

ELECTRIC BOAT *News*

The Journal of the Electric Boat Association

Volume 8 Number 2 Summer 1995

ISSN 0969-031X

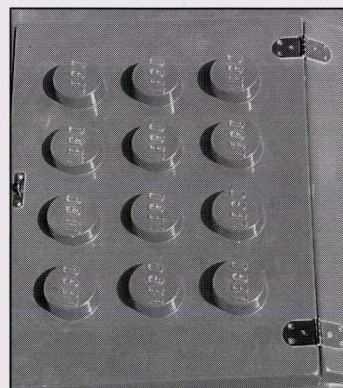


LEGO GOES ELECTRIC

ENVIRONMENTAL STUDY

RIVER WEY CRUISE

HYBRID NARROW BOAT



USE OUR CRAFT TO POWER YOURS

Chloride Motive Power batteries and chargers. The ultimate in clean, quiet power for dependable performance in electric boats. The combination of traditional skills, advanced technology and unrivalled support services that have made Chloride Motive Power No 1 in Europe. The perfect choice for every boat afloat.

**CHLORIDE
MOTIVE POWER**

Batteries · Chargers · Service

CMP Batteries Ltd (Sales Dept), Salford Road, Over Hulton, Bolton BL5 1DD
Telephone: 0204 64111 Fax: 0204 62981

DEPENDABLE POWER FOR A WORLD ON THE MOVE

380 Volt AC Propulsion

'elektra' Diesel Electric Drive and Powergeneration in ONE

- ★ Almost unlimited power . . .
- ★ Almost unlimited range . . .
- ★ AC comfort on board . . .



HFL

Further details from:

HFL Marine International Ltd
HFL House, Lockfield Avenue
Enfield, Middx, EN3 7PX

Tel: 081 805 9088 Fax: 081 805 2440

SILENT RUNNING



Speed Controllers from Curtis

*YOUR CAPTAIN'S CHOICE
FOR ELECTRIC LAUNCHES AND NARROW BOATS*

**From 125 Amps to 600 Amps
From 24V to 120V**

*ON THE GRAND UNION CANAL
OR THE NORFOLK BROADS*



- *Competitively priced
- *Silent in operation
- *Environmentally sealed
- *Simple installation
- *Single sourcing
- *Lasting reliability

CURTIS

WORLD LEADERS IN DC MOTOR
SPEED CONTROLLERS

Curtis Instruments (U.K.) Ltd., 51 Grafton Street, Northampton
NN1 2NT. Tel: (0604) 29755. Telefax: (0604) 29876



CLASSIC BOAT MAGAZINE

Wishes all Electric Boat sailors a
direct current and is pleased to offer
you a special subscription rate

- | | |
|-----------------------------|---|
| UK | <input type="checkbox"/> £25.00 - save £10.40 (normally £35.40) |
| Overseas surface | <input type="checkbox"/> £35.00 - save £14.50 (£49.50) |
| Europe & Eire (Airmail) | <input type="checkbox"/> £41.00 - save £10.50 (£51.50) |
| Rest of the World (Airmail) | <input type="checkbox"/> £56.50 - save £19.00 (£75.50) |

Mr/Mrs/Miss _____ Please complete in block capitals
Address _____

Postcode _____ Tel. No. _____

Please commence my subscription with the _____/next available issue

☐ I enclose a cheque for £ _____ payable to Link House Magazines Ltd.

☐ Please charge my Access ☐ Mastercard ☐ Visa ☐ Amex ☐ Diners ☐

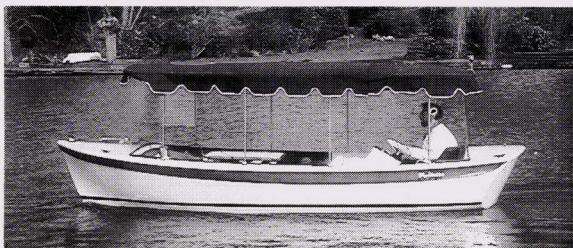
Card No. _____

Expiry Date _____ Signature _____

Please return this form to: Classic Boat, Subscriptions Department,
120-126 Lavendar Avenue, Mitcham, Surrey, CR4 3HP.

ebn 1

*The wind in the willows . . .
is all you will hear*



Voltaire 18

*The perfect electric launch
for rivers and lakes
Up to 8 hours cruising on one charge
Seats 8 adults comfortably
Easily towed behind a family car*

The Thames Electric Launch Company
PO Box 3
Goring-on-Thames
Reading RG8 0HQ
Tel: 0491 873126 Fax: 0491 872217

EBA CALENDAR 1995

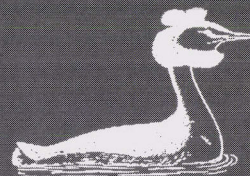
Some of the events of 1995 which may be of interest to EBA members. The EBA may be present at some of the events, perhaps with its own stand.

JUNE	3	EBA SUMMER MEETING and AGM
JUNE	11	Eighth Wargrave Rally
JUNE	24	River Pageant, Boulter's Lock
AUG	12-13	Traditional Boat Rally, Henley-on-Thames
AUG	26-28	IWA National Waterways Festival, Waltham Abbey
SEPT	2	Cookham Regatta. Parade of Boats
SEPT	10	Broads Rally
SEPT	15-23	Southampton Boat Show
SEPT	27-28	Move Electric '95 Conference & Exhibition, Trentham Gardens, Stoke-on-Trent

Notice of other events to Edward Hawthorne, please, on
01628 521606

SPONSORS

Electric Boat News has been
published thanks
to generous
sponsorship
from
Eastern Electricity.



E. C. CONNECTORS CO. LTD.
PEGASUS WORKS,
329 FRONT LANE,
UPMINSTER, ESSEX RM14 1LW.
Tel: (01708) 226485.
Fax: (01708) 221191

E. C. CONNECTORS CO. LTD
6 HAINGE ROAD,
TIVIDALE, WARLEY,
WEST MIDLANDS B69 2NB.
Tel: 021 522 4112.
Fax: 021 522 4174.

ELECTRONIC CONTROL SYSTEMS

**ELECTRONIC CONTROL EQUIPMENT FOR:
ELECTRIC BOATS, MINING LOCO'S, FORK-
TRUCKS, MILKFLOATS AND ALL D.C. POWERED
ELECTRIC VEHICLES.**

AGENTS FOR:

SEVCON TECH/OPS LTD., ANDERSON POWER PRODUCTS
(Battery Connectors), REMA BATTERY CONNECTORS.

REPAIRS TO CONTROL EQUIPMENT CARRIED OUT IN OUR
OWN FACTORIES INCLUDING:

SEVCON, CABLEFORM, GENERAL ELECTRIC and
LANSING BAGNALL.



CASTLE NARROW BOATS
USE SEVCON ELECTRONIC
CONTROLLERS—
Supplied by COLTON

Electric Boat News is published quarterly by the
Electric Boat Association.

No material from it may be reproduced or reprinted without permission.
Whilst we take every care to ensure the accuracy of the contents, the
EBA cannot be held responsible for any errors which may occur, or for
any actions that might be taken as a result of this material. Also, views
expressed in the magazine are not necessarily those of the EBA.

Electric Boat News welcomes contributions from readers and members.
If you have anything you think might be of interest, please send it in.
Bear in mind however that due to circumstances sometimes beyond our
control, we cannot be held responsible for any damage or loss which
may occur to this material.

Items of interest include letters, reports on rallies or events, reports of
particular cruises or trips, articles or advice on building or running
electric boats, and reports on items of equipment. We also welcome
manufacturers reports on new items of equipment or boats.

Printed by: Headley Brothers,
The Invicta Press, Queens Road, Ashford, Kent.

