the Elmer A. Sperry award

1968

THE ELMER A. SPERRY AWARD MEDAL

In the words of Edmondo Quattrocchi, the sculptor of the medal . . .

"This Sperry medal symbolizes the struggle of man's mind against the forces of nature. The horse represents the primitive state of uncontrolled power. This, as suggested by the clouds and celestial fragments, is essentially the same in all the elements. The Gyroscope, superimposed on these, represents the bringing of this power under the control of man's purposes."

Presentation of the
ELMER A. SPERRY AWARD FOR 1968
to **Christopher S. Cockerell**
and **Richard Stanton-Jones**
with citation to the men and women of
the British Hovercraft Corporation
by the Board of Award
under the sponsorship of
The American Society of Mechanical Engineers
Institute of Electrical and Electronics Engineers
Society of Automotive Engineers
The Society of Naval Architects and Marine Engineers
American Institute of Aeronautics and Astronautics
at the annual banquet
of The American Society of Mechanical Engineers
December 4, 1968, New York Hilton Hotel, New York City

Purpose of the award

The Elmer A. Sperry Award shall be given in recognition of—
"A distinguished engineering contribution which, through application, proved in actual service, has advanced the art of transportation whether by land, sea or air."

1968 Board of Award

Glenn B. Warren — Frederic E. Lyford
The American Society of Mechanical Engineers
Richard L. Kimball — H. Noel Zelley
Institute of Electrical and Electronics Engineers
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The Society of Naval Architects and Marine Engineers
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Robert B. Lea (Dec.)
David W. R. Morgan
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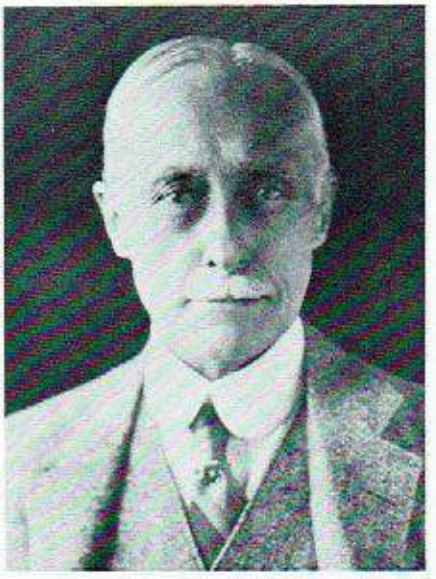
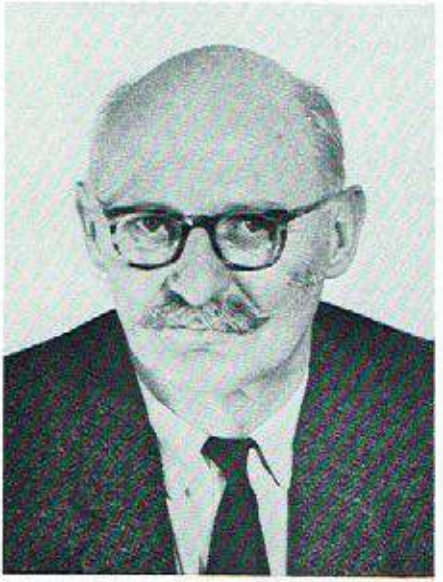


Elmer Ambrose Sperry 1860-1930

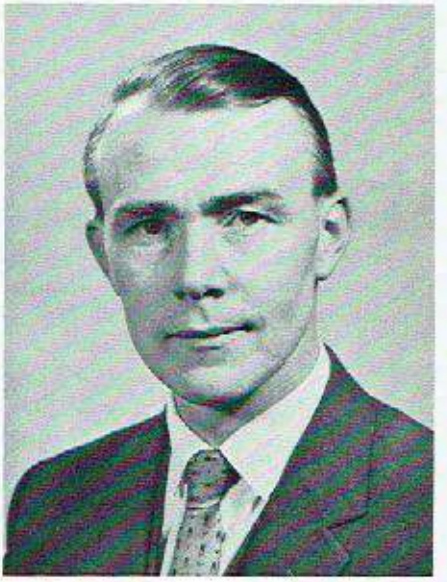
Founding of the award

The Sperry Award commemorates the life and achievements of Dr. Elmer A. Sperry (1860-1930) by seeking to encourage progress in the engineering of transportation. Much of the great scope of the inventiveness of Dr. Sperry contributed either directly or indirectly to advancement of the art of transportation. His contributions have been factors in improvement of movement of men and goods by land, by sea and by air.

