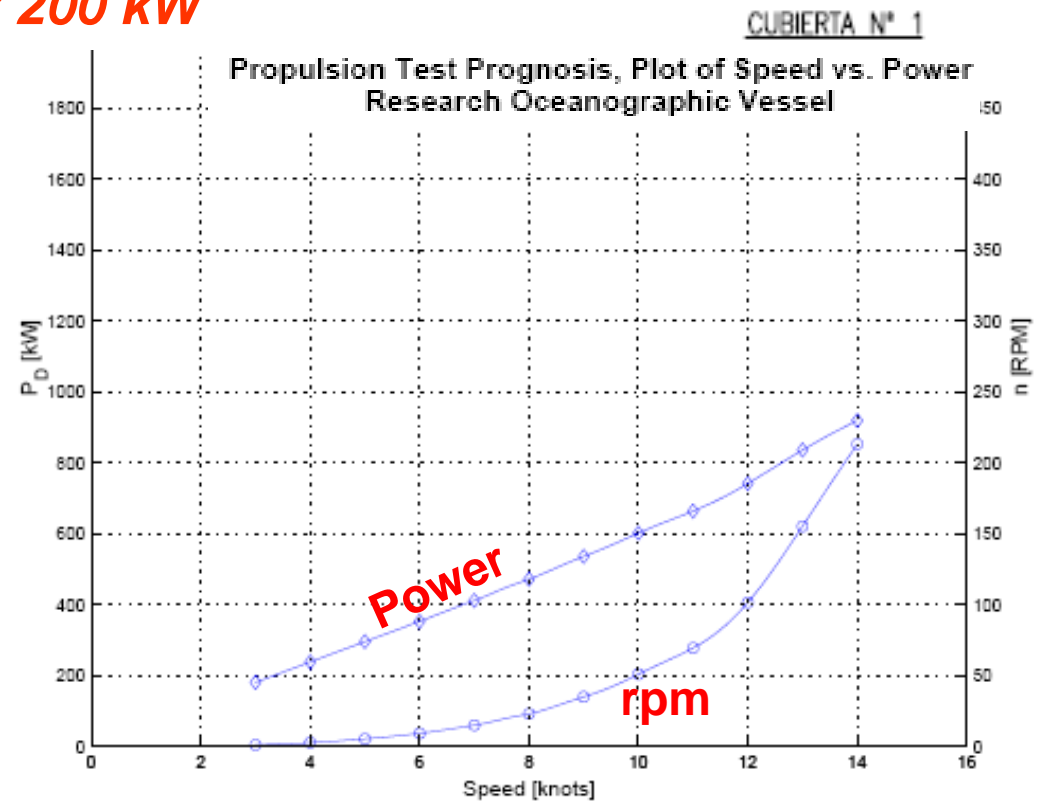
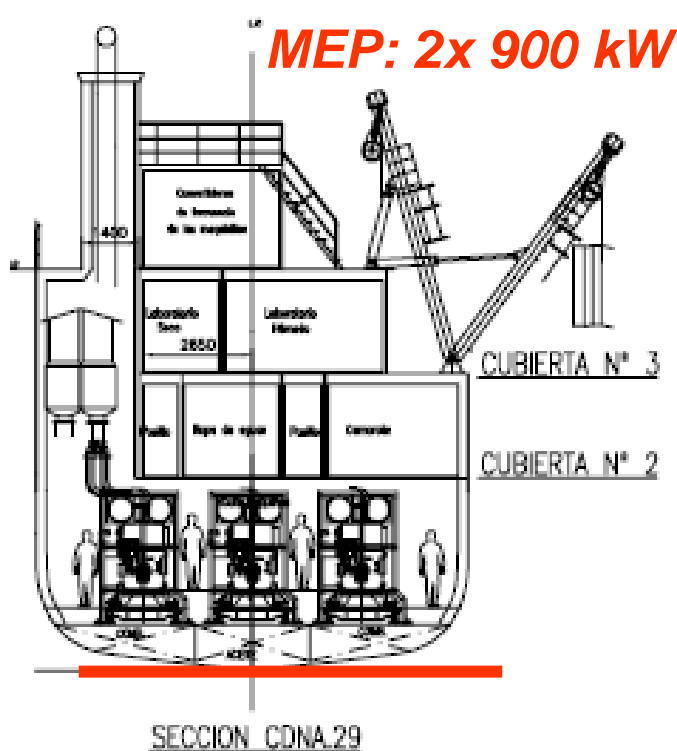
Characteristics

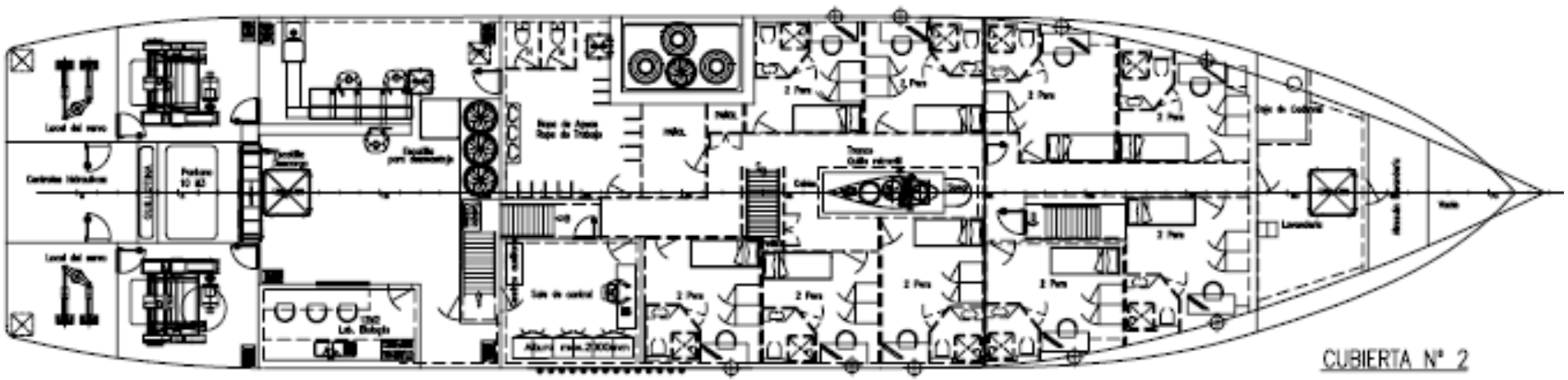
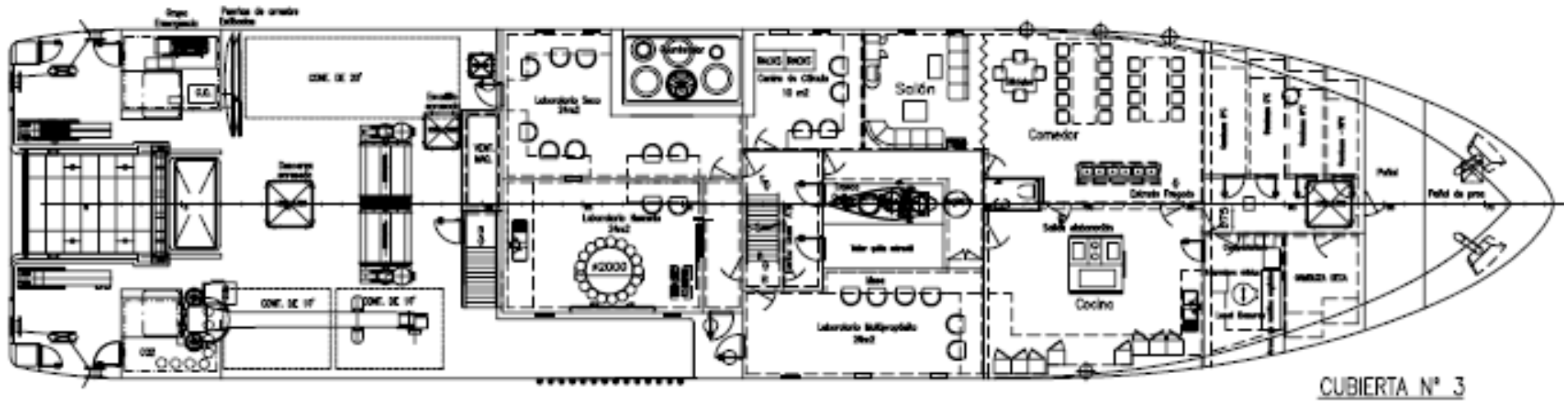
- Length 46,8 m
 - Width 10,5 m
 - Draught 4 m
 - 988 GT
 - 3 x 846 kW (1500 rpm)
 - 1 x 200 kW (Harbour set)
 - 2 x DC 900 kW
 - 2, 5 blades fixed pitch prop.
 - 2 RIM thrusters
 - Bow: 160 kW
 - Aft: 90 kW
- ❑ Drop keel: 2,5 m
- ❑ Gondola: 0,9 m

