

A SHORT HISTORY OF SAUNDERS-ROE

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(circa 1960)

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plus web links for further information.

It is no coincidence that the name of Saunders-Roe will be associated forever with high-performance water-based aircraft, for the company had its beginnings beside the river at Streatley-on-Thames, in the year 1830. The founder's name was Moses Saunders, and as a start he helped to construct weirs and locks on the Thames, to make it safer for boating and to enable goods to be carried by barge as far as Oxford, It was only a short step from such work to boat-building, and his small family business eventually became renowned for its high speed steam launches.

New premises were acquired as the demand for boats increased, and by the 1890's the company was established in the Springfield Works at Goring. It was at this stage that Samuel Saunders, grandson of the founder, came on the scene.

Sam Saunders was typical of the gifted and venturesome men of that era whose names are perpetuated by great modern industrial companies. When efficient petrol engines became available, he was one of the first to install them in marine craft. Realising that it would be impossible to take full advantage of the power and speed offered by these engines unless hulls could be made stronger without large increases in structure weight, he began developing new techniques in boat-building.

Laminated plywood skins had already been used experimentally, but the glues then obtainable did not hold well when immersed in water. As an alternative Saunders tried sewing the laminated skins together with annealed brass or copper wire and soon found that this was the answer to his problem of combining strength with lightness. Hand- sewing was slow, so he and his daughter next adapted large sewing machines so that several thicknesses of plywood could be sewn together quickly and easily.

Confident that there was a big future for the new technique, he formed the "Saunders' Patent Launch Building Syndicate", and before long boats with sewn plywood hulls were leaving the Springfield Works in considerable numbers. One, built in 1895, was the launch *Consuta* and the durability of the sewn method of construction - also known as 'Consuta' - is shown by the fact that this boat was still being used 55 years later to carry the B.B.C. television camera team which followed the Oxford and Cambridge crews in the University boat race.

It was clear that 'Consuta' had applications far beyond the building of small launches. So, as Cowes in the Isle of Wight was fast establishing itself as the centre of British yachting at the turn of the century, Saunders opened a branch works there in 1901. Five years later his agreement with the Syndicate expired and, feeling that his inventive powers were restricted by the partnership, he did not renew it but started out on his own in a derelict works by the river Medina. He soon put the place in order and renamed it Columbine Yard. Then, in 1908, he converted his business into a private limited company under the name of S. E. Saunders Limited, with a capital of £5,000, in which the Wolseley Tool and Motor Car Company held a small interest. He became Chairman of the new concern, with his son H. S. Saunders¹ as a second Director.

These moves coincided with the opening of a great era in motorboat racing, and Saunders-built boats, with 'Consuta' hulls, soon proved that they could beat anything in their class. Typical were the 49ft. *Ursula* of 1909, which won the Coupe des Nations at Monaco for four years running, and *Maple*

¹ Original text has '..his son S. E. Saunders..' which doesn't seem to make sense, so probably 'Hubert Samuel Saunders', son of Sam Saunders.

Leaf IV, a multi-step hydroplane which regained the British International Trophy from America in 1912 and defended it successfully in the following year. Nor were the company's products restricted to the home market. A number of small fast gunboats were built for Turkey; other boats were produced to Saunders design in France, Italy and Germany.

ENTERING THE AIRCRAFT BUSINESS

As a sideline to this profitable and growing business, Sam Saunders began to take an interest in aviation, which was still very much an unknown quantity. He received a contract to build two gondolas to carry the engines of the first naval airship, then being completed at Barrow-in-Furness, and was soon working also with some of the private pioneers of flying. It was natural enough that they should have sought his aid, because a high strength-to-weight ratio was as essential to the aircraft of that period, with their unreliable low-powered engines, as it was to motor-boats. In addition, it seemed good sense to build water-based aircraft, as flights over open water were less hazardous than those over land, especially if they ended in a crash, which was by no means unusual.

Sir Hiram Maxim was one of the aircraft designers for whom early experimental work was done; but the first real success did not come until 1912. In that year Saunders was asked by T.O.M. (now Sir Thomas) Sopwith if he would make the hull for a small two-seat flying-boat which he hoped to exhibit in the 1913 Aero Show at Olympia, Saunders did so, and the complete 20ft. long hull, made from two layers of cedar planking sewn together by the 'Consuta' technique, weighed only 180 lb. On this beautiful hydroplane structure was mounted a simple biplane wing assembly, carrying the tail-booms and a 90 h.p. Austro-Daimler engine.

The completed aircraft was given the name Bat Boat, after a mythical flying machine described in Rudyard Kipling's book 'With the Night Mail'.

This was an uncomplimentary choice for such a graceful little flying-boat, but nobody seemed to worry about mere names in those days and even the Admiralty allowed its first airship to be called, ambiguously, the Mayfly. The airship didn't; the Bat Boat, on the other hand, was a success from the moment when it caught the eye of the First Lord of the Admiralty, Winston Churchill, at the Aero Show. It was used by the Royal Naval Air Service for some of the first experiments in bomb-dropping, using potatoes as "bombs"; but is remembered best for a less militant exploit.

Mortimer Singer, the American sewing machine millionaire, had offered a series of prizes to encourage Britain's struggling aircraft builders. One of these prizes, perhaps the most difficult to win, was £500 for the first all-British aeroplane able to make six "out and home" flights between two points on land and on water, not less than five miles apart, within a period of five hours, carrying a pilot and passenger - a degree of versatility never before considered.

It was the kind of challenge that appealed to the pioneers. "Tommy" Sopwith promptly fitted the Bat Boat with retractable wheels and replaced its original engine with a 100 h.p. Green to bring it into the all-British category. Flown by test pilot- Harry Hawker, the little aircraft began its attempt to win the prize on July 8th, 1915, hopping between a field near the present site of Hamble aerodrome and a buoy moored in the Solent.

To make his chore worthwhile, the official observer, Lt. Spenser Grey, decided to fly as passenger. It was as well that he did, because the wheels stolidly refused to drop under their own

weight when released after each take-off from water, prior to landing ashore. As a result, the "observer" had to stand up, put a leg over the side and kick them down in flight - an effort by no means lacking in hazard.

Fortunately, nobody in those days complained about official observers lending a hand, or foot, to competitors. So Hawker, Sopwith and the Bat Boat received their £500, and Saunders could feel proud that his sewn hull had played a major part in the venture.