The award was established in 1955 by Dr. Sperry's daughter, Mrs. Robert Brooke Lea, and his son, Elmer A. Jr., and is presented annually.



Christopher S. Cockerell



Richard Stanton-Jones

Award citations

CHRISTOPHER S. COCKERELL
For his vision, ingenuity and pioneering research leading to the development of the Hovercraft, a unique and commercially useful form of transportation.

RICHARD STANTON-JONES
For his leadership, engineering skill and substantial contributions to the design of a family of Hovercraft, climaxed by the new Mountbatten Class SR.N4, the largest air-cushion craft yet completed.

Certificate of citation

To the men and women of the British Hovercraft Corporation for their steadfast perseverance in making essential contributions to the design, construction and application of a family of commercially useful Hovercraft.

The history of the development of hovercraft

It is necessary to go back 15 years to find the source of the growing Hovercraft Industry in Britain.

In 1953, Christopher Cockerell, an electronics engineer with a small commercial boat-building interest, began thinking about the age-old problem of decreasing the resistance to ships' travel through the water. First he tried introducing air films under model boats to give a kind of lubricated surface. This was not successful, and the next groping stages towards the evolution of the hovercraft principle are best described in his own words:

'After I had learnt from, and found out the shortcomings of, "air-lubrication" experimentally, the first idea I had was fixed sidewalls with hinged doors at the ends, with air pumped into the centre. The next idea, at about the end of 1954, was fixed sidewalls with water curtains sealing the ends. I stuck here for a bit, because I didn't know enough to be able to work out the probable duct and other losses and the sort of power that would be required.

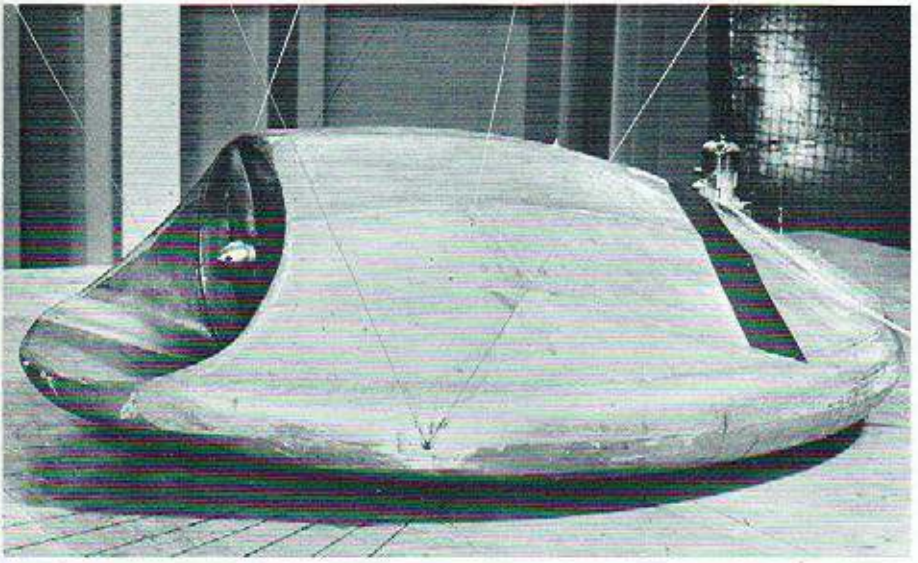
Then one Saturday evening I thought I would have a look at using air curtains. A simple calculation looked all right on a power basis, and so that Sunday I made up an annular jet using two coffee tins, and found that the air did follow the "predicted" path and that there was a "predicted" gain in lift – very exciting.'