14 kt

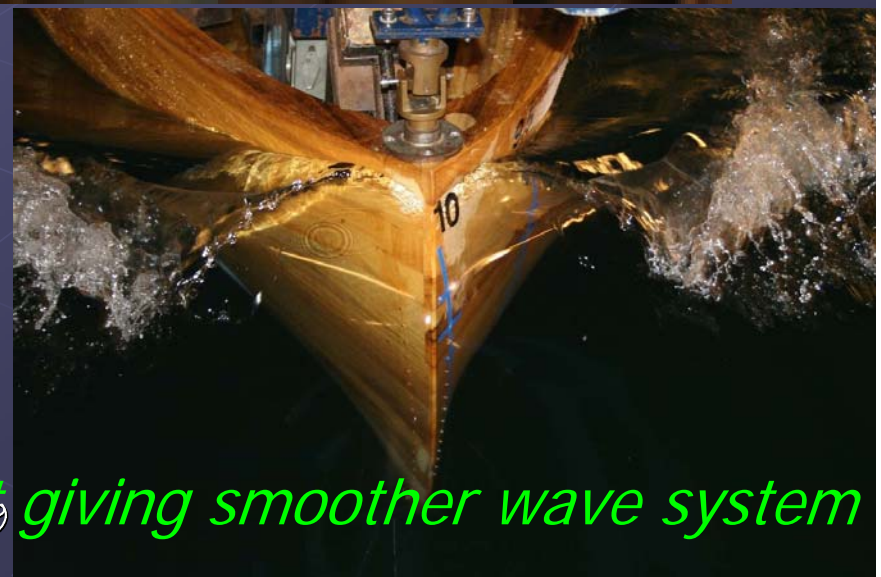
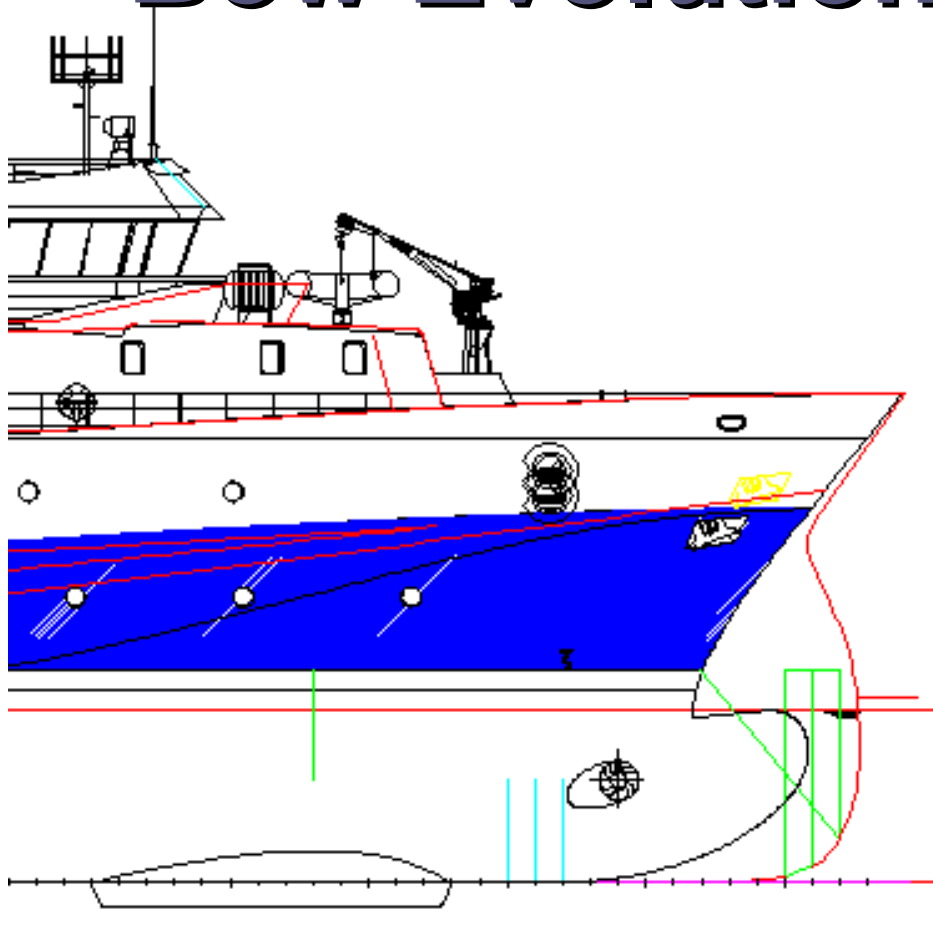


Gen set: 3x 846 kW + 1x 200 kW





Bow Evolution



Bow cuts the water instead pushing it giving smoother wave system

ETEC 2009

Icelandic bow



Hull design optimized for sea keeping



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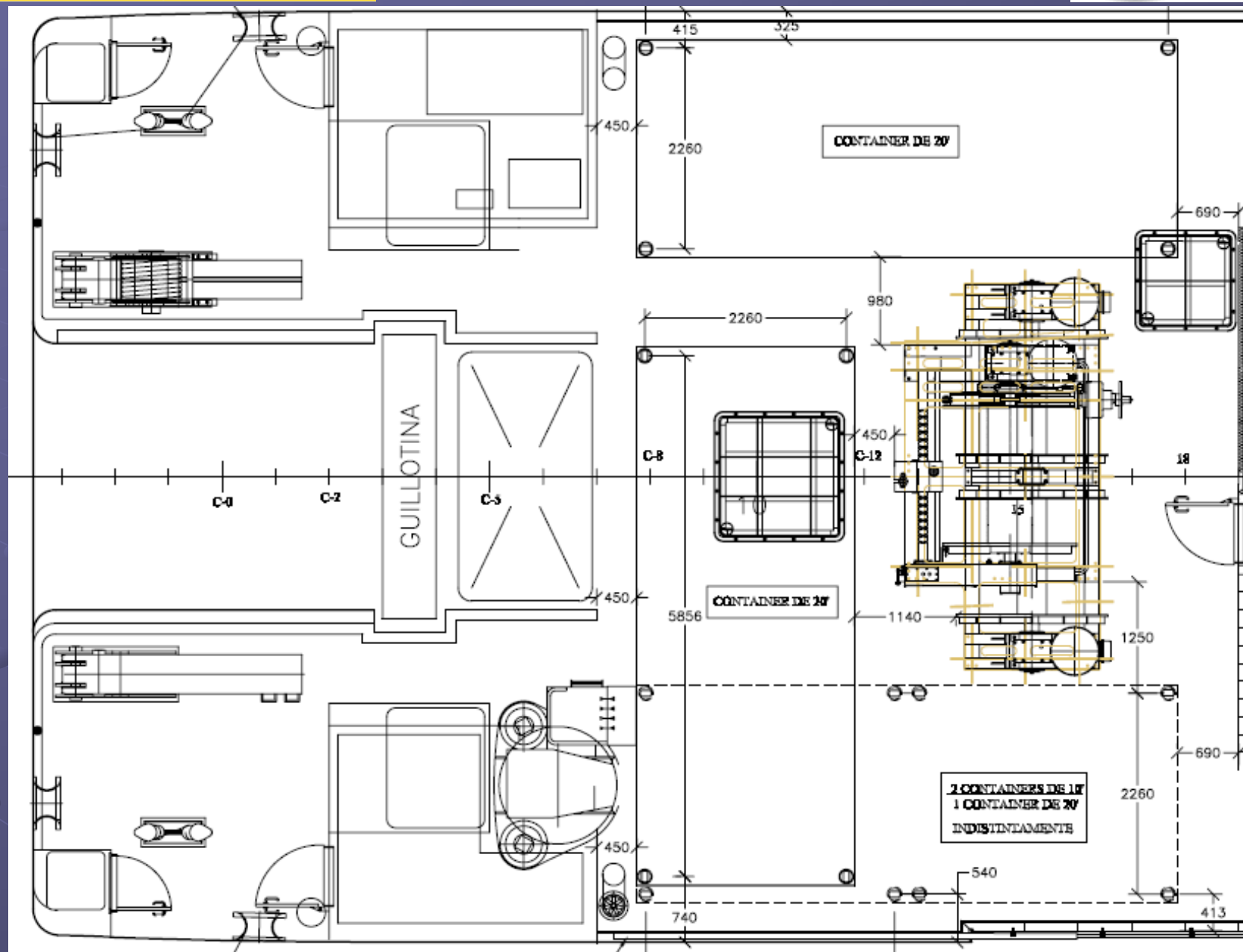
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Containers