Inspired, no doubt, by this achievement, Saunders became involved in the construction of several more flying-boats in 1913-14. One, named the Perry-Beadle was exhibited at the 1914 Aero Show. In some respects it resembled the original Curtiss flying-boat 1912, because its two propellers were driven through lengthy chains by a 60 h.p. E.N.V. engine housed in the bow of its sewn hull. Unfortunately, the lower wing was set so low that the trailing-edge was submerged when the boat was at rest on the water. The braking effect of this during taxi-ing, combined with the low power and inefficiency of the engine installation, gave the Perry-Beadle little chance of success. However, its designer, Perry Beadle, was so impressed by the quality of the hull that when he joined the White and Thompson company of Bognor shortly afterwards he used a 'Consuta' sewn monocoque fuselage in the tractor biplane land- plane which he designed for them. In 1915 the Admiralty ordered twelve of these aircraft for the R.N.A.S., whose officers bestowed on them the unflattering nickname of Bognor Bloater. Their best claim to fame is that they were probably the first aircraft in the world with a monocoque fuselage to go into production.

An earlier White and Thompson aircraft with a 'Consuta' fuselage was the flying-boat built for the 1914 Daily Mail Circuit of Britain race. Powered by a 120 h.p. Beardmore engine, it was a thoroughly workmanlike machine, very like the contemporary Curtiss designs, and might have done well in the race. Instead, it went into military service, for all sporting events were cancelled on the outbreak of war in August 1914 and the little flying-boat was taken over by the Admiralty. They must have liked it, because they ordered at least eight more similar machines, followed throughout the next four years by later flying-boats from the same company.

By the time the war started, therefore, S. E. Saunders Limited, had achieved outstanding success with its boats and modest success with the Bat Boat and White and Thompson flying-boats, for which it had supplied only the hulls. As it had built several small gunboats and had secured an important contract for lifeboats from the Royal National Lifeboat Institution, it might have been expected to concentrate on the production of naval craft for the duration of the war. In fact, although the Admiralty planned initially to use the company's resources to build coastal motor-boats, it was decided eventually that the needs of the country would best be served if its experience of high-speed hull design was devoted to the production of flying-boats and other aircraft.

For better or worse, S. E. Saunders Limited was in the aviation business to stay, and the changeover from boat-building to aircraft construction was complete before the end of 1915, except for the continued production of lifeboats for the R.N.L.I.

AIRCRAFT FOR WAR, 1914-18

The news that aircraft were to claim most of his attention for as long as the fighting lasted could not have been wholly welcome to Sam Saunders. His reputation and craftsmanship as a boat-builder

had earned him the first Admiralty order for a motor-boat and a Royal Warrant as launch-builder to His Majesty the King. Now, his contracts for coastal craft were taken away and given to other companies, and he guessed, with justification, that they would not come back when peace returned.

Despite these qualms, he flung himself whole-heartedly into the aircraft production business. He received his first sub-contract for floats for Short seaplanes within a few days of the declaration of war. Unimpressed by their lines, the company set to work to design some better floats and had the satisfaction of receiving an amended subcontract for these.

Manufacture of complete aircraft began when A. V. Roe and Company awarded Saunders a contract for 50 Avro 504A trainers in June 1915. Almost simultaneously, the Admiralty ordered 30 Short 184 seaplanes at a cost of £81,000. To cope with this work, a large erecting shop had to be built, and this was completed by the time the components for the first batch of seaplanes were ready for assembly.

Follow-on orders led to a total production of 201 Avros and 80 Short 184s; and work began in 1916 on a batch of 24 Norman Thompson (formerly White and Thompson) N.T.2B two-seat single-engined flying-boat trainers.

The company was also given a certain amount of experimental work. In particular, it assisted Cdr. John Porte in developing the fine "F" Class of twin-engined maritime patrol flying-boats from the original Curtiss designs, building prototype hulls. Possibly as a result of this, coupled with the company's unrivalled experience of building high-speed hulls, the Air Board proposed in 1917 that Saunders should build complete F.2A flying-boats. This required a further major expansion of the company's works, because the F.2A was a large aircraft for that period with a span of 95ft. 7in. and loaded weight of 11,000 lb. As a result the works soon extended on both sides of the river Medina, with smaller workshops scattered throughout the district and a rudimentary airfield at Medina Mills, near Cowes, at which the Avros were erected and flown.

One hundred F.2As were constructed, and work was under way on 50 of the later F.5s with 'Consuta' hulls when the Armistice was signed on November 11th, 1918. But such figures give only an incomplete picture of the company's war effort, because it also built large numbers of spare hulls, seaplane floats and general spares. Over 10,000 sq.ft. of aircraft 'Consuta' plywood was produced, the major part of it for the big flying-boats after their original hulls had proved unable to stand up to the wear and tear of active service.

Like every company in the aircraft industry, S. E. Saunders Limited was hard hit by the cancellation of contracts for military aircraft after the Armistice. Its works was filled with partly-completed "F" boats for which it held contracts worth over £650,000, and it seemed highly unlikely that anybody would ever want these. However, the future was not so black as it appeared. The Air Ministry let the contract for F.2As run for several more months and later decided to take a number of F.5s out of store and put them into service as the R.A.F.'s standard flying-boat. Saunders received frequent contracts for reconditioning these aircraft and for spares to keep them serviceable. Other contracts for spares for D.H.9A day-bombers came in at about the same time, tiding the company over the difficult post-war years when so many other wartime aircraft factories had to close or switch to different work.

Practically all the profits earned by the company during the war had been ploughed into land, buildings and plant for aircraft production. In addition, the demand for 'Corsuta' had justified the erection and equipping of a £53,000 factory of over 85,000 sq.ft., known as the Osborne Plywood Works, in which to manufacture it.

Useful as they were, the Air Ministry contracts were not sufficient to keep the company going, and Sam Saunders decided to make an all-out effort to get back into the market for high-performance motor-boats, with considerable success. Maple Leaf V, a 40-ft. boat powered by four 400 hp. Sunbeam engines, set up a sea speed record of 66.2 m.p.h. over one mile in 1920. Ardenrun I, a 20-ft. boat with a 70 h.p. Wolseley engine, proved the fastest 3-litre class racer of the 1923 season, and her smaller sister, the 17-ft. Ardenrun II won the 100-km. race in the 1½ -litre class at Cannes in the following year.

Famous sporting owners began to come once more to the company for their boats; Betty Carstairs won the Duke of York's Trophy on the Thames in the Saunders built 1 litre hydroplane and later bought two more small racing boats and a 71ft. 6in. multi-step hydroplane of 50 registered tons. Hubert Scott-Paine and Gordon Selfridge were among customers for the Puma class express launch which had a top speed of 45 m.p.h. and could be used also for racing.

