SCIENTIA RERUM NAVALIUM

The South African Institute of Marine Engineers & Naval Architects

The Two Oceans Journal

2025 Edition 1

2025 BRANCH COMMITTEES AND NATIONAL COUNCIL

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THE EDITORS DESK

SAIMENA is trying to build-up steam and get activities going again, but it is slow and tedious process to get all our members re-involved in SAIMENA affairs again.

Years ago (pre-covid) we had good participation but this is not always the case currently. The SAIMENA Cape Branch had a very good presentation last week on “The Electric Ship” by one of our members, where there 19 members and 14 guests at the meeting and 8 online, excellent participation by recent standards. Maybe a sign of things to come.

Please support your local branch to make the Institute functional and relevant again. Only you can advise the Branch Committees of what will interest you and nurture your involvement again.

SAIMENA is building up to celebrating 50 Years of operation, 1975 to 2025, with a synchronised formal Dinner/Dance taking place in Durban and Cape Town. We look forward to a sumptuous occasion where colleagues can re-acquaint with each other and share memories from the past.

It is a bit surprising that of the over 300 SAIMENA members less than 30% have responded at all to the invitations and that only 60 are able to join in the celebration.

SAIMENA is now urgently searching for a volunteer to take over the editorial work of the TOJ, so that the published mouthpiece of SAIMENA can be published again.
The TOJ will thus be held in abeyance till we can find a volunteer.

Please do send any material of own articles that you may have or pen to SAIMENA so that we can collect articles to publish in the future.

We would like to publish a special 50th Celebration Edition if we can obtain adequate submissions and content.

Kind regards

Kevin Watson
Hon Secretary SAIMENA

AGE PROFILE OF SAIMENA

The question is often raised regarding the age profile of SAIMENA members.

The graphic below shows that over 50% of our members are above the 65 years line, indicating that lots of work is needed to attract younger members and to change the focus of SAIMENA to support and be of interest and relevance to these potential new members.

SAIMENA DoB Report by Age Group

GroupAge	Total	Associate	Retired Associate	Member	Retired Member	Fellow	Retired Fellow	Honarary Fellow	Honarary Recogniti	Student or Cadet	Marine Partner	Applicant	Percentage
0-20 years	1									1			0.3%
21-30 years	2									2			0.6%
31-40 years	34	23		11									11.0%
41-50 years	53	25		23		5							17.2%
51-60 years	40	15		20		5							12.9%
61-65 years	13	1		6		6							4.2%
65-75 years	53	13		12	2	25	1						17.2%
76-85 years	31	2	1	4	2	12	8	2					10.0%
86-90 years	6		1			3	2						1.9%
90 years older	12				4		7	1					3.9%
No data	64	24	4	20	5	1	3						20.7%
Totals	309	103	6	96	13	57	21	3		3			
		33.3%	1.9%	31.1%	4.2%	18.4%	6.8%	1.0%		1.0%			

I suspect that the 90 years plus grouping is due to us having lost contact with these members over the years.

SAIMENA also has many members with a long membership term, thank you to you all.

SAIMENA Membership Term

Term Age	Total	Associate	Retired Associate	Member	Retired Member	Fellow	Retired Fellow	Honarary Fellow	Honarary Recognition	Student or Cadet	Marine Partner	Applicant	Percentage
00 New member	6			1						1			1.9%
01-05 years	21	9		6		2				2	2		6.8%
06-10 years	45	17		25		2							14.6%
11-15 years	38	18		14		6							12.3%
16-20 years	36	20		8		8							11.7%
21-25 years	15	7		7		1							4.9%
26-30 years	20	11		5	1	3							6.5%
31-35 years	32	8	2	12	1	6	3						10.4%
36-40 years	27	6		5		15	1						8.7%
41-45 years	25	6	1	7	2	6	3						8.1%
46 years & more	44	1	3	6	9	8	14	3					14.2%

ARRIVALS, DEPARTURES AND LOSSES

Membership Status Changed 2025

Accepted as MEMBER

Member No	Name	AuditDate
M2025001	R.D. Greenan	19-Mar-2025

Exempt section B 2.7.2

Member No	Name	AuditDate
RF1975176	J.M. Guard	03-May-2025

Deceased

Member No	Name	AuditDate
A2004014	J.R.M. De Freitas	13-Jan-2025
A2018012	R.T. Fynn	12-Jan-2025

Resigned

Member No	Name	AuditDate
M1999009	W.J. Van Zyl	22-May-2025
A1989016	B.E. Nelson	14-May-2025
F1990002	A. Muller	06-May-2025
A2021009	L.J. Jokazi	20-Apr-2025
F1997006	M.D. Foley	16-Apr-2025
A1994005	C.D. Somerset	22-Jan-2025

Suspended due to no fee payment.

Member No	Name	AuditDate
M2009014	R L Harris	21-May-2025
M1994006	G.L. Fynn	21-May-2025
M1979038	N.A. Van Rijsbergen	21-May-2025
M2009006	W.V. Van Niekerk	21-May-2025
A2021001	J.P. Tumbo	21-May-2025
M2020003	F.S. Santos	21-May-2025

Suspended due to no fee payment.

Member No	Name	AuditDate
A2017014	N.F. Rolinyati-Ncedo	21-May-2025
M1982013	R.E. Pines	21-May-2025
A1995015	B.M. Noakes	21-May-2025
M1982013	R.E. Pines	21-May-2025
A1995015	B.M. Noakes	21-May-2025
A2015011	A. Ndimande	21-May-2025
M2017010	S.M. Moela	21-May-2025
M1976019	A.N.G. Mackenzie	21-May-2025
A2015015	L.B. Jacobs	21-May-2025
A2021003	A.I. Incha	21-May-2025
A2018008	A.R. Hertong	21-May-2025
A2000008	B. Curran	21-May-2025
A2000008	B. Curran	21-May-2025
A2020005	J.C. Franque	21-May-2025
A2021002	J.G. Borja	21-May-2025
A2021002	J.G. Borja	13-May-2025
A2020001	R.K. Bhagwandeen	13-May-2025
A1993058	N.A. Ames	26-Apr-2025
A2021004	C.J. André	07-Jan-2025

26 May 2025

SCIENTIA RERUM NAVALIUM

The South African Institute of Marine Engineers & Naval Architects

THE ACHIEVEMENT OF ARMS – AN EXPLANATION

A symbolic ship's bow is superimposed on a rising sun, symbol of knowledge, power and wisdom. The ship is moving over the ocean towards the west, passing through a pair of callipers representing precision and measurement. The Arms, therefore, represent symbolically the joining together of all these attributes into one great amalgam of maritime science. The helm, torso and mantling are indicative of the standing of the Institute and represent chivalry and integrity. The crest, a lion and anchor, symbolises strength with humility. The supporters are a seal and dolphin, each of which is a mammal whose natural habitat is the sea. The dolphin's intelligence and the seal's versatility serve to amplify the symbolism of the Arms. The collars indicate the navies of the world who sail the waters of our country, ever tied to the sea. The mound represents the Republic of South Africa with the sea washing its coastline.

The motto "**Scientia Rerum Navalium**" on the Arms declares "to be skilled in the business of ships" which is what SAIMENA strives to achieve.

Scientia - to know, understand, perceive, have knowledge of, be skilled in ...