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- Multibeam EM710
- Parametric source TOPAS PS18
- Hydrographic EA600
- Scientific echosounder EK60: 6 freq. ★
- Scientific multibeam ME70 ★
- Trawl sonar FS 20/25
- Scanmar ★
- ITI
- ADCP: 150 kHz ★
- HiPap 500



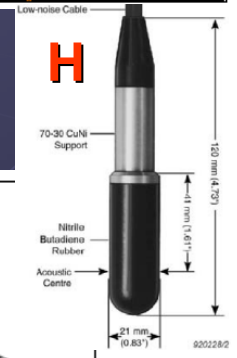
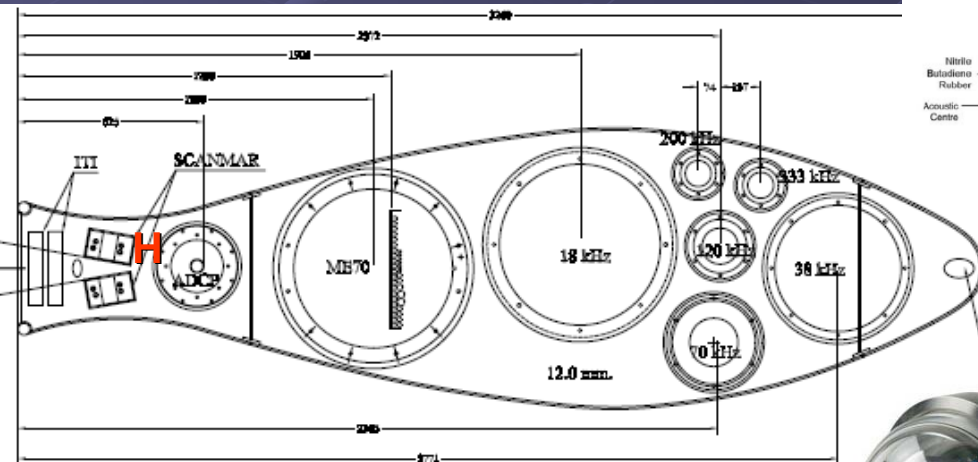
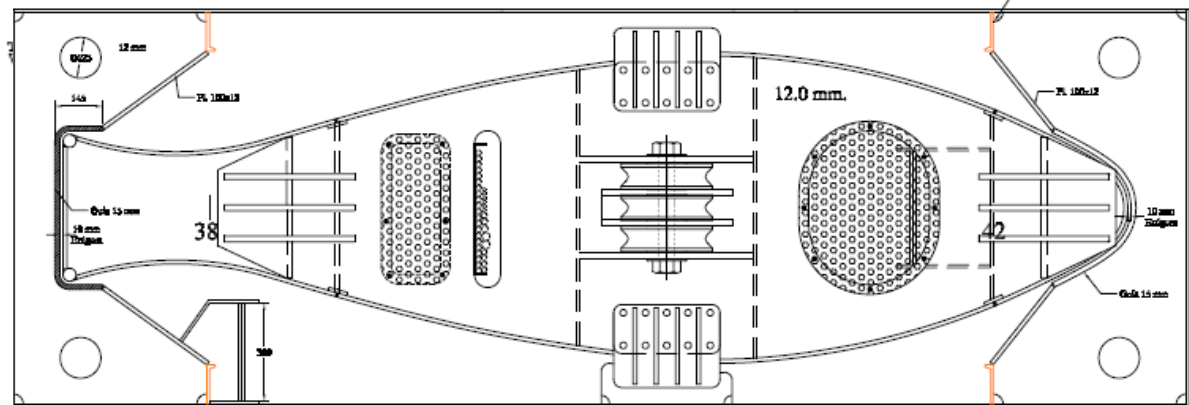
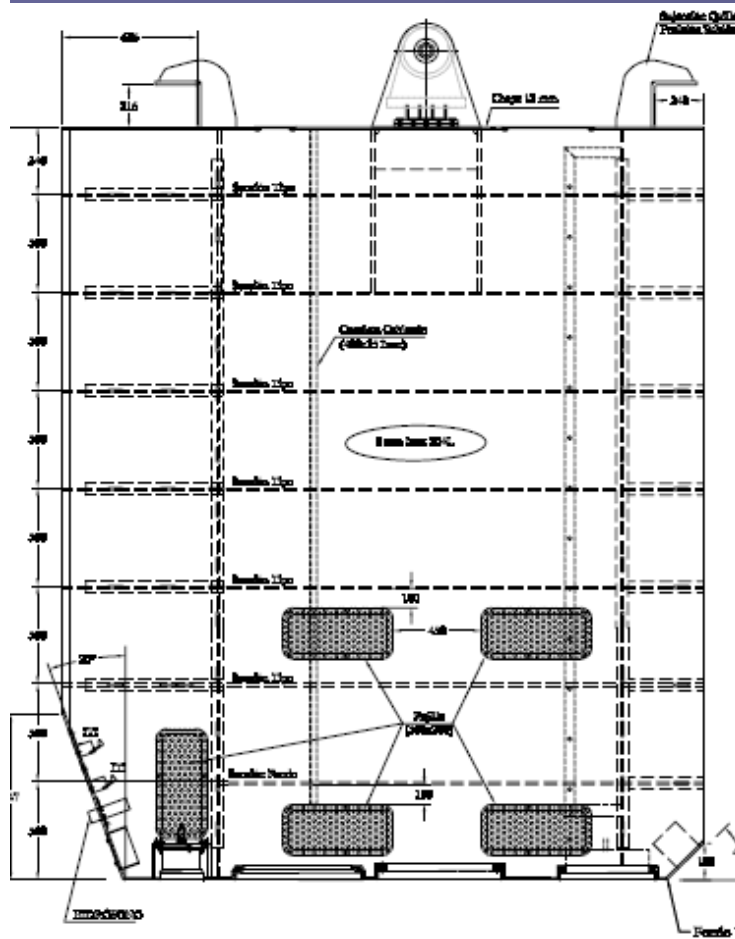
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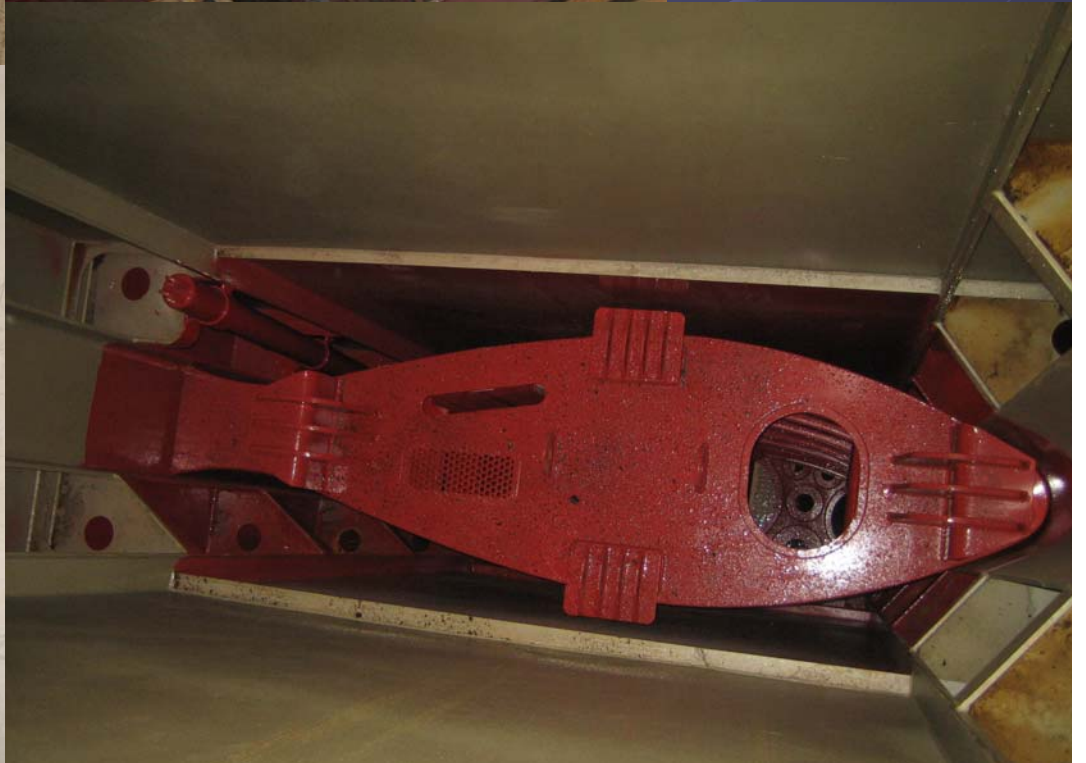