The Journal of the Electric Boat Association

Volume 8 No. 2 Summer 1995

Editor: Roy Devereux, 50 Upper Park Road, Camberley, Surrey, GU15 2EE (Phone/Fax: 01276 63009; Email: dex@cix.compulink.co.uk)

Chairman: Phil Horsley, 1 Kipling Close, Thatcham, Newbury, Berks RG13 4AY (Phone/Fax: 01635 868265)

Secretary & E B News Advertising Manager: John Gardner, 8 Glebewood, Bagshot Road, Bracknell, Berks RG12 3SD (Phone/Fax: 01344 483841)

Treasurer: Fraser Brown, Mouse Hole, Abbey Road, Knaresborough, HG5 8HX (Phone/Fax: 01423 862138)

Membership Secretary: Mrs Pat Davis, Whytegates, Berries Road, Cookham, Berks, SL6 9SD (Phone: 01628 521189)

Users' Group Chairman: Edward Hawthorne, Waters Edge, Riversdale, Bourne End, Bucks, SL8 5EB (Phone/Fax: 01628 521606)

Founder editor: Kevin Desmond

Cover pictures: Main picture: World e-boat speed record-holder Norm Boddy tests his new boat (Photo: John Paramore). Full story in our next issue.

Smaller picture: The LEGO logo on Tom Ballance's boats

The Chairman writes ...

Hello there!

Real electric boating weather at last. Easter gone and the 1995 summer on its way. Hard to believe where the time goes.

Well, what's been happening? There are several records and events that need attention from us Electric Brits. The electric boat speed record, ours for years thanks to Lady Arran, is now held by an American; the longest solar-powered voyage is claimed in both America and Australia, and one of our former chairmen, Kevin Desmond, is trying to organise an international endurance event. Who out there is willing to take up these challenges?

Kevin, who now lives in France, has been actively involved in founding the A.F.B.E. (Association Française pour le Bateau Electrique) so we have a new 'sister' en français which shows the growing European interest in electric boating. I have written on behalf of the EBA to welcome them aboard and to offer our assistance.

Our BGM (Biennial General Meeting) and Summer Meeting will be held on June 3rd. Please come along with your families. We are arranging to have speakers on various electric boat subjects and we will be running the ever-popular 'Try an Electric Boat' session'.

Please enjoy this latest edition of your magazine and have a lovely summer electric boating.

Your Chairman,

Phil Horsley

... and from the editor

I said when I took over the editorship of *E B News* that my aim would be to make the magazine bigger, brighter and the best in the business. Well, thanks to a good supply of interesting copy and some vigorous advertising sales by John Gardner, I am able in this issue to make good that promise. In this bumper summer edition we have increased the size from covers + 8 pages to covers + 12 pages ... that is 50% more editorial pages.

Calling coastal e-boaters

Most of the stories and reports that I receive are about electric boating on inland waterways. Are there any members who use their electric boats in estuarial or coastal waters? If so, *please* get in touch with me.

E-boats on the Net

Our American correspondent, John Paramore, tells us that electric boat racing is now on the Internet. One of the racing fraternity over there, Patrick Gleason, has created a Seattle Outboard Association page on World Wide Web. It contains basic information on SOA and on electric boat racing in general, including a picture of Norm Boddy's new hydroplane. With either Netscape or Mosaic (downloaded access programs) open:

<http://www.eskimo.com/~patrickg/soahome.html>.

Roy Devereux



Come to the Summer Meeting and BGM on June 3rd

LEGO GOES ELECTRIC!

Oxford Boatyard lands order for 31 electric boats

EBA member Tom Ballance, of Bossom's Boatyard near Oxford, has landed a contract to supply 31 electric boats for the new LEGOLAND at Windsor. This multi-million pound theme park, on the site of the old Windsor Safari Park, is scheduled to open in April 1996. Among its attractions will be a number of rides, one of which will be the "Boat Driving School".

And that is where Tom Ballance comes in.

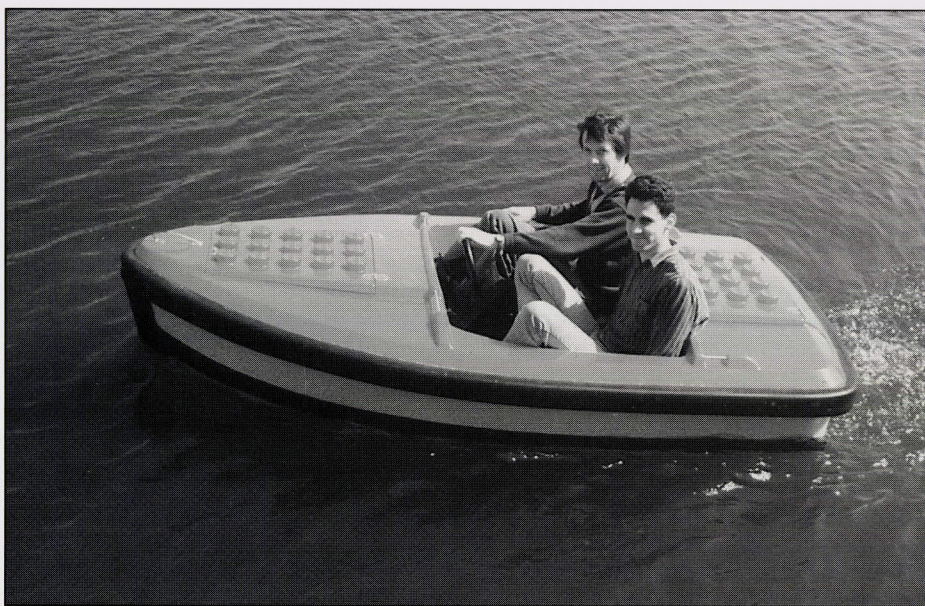
Bossom's have long been building a little 9ft GRP fun boat for hire operators at boating pools and lakes. Originally, it was powered by an internal combustion engine but a few years ago Tom Ballance adapted the hull to take a Combi Saildrive electric motor. Under

Boat News visited the yard in April, the first five boats were being fitted out and the next five were due the following week. The full order is to be completed by October.

All the rides at LEGOLAND are intended to be educational as well as fun and the Boat Driving School is no exception. The boats, carrying two children between 4 and 14 or one adult



Tom Ballance prepares to launch the #1 Legoboat



"Come in, Number One!"

the name *Tom Tom*, it was shown in the pool at the London Boat Show two years ago and has proved a very successful line.

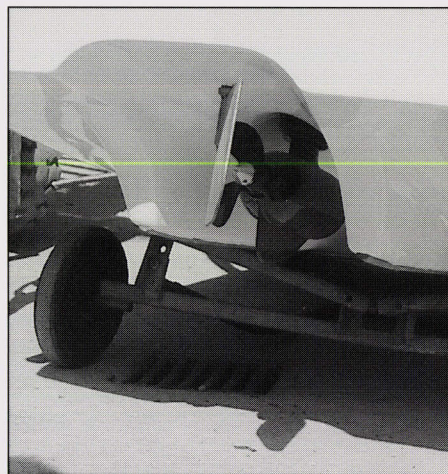
Ballance was amongst those invited to tender for 31 boats for LEGOLAND and he was awarded the contract. The LEGO boat is, in effect, a *Tom Tom* built and finished to a very high standard and incorporating as a motif on its bow and stern hatches, giant LEGO building blocks. When *Electric*

and one child, are specifically *not* 'bumper boats'. On the contrary, they are intended to help children learn how to handle a motorboat safely. An on-board electronic counter records the number of times a boat is 'bumped' and the aim will be to complete the course with a clean, no-bump score. At the time of our visit, the electronic 'trembler' was just being tested and refined.

The LEGO boat is fitted with a Combi Saildrive set at 370W, the lower

of its two speed settings. There is no provision for acceleration and no reverse gear. The motor is powered by four Chloride 175Ah batteries, delivering 24 volts - two installed in the bow and one in each stern quarter.

From our point of view, the project has a double educational value: not only will it teach some boathandling skills but it will introduce a great number of people to the joys of silent, pollution-free electric propulsion. We wish the venture every success.



The Tom Tom hull has been adapted to take the Combi Saildrive.



ANCHORS A-WEY!

Story and pictures by Paul Wagstaffe

Our last trip to Guildford by boat was in a petrol-engined Freeman 22 "Chasseur" to attend the Inland Waterways Rally in 1970. We had fond memories of the smaller, friendly and more intimate waterway.