Rerum - a thing, object, matter, affair, business, event, fact, circumstance, occurrence, ...

Navalium - of ships, ship-, nautical, naval

Reformatted and Updated 10 September 2013 by KJ Watson

SAIMENA 50TH YEARS CELEBRATION

The Birth of SAIMENA 1974-1975

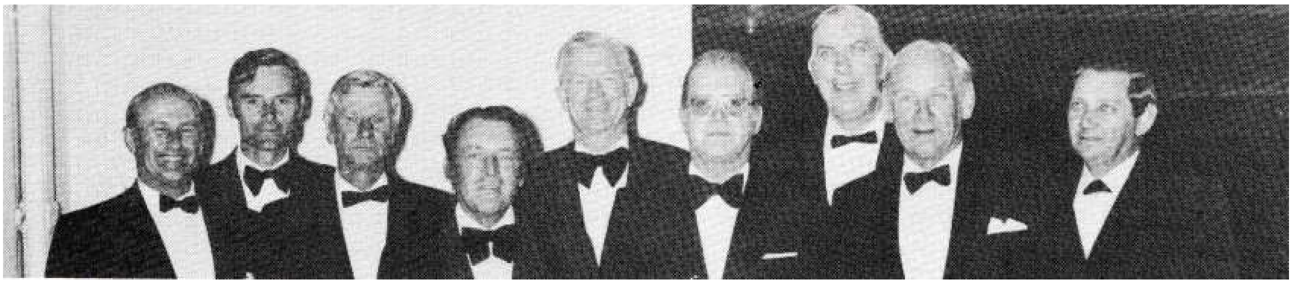
Prior to 1974 many members of the Marine Industry belonged to the Institute of Marine Engineers and/or the Royal Institution of Naval Architects, both of which had their headquarters in London.

The South African Council for Professional Engineers, created as a result of the Professional Engineers Act of 1968, refused to have affiliated institutions which were based outside the R.S.A. so Marine Engineers and Naval Architects resident in South Africa decided to form a combined Institute, with its headquarters at the Athenaeum in Cape Town.

The South African Institute of Marine Engineers and Naval Architects was constituted on 29 November 1974 after the nationwide referendum indicated that a South African Institute was desirable.

A Constitution, supported by a set of by-laws, was drawn up with professional legal advice, and the South African Institute of Marine Engineers and Naval Architects (SAIMENA) was formed with the late Harry Smith, General Manager of Globe Engineering Works as President, and the late Rear Admiral J.R. Nortier, of the SA Navy, as Senior Vice President.

All members of the institute of Marine Engineers, London and of the Royal Institution of Naval Architects, London acquired similar grades of membership in the South African Institute.



First (1975) council of the SA Institute of Marine Engineers & Naval Architects: Mr NC Humphries, Cdr (E) LRA Carroll, Mr RJ Wilson, Mr PFH Brebner, Mr W Neish, Mr HS Smith (president), Mr DF Utley, Mr AL Brown, Cdr (E) CWB Singleton.

SAIMENA 50th Celebration Event

SAIMENA has turned 50 this year, and is celebration of 50 years of Maritime engineering development by the Institute, we will be holding a synchronised formal dinner in Durban and Cape Town on Friday evening, 11 July 2025.

We look forward to seeing you there and sharing stories and memories.

SAIMENA Presidents since 1975

SAIMENA was established in 1975 and is celebrating 50 years in 2025.
For interest here is the list of SAIMENA Presidents since 1975.

SAIMENA Council Appointments - President

	SAIMENA No		Name			ECSA Grade	
1975	1975001	F	Smith; H.S.	Mr	Harry	Pr.Eng	
1976	1975001	F	Smith; H.S.	Mr	Harry	Pr.Eng	
1977	1975x03	F	Nortier; J.R.	R Adm	Dick	Pr.Eng	691086
1978	1975x03	F	Nortier; J.R.	R Adm	Dick	Pr.Eng	691086
1979	1975x04	F	Wilson; R.J.	Mr	R.J.	Pr.Eng	
1980	1975188	HF	Jenkins; R.J.	Mr	Richard	Pr.Eng	691631
1981	1975002	HF	Brebner; P.F.H.	Mr	P.F.H.	Pr.Eng	710433
1982	1975008	F	Utley; D.	Mr	Don	Pr.Eng	720743
1983	1975008	F	Utley; D.	Mr	Don	Pr.Eng	720743
1984	1975147	F	Baker; R.C.	Mr	Ralph	Pr.Eng	710432
1985	1975147	F	Baker; R.C.	Mr	Ralph	Pr.Eng	710432
1986	1975007	F	Singleton; C.W.B.	Captain	Bill	Pr.Eng	
1986	1975007	F	Singleton; C.W.B.	Captain	Bill	Pr.Eng	
1988	1975188	HF	Jenkins; R.J.	Mr	Richard	Pr.Eng	691631
1989	1975188	HF	Jenkins; R.J.	Mr	Richard	Pr.Eng	691631
1990	1975047	RF	Hughes; R.B.	Mr	Robert	Pr.Eng	860299
1992	1975039	HF	Gorman; R.H.	Mr	Ronald	Pr.Cert.Eng	9190007
1993	1975039	HF	Gorman; R.H.	Mr	Ronald	Pr.Cert.Eng	9190007
1996	1976017	HF	Rice; W.H.	Captain	Bill	Pr.Eng	850222
1997	1976017	HF	Rice; W.H.	Captain	Bill	Pr.Eng	850222
1998	1980020	F	Burnett; R.T.	Mr	Trevor	Pr.Cert.Eng	8890052
1999	1980020	F	Burnett; R.T.	Mr	Trevor	Pr.Cert.Eng	8890052
2000	1976054	F	Hitchings; R.W.	Mr	Roy	Pr.Cert.Eng	8890086
2001	1976054	F	Hitchings; R.W.	Mr	Roy	Pr.Cert.Eng	8890086
2002	1983026	HF	Armstrong; I.F.	Mr	Iain	Pr.Cert.Eng	8890070
2003	1983026	HF	Armstrong; I.F.	Mr	Iain	Pr.Cert.Eng	8890070
2004	1988020	F	Leeming; N.G.	Mr	Neill	Pr.Cert.Eng	8990031
2005	1988020	F	Leeming; N.G.	Mr	Neill	Pr.Cert.Eng	8990031
2006	1975166	HF	Deyzel; W.W.	Mr	Willem	Pr.Tech.Eng	8970132
2007	1975166	HF	Deyzel; W.W.	Mr	Willem	Pr.Tech.Eng	8970132
2008	1994012	F	Coxon; P.S.N.	Mr	Paul	Pr.Cert.Eng	9990019
2009	1994012	F	Coxon; P.S.N.	Mr	Paul	Pr.Cert.Eng	9990019
2010	1980025	RF	Shaw; R.R.	Mr	Richard	Pr.Cert.Eng	9390008
2011	1980025	RF	Shaw; R.R.	Mr	Richard	Pr.Cert.Eng	9390008
2012	2008010	F	Watson; K.J.	R Adm(JG)	Kevin	Pr.Eng	990230
2013	2008010	F	Watson; K.J.	R Adm(JG)	Kevin	Pr.Eng	990230
2014	1987012	F	Gontier; L.M.	Mr	Louis	Pr.Cert.Eng	9190028
2015	1987012	F	Gontier; L.M.	Mr	Louis	Pr.Cert.Eng	9190028
2016	1975172	F	Fiddler; D.M.	Mr	David	Pr.Cert.Eng	8890183
2017	1987012	F	Gontier; L.M.	Mr	Louis	Pr.Cert.Eng	9190028
2018	2008010	F	Watson; K.J.	R Adm(JG)	Kevin	Pr.Eng	990230
2019	2008010	F	Watson; K.J.	R Adm(JG)	Kevin	Pr.Eng	990230
2020	2008010	F	Watson; K.J.	R Adm(JG)	Kevin	Pr.Eng	990230
2021	2008010	F	Watson; K.J.	R Adm(JG)	Kevin	Pr.Eng	990230
2022	2008010	F	Watson; K.J.	R Adm(JG)	Kevin	Pr.Eng	990230
2023	2001009	F	Govender; P.	Mr	Rennie	Pr.Cert.Eng	200690032
2024	2001009	F	Govender; P.	Mr	Rennie	Pr.Cert.Eng	200690032
2025	2001009	F	Govender; P.	Mr	Rennie	Pr.Cert.Eng	200690032