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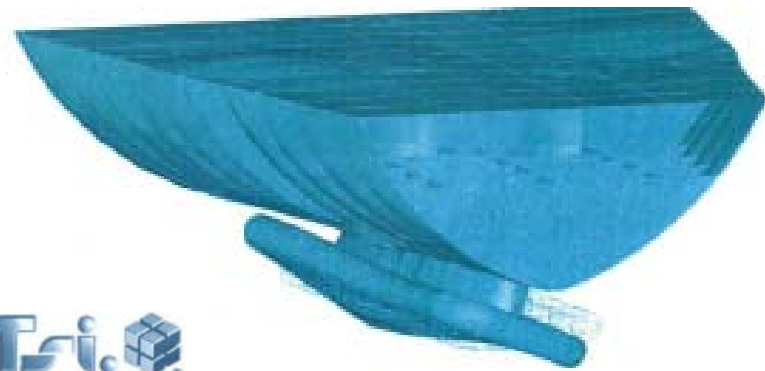
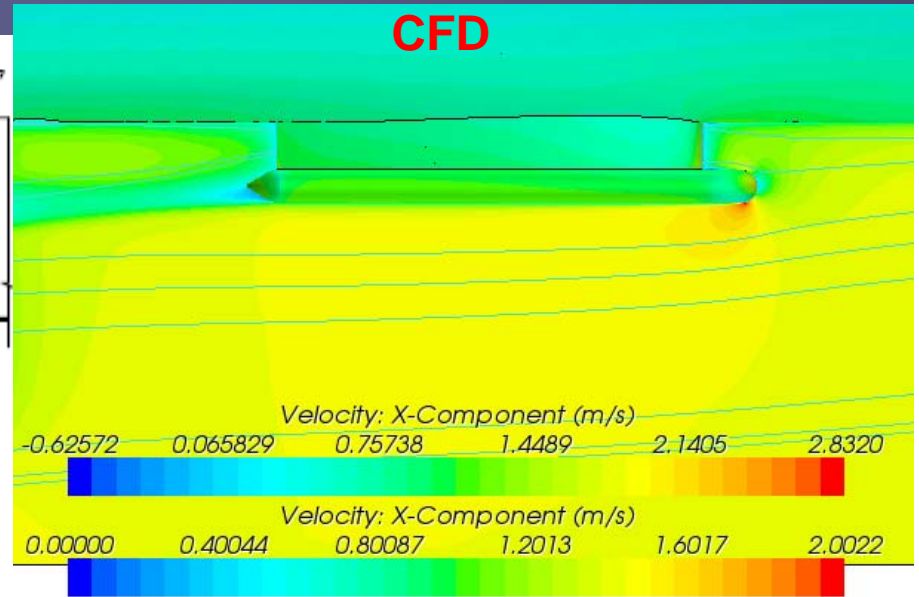
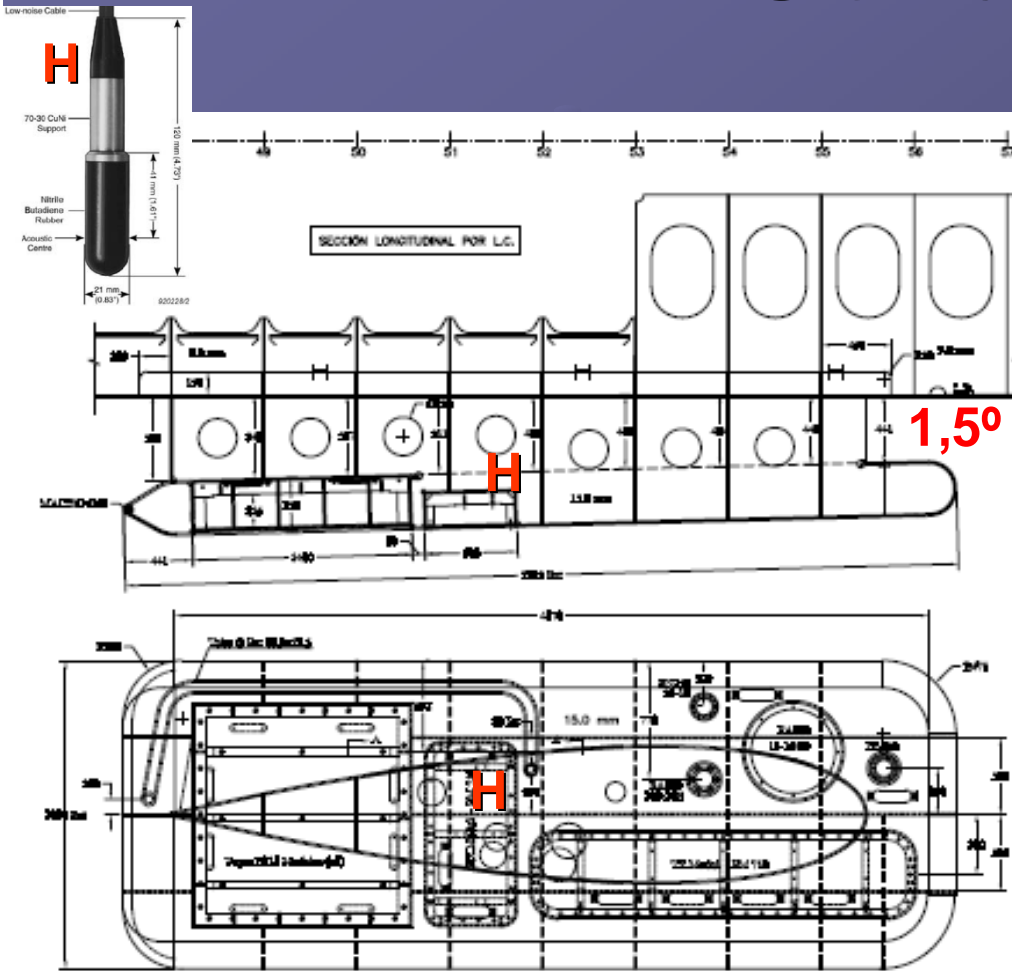
Quilla retráctil