Lessons learned with such boats were applied to the design of working craft like the 40-ft. torpedo recovery launch Lulworth, built in 1925 for the Whitehead Torpedo Company, and the lifeboats which continued to offer valuable regular work.

THE FIRST SAUNDERS-DESIGNED AIRCRAFT

This was all very good; but S. E. Saunders Limited was too deeply involved in the aviation business to revert to boat-building entirely. Nor did there seem to be any point in simply subcontracting other peoples' aeroplanes and as early as 1917 the company had begun to produce machines of its own design.

The first was a perfectly conventional two-seat biplane designated the T.1., after its designer H. H. Thomas. As might be expected, the fuselage was a 'Consuta' plywood monocoque, without metal fittings or internal bracing wires. Full dual controls were fitted to the prototype, but drawings show that it was intended to be a combat aircraft with a fixed gun for the pilot and movable gun for the observer in the rear cockpit.

If the design looks a little ordinary this is understandable, for the Saunders design team consisted at the time of five men, two boys and a tracer, who worked in a tiny hut known as the "sardine tin" in the former shipyard.

The T.1 was intended to be powered by a 200 h.p. Hispano-Suiza engine, but all engines of this type were needed for S.E. 5A fighter production and Saunders had to fit instead a 150 h.p. Sunbeam Nubian. The prototype performed quite well with this. In fact there is a somewhat apocryphal story that it was taken up one day by an R.F.C. officer from Hamble who had never before piloted an aeroplane.

It seems that his girl friend in the A.I.D. Department had been reprimanded for some misdemeanour, which so annoyed him that he decided to "let off steam" in the air. After holding the

T.1 on the ground for an interminable take-off run, he is said to have shot up almost vertically and performed every manoeuvre then known before landing and retiring for two months in hospital with nervous collapse.

When H. H. Thomas died in the 1919 'flu epidemic, further development of the T.1 was abandoned and the company returned to its old love, the flying-boat. It began by designing and building a "hollo-bottom" hull for an F.5 in an effort to improve the aircraft's water performance; but the best opportunity for making real headway seemed to be to produce an aircraft of original design and enter it for the Air Ministry competitions for civil transport aircraft, which were to be held at Martlesham Heath in September, 1920.

The result was the Kittiwake amphibian, built almost entirely of 'Consuta' at a cost of over £10,000. It was not really handsome, but incorporated ideas which made it the most advanced water-based aircraft of its day.

An important innovation was a variable-camber wing, in which the entire leading and trailing edges could be drooped to increase lift and so reduce take-off run and landing speed - a feature reinvented in recent years for high-speed jet aircraft. It required the use of interplane ailerons, and the two 200 h.p. A.B.C. Wasp engines were also mounted between the wings.

The hull was a three-storey affair, made up of a boat hull which was attached to the superstructure in such a way that it could be replaced easily if damaged. Immediately above this, at the front, was an enclosed cabin for the crew of two, with a further cabin for six passengers above and behind. This arrangement gave the passengers a unique forward field of vision and catered well for the terms of the Air Ministry competitions, which were to "promote safety, comfort and security in civilian aeroplanes".

Flown by Capt. Norman Macmillan, the Kittiwake showed great promise on its first flight, rising from the water quite quickly and handling well in the air. Unfortunately, when alighting on the water near the shore at Gurnard, it ran on to some submerged obstacle which crushed the bottom of the hull. There was no time in which to repair the damage before the opening date of the competition and all hope of winning the prize to recoup the cost of building the aircraft disappeared. Despite this, Saunders restored it to an airworthy condition and many test flights were made subsequently by F. Watton Merriam. These proved conclusively the effectiveness of the variable-camber gear in shortening the take-off run despite the comparatively high power loading of 15.5 lb./h.p.

Although the accident to the Kittiwake was a major setback, the Saunders company still had a stake in the Air Ministry competitions, for the Vickers Viking which carried off the first prize of £10,000 in the amphibian class had a 'Consuta' hull. So had the big Vickers Valentia twin-engined flying-boat which was intended as a replacement for the F.5, but did not go into production.

POST-WAR FINANCIAL PROBLEMS

The link between Saunders and Vickers was even closer than this implies, for since 1918 the latter company had held an important interest in S. E. Saunders Limited. Three representatives of Vickers had been appointed to the Board and one of them, Sir Arthur Trevor Dawson, had been elected Chairman. This brought useful contracts to the works at Cowes at a time when they were particularly needed, but by no means solved all the financial problems.

Like most aircraft manufacturers of the time, Saunders was being financed entirely by accumulated wartime profits and by sums subsequently payable to the government as excess profits tax. No new capital had been introduced during the war, and it was clear that a considerable sum would be needed eventually to put the company firmly on its feet. Vickers' Finance Committee did not wish to contribute additional capital. So it was agreed early in 1921 that Sam Saunders should buy out the Vickers and Wolseley interests, and the company was again a family business.

Orders continued to come in fairly steadily, but were not sufficient to keep the whole works in full employment. A 1925 scheme for reorganisation, in which Swan, Hunter and Sigham Richardson Limited and William Beardmore Limited would have taken a financial interest in the aircraft side of the company's work, fell through; but it was clear that a move of this kind could not be long delayed.

Meanwhile a proper aircraft design department had been set up at Cowes in 1923, and was rewarded with an Air Ministry contract for a large reconnaissance flying-boat in October of the following year. Known as the A3 Valkyrie, this was a handsome all-wooden biplane, powered by three 650 h.p. Rolls-Royce Condor engines and with an all-up weight of 26,600 lb. Bunks and living quarters for the five-man crew were provided inside the spacious hull, and the full comfort of these was appreciated when the Valkyrie set out on a 9,400 mile Baltic cruise on August 12th, 1927, as part of an R.A.F. mixed flight of prototype boats. Its companions on the long journey were a Blackburn Iris, Short Singapore and Supermarine Southampton, with which it had been in competition for a large Air Ministry contract, and there was little doubt that it could hold its own with these aircraft so far as performance was concerned. However, the Air Ministry had decided by then to order only metal-hulled flying-boats for the R.A.F. and no more Valkyries were built.