We left our home mooring at Shiplake and cruised the 17 miles downstream to Bourne End using one half of our battery capacity. Wagtail V has two separate 175 amp hour 72 volt battery sets.

Having recharged, thanks to the kindness of Edward and Dinnie Hawthorne, we ventured on to new waters through Boulter's Lock, where Simon and Pat Davis were filming with a BBC TV crew, and down through Windsor and Staines to spend the night on another friend's garden mooring in Weybridge.

With fully charged batteries, we turned right after Shepperton Lock and took the marked channel for the River Wey. As you approach Thames Lock, you must stop below the single gate and go to the lock house for guidance. There is a cill and the lower gate may be closed to give extra depth at the lock.

It is possible to buy licences in advance from the River Wey Office, National Trust, Dapdune Wharf, Guildford GU1 4RR (01483 61389) or from the first Lock Keeper. You will also need to pay a returnable deposit for the long-handled lock windlass.

The Navigation stretches 19.5 miles to Godalming. Although close to a number of major population centres, it is very green and peaceful with

only a moderate amount of boat traffic.

We stopped for lunch at a good mooring by the Anchor Pub at Pyrford. This is opposite a modern marina with



Wagtail V at Coxes Lock, near Weybridge ...

service facilities and a slipway. Our overnight mooring was in the middle of open country near Send (8 miles from the Thames) with no road or railway to disturb the peace or view.

The next morning saw us cover the



... and on the water meadows - in our most densely-populated county!

remaining eleven and a half miles of the Navigation through Guildford and up a clear, flowing, winding stream amidst buttercup meadows to Godalming. At the head of the navigation, Sainsbury's have built a Supermarket and upgraded the Wharf to provide good visitor moorings and a modern Sanitary Station.

We retraced our steps to Guildford and moored for the night to recharge at Guildford Boathouse who run a modern hire fleet and day boats and who used to operate a famous electric trip boat. The shops and all the attractions of the town centre are only a short walk away.

We had covered a total of 24.5 miles, mostly upstream, on the half battery set - mainly at about 2 to 3 miles per hour in the narrow waterway, which is a mixture of river sections with average currents and still-water canal sections.

On the return journey, we stopped for the night in a mooring opposite the ruins of Newark Priory, near the Seven Stars Pub. Lunch the next day was at the Pelican Public House with good moorings between Coxes Lock and Weybridge.

It was quite a culture shock to hand back the windlass at Thames Lock and head out on to a very, very wide Thames!

The Navigation has plenty of facilities and places to eat. There are train and bus services which follow the waterway to allow those with day boats to return and recover car and trailer. Prior contact with the boatyards or the National Trust should provide plenty of choice of charging points.

GO ON. MAKE YOUR WAY TO THE WEY!

Facts and figures

Total distance covered: River Thames 82 miles; River Wey 39 miles. *Total Cruising time:* 8 lazy cruising days.

River Wey Locks will pass craft of length 73ft 6in, beam 13ft 10in. Draught: at normal water levels, 3ft to Guildford, 2ft 6in to Godalming. Headroom: 7ft to Guildford, 6ft to Godalming.

The National Trust maintains the waterway in excellent order with landing areas above and below each lock. They publish good maps and guide books. They issue 7 and 15-day visitor licences with reductions for electric powered craft.

The Thames Electric Launch Co's unique diesel-or-electric drive system was fully described in the Autumn 1993 edition of *E B News* when it was fitted into an NRA patrol launch. In a word, the system utilises the existing propeller and shaft, with clutches that allow the main engine to be disconnected automatically when the electric motor is engaged; this in turn trips out once the main engine is started. In our Spring 1995 review of the London Boat Show we reported that the system, being marketed under the name *Selectric*, is now available to be installed from new or retro-fitted to existing boats. EBA Chairman Phil Horsley writes ...

I was recently asked by Emrhys Barrell of the Thames Electric Launch Company (as his battery supplier) to assist with the installation of TELCO's hybrid system into a 53ft rental narrow boat kindly loaned for the exercise by Reading Marine of Aldermaston, Berkshire.

This relatively simple installation consisted of a 4kW Lynch permanent magnet motor with a slip clutch driving the original propeller shaft of the diesel engine via a belt drive. The battery pack - 36 volt, 525 ampere-hour at the 5-hour rate - was supplied by Chloride Motive Power. The control boards and

the forward/reverse throttle lever were mounted in the cockpit and also included were such useful features as a 'dead man' key, an ammeter showing motor current draw and a battery condition (fuel gauge) meter.

The following weekend, I again joined Emrhys (now in my role as EBA chairman) along with a considerable number of prospective customers and interested people, for a demonstration of the system's performance in this traditional steel-hulled craft. We trav-

This system gives the best of both worlds - clean, quiet electric propulsion for leisurely cruising with the 'backup' of diesel or other engine type should extra power be needed for river travel, conservation of the battery energy or if the battery power ran out - although with a cruising current of around 70-80 amps, six to eight hours continuous cruising should be easily achievable. When moored, charging is by a standard charger via a mains hook-up - or there is always the possibility of assistance from the alternator when the engine is running.

This system, I am sure, is the halfway house, if

not the future for electric propulsion. Not just for narrow boats, although they are ideal as they need lots of ballast which can be substituted by the batteries, but in other types of boat too. In these times of insufficient charging points, and the lack of confidence in battery performance with unfounded fears of 'running out of power' by users, I am sure this system can only help to give reassurance that electric propulsion is viable, versatile and available - especially when users realise they are using the battery pack more and more.

TELCO's Diesel-Electric conversion was reviewed in the February 1995 edition of MotorBoats Monthly.

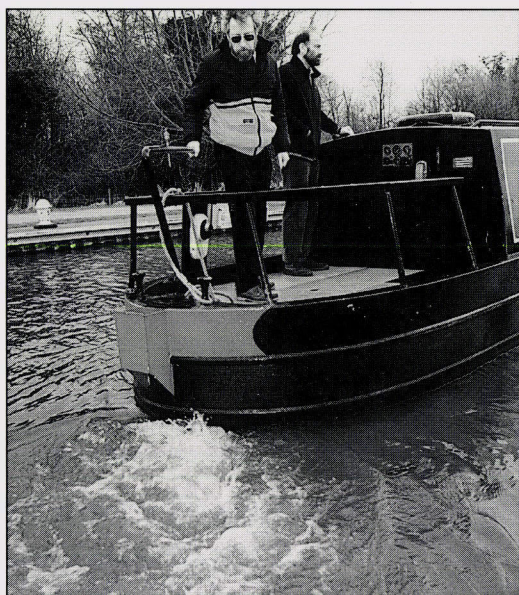
Is Hybrid Electric Power the future for Narrow Boats?

elled between Aldermaston Wharf and the Kennet westward toward Newbury, approximately 1 mile, turning when we reached the river on a gloriously sunny but cold day.

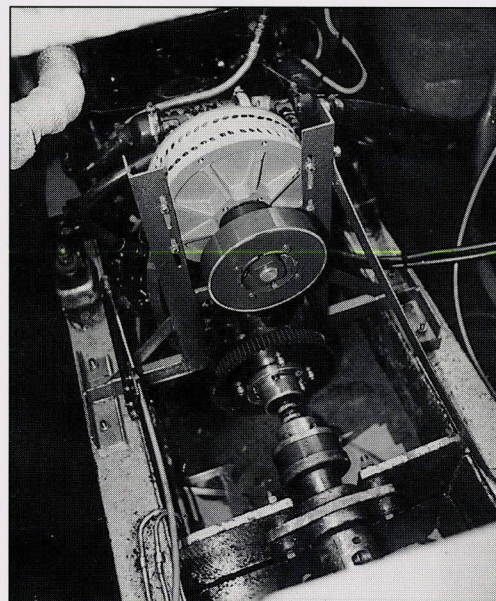
I can only say that I was extremely impressed (as were the other attendees) by the performance, easily reaching a 3 - 4 m.p.h. cruising speed with plenty of power to spare. The quietness was profoundly evident and it was easy to converse to others at the opposite end of the boat. I can foresee this as a major benefit when mooring, locking or navigating, - no more waving and shouting!