SIGNALS FROM MEMBERS

Greetings to you SAIMENA,

I trust you are ship-shape and well.

Regarding the identification of Interests and Capabilities of Members Survey/Input request - Just an idea: Perhaps under “Consultants” add the sub-heading: “Investigations into causes” of e.g. Machinery Problems and Failures, Accidents and Injuries, - and possibly also Potential Import Substitution of expensive / difficult to source replacement spare parts.

Unicorn Shipping became most adept at finding local suppliers (or rebuilders / restorers) of imported equipment during the political sanctions period. Our fleet of motorships were running on high-pressure fuel –injection equipment that when worn-out was restored to as-new factory condition by a small specialist firm way up in Postmasburg in the dry Northern Cape. The local jobs lasted longer than the OEM-supplied items. It was also a contractor to Armscor - I saw a lot of sensitive stuff in their impressive workshops – which from the outside looked like a farm equipment repair outfit!

Modern ships have become so very complex that the technical staff might very well need an additional internationally-recognised qualification in cybernetics within the next decade!

The traditional lathe, drilling- and welding-machines in ships’ Engine Room Workshops are likely to give way to a well-equipped dust-proof and climate-controlled Electronics Workshop with electronic testing equipment, power supplies and screens, plus spare hard-drives and other electronic componentry. The Electrician will give way to an Electronics fundi with a degree in computer science, or similar.

Internal-combustion engines will progressively be replaced by electric motors – especially in short-sea vessels in Scandinavia and north Europe, where increasingly-efficient storage batteries will be recharged in port by economic hydro- and wind-derived electricity.

The Good Lord knew what he was doing when he programmed the average human’s lifespan to “three-score years and ten”. However, my late mother passed away last July the day after her 104th birthday, so I might be blessed to see some of what I imagined above, but by then it would be well beyond my understanding.

Best wishes, and “steady as you go”

Rob Young
Langebaan

Thursday, 13 February 2025

Re Voortrecker - 30 years ago

In response to a previous TOJ edition.

“Dear Sirs,

Thanks for your article about the Voortrecker tragedy offshore Mosselbay !
I was one of the eye witness of the capsizing of the Voortrecker and was later at the court of enquiry at Cape Town.
Every year in September I think about that tragedy but not keeping me and even my son away from going to sea.
Whenever I will get a chance to visit South Africa, I shall go to Mosselbay !

Kind regards

Thomas Reuter
Elbe Pilot

email 2025/02/04

Von meinem iPad gesendet “

M.V. 'Santander'. A trip down memory lane. Just a wee yarn.

Maybe this will stir old memories for some.

A voyage on the good ship 'Santander', as usual like any trip, it had its ups and downs. I walked along the quay in 1966 in Liverpool and before my eyes I beheld the stern of the 'Santander' a vessel owned by P.S.N.C. I later saw her in profile and she had, to my eyes, very nice lines. The Hull rivets gave me a notion of her age.

Suitably clad in boiler suit I ventured into the Engine Room where a Generator was merrily bombing along. No ear muffs around in these days or Control Room to get away from the noise. I was curious as to why the Main Engine and the Generators were painted black and I was informed that the oil leaks that oozed from the engines had urged one previous Chief Engineer to decide that black was a more appropriate colour than the usual eau-de-nil or suchlike. The Main Engine ran on HFO, even for manoeuvring. However the overall effect was like a cloak of black high gloss enamel. The Main Engine was a Harland & Wolf, B&W Double-acting 8 Cylinder Diesel with a Roots Blower. That engine throughout the voyage never missed a beat, bless her, and only had one scavenge fire. To walk past the Roots Blower after Full Away was scary as when overhead it made an extremely loud rumbling noise, the floor plates shook and its sheer size was intimidating. The Generator Diesels were British Polar 2 strokes with a large Scavenge Pump at the one end. Black high gloss again. I found the Scavenge Pump later on in Ellesmere Port a real boon as it was just after Christmas and the Engine Room was as cold as a mother-in-law's smile and made a twelve hour Port Watch a misery. I made use of the Scavenge Pump by sitting on top of it to get some heat into my nether regions.

The voyage itinerary was Jamaica, Panama, Ecuador, Peru, Chile and Mexico. At Montego Bay Jamaica we discharged at anchor into dumb barges. Explosives had been taken on board at Falmouth, England for the copper mines of Peru. This sometimes required going into a port to off-load the explosives then head off to another port that would not let you in with explosives on board. Once done there, it was back to the first port to load the explosives again. Bit of a schlep when it was all done in one day.

During the trip the 2nd. Engineer decided that he would paint the Generators eau-de-nil. It did brighten up that part of the Engine Room a bit but after the first Generator was done the eau-de-nil colour didn't last, as once the machine ran and the small leaks were wiped by our intrepid oilers the poor machine was like the Irish 'Forty shades of green'. Nice try.

The vessel took twelve Passengers and we had a Minister of Religion and family, a business man and a number of Christian Missionaries headed to minister to Peruvian Indians in the rain forest somewhere. Nice bunch of people. An old lady was chaperoning her daughter but one look at her tended to make you think that a chaperone was maybe a bit of overkill. As we all know the English spoken at sea is heavily laced with colourful swear words. It is just the lingua franca of the Merchant Navy. However around Missionaries it tended to produce a pregnant silence. On one occasion I dropped a word while on deck not knowing a Missionary was on the deck above my head. The nice chats she and I had come accustomed to came to an abrupt end. I wasn't the only one that ended up persona non grata.

There was no Officers' Pantry, which was par for the course in these days, so after the evening meal you walked away with two little sandwiches made up of jam with bread as wide as two fingers and so thin you would think it had been cut on a bacon slicer. I supplemented my sarmies when possible with a number of great cakes. There was a Baker on board, a leftover from the large passenger ship days, and there were days when a full Baker's Tray was adorned with cakes. Fortunately the tray was left lying at night near a barred opening in one of the Galley Bulkheads. Using a sharpened welding rod tied to a few more it was possible to spear the cakes and liberate them. It took a while to perfect this manoeuver and also not get caught in the act.