Christopher Cockerell secured the assistance of a fellow boat-builder in constructing a working model of the type of craft envisaged. This was used as a test model for several years and is now in the Science Museum, South Kensington. In December 1955 Christopher Cockerell applied for his first British patent covering lift by means of peripheral annular jets.

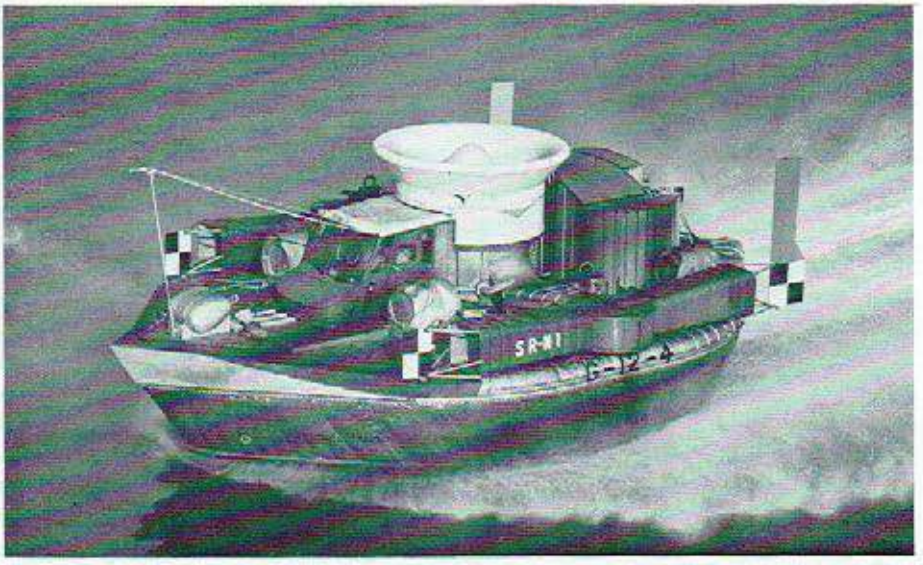
For the next two years Christopher Cockerell was doing the rounds of industry and government departments with remarkably little to show for it. The shipbuilding firms said, "It's not a ship, try the aircraft industry", and the aircraft firms said, "It's not an aircraft try the shipbuilders". The engine manufacturers said, "Not for us, but if you get your invention taken up, remember to use our engines".

However, he did receive valuable encouragement from Mr. R. A. Shaw of the Ministry of Supply, and eventually during 1957 the Ministry approached Saunders-Roe who accepted a contract to undertake a feasibility study and to do model tests.

The Saunders-Roe design team who undertook this initial study now form the nucleus of British Hovercraft Corporation's technical staff, and had, for many years, been engaged on the design and construction of flying boats and hydrofoils.



Christopher Cockerell's working hovercraft model on test in a wind tunnel.



SR.N1 – the original manned development craft used for intensive research over a period of 4 years from 1959 particularly for the early work on long flexible skirts.

The 70 seat SR.N2 and the 26 seat VA.3 built by Westland and Vickers respectively in 1962 for experimental passenger services. Westland and Vickers hovercraft interests amalgamated in 1966 to form the British Hovercraft Corporation.

It was precisely because of this background of 'fish and fowl' expertise that the hovercraft principle was enthusiastically pursued.

Richard Stanton-Jones headed the technical team from the outset, progressively rising from Chief Aerodynamicist through Chief Designer, Technical Director, to his present position of Managing Director of British Hovercraft Corporation. He has been particularly responsible for the design and development of a family of hovercraft ranging from the first practical vehicle the 4-ton SR.N1 to the latest B.H.C. product, the 160-ton Mountbatten Class SR.N4, the largest hovercraft operating in the world today.

Christopher Cockerell in the meantime had approached the National Research Development Corporation (N.R.D.C.) who also realised that hovercraft were likely to become a revolutionary new form of transport and through them, a subsidiary Company known as Hovercraft Development Limited (H.D.L.) was set up in January 1958 with Christopher Cockerell leading the research group as Technical Director.