ERVO 2009

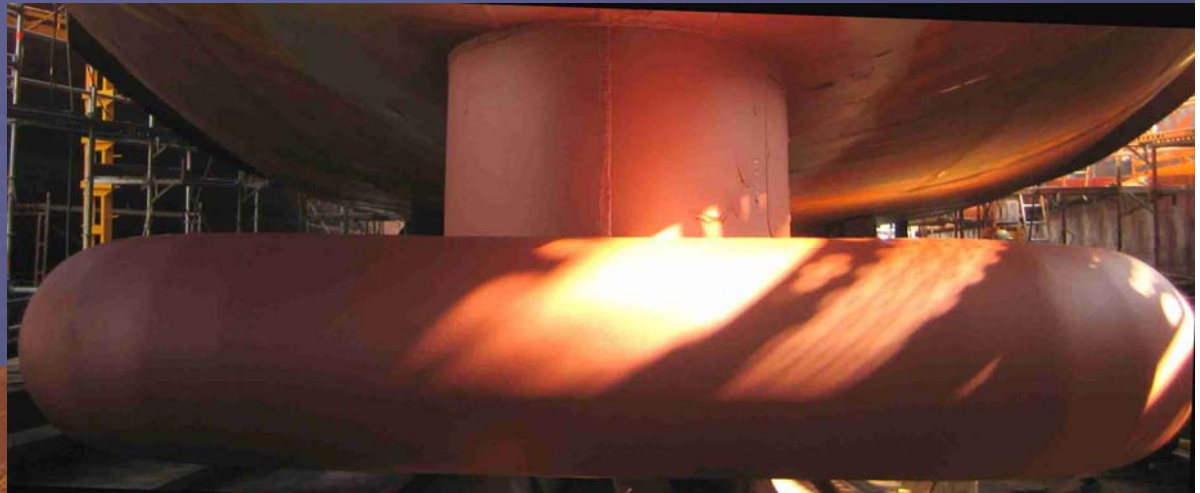


Góndola



EM710, TOPAS PS18
EN250, EA600
 ERVO 2009

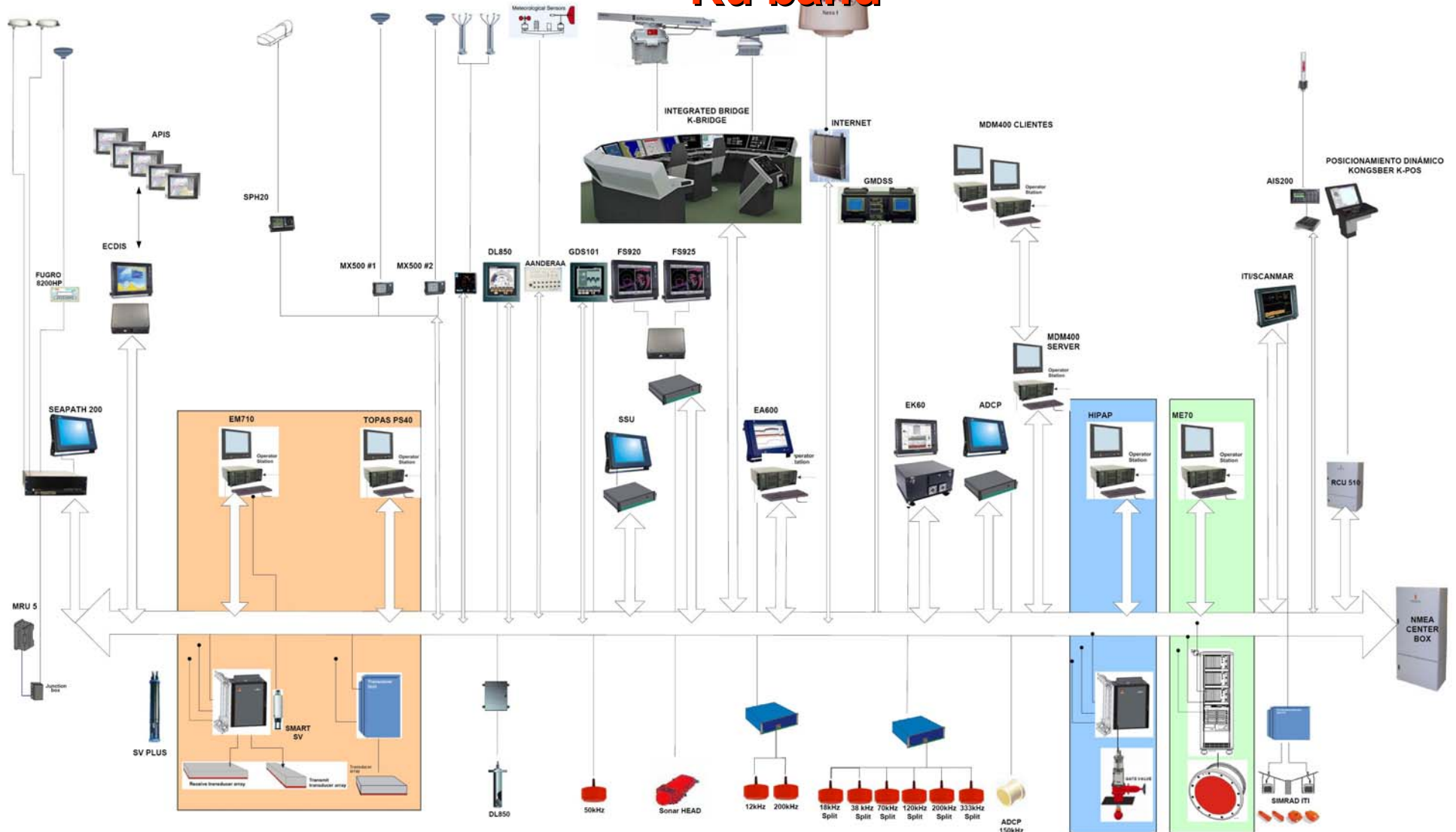




INTEGRATION

BUQUE OCEANOGRÁFICO
DIAGRAMA DE INTEGRACIÓN

128 kbps
VSAT
+ FB500 + GPRS
Ku band



Target: ICES 209

New approach

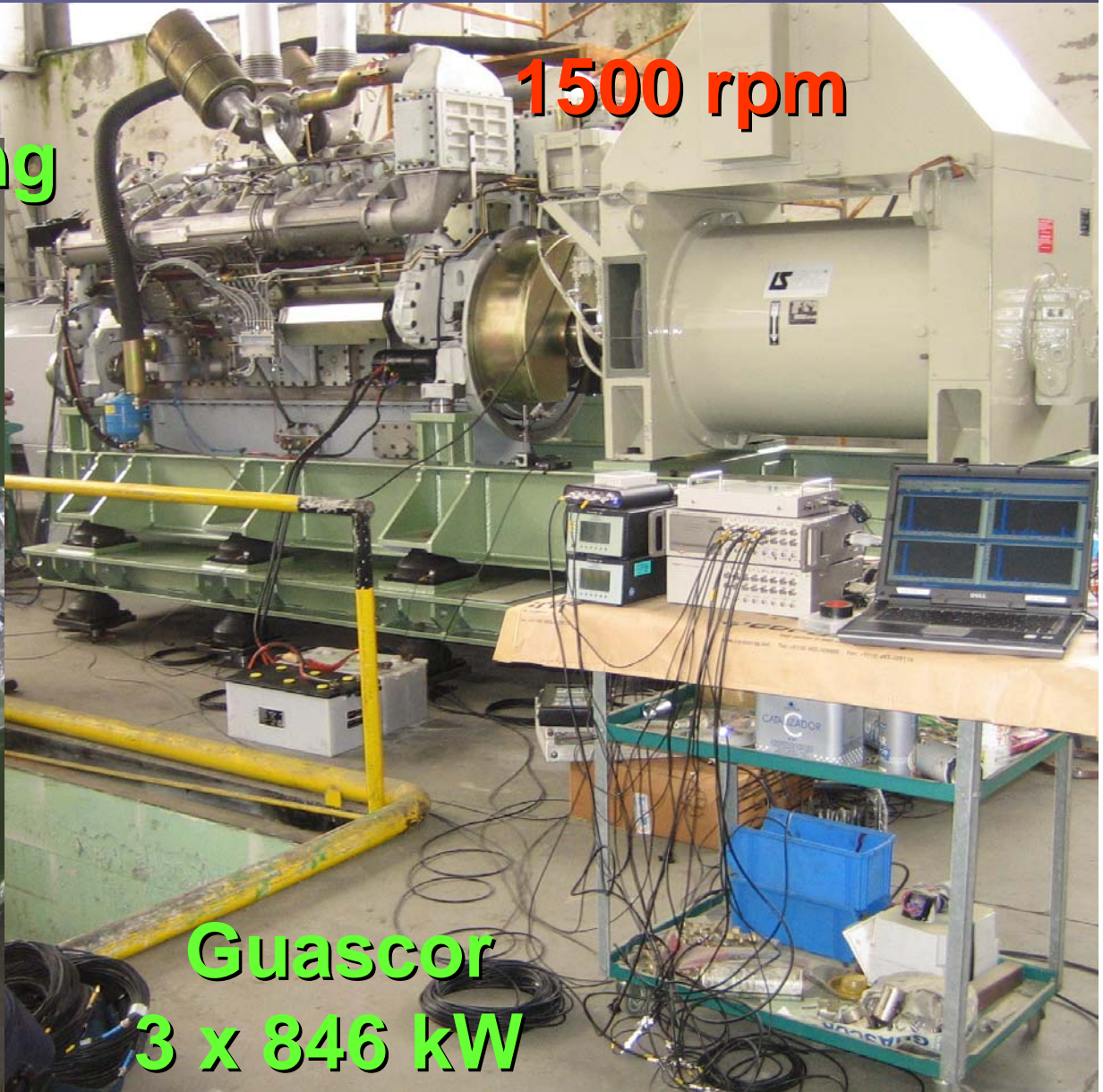
- Careful hull design
- Elastic paints engine room
- Double resilient mounting for gen-set **Miguel Oliver**
- Encapsulated gen-set
- 20 Tm dead weight under propulsion engines
- Resilient mounting for propulsion engines & elastic coupling
- AFE converters **Miguel Oliver**
- Propeller design
- Double resilient mounting & elastic coupling pumps
- Elastic tight for piping
- Low rugosity paints: Intersleek