While going through the Panama Canal the ship found itself in one of the Locks with an American Naval Vessel. It just so happened that at the side of the Lock there was a set of tiered benches full of tourists. An American with a microphone was proudly giving the 'full monty' on the American vessel. Couldn't stop singing its praises. Bearing in mind that P.S.N.C. had countless vessels going to the West Coast of South America from about 1840 it came as a terrible shock, I was told, when it was announced loudly over the speakers, 'Ladies and gentlemen here we have the 'Santander' an English Tramp Ship.' I understand the Old Man was nearly apoplectic.

One day in the Engine Room an enterprising soul decided the Main Engine Overhead Crane would look nicer at the after end of the Main Engine. However on the way to its new abode the crane hook lifted a foam extinguisher and once at the after end of the Main Engine it preceded to fall off the crane hook, active and cover the whole open DC Switchboard with foam. Upon seeing this the Electrician demonstrated his extensive knowledge of Merchant Navy parlance, in spades.

The Slop Chest had its usual list of goodies to buy but seemed to be down at the head with boxes of female cosmetics. I didn't think that such could be consumed on this trip although, with respect, some of the female passenger's looks could have been enhanced by a liberal amount of product. On our way up to Guayaquil, Ecuador I was on deck and observed a large dugout canoe coming alongside. I eventually realised that the dugout was getting filled up with lots of cosmetics. There was obviously a business transaction taking place which was standard procedure on this coast. In most ports it was as usual par for Customs Officers to get a bottle of spirits and two hundred fags as a sweetener. I just couldn't understand how a bottle and two hundred ciggies at times had to be carried off in several large cardboard boxes.

Food wise we ate well and the old boiled potato, roast potato and lamb were well represented. With the price of lamb nowadays maybe we should have eaten more when we had the chance. I was stymied one day when a green edible ding was the entrée. We sat looking at each other until someone told me it was an artichoke and how to eat it. I thought it was much ado about nothing. The vessel was experiencing some rough weather in the North Atlantic and it was a case of hang on with one hand and eat with a fork in the other. Chairs chained to the deck was a must but unfortunately the old lady chaperone's chair had been overlooked. One particular roll and she went flying backward screaming as she went with legs flailing and her undergarments on full display. Said garments were anything but erotic. No 'Victoria's Secret' there. Poor soul was shaken up for days.

We visited many ports on the coast with the usual ones like Arica, Antofagasta, Callao, Valparaiso, and Talcahuano. Many of these ports had public watering holes universally familiar to the Merchant Navy fraternity. Such establishments, like Yako Bar in Valparaiso, were not coffee shops per se but a place to tarry and enjoy an alcoholic beverage and maybe a chat with a local diva. We got held up when it was time to leave Antofagasta due to the absence of crew. The Old Man on one of the company's other vessels was asked if he could lend some souls but he was no mug and knew that once past the breakwater he could kiss his men goodbye until the vessels hit the next port that the vessels would meet up in. However the Agent saved the day and skidded his bakkie to a halt pouring out our jolly tars at the bottom of the gangway. They had been trading niceties with locals resulting in bloodletting and swollen faces. C’est la vie. A D.R. in one’s Discharge Book at the end of a trip was standard fare for many a British Seaman.

On the Chilean Coast I was intrigued to see large white letters on the barren hills spelling out Bernardo O’Higgins and Arturo Pratt. National heroes of yester year. Poor Bernardo ended in exile in Peru but still a Chilean hero. I started reading up extensively on South American history as that Irish name intrigued me.

One day while travelling North and about thirty nautical miles off land the sea as far as the eye could see in any direction had large circles of thrashing water caused by fish that were being forced to the surface by whales. The whales were surfacing and diving continuously. Birds were dive-bombing the poor old fish. An amazing sight. The next day there were sharks everywhere. No fish, no whales, just sharks. The sharks would come and rub against the vessel.

Mexico found us at Coatzacoalcos to fill the vessel with sulphur. That sulphur dust got everywhere and you ran the gauntlet going ashore as the dust seemed to target your eyes which was hell. Once the main engine started on departure the sulphur dust on it smoked off and nearly popped your lungs. In these days, 1966, going up the road here was like walking onto the set of a Clint Eastwood western movie. Stereotype Mexicans on saddleless horses bobbing slowly down the road and wearing a muckle great hat as the odd cars rolled past them.

One watch in the middle of the North Atlantic saw an oiler, who was well oiled, blow the contents of the scavenge space drain drum right up into the air as he opened the scavenge space cock full bore. The oiler then proceeded to fall and roll around in that muck. I and another had to get the oil soaked soul across the after deck to the Crew Accommodation. We were rolling like crazy and the deck awash but we made it and didn’t lose our inebriated oily ding. Just chucked him into his bed, oily as he was, right on to nice clean sheets. Sleep tight shipmate as you will be having a tête-à-tête with the Old Man tomorrow.

There were other things but best finish now.

M.V. "Santander" P.S.N. Co.

SANTANDER was built in 1946 by Harland & Wolff at Belfast with a tonnage of 6648grt, a length of 466ft 4in, a beam of 62ft 9in and a service speed of 15 knots.
Sister of the Salinas she was sold to Navmachos Steam Ship Co. of Famagusta for £147,500 in 1967 and renamed Navmachos.
On 9th December 1971 she was sold for $166,000 and broken up in Spain by Villaneuva y Geltru.

ARC FLASH AT SEA – A STARTING POINT

Extracted from NFPA 70E (2012)

Arc Flash Hazard. A dangerous condition associated with the possible release of energy caused by an electric arc.

Informational Note No. 1: An arc flash hazard may exist when energized electrical conductors or circuit parts are exposed or when they are within equipment in a guarded or enclosed condition, provided a person is interacting with the equipment in such a manner that could cause an electric arc. Under normal operating conditions, enclosed energized equipment that has been properly installed and maintained is not likely to pose an arc flash hazard.

Arc Flash Hazard Analysis. A study investigating a worker's potential exposure to arc flash energy, conducted for the purpose of injury prevention and the determination of safe work practices, arc flash boundary, and the appropriate levels of personal protective equipment (PPE).

Arc Flash Hazard. A dangerous condition associated with the possible release of energy caused by an electric arc.

Informational Note No. 1: An arc flash hazard may exist when energized electrical conductors or circuit parts are exposed or when they are within equipment in a guarded or enclosed condition, provided a person is interacting with the equipment in such a manner that could cause an electric arc. Under normal operating conditions, enclosed energized equipment that has been properly installed and maintained is not likely to pose an arc flash hazard.

Arc Flash Hazard Analysis. A study investigating a worker's potential exposure to arc flash energy, conducted for the purpose of injury prevention and the determination of safe work practices, arc flash boundary, and the appropriate levels of personal protective equipment (PPE).

As ships grow larger or take on industrial functionality as occurs in the largest container ships, or FPSO ships, or mining, or any number of other ships, the electrical generation on board has grown.

Cargo and industrial needs take up much more energy than hotel services, (except of course when 6000+ passengers are catered for – yet another special category) with the result that ship's generation resembles a power utility more than an in-house service.

Designers, specifiers, surveyors, owners and operators in the marine industry would do well to exercise some caution when assessing risks associated with faults that occur inside switchboards. Arc flash risk is one such aspect, and often treated as a manufacturer's problem and not an operational liability.

The engineering term "arc flash" has its origin in American industry, and mitigation focusses on increased safety of the individual through clothing and practices which separate the switchgear from human proximity.