The report of the Saunders-Roe feasibility study was favourable, as a result of which, N.R.D.C. placed a further contract with the company for a programme of work which included the design and manufacture of a manned development craft designated SR.N1. At the same time Saunders-Roe set up their own Research and Development programme. This historic craft SR.N1. was completed on 28th May 1959. Although it was only originally intended for a six month trials programme, it proved to be an excellent research tool for over four years.

This small craft (weighing 4 tons) demonstrated the basic principles of riding on a cushion of air to be sound. A series of development modifications associated with alternative power plants and planform shapes in succeeding years increased the speed boundary from 25 knots to 65 knots, but of more significance was the development of long flexible skirts which enabled the craft to operate successfully in 4-5 feet waves whereas in its original form it was only capable of operating in wave heights of no more than 1½ feet.

In July 1959, in its original form, it crossed the English Channel from Calais to Dover with Christopher Cockerell on board to mark the 50th anniversary of the first cross-channel flight by Bleriot in an aeroplane.

25 seat VA.3

The results of the technical investigations, indicated that a competitive commercial hoverferry would probably need to be 125 to 150 tons in weight and some four times the length and breadth of the SR.N1 manned model, in order to cope with 4 to 6 feet seas.

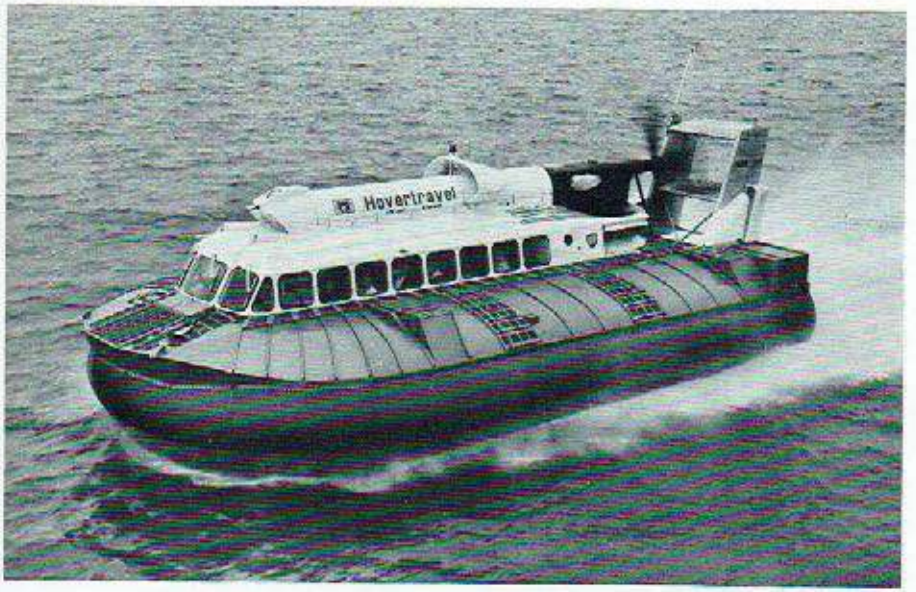
However, a jump from 4 tons to 125 tons represented such a major engineering step that it was decided to approach this in three stages over a 7 years programme.

The first stage was the 27 ton SR.N2 used to develop the swivelling pylon mounted propeller control system, and the integrated lift/propulsion concept. The second stage was to stretch this craft to the SR.N3, to obtain the largest craft capable of being operated with the 3,600 h.p. of the SR.N2, and the final stage was to use the experience gained with the developed machinery and systems to produce a 125 ton SR.N4.

Westland Aircraft Limited, who had taken over Saunders-Roe late in 1959, backed this long range programme, and in 1960 the SR.N2 was jointly funded by N.R.D.C. and Westland.

SR.N2, capable of carrying 70 passengers at 60 knots was launched in January 1962 and was used on passenger services in the Solent and the Bristol Channel, and made an historic crossing of the Lachine Rapids on the St. Lawrence river.

Amphibious versatility illustrated by a 7 ton 18 seat Warden Class SR.N5.