Another prototype of this era was the A4 Medina, completed in 1926 as a potential commercial flying-boat for Imperial Airways. This, too, was an all-wood biplane, considerably smaller than the Valkyrie, with a span of 58ft. and loaded weight of 11,560 lb. Powered by two 450 h.p. Bristol Jupiter engines, it was designed to carry a crew of two and six passengers in a high degree of comfort for 360 miles at 90 m.p.h.

The company was no more successful in getting a production order for the Medina than it had been in the case of the Kittiwake and Valkyrie. Even more disconcerting was the knowledge that the day of the wooden-hulled flying-boats was over and with it the major application of 'Consuta' to aircraft production.

Saunders knew that the experience gained in nearly 100 years of boat design could be as valuable in the design of the newly popular stressed skin metal hulls as for the wooden type. Unfortunately, a switch to metal construction would demand still more capital for new equipment. There seemed some hopes that the old links with Vickers might be reforged, as this company planned in 1928 to reconstitute its aircraft activities as a separate subsidiary, which would obviously be a very powerful unit of the aircraft industry. However, the terms offered were unacceptable to Saunders and the badly needed finance came eventually from an entirely different source.

ENTER SIR ALLIOTT

In brief, what happened was that S. E. Saunders Limited was taken over in 1928 by Sir Alliott Verdon Roe, John Lord and H. E. Broadsmith. They subscribed £42,500, to which was soon added further large sums from the Aircraft Investment Corporation, Whitehall Securities Corporation, Sir Alliott and his associates and Leslie Irvin, the great parachute pioneer to whom the company had supplied parachute boxes.

The company was renamed Saunders-Roe Limited, and with this change the last vestige of the old family business disappeared; in its place was an organisation strong enough to weather the financial ups and downs of the late 1920's and early 1930's. It needed to be strong, for by 1932 the accumulated losses exceeded issued capital. But three years later the whole financial position changed with the start of the government's massive rearmament programme, and for a quarter of a century after that there was never to be a time when the company did not hold large official contracts.

It is interesting here to record something of the abilities of the men who now controlled the company. At the top was Sir Alliott Verdon-Roe, greatest of Britain's early pioneers, newly-knighted for his first brief flights at Brooklands in 1908, and creator of the famous Avro company which he had recently sold out to John Siddeley (later Lord Kenilworth). Almost unrivalled as an inventive genius, modest to the nth degree, and convinced that the entire monetary system must be wrong that allowed good companies to founder through financial difficulties, he was not a person to concern himself with the day-to-day world of high finance. So the man who kept the wheels turning was John Lord, the superb businessman.

Matching Lord's administrative ability was the design skill of Henry Knowler, Chief Designer since 1923 and one of the outstanding flying-boat engineers of the world. It was his task to show that Saunders-Roe (usually abbreviated to "Saro") could build as good aircraft in metal as S. E. Saunders Limited had built in wood, and he began by designing a metal hull to which were fitted the wings of a Supermarine Southampton. This hull, designated A14, was quite different from those fitted to other contemporary flying-boats. It was rather slab-sided and the skin was integrally stiffened by corrugations. Nobody would have claimed that it looked as beautiful as a smoothly-rounded hull, but it proved highly-efficient on the water and in the air, and became the prototype for the hulls of most of the Saro water-based aircraft of the next decade.

During those years the company's aircraft work gradually assumed larger proportions, and boat-building diminished; but the boats that did take the water from the slipway at Cowes were still world-beaters. In 1929 Lord Wakefield sponsored the boat in which Sir Henry Segrave planned to attack the water speed record. Powered by two 1,750 h.p. Rolls-Royce engines and named Miss England II, she was launched on June 5th, 1930, only six months after Saro began her construction. After two test runs on June 15th, Sir Henry attempted a full-throttle run, during which he was estimated to have reached 120 m.p.h. Unhappily, towards the end of this run the boat struck a submerged log and both Sir Henry and his mechanic were killed.

The average of 96.2 m.p.h. set up in the first two runs was a new world record. Nor did the accident mark the end of Miss England's career, for she was repaired and, raced by Kaye Don, raised

the speed record first to 103.4 m.p.h. at Buenos Aires and then to 110.2 m.p.h. on Lake Garda in Italy in 1931.

Five years later, Saro built another high-speed boat, named the Bluebird, for Sir Malcolm Campbell. By then the record stood at 124.8 m.p.h., set up by Miss America X, a boat of 7,000 h.p. Bluebird's single Rolls-Royce engine developed only about 2,000 h.p., yet she raised the record first to 126.3 m.p.h. and then, in 1938, to 130.9 m.p.h.

Going back now to 1928, it is somewhat surprising to discover that the first complete metal aeroplane of Saro design to fly was not a flying-boat, but a single-seat multi-gun fighter biplane designated the A10. Powered by a 470 h.p. Rolls-Royce F engine, with a tunnel radiator, it was a clean and businesslike little machine, with a span of 32ft. and all-up weight of only 3,726 lb.

Preceding it in initial design, but not flown until 1930, was an aircraft more in the Saro tradition - the A7 three-engined military biplane flying-boat. Designed to an Air Ministry specification and known usually as the Severn, for obvious reasons, it was smaller all round than the Valkyrie, with three 485 h.p. Bristol Jupiter engines and a metal hull of the kind first seen on the A14 "metal Southampton".

With a span of 88ft. and all-up weight of 22,000 lb., the Severn was intended as a possible intermediate type between the standard twin and three-engined flying-boats then in service with the Royal Air Force, and was put through a gruelling official test programme. This concluded with a 12-day cruise from England to Port Sudan and back, during which a total of 8,324 miles was covered in 90 flying hours. On seven of the days stages of more than 655 miles were flown, and lengthy stops were made in some places for trials under specific local and tropical conditions.

At Algiers the Severn successfully rode out a gale of intense severity. She then ended the cruise with a magnificent non-stop last stage of 1,230 miles from Gibraltar to Plymouth in 13 hr. 40 min. To demonstrate further the ample power reserve and safety factor inherent in the design, the final two hours were flown with one engine shut down, and Saro must have felt that such a flight would be sufficient to produce at last a production order for one of the company's own designs. But it was not to be and the Severn, too, remained but a promising prototype.

FAMILY OF FLYING-BOATS

Although they could not have known it, success was quite near. It followed the decision to produce a series of small metal flying-boats and amphibians, which broke new ground in that they were cantilever mono-planes with their engines mounted high above the wing, clear of spray during take-off and landing.