A principal key of the American philosophy as applied to arc flash is that the parameters which lead to the risk of death, injury or asset loss through arc effects are quantified for arc incidents. Arc flash occurs where a workspace in a switchboard has conductors exposed to open space at the time of a short circuit, or where exposure is triggered by (a.o.) enclosure failure because of a short circuit. The assessed parameters determine the characteristics of the required PPE, and in defining "deemed safe" switching procedures.

In the European environment, a related engineering concept was developed in the form of "internal arc certification (IAC)". The standards require that the method of construction of a switchboard is such that arc effects are contained behind the enclosure's cover(s) or are directed away from personnel. The objective is to achieve an environment which limits the risk of injury to quantified extent, and to achieve this in close proximity to the switchboard.

In a nutshell, where in the USA the recommended mitigation is to separate the individual from the arc in the switchboard, the European mitigation is to separate the arc from the individual. And here lies the crunch. Arc Flash defines what happens through open doors, IAC defines what happens behind closed doors.

<u>The philosophies are complimentary and not mutually exclusive, and specifically, IAC is not a countermeasure for arc flash.</u>

Regardless of the underlying philosophy, arc faults will occur inside switchboards and the effects must be managed to support a safe working environment.

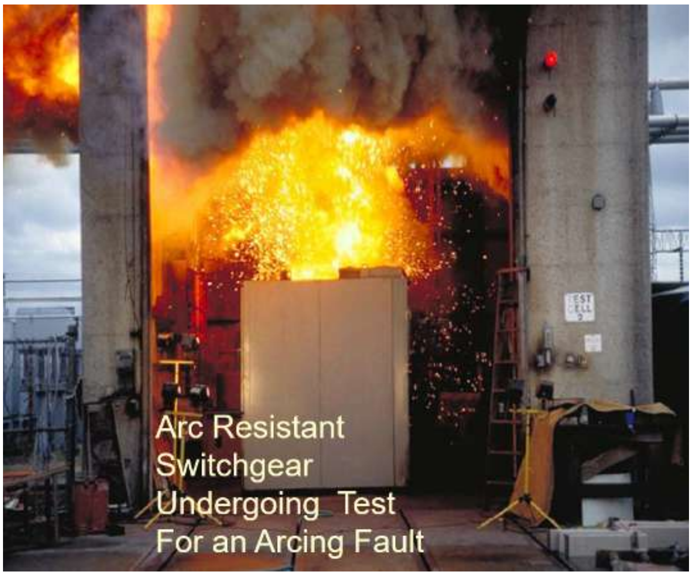


Figure 1: Panel under test for IAC. (Photo: EWB Engineering)

Magazine articles, the introduction of generic arc flash calculation software and increasingly, the popular misunderstanding of the differences between arc flash and IAC principles has led to crosstalk, contamination of mitigation, inappropriate operational practices and the introduction of risk factors to substations.

<u>Flawed thinking leads to avoidable risks</u>.

Some common assumptions that would bear reassessment, in no particular order, are:

1. Assuming that an IAC certificate allows safe working conditions in a switchboard with one or more doors open.
An open door is an arc flash condition while the switchboard is energised and PPE to suit the risk must be worn.

2. Assuming that a substation is safe because the switchboard has an IAC rating.
This is only true if the compartment dimensions do not require that arc products are to be ducted away. Deckhead height and the overall compartment dimensions can prevent the pressure wave and arc debris from dissipating safely.

Figure 1 illustrates typical effects of arc energy being dissipated.

3. Assuming that smaller switchboards do not have an arc flash risk.
The risk exists in all energised enclosures, including single phase distribution boards and should ideally be assessed as part of an arc flash hazard study.

4. Allowing a compartment containing switchboards to also serve as a transit route for personnel.
Equipment ageing and eventual failure can and does occur in the best products. Crew are unlikely to wear PPE appropriate to the substation's assessed risk while in transit.

5. Assuming that a low arc flash category in one area also applies to all other parts of a switchboard.
The risk of injury is specific to the location and outfitting of each element of the switchboard. Different sections will present different risks and procedures and PPE must be adapted to the assessed category of risk.

6. Assuming that batteries and DC systems do not present arc flash hazards.
DC (Direct Current) arcs are particularly onerous to contain. The risk is not only in the battery room.

by Mr G.P. Nieuwoudt Pr Eng, B Eng (Electrical), FSAIMENA
Raubicon Engineers & Project Managers

SHIP DESIGN METHOD TO REDUCE CARBON EMISSIONS

by Prof. Dr. Ing. Karl-Günter W. Hoppe
MD of Foil Assisted Ship Technologies cc, Somerset West, South Africa

Concerning ship design and especially the design of Fast-Light Craft the environmental pressure will increase in future as more catastrophic weather appearances will appear.
Naval Architecture requires new input as ships have to become more efficient to reduce carbon footprint.

The ships performance alone is not sufficient but requires now also highest possible efficiency to reduce carbon emissions which means "Greenboats" are in question.
Electric batteries are still very heavy for these kW-hours used in ships and on which the range of a ship is dependent. This applies especially to the so-called Fast Light Craft which are used as Yachts, Fishing boats, Ferries, Patrol Boats, Police and Military craft etc.

It was found that most efficient craft for these applications with good speed could be Hysucraft-type hulls. In the discussion below this shall be elaborated, see Hoppe [2].

During the Hysucraft development a tool was required which allows to compare the ship efficiency between craft. We already used a method to compare the quality of a foil wing with a planing craft by use of the aeronautical term lift/drag ratio which is publicly well understood.
In ship building the inverse is used to compare hull qualities, called the Resistance/Displacement weight ratio ε with R and D in Newtons it gives a dimensionless ratio, εs = R/D with (R) being resistance and (D) being weight force.

The ship weight D [t] is usually given in metric tonnes with t = 1000 kg, but as a force has to be expressed in Newtons or more commonly kN:

D [kN] = D [t] * g [m/s²] with g being acceleration of earth, 9.81 [m/s²].

However, to consider the ship situation a propulsion system is used which creates a thrust force (T) which has
to counter balance the resistance force and which is a horizontal force, to create equilibrium of horizontal forces. However, the propulsion efficiency is involved with T = R/O.P.C. with O.P.C. being the overall propulsive coefficient, see Blount et all [4] for propeller efficiency.

The thrust force consists of aeronautical and hydrodynamic forces, but the sum of all has to be the resistance force.

All vertical forces have to be equal to the lift forces which also can be aeronautical and hydrodynamic or hydrostatic forces but their sum has to be equal to the weight force vertically down.
The Resistance / Displacement weight ratio εs can now be extended by multiplying both parts with the ships velocity Vs to compare the powers.

$$\varepsilon_s * V_s = EPS = \frac{R[kN] / O.P.C}{D[kN]} * \frac{Vs\,[m/s]}{Vs\,[m/s]} = \frac{Pthrust}{Pbasic}$$

which is a dimensionless ratio and defined by Gabrielli and von Karman as the Transport Efficiency (TE), see [1] and referred by Wright [3].

In the case of Hovercraft or SES this propulsion power has to include the power required for driving the lift fans.