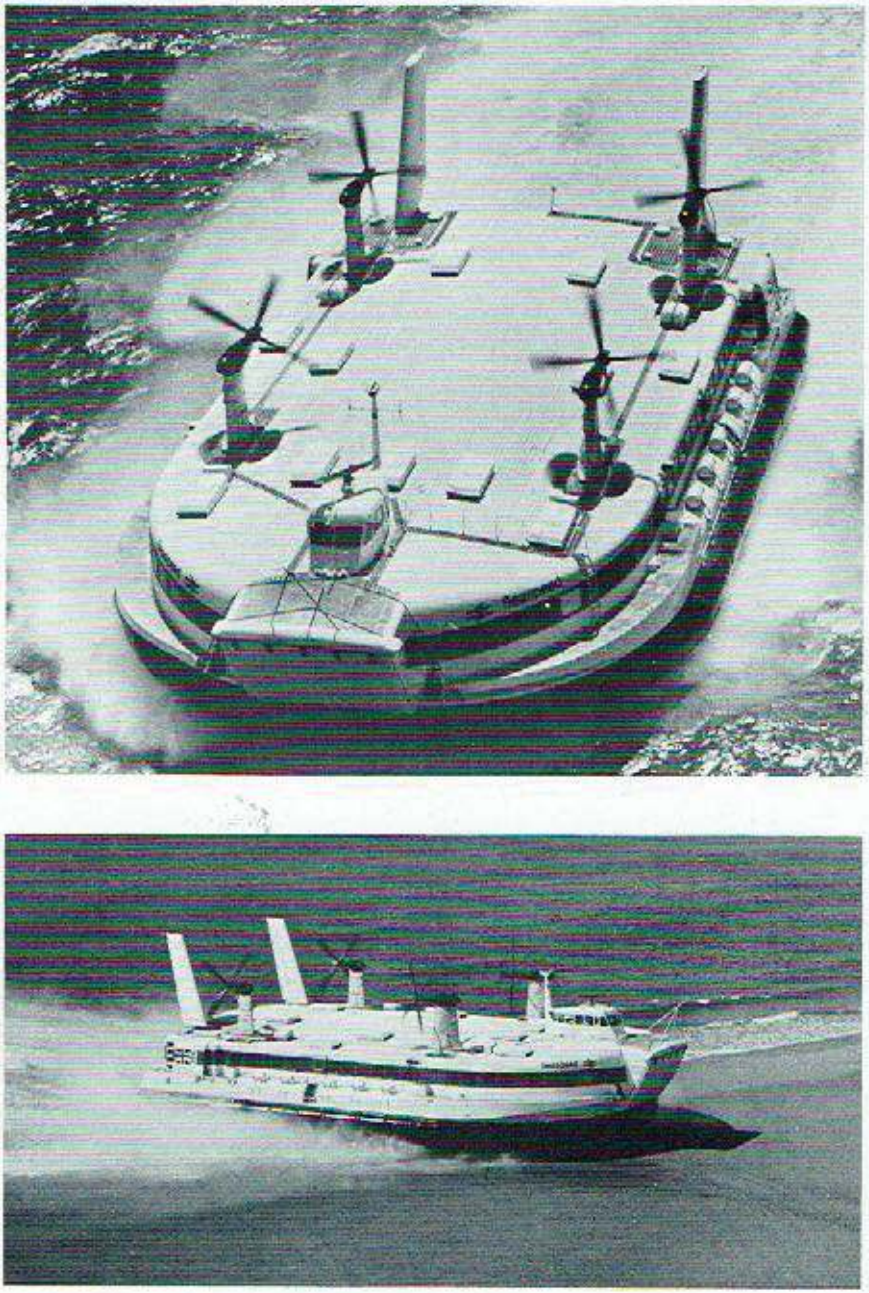
One of the 38 seat Winchester Class SR.N6's on regular service over the Solent, between Portsmouth and Ryde, Isle of Wight.

The SR.N3 originally intended as a 150 seat craft, was eventually ordered by the British Government for evaluation trials which are still continuing today.