Stopping was also very reassuring, with the motor being easily put into reverse to bring the 12-tonne craft to a halt within an acceptable distance. Inside the cabin, the relaxing 'purr' of the motor was very pleasant. Again, conversation was possible without having to raise one's voice and there was a very noticeable lack of vibration.

The other conspicuous benefit of reduced noise levels was the wildlife. Even though some sound was emanating from the motor, the bird song could easily be heard and even fishermen on the banks obviously realised something was different about this boat - but what? All gave us inquisitive looks as we passed.



Emrhys Barrell keeps an eye on progress



The Selectric installation



THE STEAM & ELECTRIC LAUNCH CO.

Many readers will be aware that the Steam & Electric Launch Company has ceased to trade.

The firm, founded and run by EBA trade member Rupert Latham, a pioneer electric boating enthusiast, produced a range of electric boats, including the *Frolic*, the *Deltic* and *Mystic*, many of which are owned by EBA members. The Eastern Daily Press reported that a bankruptcy order had been made against Mr Latham but that this was a so-called 'debtor's petition', which means the order was made at Mr Latham's request.

About 18 people worked for the company which moved from Ludham to larger premises at Hoveton about a year ago.

The paper reports that "reaction to his plight from the Broads community was one of sadness" and that will be echoed by his many EBA friends.

It is hoped that the business may be relaunched at some time in the future, but it is unlikely to be under the Steam & Electric banner.

Mr Adrian Tilbury of Swancraft Ltd on the Berkshire bank of the Thames at Wargrave tells us that that company is still selling used STELCO boats and can still supply parts, service or technical advice for STELCO models. Swancraft's number is 01734 402577.

We also understand that Falcon Sports Boats of Brundall, Norfolk are completing some orders for *Deltic* and *Mystic* cruisers. Enquiries should be addressed to Mr Lake of Falcon Boats, on 01603 35516.

We have also heard from Mr Simon Read, formerly the Production Manager of STELCO, who has set up a new company, Creative Marine, "to continue the tradition of fine craftsmanship in boatbuilding". Creative Marine say that they have available "some of the finest craftsmen in the country" and have a fully-equipped machine shop, a main building workshop for boats up to 35 ft and a dinghy workshop. "In the coming months", they tell us, "we shall build up a full service facility for electric launches, stocking parts used in many of those built over recent years".

The new company can be contacted at Carpenter Cottage, The Oaks, Swanton Abbott, Norwich, Norfolk. NR10 5DU. Phone: 01508 548035 (workshop) or 01692 538503 (evenings).



Rupert Latham in happier times at Hoveton. [Picture: Eastern Daily Press]

SIMON READ

CREATIVE MARINE

A decade of experience in building electric boats from canoes to classic gentleman's yachts.

Workshop facilities include fully equipped machine shop, main building workshop for boats up to thirty five feet and a dinghy workshop.

In the coming months we shall be offering a full service facility for electric launches, stocking parts and propulsion systems.

**Carpenter Cottage,
The Oaks,**

Swanton Abbott,

Norfolk. NR10 5DU

Workshop Tel: 01508 548035

Evenings: 01692 538503

"Energy and Environmental Aspects of Electric Boating"

by R. T. M. Smokers of the Netherlands Energy Research Foundation, ECN
(June 1994)

Hans Asyee, chairman of the Dutch Electric Boat Association, has sent us a copy of a study undertaken by the Netherlands Energy Research Foundation, on behalf of the Association, into the environmental impact of electric boating. The Foundation, which employs more than 900 staff, is the leading institute in the Netherlands for energy research. Hans tells us that the author of the study considered all polluting aspects from the moment fossil fuels enter the country. (Readers should be aware that about 50% of the Netherlands' electricity is based on coalburning).

The full report, comprising 38 A4 pages, is in Dutch. It has been translated and summarised by EBA member Jan Smulders. The original may be borrowed from Edward Hawthorne (phone and fax: 01628 521606).

Range of report.

This study, based on 21 listed reference documents, compares the environmental effects of three different forms of boat propulsion used in the leisure industry, viz. electric motor, diesel engine and two-stroke petrol engine. Aspects considered are:

Fouling of the surface water.

Air pollution from exhaust gas emissions.

Damage to shore and underwater vegetation.

Noise.

Primary energy consumption and emissions.

Batteries.

The purpose of the study was to review whether the use of electric propulsion might be beneficial to the environment.

Fouling of the surface water.

Exhaust gases contribute to the fouling of the surface water but most evaporate quite fast into the atmosphere. Oxides of nitrogen do contribute marginally to water nitrate and sulphate levels. Two-stroke petrol engines contribute lead and oil particles to the water. In-board engines cause bilge water mixed with fuel and oil to be dumped and, in addition, anti-freeze used for winteris-

ing. All these have a detrimental effect on water quality and, though not quantified, are, in principle, avoidable pollutions.

Air pollution from exhaust gas emissions.

The pollution caused by engine emissions in the leisure boating industry in Holland is a very small percentage of that caused by road traffic, viz:

3% for hydrocarbons (HC) and carbon monoxide (CO); 1% for nitrous oxides (NO_x) and sulphur dioxide (SO₂); 0.2% for particle emissions.

In addition, pleasure boating generally takes place in less populated areas where the overall air quality is already better and where wind disperses the exhaust emissions more easily.

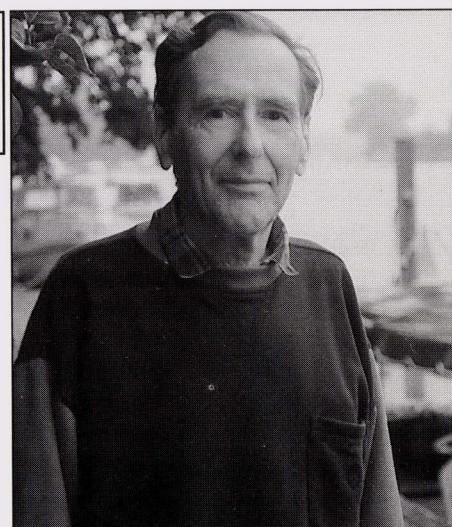
ELECTRISCH VAREN IS HET BESTE! OFFICIAL!

Damage to shore and underwater vegetation.

Physical damage is caused to shores and underwater vegetation through wave action and turbulence and is sharply increased by fast boating.

Noise.

Excessive engine noise is generally caused by fast boating and causes most disturbance to people when it occurs in short sharp bursts (speed boats and water scooters).



EBA member Jan Smulders, who translated and summarised the report.

Noise has been measured on similar boats from two aspects: noise on board and noise on shore. Fig 1 shows measured noise levels on board for two types of launch, each separately equipped with diesel and electric propulsion. The noise intensity in dB(A) is so defined that each increase of 3 dB(A) represents a doubling of noise level. The curves show

that at low speed the diesel-engine boat is approximately four times as noisy as the electric boat and at the highest speed, approximately twice as noisy - both measured on board. Similar noise measurements were made on-shore, four metres from the boats. Fig 2 shows that the differences are less dramatic due to the increasing noise generated by the hull moving through the water with increasing speed. When compared with a two-stroke outboard, the advantage will be even more pronounced for the electric boat.

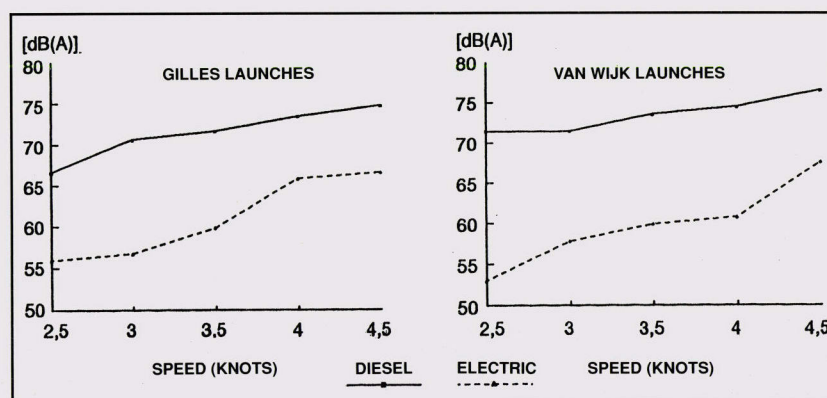


Fig 1. Noise level of diesel and electric launches, measured on board.