The Transport Efficiency (TE) is defined as TE = Pb [kW] / (D [t] * g [m / s2] *Vs [m/s]) and in other words our EPS is also the Transport Efficiency when the power Pb is known or measured on the ship propulsion system. So, the Transport Efficiency can be determined when the ship is running at 100% MCR (full power!) and the speed is measured and the full load weight is known. EPS and TE are interchangeable terms!

] $* \nabla 0.3333\ [m]$ with ∇ [m³] being the ship weight in [t] but for a ship in fresh water also in cubic meters and the acceleration due to gravity. For simplicity we compare the ships to operate in fresh water for which D [t] is equal to D [m3]. In sea water $Fn\nabla$ changes slightly but less than 3.5%.

The Transport Efficiency (TE) is recommended by Gabrielli and von Karman to be used when comparing ships and other forms of transportation. [1].

We determined the EPS ratios of many different ship and boat types from published data and collected them in Table I and plotted some of them over the dimensionless ship speed, (the Froude Displacement number) in Table 1, which also shows tendency curves of typical ship types. This gives a good idea how ships compare and for which non-dimensional speeds they are best suited. There is still the problem of the power required to operate ships in waves and winds, but it shall be left for later studies.

We developed the Hydrodynamic Performance Ratio (HPR) by dividing the Froude number by the EPS value. The HPR indicates a ships quality by a single number. Unlike EPS, the largest number of HPR now indicates a most efficient craft. The most efficient ships hardly reach a HPR of 30, which would be a most efficient craft and well acceptable, see Table 1.

A company specializing in the development of Fast Light Craft (FLC) with hydrofoil support was established in 1998 and was called Foil Assisted Ship Technologies cc (FASTCC).
It was a ship design company established to collaborate with Naval Architects on the hydrofoil development and optimization of Hydrofoil Supported Craft (Hysucraft).

In the early years many Hysucraft model tests in the towing tanks were conducted on the preferred hulls of planing type catamarans. Model tests on the hulls without foils and after this, the designed foil systems free running in the towing tank and later with hull plus foils were conducted. It was found out that the foil system inside the Catamaran tunnel reached much higher efficiencies than in the free running condition of the hull without the foils.

The test results allowed the development of computer programs with empirical formula establishment which allowed the-so called “Mathematical Hysucraft Model” which also contains foil strength calculations and optimized power predictions.

The software was developed with feedback of built Hysucraft and new model tests continuously updated and now after more than 30 years development used to design optimized Hysucraft.

The use of the Transport Efficiency (TE) and the HPR Rating Number are included in the Performance print-out and allow an immediate judgement of craft efficiency in comparison to many other types of craft which are collected in Table 1 and shown on Fig. 1, EPS over Froude Displacement Number.

To determine the Transport Efficiency (TE) see the following example:

*The French A2V 24m for 60 passengers with a top speed of 60 knots (30.867 m/s), full load weight of 55 [t] and a power of 2 * 1440 kW (2880kW) at MCR,* work out dimensionless speed (Froude Displacement Number):

$$Fn\nabla = V / \sqrt{g \ * \nabla^{0.3333}} = 30.867\ (m/s) / \sqrt{9.81 * 55^{0.3333}} = 5.0539$$

EPS = P [kW] / Δ[t] * g [m/s2] * Vs [m/s] = 2880 / (55 * 9.81 * 30.867) = 0.17296 which is also the Transport Efficiency, (TE).

The Hydrodynamic Rating Number HPR is then Fn∇ / EPS:

$$HPR = \frac{5.05696}{0.17296} = 29.2377$$

HPR is strongly dependent on the speed for the craft and reaches top values at very low speeds and also for very high speeds. For most craft the top speed is used for HPR. However, for ferries the cruising speed might be of interest.

If you compare the HPR of the A2V (number 64) with data of Table 1 it is one of the largest HPR number with 29.22 of all the ships in the Table and indicates a most efficient ship. Work out your own ship in a similar way.

The best Hydrofoils indicated on Table 1. reach about 22, Tucumcari 2 about 18.3, some Hovercraft about 26.3, SES Corsair about 22.54, ThunderChild 2 world record run has HPR = 26.176 at top speed and 24.117 at 45 knots cruising speed, Stealth Yachts 16m Hysucraft is 22.73, Halter E-Cat Hysuwac is 20.84, GEO Shipyard ferry 80' is 17.104, Alpha Yacht 80' is 28.765, most efficient high-speed Yacht. Hysucraft compete well with most other craft types.

The HySuGe-Cat (no. 67) stands for hydrofoil-supported-ground-effect Hysucraft Catamaran and is the latest development of an optimized Hydrodynamic and Aerodynamic design with the highest of the tabulated HPR of 44.37 which means it is the most efficient vessel design available of all the collected data. An example of the power prediction is shown in Table 2 with these Hydrodynamic Performance Ratio (HPR) calculated at 60 knots. The HysuGe-Cat is the Alpha Yacht 80' platform with an optimized super structure (airfoil-like) and aerodynamic in Ground Effect which becomes extremely efficient at high speeds. It seems to be one of the most efficient Blue- Water Yacht world-wide. However, so far it is the result of the Optimization and we have still to find an Investor to support the build and approve the prediction.

The above evaluation method gives every vessel owner a tool to find out how his vessel performance compares to others.

Conventional Hydrofoils HPR data are somewhat disappointing which might be badly influenced by low O.P.C data of the propulsion system and by the additional drag associated with the still often-used surface piercing V- foils.

Hydrofoils are still used in certain countries with only a few new developments but are starting to make a come- back for electric ferry proposals etc.

The Canadian Hydrofoil Bras D'or has a HPR = 16.6, not that good for efficiency but it has great performance, due to Gas Turbine propulsion.

An advantage of this Evaluation Method is that fast and slow craft, small and large ships and ships with Internal Combustion Propulsion engines and even ships with electro-battery propulsion can be compared.

The use of Hydrogen Technology with fuel cells shall be investigated in future projects, for craft with long range requirements.