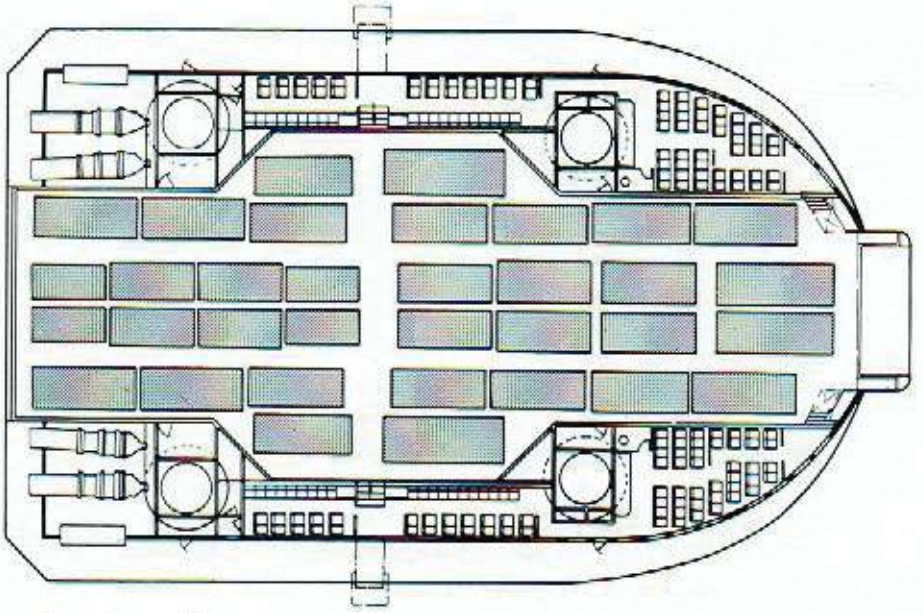
During the 1961-63 period, other Companies had developed research and experimental craft. Vickers built the VA.1 to 3 series, Denny Bros. built two sidewall craft. Britten-Norman built the CC1 and 2 and H.D.L. designed and built its own HD1.

The formation of British Hovercraft Corporation in 1966 merged the principal Hovercraft interests namely Westland, Vickers and N.R.D.C. into a single company. Britten-Norman continued to develop their own smaller light weight hovercraft; and two other companies Hovermarine and Vospers have now entered the field.

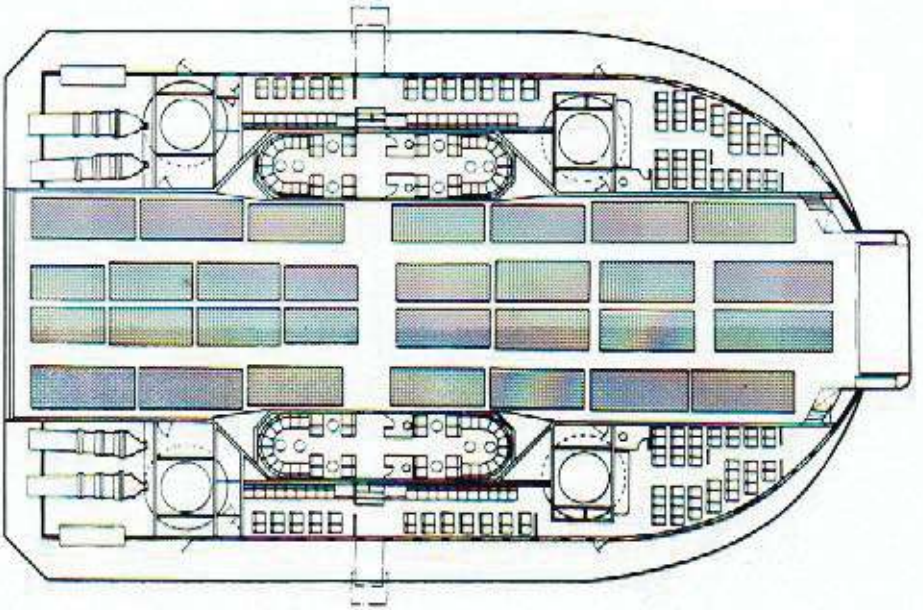
By the time the SR.N3 was built flexible skirts were considered an integrated part of a hovercraft, and acknowledged to be of primary importance. They have transformed the hovercraft from a vehicle of great interest but limited usefulness, to one with work-a-day capabilities, able to traverse obstacles on land and waves at sea which would have been insurmountable for a given craftsize before the advent of skirts.