Primary energy consumption and emissions.

The study only considers the two most-used engine types in Holland: diesel inboard engines and two-stroke outboard engines. The fuel used by these engines represents 1.3% of fuel used by motorised road traffic. The use of smaller engines allowing operation at greater efficiency, the development of more efficient two-stroke engines and the lesser use of liquid fuel engines would all reduce fuel consumption and therefore the emission of pollutants.

The use of lead acid batteries for electric boat propulsion requires the generation of electric power and the study reviews the primary energy consumption at the power station and the resulting emissions there. The primary energy consumption is also compared as between diesel engine and electric motor-driven launches, with the latter being shown to be somewhat more economic.

The results of this part of the study are shown in Fig 3. As emission in absolute values can vary considerably, it was decided to show relative values. For each type of boat propulsion and for each type of emission, the highest value is shown as 100%. The equivalent values for other types of boats is then shown as a percentage. The grey top section of each column represents the range between the best and worst expected performance.

For the primary energy consumption, the *least* efficient propulsion is shown as 100%. The arrow against the column shows the average fuel consumption of the diesel engine launch actually tested and is compared with that of electric and two-stroke engine propulsion. It should be noted that all data is based on averages obtained for boat speeds between 3 and 4.5 knots.

It should also be noted that the primary energy consumption of the electric-driven boat is about

the same as that of the diesel-driven boat, whilst the most efficient two-stroke petrol engine uses twice as much primary energy as the electric boat. The much higher consumptions frequently encountered for diesel and two-stroke engines tends to be caused by the installation of excessively large engines for use at high boat speeds. Note that the emission of CO₂ corresponds with that of the primary energy consumption; the emission of SO₂ and NO_x is very high for the diesel engine; the SO₂ emission for the two-stroke engine is

Batteries.

The study reviews the environmental effect of the manufacture of lead acid batteries and concludes that with adequate safeguards and given the vast market requirement for car batteries, this must be considered minimal.

Conclusions.

The study concludes that as pleasure boating is a recreational activity, the environmental effects are, in principle, avoidable. From the point of view of

the environment, the electric drive has the following advantages over diesel or two-stroke petrol engines:

- ☐ Electric boats cause no exhaust emission
- ☐ The noise generated by electric drive is considerably lower than diesel or two-stroke engine drive
- ☐ Taking into account losses caused during the power generation process, the electric boat uses considerably less energy than the average diesel or two-stroke alternative. Only the most economical diesel matches the electric drive for energy consumption.

Only the most economical diesel matches the electric drive for energy consumption.

☐ The emission of CO and HC as a result of using electricity can be ignored and the emission of particles is very low.

☐ The electric drive does not cause fouling of the water through spillage of fuel, oil, grease or anti-freeze.

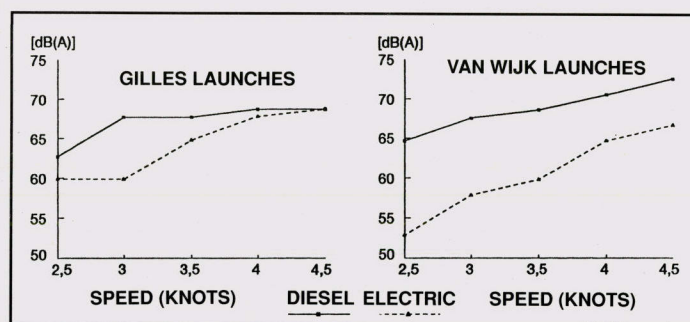


Fig 2. Noise level of diesel and electric launches measured on shore, 4m distance from the boats.

indirect only and caused at the oil refinery; the SO₂ emission of electric boats is also indirect only and caused at coal-burning power stations. Electric boat propulsion caused hardly any emission of CO or particles. As expected, the inefficient two-stroke petrol engine shows very high CO and HC emission values. The high particle emission of diesel engines is caused by the formation of soot.

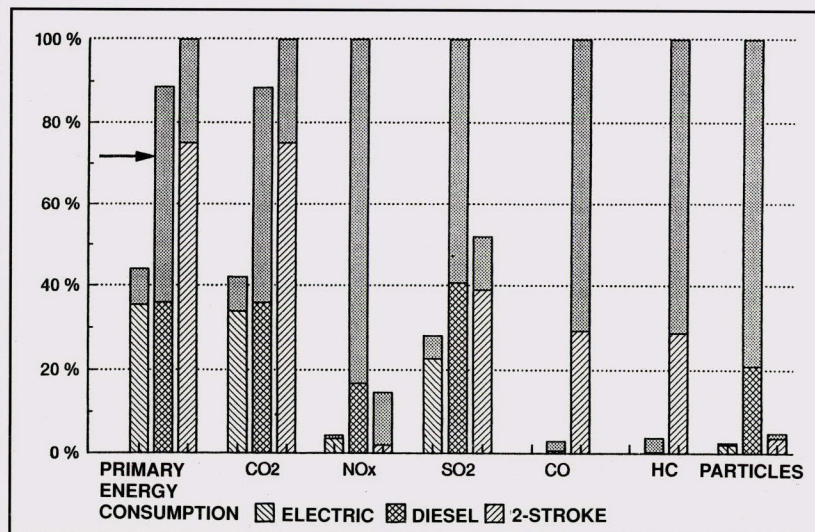


Fig 3. Comparison of primary energy consumption and emissions of electric, diesel and two-stroke propulsion. For further explanation, see text.

It can be concluded that electric boat drive costs considerably less total energy than diesel or two-stroke engine drives. In addition, the overall resulting emissions are considerably lower than those that apply to the use of diesel or two-stroke petrol engines. Above all, electric-driven boats are clean and quiet at the point of use.

TALKING OF RECORDS ...

Following the news in our last issue of the two new records from the USA, Kevin Desmond rang *E B News* from France to remind us that we still hold at least one electric boat record in the UK.

In 1986, Kevin and Rupert Latham set out to see how far they could cruise in an electric boat in 24 hours. Their self-imposed conditions were that the trip had to be in a standard production boat, there would be no recharging of the batteries (and no solar panels) and that they would run continuously for up to 24 hours. They would stop only for food, to change crew members or to pass through locks. They made the voyage in a Steam & Electric Frolic 21, powered by Oldham batteries.

Under these conditions they travelled 101 miles in 23 hours - a feat which, Kevin claims, still stands as a world record.

A notable achievement indeed, but now nine years old. Is it not time that it was challenged?

What support would there be, we wondered, if someone organised a 24-hour marathon in 1995? The ground rules would have to be established and

many details thought out (for example, any possible help from tides or currents would have to be eliminated from the course) but, in principle, it could be done.

And, if we set up such an event here, what if that UK event were to be treated as an eliminator for an *international* endurance trial, wherein our UK winner would compete against challengers from the rest of the world? Would not this be, we said, a marvellous opportunity for the Electric Boat Associations of Britain, USA, France, Netherlands and others to get together? What a super social event it could be! ... and what publicity for the winning manufacturers!

Well, since that brainstorming telephone conversation, the idea has moved on. We now hear that Kevin has indeed set the wheels in motion and correspondence has been flying between the chairmen of the EBA of Britain, Netherlands and USA. Ken Matthews in the USA and Hans Asyee

in Holland have been exchanging views and trying to come to a common view about the conditions which should govern the event.

Hans, for example, asks the question: who, or what, would be competing? If the skill of the skippers is to be measured, only identical boats should be permitted; but if different boats are to participate, then some handicapping system will be necessary. One thing that now seems to be settled is that the duration of the trial will be 8 hours.

In Britain, Peter Howe is considering including the UK 'heats' in his Broads Day on September 10th on South Walsham Broad. As he says, the details are still to be worked out.

The plan is to hold the International Finals in May 1996 at Bordeaux - "in a blaze of media publicity" says the irrepressible Kevin.

Write, phone or fax *Electric Boat News* with your views. Let's hear from all four countries!