First to fly in 1929 was the A17 Cutty Sark, a four-seater which began as a flying-boat with two 105 h.p. Cirrus Hermes engines. The prototype had wooden wings and a smooth-skin metal hull, but subsequent Cutty Sarks had integrally-stiffened skin with external corrugations. Some were flying-boats, other amphibians with semi-retractable wheels on each side of the fuselage under the wing. What is more, the position of the engines made it possible to fit almost any kind of power plant the customer specified, with the result that, although only 12 Cutty Sarks were built, they flew at various times with 200 h.p. and 215 h.p. Armstrong-Siddeley Genet Major, 98 h.p. Gipsy I and 120 h.p. Gipsy 2 engines, and probably others as well.

Two Cutty Sark went to Air Service Training, where they put in some fine work as flying and navigation trainers for airline crews. Others went as far afield as China, the Royal Singapore Flying Club and Santo Domingo.

Their success was paralleled by the eight-seat A19 Cloud, which followed in 1930 and was built on exactly the same lines, but with twice the power. It, too, was produced in both flying-boat and amphibian form, and with a variety of engines. Most usual were the Wright Whirlwind or Armstrong-Siddeley Serval (Double Mongoose), each of 340 h.p., but one Cloud amphibian, sold to Mr. Bata, the Czech shoe manufacturer, had two 380 h.p. Walter Pollux engines and another was flown with 340 h.p. Napier Rapiers.

Altogether 22 Clouds were built. Of these, four went to civilian customers including the Hon. A. E. Guinness, and one was fitted experimentally with a Monospar wing. The remainder (built under the designation A29, with Serval engines) were used by the Royal Air Force for the instruction of flying-boat pilots before they passed on to bigger boats such as the Southampton, and as "flying classrooms" for navigation training. They were ideal for this work, as the roomy cabin offered plenty of space for chart tables and equipment; added to which the high-wing layout ensured a good view of the ground or water below. Unlike most water-based service aircraft of its time, the Cloud even brought its pilots the comfort of an enclosed cabin.

Third member of the team was the four/six-seat A21 Windhover, which came mid-way between the Cutty Sark and Cloud in size. Unlike the others, it had three engines and this added complexity may have scared away prospective customers, for only two Windhovers were built. There must have seemed to be more at the time, for these two machines flew in both flying-boat and amphibian form, with various engines, including the Gipsy and Serval. What is more, they were supplied with a small auxiliary wing, which could be fitted above the engines to give improved lift, and were seen with or without this almost on alternate days, according to the whim of their owners.

While these little flying-boats and amphibians were in production, Saunders-Roe were also building under sub-contract aircraft designed by other companies. First, and most important numerically, was the Blackburn Bluebird IV all-metal two-seat light plane, of which at least 55 were turned out at Cowes between the end of 1929 and May 1931, leaving the parent company free to cope with its military commitments.

Many of the Bluebirds were used for training, 25 going to National Flying Services at Harworth alone. Others were flown by great pilots of the 1930's, but none achieved greater fame than G.-ABDS, supplied to the Hon. Mrs. Victor Bruce. With only 40 hours of solo flying in her log book, this gallant lady set out from Croydon in July 1930 to attempt the first solo flight around the globe - on a 120 h.p. Gipsy II engine. She followed the airline route to Karachi and Rangoon, then carried on to Shanghai and made a superb 600-mile flight across the Yellow Sea to Seoul in Korea. After flying on to Tokyo, she made the ocean crossing to Vancouver by ship, then piloted herself across North America to New York, where she boarded a second ship to Le Havre. When she flew in to Croydon on February 20th, 1931, almost every airworthy Bluebird in the country was there to meet her.

Simultaneously with this work for Blackburn, Saunders-Roe undertook the detail design and construction of a highly-advanced four-seat touring aircraft conceived by Sir Henry Segrave, who had been a fighter pilot in the 1914-18 war. Known as the Saro-Segrave A22 Meteor, the prototype was

of all-wooden construction and was beautifully-streamlined, with a cantilever low wing into which the 120 h.p. Gipsy III engines were neatly faired. In a biplane age, it was a revolutionary design, and bore comparison with aircraft produced many years later, except for its fixed undercarriage. Nor did it just look pleasant, for it was designed to be capable of flying on one engine and to combine a maximum speed of 145 m.p.h. with a low and safe landing speed.

Only the prototype was built by Saunders-Roe, production being taken over by the Blackburn company, who changed the fuselage from wooden to metal construction. After only three more had been built, Sir Henry Segrave was killed and, as Blackburn were by then very much involved with military orders, further production of the Meteor was abandoned.

IN THE AIRLINE BUSINESS

Not long after this first venture in the construction of a passenger-carrying landplane, the company found itself in the air transport business. The story of how this came about begins in February 1931, when Spartan Aircraft Limited, manufacturers of the Arrow three-seat light plane, moved over to Cowes from the Mainland. Before long its Board was strengthened by the addition of Sir Alliott Verdon-Roe and some of his fellow Saro Directors, and when Spartan designed a three-engined monoplane for economical long-range mail-carrying, the prototype was built by Saunders-Roe.

It was of all-wooden construction and had three 120 h.p. Gipsy III engines, which gave it a top speed of 122 m.p.h. and endurance of six hours at 105 m.p.h. Impressed by its possibilities, Saunders-Roe re-designed it with a metal fuselage, equipped to carry a crew of two and seven passengers in comfort, and named the result the Spartan Cruiser.

Only one Cruiser Mark 1 was built, with 120 h.p. Gipsy III engines, after which the design was cleaned up and put into production as the Cruise II, with alternative 135 h.p. Gipsy Majors or 120/130 h.p. Hermes IVs. Cruising speed with the Gipsy Majors was 118 m.p.h. and the aircraft could maintain height on any two of them. Furthermore, it was so economical that the company decided it would be worthwhile forming an airline to cash in on the money-making capabilities of its latest product.

As a result, although Cruisers were sold to the Yugoslav airline Aeroput, the Bata company of Czechoslovakia and customers in Egypt and India, most of the dozen Mk.IIs produced went into service with Spartan Air Lines. In conjunction with Railway Air Services, this Saro-controlled company operated scheduled return services between Heston, Bembridge and Cowes two or three times a day, with fine regularity and at incredibly low fares until it became part of the British Airways combine in 1935. Even tho, the Cruisers continued to be used by British Airways, as far afield as the Scottish islands and Highlands.

One further version, the Cruiser Mk.II, appeared with more streamlined fuselage, "trouserred" undercarriage and other refinements but only three of these were built before Spartan Aircraft ceased operations in the mid-thirties.