Mountbatten Class SR.N4 Hoverferry during cross-channel operations.



basic craft 174 passengers 34 cars



standard craft 254 passengers 30 cars

Typical car and passenger layouts of the Mountbatten SR.N4.

A projected 4,000 ton hoverfreighter with trans-Atlantic range.

Back in 1957 Christopher Cockerell had concluded that a flexible bottom configuration was a necessary part of a hovercraft, but this was not incorporated in early craft. The solution came in the form of long flexible skirts in 1962 following a patent by Latimer-Needham, and the invention and development of practical flexibles by B.H.C. and H.D.L.

The successful development of skirts enabled British Hovercraft Corporation to lay down the world's first production line of hovercraft in 1964. This was the 7 ton SR.N5 – now known as the Warden Class to be followed the next year by a stretched version – the 10 ton 38 seat SR.N6 – named the Winchester Class. 45 craft have now been produced and are in operation throughout the world including regular passenger operations, around the British Isles, in Italy, Japan and the Americas.

Experience gained with SR.N2 and SR.N3, together with the growing skirt technology developed on the SR.N1, SR.N5 and SR.N6, indicated that the original proposed design of the SR.N4 needed to be revised. Project studies recommenced in 1964, and the SR.N4 emerged with a new shape, structural design, engines and skirt arrangements, at an all up weight of 165 tons.

The SR.N4 – now known as the Mountbatten Class – commenced trials in February 1968, and made its first channel crossing from England to France on the 11th June, about 9 years after the historic SR.N1 crossing.

The Mountbatten is the first truly open-water passenger/car ferry, capable of all-year-round services over sea routes where wave heights of 8 to 12 feet can be encountered.

In its basic form, weighing 165 tons, 254 seated passengers and 30 cars can be accommodated. The passenger/car ratio can be varied by converting some of the passenger cabins to additional car space.

It is planned that four of these craft will be in operation on a variety of routes by the end of 1969.

SR.N4 is powered by four Rolls-Royce "Marine Proteus" gas turbine engines of 3,400 h.p. rating, each driving a variable pitch propeller mounted on a pylon. Interconnected with the propellers are four centrifugal fans for delivering cushion air. The craft is operated by a three-man crew and is controlled by varying the propeller blade angles and by swivelling the pylons to change the direction of thrust.

In itself, the Mountbatten is more than just another hovercraft; rather, it symbolises the hopes and aspirations of the entire Industry, particularly those elements pursuing the development of the amphibious skirted hovercraft, or, as it is sometimes known, the "soft wall" type of craft.

Heavy Load Transporter carrying a 200 ton transformer, operating on a normal road with its skirts raised.

Off-the-Road Transporter carrying a 9 ton load over soft open country.

Already a further craft, designated the Wellington Class BH.7 is being built and it is planned that civil versions will be in operation during 1970. Smaller than the Mountbatten and grossing 45 tons it makes extensive use of components used in Mountbatten.

It will carry 6 or 8 cars and 70 passengers or can be converted to a 180 passenger commuter role. It is possible that by the time this craft enters service, development in skirt technology will make the Wellington capable of open-sea operation, although possibly not with as high a degree of comfort found with the larger Mountbatten craft.

Looking beyond the Mountbatten and the projects directly emanating from it, B.H.C. is moving towards the development and eventual production of a 200/300 ton hovership. Work on this programme is already advanced and further advances in technology coupled with the experience of the Mountbatten programme, will contribute to the overall development.

Beyond this, a more ambitious programme has been mapped out, progressing through various stages to hoverfreights of up to 4,000 tons with a trans-Atlantic range. Such craft could have exceptionally high work capacities and may carry payloads of up to 2,000 tons of containerised cargo. On such craft, airscrew propulsion would probably be replaced by water-jets as limitations imposed by propeller development and transmission gearing may occur at an all up wieght of 750 to 1,000 tons.

The advent of the hovercraft has led to creation of a new branch of technology involving the marriage of hydrodynamic and aerodynamic design, and production principles.