Competitors from any country which has an Electric Boat Association would be very welcome. In Britain, members of the EBA who are interested in competing should contact Peter Howe of Camelot Craft on 01603 783096.

In our last issue, we printed a report from John Paramore on the new electric boat world speed record. Together with that report, John sent over a mass of material about electric boat racing in the USA.

John, a retired electricity utility employee and a former racer, played a central role in getting e-boat racing established in the American NorthWest. He was made, he says, a sort of 'Mother Hen' to the fast e-boat contestants.

Apparently, the racing only started in 1991 when a local electricity authority in Washington state increased the height of a dam and were required by the Federal government to establish and promote recreational activities on the lake behind the dam.

From the beginning, he says, the e-boat racers elected to do what the 'gas' racers do. "Playing by their rules brought respect so that now we are regarded as part of racing rather than a sideshow". In 1993, John talked to people in the American Power Boat

Association and the Seattle Outboard Association about racing electric boats as part of their organised racing programme. He says that the speed record really couldn't have been set had it not been for their co-operation. The competition 'platform' that they provided raised the performance of electrics to the required peak.

John's enthusiasm for racing, as a catalyst for overall e-boat improvement, is infectious. "I believe that a number of benefits can come from racing. What we race now acts as a great test bed for alternative motors, power sources and electronics". And racing is good for spreading the e-boat message, too: "After seeing our races, powerboaters who used to think only in terms of smoke and raw power are learning to accomplish the same goals in a totally new way - and they like it. It's no good preaching to the converted - if we are serious about getting the message of electric boating out, we need to take it to the people driving Evinrudes and Mercurys".

He hopes that electric boat racing will take off in other countries and international standards and rules be adopted. This leads E.B.News to wonder why there isn't a lively racing fraternity over here. It can't be a question of 'cost' - the Americans seem to be doing it all on a relative shoestring.

Included in his package was a videotape with clips of all the highlight races and tests from 1992 to the record run last October. We have had it converted from the US system and EBA members may borrow it - together with John Paramore's four-page written commentary - from our User Group Chairman, Edward Hawthorne (address/ phone on Page 1).

Clearly, we are going to hear a lot more from these inventive and imaginative boys in the American North-West. We look forward to future reports from John Paramore's delightful, freewheeling pen ("... when Boddy switched on, the whole boat leaped from the lake like a rocket-powered salmon ...").



The Electric Boat Association User Group AGM and Summer Meeting

Saturday June 3rd

Hambleden Mill Marina, Mill End, Henley-on-Thames - by kind permission of Peter Jones.

Combine EBA business and pleasure at this important event. As well as the social programme, a number of presentations are planned on the development and running of electrically propelled boats.

Details from Edward Hawthorne (see page 1).

PLEASE NOTE: Peter Jones asks us to remind members that there are no visitors' moorings available at Hambleden Mill but there is ample car parking space.



**All electric boaters
welcome!**

Silent Sensations '95

Sunday September 10th

10.00 am to 5.00 pm

South Walsham Broad

Another chance to enjoy the delights of the Broad through silent, non-polluting forms of propulsion - sailing, canoeing, rowing *and electric boating*.

Bring your own boat. Launching facilities available.

Further details from Peter Howe, Camelot Craft, The Rhond, Hoveton, Wroxham, Norfolk NR12 8UD
Phone: 01603 783096

Wargrave & Mid- Thames Electric Boat Rally

Sunday June 11th

The eighth "Wargrave Rally" will be held at Willowmead, Willow Lane, Wargrave at 12.30 pm. This delightful venue is on the Berkshire bank, downstream from Val Wyatt Marine, courtesy of Mr and Mrs Jack Wyatt.

The charge will again be £5.00 per boat, to cover costs. Bring your own picnic, wines, rugs, etc.

Details from Peter Butler, The Orchard, Lower Shiplake, Henley, Oxon. 01734 403614

**THIS SPACE COULD
BE WORKING FOR
YOU ...**

**FROM AS LITTLE AS £50 PER
ISSUE**

Electric Boat News is read by every member of the Electric Boat Association, including boaters in the USA, Holland, France, Italy and Australia.

Choosing and negotiating for the right components to electrify a traditional pinasse d'Arcachon has taken the technicians of our fledgling Association Française pour le Bateau Electrique a little longer than expected. I therefore take this opportunity to tell you about those bébés already in operation *dans la France profonde*.

Our journey starts in central Bordeaux in the Jardin Publique, where for many decades round trips have been given around the ornamental lake by *Le Petit Mousse* (= little cabin boy), which although proud of its original riveted hull (painted orange, white and red) has gone through its fair share of battery and motor replacements since construction over a century ago.

We then migrate to the far warm south-eastern corner of the Hexagon - in the Alpes of Haute Provence to be precise. Here, downstream from the popular Verdon Gorge, is the magnificent 2,500 hectare artificial lake of Sainte Croix. To take an hour-long trip around this lake, you can go to Les Salles de Verdon and board one of two Hydrobuses 75, constructed since 1987 by the Franco-Swiss boatyard in Franche-comté: *Le Canyon* or *La Perle du Verdon*.

Also on the Sainte Croix lake are twelve *Ruban Bleu* electric hireboats, 3.60 m long x 1.60 wide, each propelled by an enclosed 480 watt Minn Kota deriving its power from two 180 amp Hoppecke Minitrak semi-traction batteries. These robust but attractive little dayboats, available in dark blue or bordeaux red with an autonomy of 8 hours, are constructed on the Ile de Versailles, near Nantes, by Monsieur Jerome Croyère; fleets of rubans bleus (blue ribbon) are also in use in Holland and in the Vendée, the Aisne, on the Loir near Chartres.

Monsieur Croyère is currently working with EDF Nantes (Electricité de France) to provide a five-passenger shuttle on the Erdre, a tributary of that city, where Ruban Bleu has its boatyard.

Having left the Midi with its lavender fields and rosé wine, we journey elsewhere, on the Lot, near to Cahors, where we may observe 5 small electric

Neveux-type catamarans for hire from Lot Navigation, their 70 amp car battery giving 5 hours autonomy.

Again thanks to EDF, but this time at Fontenay-le-Comte in the Vendée, eleven flat-bottomed *capucine* (= either nasturtium or Capuchin nun) day-hire-boats which run from Maillezais where the River Sevre joins the River Autize in the poitevin marshland - have been converted from petrol to electric. Each 8-metre boat is now equipped with a 2Kw motor.

Then there is Saviboat of Saint Savinien in the Charente, land of Cognac, as directed by the dynamic Brigitte Foucaud, her staff custom-

rides to visiting tourists, the local Protection Society, led by Monsieur Nisso Pelossoff, have insisted on electric propulsion. The result, each *barque* is fitted - thanks again to Monsieur Didier - with twin submerged Accumots, giving 4 speeds, and powered by Fulmen nickel-cadmium batteries - with an autonomy of ten hours at 3 km/h.

We should not omit the British connection: Gaddesden Day Boats, run from St Jean Le Poterie in the Morbihan, by longtime British settlers and one-time ex-Burgundy hireboat operators, Keith and Margaret Gaddesden. Their eight, Norfolk-built, Lynch-engined 5 m *Alouette* boats (*alouette*=

THE FRENCH CONNECTION 3: ELECTRIC BOATS IN FRANCE

by Kevin Desmond

building little 2-3 metre "tugboats", "ferries" and "paddle-steamers" which families visiting leisure parks hire out for the amusement of their enfants. For ease of installation and maintenance, the saviboats are, of course, electric.

At Gerardmer (pronounced Jeremy), a beautiful natural lake in the Vosges in North-East France, starting as long ago as 1962, there is now a 48-strong fleet of variously-sized Austrian Accumot-engined hireboats - run by several operators.