START OF R.A.F. EXPANSION

While all this was happening, Saunders-Roe was getting itself established at last as a designer of military aircraft. As well as Cloud amphibian trainers for the R.A.F., it had sold some Gipsy Major powered Cutty Sark's overseas for coastal reconnaissance duties, with a Vickers machine-gun mounted in the bow cockpit and racks for eight 20 lb. bombs.

Even more important, it had received an Air Ministry contract to build a prototype twin-engined general-reconnaissance flying-boat to Specification R24/31. First flown in 1934, under the company designation A27, this aircraft was a sturdy biplane of all-metal construction, with a two-step hull on the same general lines as that of the Cloud and powered by two 775 h.p. Bristol Pegasus III engines. It carried a crew of six and was armed with three machine-guns in the bows and amidships, plus racks for 2,000 lb. of bombs or depth charges.

This time there was no disappointment, for the Air Ministry ordered the A27 into immediate quantity production as the London. Altogether 48 were delivered between the Summer of 1936 and May 1938. Of these the first ten were London Mk.I's, with Pegasus III engines in polygonal cowlings. Following successful modification of the prototype to specification R3/35, the rest were London Mk.II's, with 1,000 h.p. Pegasus I engines in circular cowlings.

First Squadron to receive Londons, as replacements for its Southampton's, was No. 204 at Mount Batten; and they eventually went into service also with Nos. 201 and 240 Squadrons at home and No. 202 in Malta and Gibraltar. They proved extremely popular with their crews, and in 1937 No. 204 Squadron was chosen to make a long-distance cruise across half the globe to represent the R.A.F. at celebrations to mark the 150th anniversary of the founding of the State of New South Wales.

Five Londons were specially-modified for the flight, with a large external fuel tank mounted above their hull, aft of the Cockpit, to increase their range from the normal 1,100 - 1,740 miles to 2,600 miles. They set out in December 1937 and returned five months and 30,000 miles later to report that the trip had been "without incident".

THREE SEPARATE COMPANIES

To provide adequate space for assembly of the Londons, Saunders-Roe began its own programme of expansion and reorganisation in 1935. As a start, it awarded Boulton & Paul Limited a contract to build a new erecting shop at Cowes, with a clear floor area of 150 x 200 ft. and height of 40ft. in the main shed. Under the same massive roof were to be housed the dope and covering shops, sheet metal department, sewing and metal wing assembly departments, a three-storey office block, the Aeronautical Inspection bureau, finished parts and free issue stores, lecture and schoolroom, mould loft, parachute packing room and chief pilot's office and kit room. A slipway was provided "to a design which had in view its future use by flying-boats having a weight of 50 tons". Little did the architect know that one day a 140-ton flying-boat would take shape in that erecting shop by the river, and that its designers would have cause to be grateful that he had planned the building on such a mighty scale.

Other expansion followed rapidly. For a brief period in 1936-37, a workshop at Luton was managed for the company by the Adamant Engineering Company for the manufacture of flying-boat

components; but this was not successful and in 1937 the Luton works was superseded by a small factory established in buildings at Southampton Airport, Eastleigh.

Also in 1937, Saunders Shipyard Limited was formed as an associate company of Saunders-Roe Limited to handle the company's boat-building activities, centred in the Cornubia Yard half-a-mile up-river from the aircraft works. This conformed with the latest ideas on company management, and it was decided that the rapidly-growing plywood business would also develop more satisfactorily as a separate company. So, early in 1938, Saro Laminated Wood Products Limited came into being at Folly Works (named after the nearby Folly Inn) where the earlier production of 'Consuta' had been followed by manufacture on a vast scale of everything from flush doors for ocean liners and hospitals to panelling for railway carriages, roofs for trolley buses and cubicles for swimming baths. New processes like resin-impregnation and compression of plywood to produce "tailor-made" panels and pre-formed shapes were also developed during the 1930s and with these the wheel turned full circle, for by 1939 Saro Laminated Wood Products were again producing nearly 40% of all aircraft plywood made in the United Kingdom.

Free to concentrate on aircraft, now that boat-building and plywood were no longer among its responsibilities, the parent company devoted its efforts to evolving a replacement for the London. First it submitted a design to meet the requirements of Specification R2/33, which called for a four-engined monoplane flying-boat to replace the large biplanes then in service. It received a contract for one prototype, at a cost of £68,000, in competition with Short Brothers, and set to work building the aircraft early in 1936.

Designated A33, the new boat was to be different from anything the company had tackled before. quite apart from its great size and weight of 41,500 lb., it was to feature a Monospar Wing and to make use of stub-wing stabilising surfaces instead of the usual wing-floats. Both of these innovations were given a thorough testing on a modified Cloud before being incorporated in the prototype and Saunders-Roe had every reason to look forward with confidence to the flight tests of the A33. Unfortunately, as it was taxing out for take-off on October 25th, 1938, it hit the wake of a passing ship with such violence that the starboard wing suffered a structural failure and twisted out of shape.

All further work on the A33 was dropped and the future again began to look gloomy, with little prospect of production work after the last London had been delivered. A programme of sub-contracting was undertaken, to keep the shops busy so far as possible, and the company decided to begin the design of a monoplane replacement for the London, as a private venture, to Specification R1/36.

Somewhat unexpectedly, the Air Ministry announced in December 1936 that it intended to order between 11 and 21 of the new R1/36 flying-boats "off the drawing board" under the name of Lerwick, and the contract for these aircraft was signed in July 1937. This was somewhat embarrassing, as the work had to be delayed while the company cleared up £30,000 worth of sub-contracting.

The first Lerwick (Saro Type S36) flew in 1938 and looked rather like a tubby twin-engined Sunderland. Powered by two 1,375 h.p. Bristol Hercules II engines, it carried a crew of six and 2,000

lb. of bombs. Defensive armament comprised one machine-gun in a nose-turret, two in a dorsal turret and four in a tail turret.

All seemed set for another good production run; but the Lerwick failed to live up to its promise. The Air Ministry allowed the 21 aircraft covered by the original order to be completed, but cancelled a follow-on order for 31.

Faced by yet another set-back, Saunders-Roe decides to try its hand at producing a very large commercial flying-boat. The prospects for such a machine seemed excellent, because Britain's national airline, Imperial Airways, was using a fleet of 40,500/48,000 lb. Short "C" class flying-boats exclusively on its Empire routes, with such success that it would almost certainly be in the market for a larger flying-boat to replace the "C" class in due course.