Despite the rapid pace of development, hovercraft are still in their infancy and much has still to be learned. Progress has been encouraging, particularly in the field of skirt engineering, and as previously indicated, this is possibly the most important single area of research and development.

Over the last twelve months, advances in skirt design and the development of new materials have resulted in the production of more hard-wearing, salt water resistant skirts. The introduction of 'finger' skirts which flex more in sympathy with wave undulations, has greatly reduced air losses and resistance of the cushion system with a consequent increase in performance particularly over waves.

Apart from marine hovercraft, equally exciting developments are taking place, in the application of the air cushion principle in the industrial field.

A loaded 1 ton Hoverpallet. For handling goods in many branches of Industry.

Already, air cushion transporters are in commercial use facilitating the carriage of extremely heavy loads (up to 200 tons) over weak bridges and road surfaces and smaller loads (up to 9 tons) over farmland and open country. With the former vehicle, the heavy cost of bridge strengthening and road repairs is obviated and with the latter the payment of compensatory costs to farmers is also avoided.

At the other end of the scale are hoverpallets which operate on the air lubrication principle at relatively low pressures such as are available from normal industrial supply air lines.

Current types can carry containerised loads of up to 5 tons in weight and several are in service with shipping companies and other industrial organisations. Their high manoeuvrability and simplicity of operation have led to economics in manpower, time and a more efficient utilisation of storage space.

The rate of development of the hovercraft principle has been relatively rapid. Some 20 different types of full-scale practical hovercraft have been designed and built in Britain over the past 9 years.

The widespread adoption of this principle may take many more years, but nevertheless, it has started encouragingly. However, its future growth will depend on the continued acceleration of development effort.

PREVIOUS ELMER A. SPERRY AWARDS

1955 to WILLIAM FRANCIS GIBBS and his Associates for development of the S.S. United States.

1956 to DONALD W. DOUGLAS and his Associates for the DC series of air transport planes.

1957 to HAROLD L. HAMILTON, RICHARD M. DILWORTH and EUGENE W. KETTERING and Citation to their Associates for the diesel-electric locomotive.

1958 to FERDINAND PORSCHE (in memoriam) and HEINZ NORDHOFF and Citation to their Associates for development of the Volkswagen automobile.

1959 to SIR GEOFFREY DE HAVILLAND, MAJOR FRANK B. HALFORD (in memoriam) and CHARLES C. WALKER and Citation to their Associates for the first jet-powered aircraft and engines.

1960 to FREDERICK DARCY BRADDON and Citation to the Engineering Department of the Marine Division, SPERRY GYROSCOPE COMPANY, for the three axis gyroscopic navigational reference.

1961 to ROBERT GILMORE LETOURNEAU and Citation to the Research and Development Division, FIRESTONE TIRE AND RUBBER COMPANY, for high speed, large capacity, earth moving equipment and giant size tires.

1962 to LLOYD J. HIBBARD for application of the ignition rectifier to railroad motive power.

1963 to EARL A. THOMPSON and Citation to his Associates for design and development of the first notably successful automatic automobile transmission.

1964 to IGOR SIKORSKY and MICHAEL E. GLUHAREFF and Citation to the SIKORSKY ENGINEERING DEPARTMENT for the invention and development of the high-lift helicopter leading to the Sky Crane.

1965 to MAYNARD L. PENNELL, RICHARD L. ROUZIE, JOHN E. STEINER, WILLIAM H. COOK and RICHARDS L. LOESCH, JR. and Citation to the Commercial Airplane Division, THE BOEING COMPANY, for the concept, design, development, production and practical application of the family of jet transports exemplified by the 707, 720, and 727.

1966 to HIDEO SHIMA, MATSUTARO FUJII, and SHIGENARI OISHI and Citation to the JAPANESE NATIONAL RAILWAYS for the design, development and construction of the NEW TOKAIDO LINE with its many important advances in railroad transportation.

1967 to EDWARD R. DYE (in memoriam), HUGH DeHAVEN and ROBERT A. WOLF and Citation to the research engineers of Cornell Aeronautical Laboratory and the staff of the Crash Injury Research projects of the Cornell University Medical College.