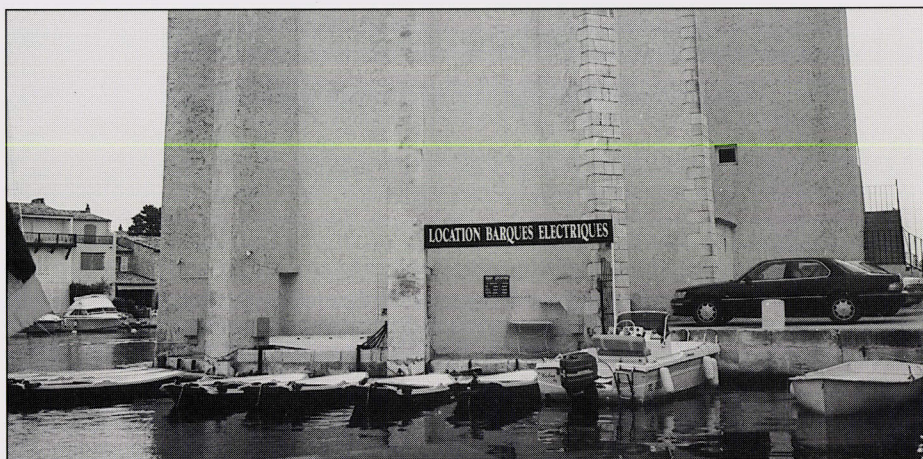
Over to Amiens, in the Somme région, some 300 hectares of pre-Roman marshland locally known as "Les Hortillonnages", navigated for a very long time by the Hortillons in their *barques à corné*, 10 metres long by 1.70 m beam, of oak construction. For these eight gondola-like boats to give

lark) can be enjoyed from the Port de Plaisance de la Villaine to Rennes, or along the Vannes-Brest Canal to Vannes and Redon.

This little survey of some of les bébés (bateaux à l'énergie des batteries électriques) de la France is happily not as yet all-comprehensive, and we therefore include EBA member Andrew Spyrou of Cap d'Ail in the Alpes Maritimes - whose 3.12 m solar-powered *Kyknos*, still available in pale blue, dark blue or primrose, continues to promise a most pleasurable and sunny option.

Should any of you, taking a holiday in France, come across any further privates, hirefleets or waterbuses, I'd be grateful to hear about them. (54 route de Latresne, 33360 Carignan de Bordeaux, FRANCE)

Voyagez tranquillement - A bientôt - Sparks (= Etincelle).



Electric boats (Mariner outboards) for hire at Port Grimaud, near St Tropez, spotted by EBA member David Jolly..



Dear Editor,

I have just read of the voyage of Bud Roberts in the Spring 1995 issue of *Electric Boat News* and of his claim to a world record for a solar powered boat.

His performance is a great achievement but several earlier voyages in Australia have exceeded this in distance travelled.

These were all down the River Murray and were as follows;

1. Alan Colbeck. Jan-Feb 1989. 5½ weeks. 1014 nautical miles.
Yarrowonga to Murray Bridge. A 14ft dory with 5 x 45 watt solar panels and a Mariner electric trolling outboard, 21 lb thrust.
2. Prince Alfred College. Dec 1992. 1075 nautical miles. Yarrowonga to Murray Mouth. This was a twin-hull design 10 metres long and 4 metres overall beam with two Evinrude underwater electric motors.
3. Alan Colbeck. Jan 1993. 1137 nautical miles. Hume Weir to Murray Bridge. This boat was based on a Wharram design catamaran 5 metres long and 2 metres beam. There were 4 x 90 watt solar panels and two electric trolling motors, each 21 lb thrust.

Yours faithfully,

R T Slatyer, 66 Raglan Street, Mosman, NSW 2088, Australia.

Editor's Note. I have invited Mr Slatyer to write an article for E B news, giving full details of these voyages. The latest issue of 'Current', the magazine of the EBA of America, carries a report of Alan Colbeck's 1993 voyage in his boat "Solecist II". Mr Colbeck is quoted as saying that, for verification, he got endorsements in his log book at the start and finish as well as at some of the 13 locks along the way.

Dear Editor,

Following your coverage of Camelot Craft, we (wife, self, labrador) booked a short break with Peter Howe from Camelot.

It is a long, long time since we have sailed a 25 ft yacht, but Peter provided

well-qualified and supportive instruction. We set off from Wroxham on an idyllic short break on 12th April.

We used the motor alone sometimes, used it to supplement sailing at other times and sometimes just sailed. We also went for walks with the dog at a variety of

pretty spots. A lot of bacon and eggs and some Guinness were consumed. On the minus side, the dog somehow got the pillow end of the bed - my pillow end. We had the best of the weather and saw beautiful sunrises and sunsets, with much wildlife. We have put in our claim to have been bitten by the first mosquito of the year! - which was subsequently killed off by cooler weather, I hope.

Electric power is an agreeably lazy, modern alternative to the long pole used to push sailing boats along when I went on the Broads as a child and also helps conceal any rustiness in manoeuvring skills! The motor was a Lynch, supplied and well fitted, I understand from Peter, by London Innovation. It worked well.

In all, we felt that for anyone who fancies electric power with a sailing option, Camelot provides good support and proper boats.

Yours sincerely,

Jon Willmore, Taplow, Bucks.

Dear Editor,

I thought your readers might be interested in a report which appeared recently in *The European* newspaper. (I have summarised the main points).

"The German post office is to start running a fleet of electric vehicles that not only drive further and faster but also take only a few minutes to refuel. The new battery, developed by Israeli engineers, uses a mixture of zinc and air to produce five times as much energy as a conventional lead-acid battery.

Zinc-air batteries have proved difficult to recharge because the zinc tends to grow between the plates

inside the battery and short-circuit it during recharging. However, engineers at Electric Fuel in Jerusalem have developed a battery where the zinc is held in cassettes which can be removed for recycling.

The engineers then produced an array of zinc plates that presented the highest possible surface area for the power-generating reaction to take place.

Deutsche Post's vehicles will have electric motors provided by Siemens and Electric Fuel will supply the production plant for recycling the zinc cassettes. The Mercedes vans will use eight battery units weighing a total of 750 kilos, and early tests suggest that the vans could have a range of up to 400km on a single charge.

"It gives you the same amount of energy as a tank of petrol", explained the company's vice-president.

Electric Fuel has already delivered a small fleet of demonstration vans and a recycling plant to Italy's leading private fuel company, Edison, which has the rights to market the technology in France, Spain and Portugal."

I have telephoned the Edison Company in Italy. They say they are not yet able to publish any information about the Electric Fuel project, but they expect to be doing so shortly. A case of 'Watch this space'!

Yours sincerely,

David Higgins, Luddington, Stratford-upon-Avon.

Editor's Note. I checked carefully to make sure that this article was not dated 1 April.

FOR SALE

Equipment approximately six years old, some completely unused.

5 2.6 kW motors, 45 volt, 900 rpm, 73.5A, manfd by E.P.E. Ltd.

5 controllers, Electronicon.

3 Curtis Battery Level Indicators.

2 Chloride AutoFill Units.

2 Spigel Overnight Auto Chargers by Chloride: Type SEP 72/320.

Offers, around 40-50% of new retail prices, to **John Dytech**, Dartline, Canal Wharf, Bunbury, Tarporley, Cheshire. Phone 01829 260638. Fax (UK) 01829 260525, (International) 44 829 260525.

In our last issue we told the story of the attempt to rescue the Viscountess Bury. The work goes on ...

FACT FILE:

⚡ Viscountess Bury was built in 1888 by W. S. Sargeant & Co. at Chiswick as an electric river launch - at 65ft, the largest of her kind in the world at that time

⚡ She was named after the wife of the Viscount Bury who had become interested in battery power after meeting Thomas Edison in the 1870s and was inspired to form the General Electric Power & Traction Co. with German engineer Moritz Immisch.

⚡ Her twin Immisch electric motors propelled her at 5.5 knots for up to ten hours before her batteries needed re-charging.

⚡ By 1902 there were over 100 electric launches plying the Upper Thames - 50 of them owned by Immisch - but eight years later, the Viscountess was converted to petrol.

⚡ In her first four seasons, the Viscountess was chartered by the then Prince of Wales, later King Edward VII.

CAN YOU HELP?

If you would like to join the Friends of the Viscountess Bury, contact Linda Ashton on Ely 661226. Suggested subscriptions: £5 Unwaged; £15 Individual; £25 Family.