Calculations showed that an all-up weight of about 184,000 lb. would be the limit possible with four of the most powerful engines then envisaged. So it was decided to accept this weight as the basis for the aircraft, which was to be fitted with a pressurised cabin, to make possible a cruising speed of 250 m.p.h. at 25,000ft.

As In the case of the A33, features of the design were tried out on the water and in the air tin, a scaled-down form. This time, however, the research vehicle was not just a modified Cloud, but a perfect one-third scale piloted "model" of the projected aircraft. Designated S37, but known usually as the Shrimp this little machine flew for the first time in September 1939. With its neatly-streamlined metal hull and four 95 h.p. Pebjoy Niagara engines, mounted on a cantilever wooden wing, it looked so like a big transport flying-boat from a distance that it was difficult to appreciate that it spanned only 50ft. and carried only two persons.

If it had been able to continue its research flying in peace, the whole pattern of world air transport might have been different today; but the month in which it flew was also the month in which Britain again went to war against Germany. During that war long concrete runways for bombers were to be laid down in every corner of the globe, and big landplanes were to be developed in the United States for service as military transports. Although it was not appreciated for many years, these two developments between them ended forever the reign of the large flying-boat airliner.

SARO IN WORLD WAR II

When World War II began, on September 3rd, 1939, the only Saro-built aircraft in service with the Royal Air Force were 28 Londons and two Lerwicks of Coastal Command. Two of the Londons were actually on patrol over the North Sea at the moment war was declared and the type remained in use by No. 202 Squadron at Gibraltar until 1941. The first full Lerwick Squadron, No. 209, was formed at Oban, Scotland, in 1940 and operated these aircraft only until 1941, when it re-equipped with Catalina's. Other Lerwicks were used by No. 4 O.T.U. at Invergordon and No. 422 (Canadian) Squadron for training; but by 1942 the type was declared obsolete. It was as well that the employees of Saunders-Roe were unaware then that no Saro fixed-wing aeroplane would ever again serve with the Royal Air Force - or, for that matter, with any other air force or airline.

The major part of the company's wartime productive effort was devoted to the manufacture of Supermarine Walrus Mk.II and Sea Otter air/sea rescue amphibians for the R.A.F. The first contract

for 25 Walruses was dated January 25th, 1940, and specified a purchase price of £10,500 for each aircraft, including £500 profit. Further contracts for 100 and 210 Walruses followed in July and August 1940 respectively, by which time it was clear that the company would lose about £75,000 on the deal unless the price per aircraft was raised. This led to a repetition of the financial haggling that had punctuated the London production programme in the mid-30's and had plagued most other manufacturers since the R.A.F. expansion programme began. However, it was not allowed to hold up the work and 453 Walruses were delivered by Saunders-Roe up to mid-January 1944 from the main factory at Cowes and a dispersal factory at Weybridge, Surrey, both of which were fed with components from Eastleigh. The Walruses were followed by 209 Sea Otters, built between mid-1943 and July 1946, and many pilots owed their lives to these amphibians.

Air/sea rescue sorties often involved flying within sight of the enemy coast and alighting in mine filled waters to pick up a ditched airman from his rubber dinghy. Inevitably it resulted in the loss of some Walruses and Sea Otters to enemy fighters; but the achievements of the others made up for this and Saunders-Roe had good reason to feel satisfied with their wartime task, although the aircraft produced were less glamorous and less publicised than fighters or bombers.

In addition to new production, a total of 435 damaged aircraft were repaired and returned to service, and 336 American-built Catalina amphibians were equipped with ASV radar and other devices to suit them for their role in the war at sea.

Much of this work was done in a new factory which the company built on the shores of the Menai Straits, near Beaumaris in Anglesey. There, too, was done wind-tunnel testing and design work on the R14/40 long- range military patrol and reconnaissance flying-boat. Both Short Brothers and Saunders-Roe submitted designs to meet this specification, only to be told that a prototype contract would not be awarded unless the two companies worked together on the project. Despite the obvious disadvantages in this, the terms were accepted and the Ministry of Aircraft Production then ordered two prototypes.

Saunders-Roe was made responsible for design and manufacture of the component parts of the wings, including the flaps, ailerons, engine mountings and wing-tip floats. The remainder of the work, including assembly and flight testing, was the responsibility of Short Brothers. Both prototypes were eventually completed and flown, the first being a 120,000 lb. military boat and the second an embryo civil transport version; but there the project rested.

BEGINNING AFRESH

When the war ended in 1945, the future of the company looked no more assured than it had done in 1919, and the first task was to reorganise on a peacetime basis what had become a widely-dispersed collection of factories engaged on an immense variety of work, much of it with little application to peacetime needs.

As a start, many of the dispersed units were closed and aircraft work was re-grouped in two main centres, in the Isle of Wight and at Eastleigh.

Beaumaris works was taken over by Saunders Shipyard Limited, whose Cornubia Yard at Cowes had been destroyed in a bombing raid in May 1942, together with the Solent works on the opposite bank of the river from the main aircraft factory. To indicate better the widening scope of the

Shipyard company's activities, its name was changed first to Saunders Engineering and Shipyard Limited and then in January 1951, to Saunders-Roe (Anglesey) Limited.

Boat-building continued to form a major part of its work at Beaumaris, and the company soon established itself as one of the major design and construction units for small naval craft in the country. One of its earliest post-war contracts was for the first aluminium-alloy motor torpedo boat for the Royal Navy. Launched early in 1948, this boat (MTB.1602) had three Packard engines developing a total of 3,750 h.p. and reached a speed of 42 knots on trials.

As a result of experience gained with MTB.1602, Saunders-Roe (Anglesey) was entrusted with the design of the "Dark" class of fast patrol boats for the Royal Navy, and supplied boats of this type also to Burma, Finland and Japan. Contracts for inshore minesweepers followed in 1954-55 and other boats launched down the new slipway ranged from 18ft. glass-fibre dinghies for the R.A.F. to the 72ft. yacht Morag Mhor, the construction of which represented the first large-scale marine application of the Argon aluminium-alloy welding process in Britain.

Substantial numbers of aluminium airborne lifeboats for airdropping from Coastal Command Shackleton aircraft were also produced at Beaumaris, together with over 1,500 bus bodies, some of the world's largest tanker lorries for fuel and high test peroxide, stabilisers for small ships, equipment for the U.K. Atomic Energy Authority and control surfaces for high-speed military aircraft.