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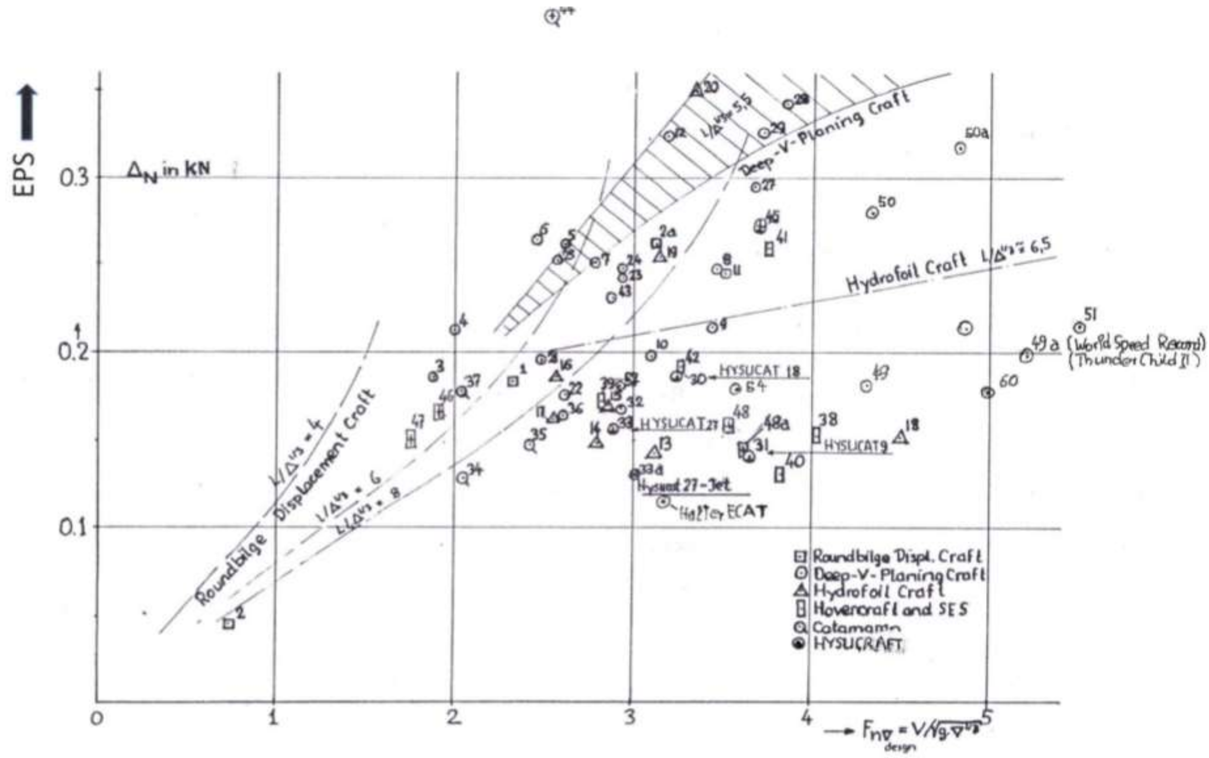

Figure 1. High-Speed-Surface Craft Power-Ratio EPS

Table 1:

Hydrodynamic Performance Comparison of High-Speed-Small-Craft

(See Fig. 1)

Sym	No	Name of Craft	Builder	Δ[t]	V[knot]	p[kw]	Fn∇	EPS	H.P.R*** Rating
		Round bilge Displacement and Semi-Displacement Craft							
⊡	1	Type S 143	Lürssens	375.00	38.0	13235	2.330	0.184	12.540
⊡	2	PB	Italy	1361.00	15.0	4706	0.740	0.046	16.110
⊡	2a	Sherger, Lürssens	Bremen - Germany	188.00	45.5	11290	3.130	0.262	11.920
		Deep - V - Planing Craft							
⊙	3	PT	Damen	85.00	24.0	1847	1.880	0.186	10.12
⊙	4	Cohete	Lewi Dsgn	60.00	24.0	1544	2.000	0.213	9.38
⊙	5	SAR33	Abekg&Rasm	250.00	40.0	13235	2.620	0.262	10.08
⊙	6	Zarcos 16	Lewi Dsgn	22.00	25.0	735	2.460	0.265	9.27
⊙	7	Zarcos 12	Lewi Dsgn	8.00	24.0	243	2.790	0.251	11.12
⊙	8	Nasty Class	Norway	83.00	44.0	4559	3.470	0.248	14.00
⊙	9	P2 000	G.B.	49.00	40.0	2118	3.440	0.214	16.00
⊙	10	P2 000	Dheeb Al Behar	49.00	36.0	1765	3.100	0.198	15.60
⊙	11	Intermar.	MK55	165.00	50.0	10294	3.510	0.247	14.19
⊙	12	Ilikai	Lewi Dsgn	9.00	28.0	412	3.190	0.324	9.84
		Hydrofoil Craft							
△	13	PT 20	Supramar	33.00	34.0	810	3.12	0.143	21.82
△	14	PT 50	Supramar	63.00	34.0	1620	2.80	0.149	18.81
△	15	PT 75	Supramar	78.50	36.0	2420	2.86	0.170	16.83
△	16	PT 150	Supramar	150.00	36.0	5058	2.57	0.186	13.81
△	16a	PT 150	Supramar	150.00	36.0	with start. power boosting			
△	17	High PointPCH1	USA	120.00	48.0	4706	3.56	0.162	21.94
△	18	Tuccumcari	USA	52.00	49.0	2941	4.50	0.23	18.206
△	19	Plainview AGEH-1	USA	320.00	50.0	20588	3.15	0.255	12.32
△	20	PHM Nato Hydr.	Boeing	218.00	50.0	19265	3.35	0.350	9.52
		Recently built Craft and Catamarans							
⊙	21	Sea Link Cat. Ferry		50.00	29.0	1430	2.490	0.196	12.680
⊙	22	Jet Cat Ferry JC-1		73.00	32.5	2100	2.620	0.176	14.860
⊙	23	EM1, China SH. Tradg		78.00	37.0	3529	2.940	0.243	12.120
⊙	24	Dvora, Israel Airc. Ind.		47.00	34.0	2000	2.940	0.248	11.870
⊙	25	Olympic 76	Greece	50.00	30.0	1912	2.570	0.253	10.160
⊙	26	Span. Cust: Craft (with Ri.CaL Jets)		15.00	55.0	1470	5.760	0.353	16.310
⊙	27	Indonesian Wat.jet. PT Kodja	PT Kodja	4.09	28.3	172	3.680	0.295	12.470
⊙	28	P1200	G.B.	13.00	36.0	810	3.860	0.343	11.250
⊙	29	Precision Offshore 17	Australia	22.00	38.0	1375	3.730	0.326	11.450
⊙	30	HYSUCAT 18	Technautic Thailand	36.50	36.0	1240	3.250	0.187	17.500
⊙	31	HYSUCAT 9	Tank predict	33.50	40.0	950	3.660	0.141	26.000
⊙	32	PT 14.5 Singap. S. + E.		23.00	30.0	934	2.930	0.268	10.933
⊙	33	HYSUCAT 27	Lürssens, Dsgn-Tank pred.	140.00	40.0	4412	2.890	0.157	18.400
⊙	34	Tropic Sunbird Cat.	SFB-Eng. Austr.	127.00	28.0	2320	2.050	0.129	15.890
⊙	35	Tassie Devil 2001	Int. Cat. Tasmania	72.00	26.0	1660	2.420	0.148	16.350
⊙	36	AZ60	Azimut, Italy	30.00	28.0	1118	2.610	0.264	9.880
⊙	37	Norsul Cat., Fjelstrd.	Norway	84.00	26.0	1956	2.040	0.178	11.500
⊡	38	Hovercat API. 88	G.B.	38.50	45.0	1338	4.030	0.153	26.300
⊡	39	SES Norcat	Norway	85.00	36.0	2650	2.820	0.172	16.420
⊡	40	SAH 2200, Slingsby Aviat.	G.B.	6.80	32.0	140	3.830	0.131	30.200
⊡	41	4000TD, Griffon	G.B.	12.80	38.0	588	3.760	0.243	14.264
⊡	42	SES Jet Rider, Karlskronavarvef	Sweden	88.30	42.0	(90%) 3582	3.270	0.192	17.070
⊙	43	Westcruiser	Norway	30.50	31.0	1103	2.880	0.231	12.470
⊙	44	Lady K, Wat.jet.	T-Craft Cape Town	8.30	22.0	368	2.540	0.399	6.360
⊙	45	Lady K, Wat.jet.	T-Craft Cape Town	8.30	32.0	368	3.700	0.275	13.480
⊡	46	Mark I	Shanghai Zhonghua SES China	95.00	25.0	1968	1.930	0.166	11.630
⊡	47	Mark II	Shanghai Zhonghua SES China	124.00	24.0	2265	1.770	0.151	11.700
⊡	48	Corsair	Blohm+Voss, Germany	160.00	50*	6320	3.530	0.157	22.540
⊡	48a	Corsair, reported max. performance			52*	6320	3.630	0.142	25.630
⊡	49	ThunderChild II, World Record Run	Safehaven Marine Cork/Ireland	25.00	45.0	1024.4	4.341	0.180	24.117
⊡	49a	ThunderChild II top performance	Safehaven Marine Cork/Ireland	25.00	54.0	1358.2	5.209	0.199	26.176
⊡		in Cork-Fastnet Race 09/08/2020	*(Hydrodynamic Performance Rating is 1.683 higher due to foils!)*						
⊡	50	ThunderChild II without foils	Safehaven Marine Cork/Ireland	24.50	45.0	1563.8	4.354	0.280	15.550
⊡	50a	ThunderChild II top performance	Safehaven Marine Cork/Ireland	24.50	50.0	2187.54	4.837	0.308	15.705
⊡	51	Alu RIB 12m	Design FASTcc	8.50	47.5	882.4	5.484	0.215	25.570
⊡	52	Fast PT Boat 17m	Design FASTcc	30.00	45.0	1250	4.211	0.163	25.834
⊡	53	Stealth Yacht 16m	Stealth Yachts Cape Town	22.50	49.0	1226.4	4.910	0.216	22.730
⊡	54	USACE Survey Boat, Catlet	TAI Inc/Aluma Marine, LA - US	38.60	40.0	1354.6	3.589	0.174	20.630
⊡	55	Ultimaratio Yacht	Henze Shipyard, Bremerhafen Germa	27.00	37.0	1000	3.509	0.191	18.370
⊡	56	Rheinjet Ferry	Henze Shipyard, Bremerhafen Germa	27.50	37.5	1000	3.527	0.194	18.180
⊡	57	E-Cat 45m Hysuwac	Halter Marine LA-USA	175.00	46.0	3820	3.200	0.110	29.050
⊡	58	Geo Shipyard ferry 80'	GeoShipyard Louisiana, USA	64.00	34.0	2090	2.805	0.164	17.104
⊡	59	Azimut 7m Tender, Electric	Azimut, Italy	1.58	27.5	50	4.200	0.223	18.830
⊡	60	Alphajet Yacht 80'	Design FASTcc	63.25	55.0	2830	4.545	0.158	28.765
⊡	61	Kawasaki Jetfoil	Japan (cruising speed)	115.00	45.0	4740	3.352	0.181	18.467
⊡	62	Speedy Jetfoil Australia	UK (cruising speed)	119.00	45.0	4740	3.333	0.175	19.000
⊡	63	Candela Hydrofoil - 7m	Sweden	1.30	28.3	50.0	4.820	0.256	18.790
⊡	64	A2V-WIG-20m	France/La Rochele	55.00	60.0	2880	5.054	0.173	29.220
⊡	65	Dolphin V1-10m	Russia/St. Petersburg	3.50	45.0	198.5	8.000	0.251	31.873
⊡	66	Sagaris Hydrofoil 10.5m (streamlined superstructure)	Russia/St. Petersburg	4.17	59.4	382.8	7.690	0.306	25.120
⊡	**67**	**HysuGE-CAT , hydro - and aerodynamics optimized**	**Design FASTcc**	**73.4**	**60.0**	**2332**	**4.830**	**0.109**	**46.000**
⊡	68	Bolide 80'	Victory Design Team, Italy	27.0	73.0	4412	6.927	0.429	16.160