Do you have any special abilities or knowledge? Could you give practical help in areas such as wooden boat-building, carpentry, timber treatment and painting, mechanical and electrical engineering, publicity, administrative work, fund-raising?

As a Friend, you would receive a quarterly newsletter keeping you up to date with developments. Please make cheques payable to "The Viscountess Bury Trust" and send to "The Friends of the Viscountess Bury", The Wharf, Waterside, Isle of Ely, Cambridgeshire CB7 4AU.

CHAMELEON: THE CONVERTIBLE TRAILER/TENT/DINGHY !

by Tim Roper, of Matrix Advanced Composites Ltd, t/a Chameleon Leisure

The Chameleon is a new and unique multi-purpose recreational vehicle that represents a revolutionary concept in leisure products. It is a versatile, lightweight camping/DIY car trailer which, by removing the wheels, becomes a dinghy, specially adapted for electric power and designed for sailing and/or camping afloat.

Ultra stable and unsinkable (even with a full battery pack on board) it is spacious enough, and has been specifically engineered, to carry a family in absolute safety. All for a base price of £995.

Is it a car trailer?

The Chameleon is moulded entirely from glass and carbon fibre, using foam sandwich technology. This gives a trailer of unbelievable lightness and strength, yet one that is rugged and virtually maintenance-free and, because the trailer body is moulded completely from advanced composites, is capable of being stored outdoors in the elements for long periods without suffering any detrimental effect.

A range of extras is available such as a cover which complements the trailer's sleek, aerodynamic lines. A removable easy-clean lining (for gardeners) and an optional top-mounted roof rack or multi-bike rack are also available, the total package providing stylish, versatile, spacious, secure equipment transport for the active family or outdoor leisure enthusiast.

Is it a dinghy?

Having performed its role as a car trailer, with the equipment now unloaded, in normal circumstances one would be left with a redundant trailer for the rest of the holiday. Here the Chameleon has a very clever trick up its sleeve. By undoing one nut and a strap, the complete wheel/axle assembly removes to transform the Chameleon into a family-sized dinghy, capable of carrying four adults.

This assembly stores under the towing vehicle, thereby requiring only one parking space.

The dinghy's hydrodynamic hull form was designed by the international-

ally acknowledged Everitt Design Group (Yacht Designers and Naval Architects) with the brief being for a safe, stable, unsinkable vessel to provide an entry-level product for novices wanting to take up boating or sailing.

Whilst the overriding design brief was one of family safety, through the Everitt Design Group's unique interpretation of a trimaran hull arrangement, the Chameleon can be rowed, will take an outboard (petrol or, specifically, electric) and as a key element has been designed to be rigged for sail. Four rigs, from child novice to adult experienced, are available.

A battery compartment has been incorporated into the construction of the deck moulding, allowing the use of two 6-volt traction cells (rated at 175 Ah over five hours) - i.e. more than enough power to run an electric outboard all day.

An innovative feature is the capability of using this heavily reinforced battery compartment (forward) for ballasting the dinghy and thereby setting its trim to suit varying passenger loadings.

Is it a tent?

Stainless steel mounting points are moulded into the topsides of the dinghy. Flexible composite rods locate transversely in these mountings across the boat forming 'hoops' to act as tent frames. An inner tent also provides robust weatherproof accommodation.

This is ideal for an exploring holiday or for overnight on-water camping such as night fishing, hunting trips or just getting close to nature (with electricity on board!). The same mounting points provide for a canopy or cuddy for hire boat use.

The hull (length 3m, beam 1.8m) forms an upgradable modular starter pack available with or without a dagger box moulding (for sailing) where a trailer kit, sailing rig, batteries, tent, etc. can be purchased at a later date as affordable or desired.

Demonstrations are available on reservoirs, rivers, canals or on shore coastal waters.

For more information and a brochure, contact Chameleon Leisure on 01460 281567 (phone and fax).



Electric chameleon



175 AMP/HR BATTERY COMPARTMENT
ALLOWS 8-10 HOURS CONTINUOUS
CRUISING.

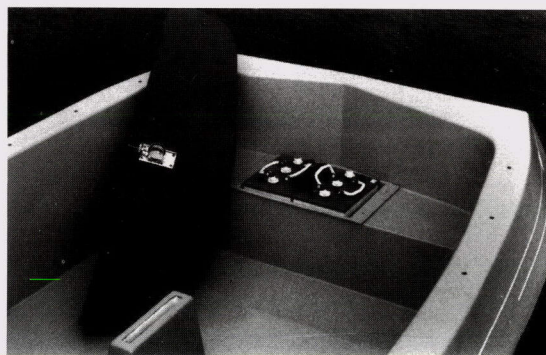
CAN BE RECHARGED OVERNIGHT VIA
A 17.5A PORTABLE GENERATOR ON
"EXPEDITIONS"



STABILITY

UNSINKABLE
MASSIVE
BUILT IN FAMILY
BUOYANCY
(INCLUDING
BATTERIES)

FROM
£995



VERSATILITY

- AFFORDABLE ELECTRIC BOATING.
- RUGGED BUILD, FLAT FLOOR MEASURES 2.05M x 1.35M x .50M MINIMUM.
- WHEELCHAIR FRIENDLY.
- IDEAL HIRE/WORK BOAT.
- SAILING VERSION AVAILABLE.
- INTEGRAL TENT FOR ON WATER CAMPING.

FOR VERSATILE EXPLORING OR JUST SILENT
POLLUTION FREE CRUISING.

FOR A BROCHURE CONTACT:

CHAMELEON LEISURE,
HOLLY COTTAGE, GANGES HILL,
FIVEHEAD, TAUNTON, SOMERSET
ENGLAND, TA3 6PF

TELEPHONE AND FAX: 01460 281567 MOBILE: 0831 413710

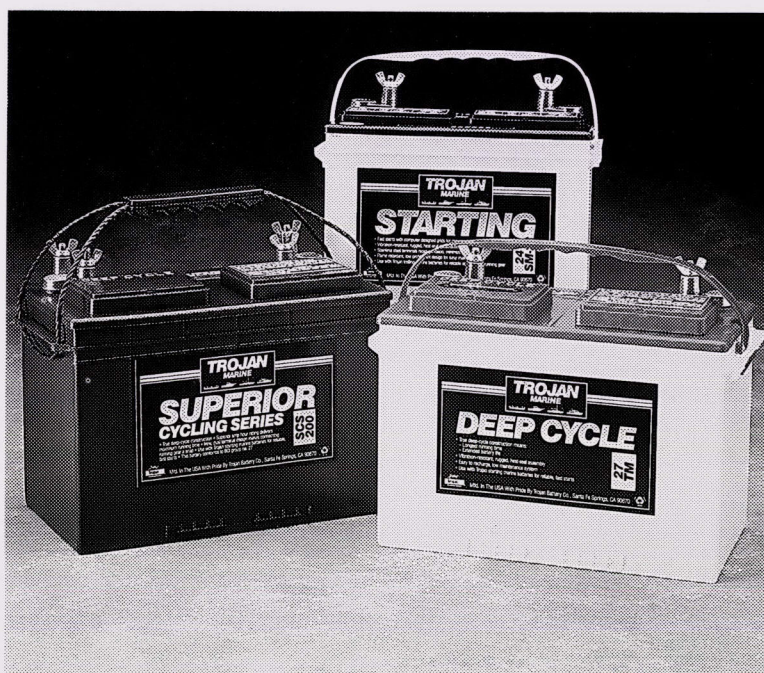
TROJAN MARINE BATTERIES

Most battery
manufacturers just
make batteries.
Trojan make
history. In business
for nearly seventy
years, Trojan are
Americans No 1
manufacturer of
Deep Cycle long
life batteries.



Trojan

The Better Battery



The Superior Cycle
Series has been
developed for marine
applications, details
of these, together
with our full range of
motive power,
standby power
batteries and chargers
are available by
contacting our
sales/technical
department

Industrial Battery Systems Ltd.,

Unit 8, Denington Court, Denington Road, Wellingborough, Northants, NN8 2QR. Tel: ((0933) 441419 Fax: (0933) 442107