Gen Set

Double resilient mounting

1500 rpm



Engine encapsulation

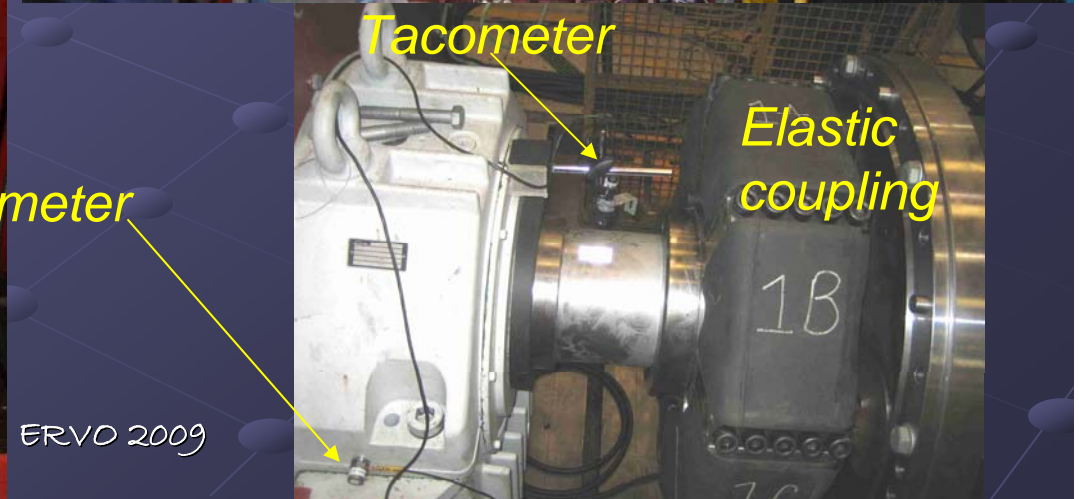
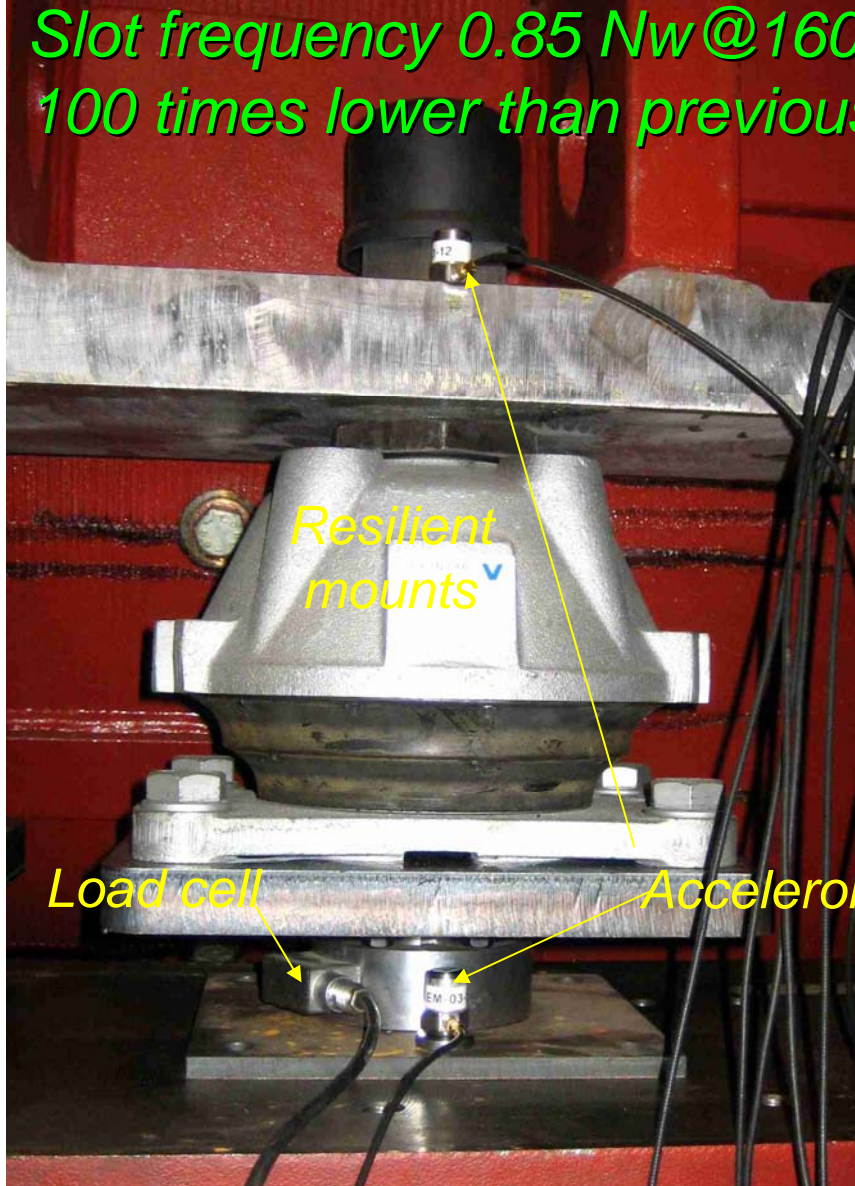