When the power Pb is known or is measured on the ship then the Transport Efficiency TE is equal to EPS.

Table 2:

High Speed 80' Yacht with optimized Superstructure and Surface Propellers

DATE : 3112022 HYSUCRAFT PROPULSION DATA

CHINE LENGTH= 22.800 m DISPLACEMENT: 73.400t LCG=36.0 %LCHI LCP=46.0%LCHI
PROPULSION POWER: 2830.0 KW FUEL STORAGE: 6250.0 KG FUEL SPEC.DENSITY:0.860
HEAD WIND: 0.04KNOT SLEND.RATIO= 5.49 TRIMTAB:1.00 DGR RFOILDIHDR: 0.00 DGR

SPEED KNOTS	TRIM DEGREE	Rtot KN	Peff KW	Pb KW	FUEL l/h	RANGE N.MILES	FUEL L/N.M	CO2 Kg/h	MPG USA	EPS --	FND --	HPR --	MPH USA	RANGE MILES
20.00	2.59	52.938	544.68	1233.45	299.5	485.75	14.961	805.1	0.291	0.166	1.612	9.68	23.02	559.10
30.00	2.23	53.154	820.37	1552.36	377.3	578.48	12.563	1014.1	0.346	0.140	2.418	17.31	34.52	665.83
40.00	2.88	57.782	1189.04	1892.92	465.4	625.28	11.623	1250.9	0.374	0.128	3.224	25.24	46.03	719.70
50.00	2.78	52.925	1361.38	2010.90	497.6	731.00	9.942	1337.5	0.438	0.109	4.030	37.12	57.54	841.38
60.00	2.36	52.199	1611.23	2336.66	592.5	736.77	9.864	1592.4	0.441	0.105	4.836	46.00	69.05	848.02

EXPLANATION OF PERFORMANCE DATA

Speed:Shipspeed in Knots
TRIM: Aangle at speed in degree
Rtot: Hull total resistance in K-Newtons,Propulsionsdrag
  not included but part of overall propulsive coefficient
Peff: Effective hull power in Kilo-watt (Peff=Rtot*VS)
Pb: Engine crankshaft power in kW (Pb=Peff/OPC) see[1]
FUEL: Fuel consumption in liter per hour at speed
RANGE:Traveldistance of ship in Naut.miles with full fuel
FUEL: Fuel consumption in LITER per Naut.-mile
CO2: Carbondioxyd Consumption in kg per hour
MPG: Stat.miles/US-Gallon(multiply by 0.8676for naut.miles
  OR BY 0.229194 FOR Naut.Miles per liter fuel)
EPS: Inverse of well known Transport efficiency
  EPS=Pb[KW]/(D[t]*9.81[m/sec**2]*VS[m/s])
FND: FROUDE DISPLACEMENT NUMBER, DIMENTIONLESS SPEED
Best efficiency indicator,lowest value=highest efficiency
HPR: HYDRODYNAMIC PERFORMANCE RATING , HPR=FND/EPS
MPH-USA:ONE USA-MILE IS 0.867604 NAUTICAL MILE
[1] D.L.Blount,D.L.Fox,"Small-Craft Power Prediction"
  Marine Technology,1st.January1976,pp14-45

DEVELOPED MOST EFFICIENT HIGH SPEED SMALL CRAFT.

Please see my talk for the International Hydrofoil Society which I gave some years ago, https://www.youtube.com/watch?v=dihh7BVkGCs

It shows that Hysucraft can be as efficient as HYDROFOILS, but much cheaper to build.

Prof. Dr.-Ing. Karl-Gunter W. Hoppe / Mech. Eng., Naval Architect.

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Thank you

The Editor..