**GLOBAL ATENUATION
43,29 dB**

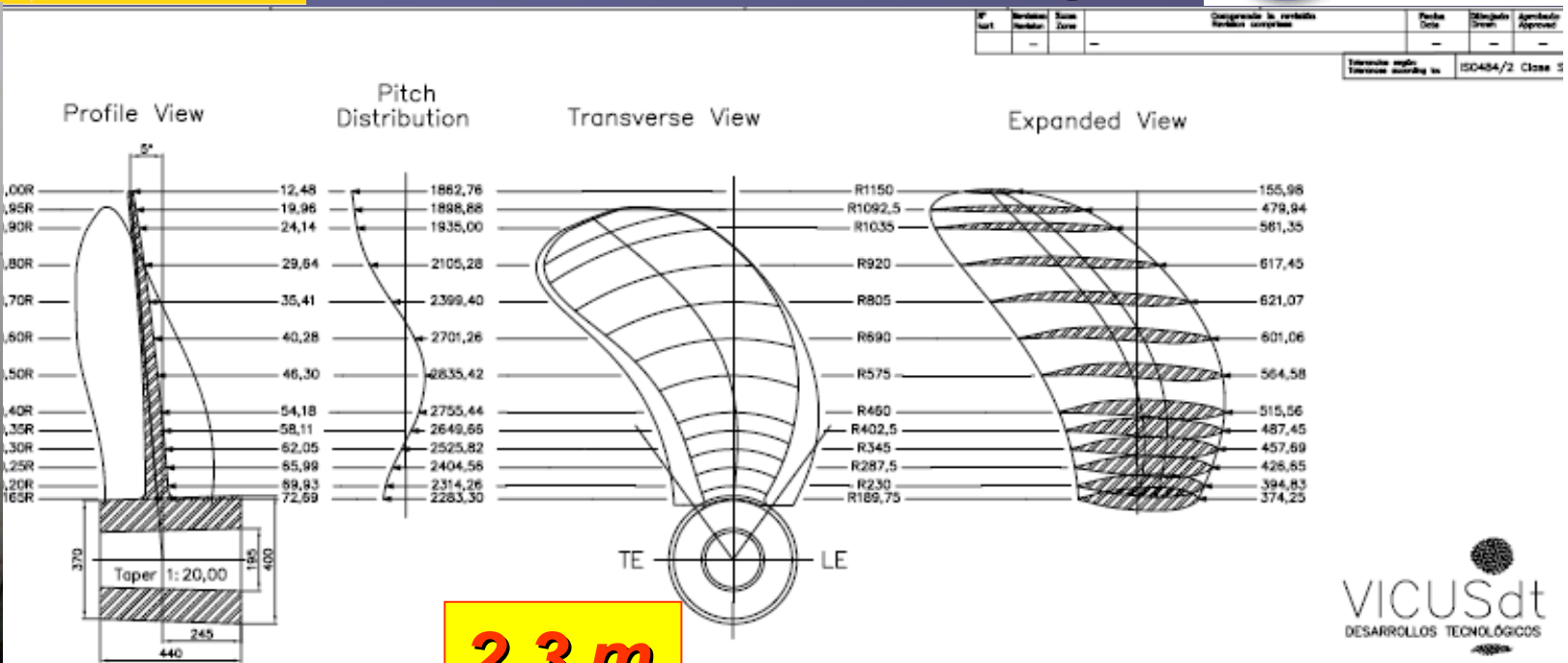
ERVO 2009

targeting ICES 209

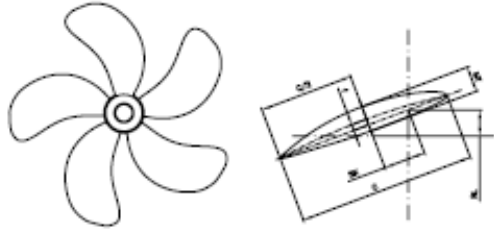
Slot frequency 0.85 Nw@160 rpm
100 times lower than previous engines



Propeller design



AP	Revisión	Fecha	Comprobado la verificación	Fecha	Aprobado
1	1	2008	Revisión	2008	2008
Tolerancias según			ISO484/2 Clase 5		



2,3 m

Coordinates of blade surface to be according to attached offset tables.
Coordenadas de la superficie de la pala según las tablas adjuntas

Blade sections to be checked with templates.
Las secciones deberán ser comprobadas con plantillas.

Thicknesses in offset tables are not including fillets in blade root
Los espesores en las tablas no incluyen los radios en la raíz de la pala

PARAMETROS PRINCIPALES / MAIN PARAMETERS

r/R	r	C	MT	SK	P	P/P07	RL	TE RAD.	LE RAD.
1,000	1150,0	155,98	12,48	480,3	1862,8	0,776	0,0	1,0	1,000
0,975	1121,3	386,20	17,52	433,5	1893,4	0,785	0,0	1,0	1,000
0,950	1092,5	479,94	19,56	486,2	1894,9	0,791	0,0	1,0	1,000
0,900	1035,0	561,35	24,14	381,3	1933,0	0,808	0,0	1,0	1,320
0,800	920,0	617,45	29,54	244,2	2105,3	0,877	0,0	1,0	1,320
0,700	805,0	621,07	35,41	148,8	2399,4	1,000	0,0	1,0	1,320
0,600	690,0	601,06	40,28	-1,7	2701,3	1,126	0,0	1,0	1,320
0,500	575,0	554,59	46,30	-7,1	2833,4	1,182	0,0	1,0	1,860
0,400	460,0	515,96	54,18	-3,4	2753,4	1,148	0,0	1,0	2,784
0,350	402,5	487,45	58,11	-9,9	2643,7	1,104	0,0	1,0	3,387
0,300	345,0	457,69	62,05	-21,1	2523,8	1,053	0,0	1,0	4,110
0,250	287,5	426,85	65,99	-7,5	2404,6	1,002	0,0	1,0	4,990

Blade to be delivered with certificate from La pala se suministrará con certificado de		BV	Ice class Cota de hielo	NO ICE
Tensile strength / Carga de rotura		Yield strength / Límite elástico	Dangston / Dangston	
Min 620 N/mm2		Min 250 N/mm2	16%	
PROPELLER DATA	Propeller type	FP		
	Rotation	Inwards		
	Number of blades	5		
	Diameter	2300	mm	
	Pitch (nominal)	2580	mm	
	Pitch ratio P/D 0.7	0.93		
	Mean pitch ratio P/D mean	1.017		
	Expanded area ratio	0.613		
	Rake angle	5	Deg	
	Skew angle	24,5	Deg	
Material type	Ni Al Br			
Density	7,8	g/cm3		
Propeller weight	881,9	Kg		
Polar dry moment of inertia	251,9	Kg m ²		
Polar added wetted moment of inertia	94,1	Kg m ²		
Absorbed power at design pitch	900	kW		
Design RPM	230			
2 1	NUCLEO DE HELICE PROPELLER HUB	3225		
1 1	HELICE DE PASO FIJO FIXED PITCH PROPELLER		Ni Al Br	Class 5
Marca	Cont. Descripción	Referencia	Materiales	Notas
Construction	Plant	If in position Order No./Prod. No.		Pen Test Req. Tolerances
M. CIES 91		N0401		881.9
Drawn	VR	Comprobado Checked	AS	Aprobado Approved
Drawn	MB	Supplemental specification 80/9 1302 No. on Surface texture 80/9 1302 No. on		
BALIÑO, S.A.		FIXED PITCH PROPELLER		Scale 1:10
HELICE DE PASO FIJO				Date 18/06/2008
				Sheet 1 of 1

Cavitation Test

$N_s = 159.9$ rpm, $V_s = 11.00$ knots
 $\sigma_n = 6.522$, $K_T = 0.175$

160 rpm
265kW/x2

$N_s = 159.9$ rpm, $V_s = 11.00$ knots
 $\sigma_n = 6.522$, $K_T = 0.175$

11 kt

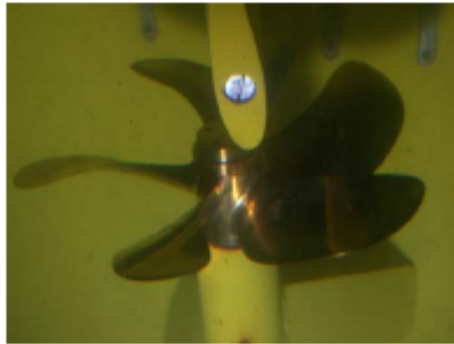


Fig. 1.3. pressure side



Fig. 1.4. $\phi=15^\circ$



Fig. 1.9. $\phi=105^\circ$



Fig. 1.10. $\phi=120^\circ$



Fig. 1.5. $\phi=30^\circ$



Fig. 1.6. $\phi=45^\circ$



Fig. 1.11. $\phi=180^\circ$



Fig. 1.12. $\phi=210^\circ$



Fig. 1.7. $\phi=60^\circ$



Fig. 1.8. $\phi=90^\circ$

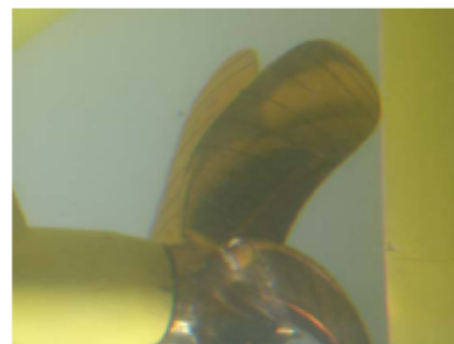


Fig. 1.13. $\phi=330^\circ$



Fig. 1.14. $\phi=360^\circ$

Cavitation Test

116 rpm
172 kw/x2

3 kt

$N_s = 116.0 \text{ rpm}$, $V_s = 3.00 \text{ knots}$
 $\sigma_n = 12.393$, $K_T = 0.380$

$N_s = 116.0 \text{ rpm}$, $V_s = 3.00 \text{ knots}$
 $\sigma_n = 12.393$, $K_T = 0.380$

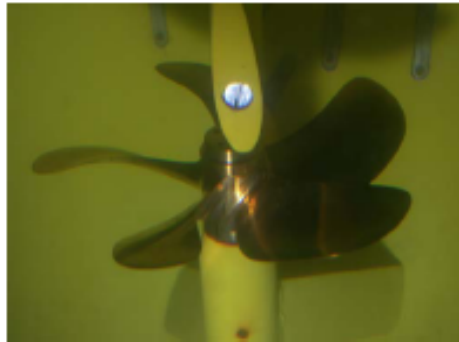


Fig. 1.15. pressure side

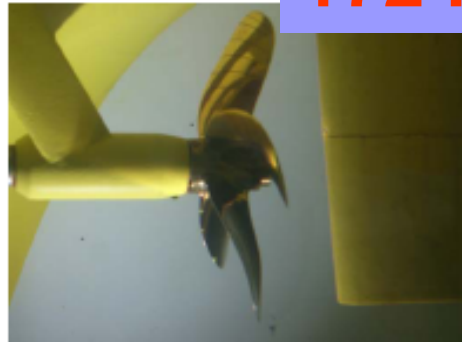


Fig. 1.16. $\phi=0^\circ$



Fig. 1.21. $\phi=180^\circ$



Fig. 1.22. $\phi=225^\circ$



Fig. 1.17. $\phi=30^\circ$



Fig. 1.18. $\phi=45^\circ$

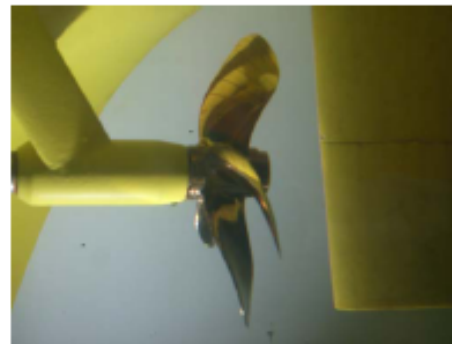


Fig. 1.23. $\phi=270^\circ$

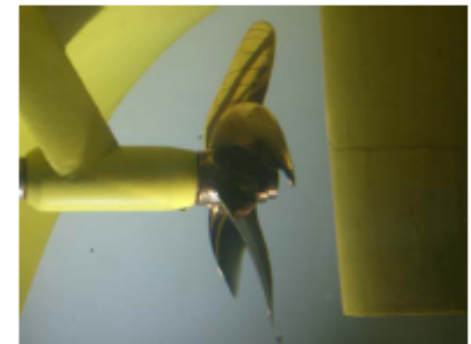


Fig. 1.24. $\phi=300^\circ$



Fig. 1.19. $\phi=75^\circ$



Fig. 1.20. $\phi=150^\circ$

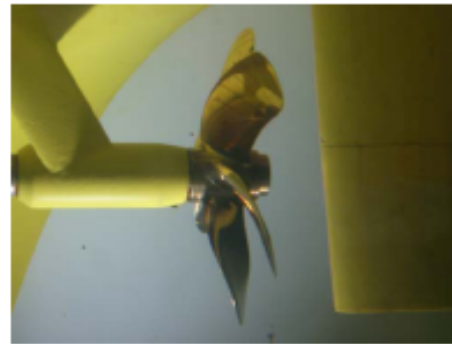


Fig. 1.25. $\phi=330^\circ$

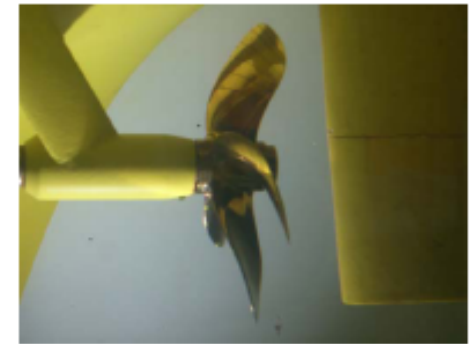


Fig. 1.26. $\phi=345^\circ$

Cavitation Test

$N_s = 146.7 \text{ rpm}$, $V_s = 3.00 \text{ knots}$
 $\sigma_n = 7.763$, $K_T = 0.410$

146,7 rpm
367 kW/x2

$N_s = 146.7 \text{ rpm}$, $V_s = 3.00 \text{ knots}$
 $\sigma_n = 7.763$, $K_T = 0.410$

3 kt

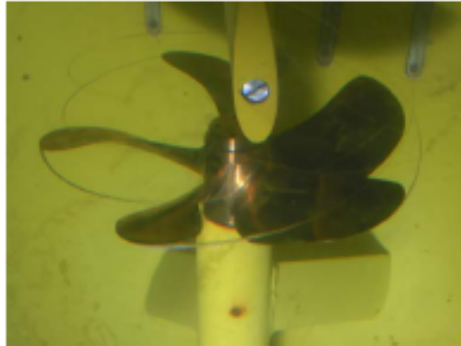


Fig. 3.27. pressure side



Fig. 3.28. $\phi=60^\circ$



Fig. 3.33. $\phi=210^\circ$

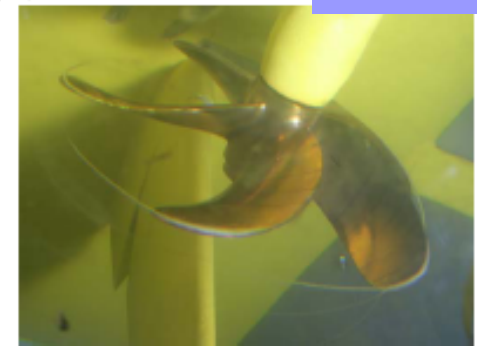


Fig. 3.34. $\phi=240^\circ$



Fig. 3.29. $\phi=90^\circ$



Fig. 3.30. $\phi=120^\circ$



Fig. 3.35. $\phi=270^\circ$



Fig. 3.36. $\phi=300^\circ$



Fig. 3.31. $\phi=150^\circ$



Fig. 3.32. $\phi=180^\circ$

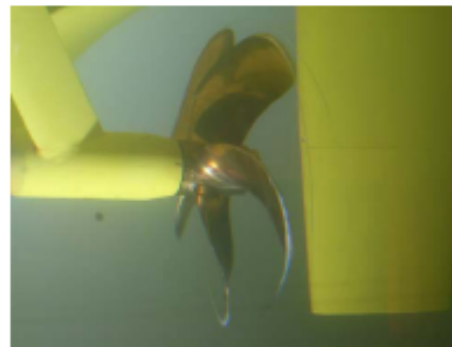


Fig. 3.37. $\phi=330^\circ$

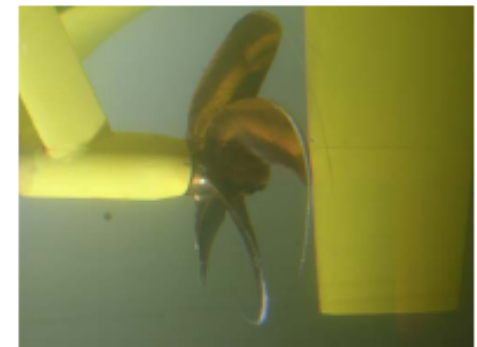


Fig. 3.38. $\phi=360^\circ$



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19 M€ *each*
VAT included



Thank you very much for your attention

In case of doubts, please ask:

jose.diaz@st.ieo.es

Sea trials December 09