Similar versatility was displayed by Saro Laminated Wood Products. Faced with a decreased demand for plywood after the war, it began to concentrate again on flush doors and panelling, and also entered the new field of plastics. Many buildings were soon fitted with its Sarolite and Saropane translucent corrugated roofing sheets instead of glass windows, while the demand for Saroy thermoplastic sheet, for applications such as lining refrigerators, became so great by the beginning of 1960 that six machines were continuously extruding it for home and foreign markets.

As a further diversification of its interests, Saunders-Roe Limited formed in May 1958 a company named Saro Structures Limited to specialise in designing and building light alloy structures for civil engineering and other commercial applications. This was followed by the formation of Saro-Nuclear Enterprises, to operate in specialised fields of nuclear engineering, including nuclear irradiation and allied interest.

FASTEST AND BIGGEST AIRCRAFT

So, the little company that started beside the Thames at Streatley grew in 130 years into quite a giant, with interests ranging over fields of modern technology of which Moses Saunders could never have dreamed.

Remarkable and advanced as its aluminium welded boats, nuclear equipment and plastics might be, they are overshadowed by the post-war achievements of the main aircraft company.

Realising that research is the key to success in modern aviation, Saunders-Roe began to add to its test and development equipment as soon as the war ended. On the aerodynamics side, it built new wind and water tunnels. To speed the design of the high-performance water-based aircraft it believed would be needed in an age when land airfields are terribly vulnerable, it created hydrodynamic test facilities second-to-none in the world's aircraft industry. New hull form for high-

speed craft and flying-boats have been conceived in the 618ft. long No. 1 towing tank. Fully detailed dynamic models of almost every important new British aeroplane have been catapulted into another tank to test the landing characteristics of seaplanes and the ditching qualities of landplanes and helicopters.

First Saro aircraft to benefit from lessons learned in the new research facilities was the little SR.A1 of 1947. The versatility of a water-based aircraft was combined for the first time with the power of jet-propulsion to produce a new kind of fighting aircraft. With two Metrovick Beryl turbojets of only 3,750 lb. s.t. each, it could fly at over 500 m.p.h., and was by far the fastest marine aircraft ever seen up to that time. Its manoeuvrability and handling qualities were shown in a never-to-be-forgotten way at the 1948 S.B.A.C. Flying Display, when test pilot Geoffrey Tyson flew along the runway inverted, a few feet above the ground.

Only three SR.A1's were built, and even when the company showed that a supersonic flying-boat fighter was perfectly feasible no further official interest was shown.

From the fastest aircraft of its kind, Saunders-Roe next turned to the biggest. Even before the war ended, it was clear that the newly invented turboprop could make it possible; a flying-boat transport compared with which the 1939 project of 184,000 lb. and 250 m.p.h. was but a toy. Under the technical leadership of Sir Arthur Gouge, who had joined the company from Short Brothers in 1943, a completely-new flying-boat was projected, with turboprop power.

This initiative, was rewarded in July 1945, when Saunders-Roe was invited to tender for the construction of a very large flying-boat for possible use by B.O.A.C. Six months later B.O.A.C. informed, the Ministries of Supply and Civil Aviation that they were satisfied an order should be placed for three such machines, and in May 1946, Saunders-Roe were authorised to begin work on them. Originally they were to be powered by Rolls-Royce Tweed turboprops, but when development of this type of engine was abandoned the Bristol Proteus turboprop was chosen instead, the installation comprising ten engines, in four coupled pairs and two single units.

So, by 1947, after consideration of a project of 260,000 lb., the design of what became known as the Princess flying-boat was finalised as a 140-ton aeroplane with an estimated cruising speed of 385 m.p.h. at 30,000ft., carrying 205 passengers. The basic design was orthodox, but the airframe was the largest metal structure ever designed for an aeroplane up to that time, and this raised many problems. Indeed, construction might have been impossible but for the farsightedness of those who had planned the vast assembly hall at Cowes in 1936. Even this was not big enough to take a complete Princess, but little remained to be done after the prototype had been towed out on to the slipway, and it made its first flight on August 22nd, 1952.

Like the little SR.A1 before it, this mighty, majestic aircraft stole the show when it cruised over the airfield at Farnborough during the 1952 S.B.A.C. Display. Here was an aircraft to restore Britain's leadership on world air routes - the only airliner of its time which could make possible non-stop flights between New York and London.

Unfortunately, it never got a chance to do so. Early in 1951 B.O.A.C. said that it was fully committed to landplane operations and no longer had any requirement for the Princess. It was announced immediately that the three aircraft would be completed as long-range military transports

for the R.A.F. Then this was denied, and an official statement said that the second and third Princesses would be Cocooned and stored until more suitable engines were available to power them.

Despite persistent rumours that they would be used by an independent airline company, or would be modified to flight test America's first airborne atomic power plant, all three Princesses were still Cocooned in 1960, the first prototype having joined the others under a plastic skin, to await engines that will never come.

It was apparent by the mid-1950's that unless there was major change of heart, the flying-boat would gradually disappear from the aviation scene. Bitterly disappointed that both the SR.A1 and the Princess should have been spurned, Saunders-Roe gladly accepted a challenge to try something new.

To cope with high-performance bombers likely to enter service within a few years, the R.A.F. needed a fighter that would climb tremendously quickly to the bombers' ceiling and then give chase at supersonic speed. Only a rocket-engine could give the kind of performance needed, but it would burn up its propellants far too quickly if used throughout an interception sortie. So Saro decided to combine it with a powerful lightweight turbojet in a "mixed-power" unit fighter, and to use the rocket only for take-off, climb and combat. In charge of the project was Maurice Brennan, who had taken over as Chief Designer from Henry Knowler in 1952.

After the announcement in 1956 that de Havilland Holdings Limited had acquired a interest in the company, it was no surprise to learn that the new fighter designated the SR.53, would have a de Havilland Spectre rocket motor and an Armstrong Siddeley Viper turbojet. The first of the prototypes flew on May 16th, 1957, and proved tremendously impressive. It was underpowered when using the Viper alone; but the production version, designated SR.177 was known to combine its Spectre rocket with a lightweight and immensely-powerful de Havilland Gyron Junior turbojet, giving a top speed in the Mach 2 Class.

Once again nobody doubted at first that Saunders-Roe had produced a world-beater. But just before it flew the government announced in its now-notorious 1957 White Paper on Defence that the R.A.F. would get no more piloted interceptors after the English Electric Lightning, which has been ordered for Fighter Command.

There was still hope for the SR.177 as both the Admiralty and the West German Government were interested in it. But the Germans refused to have it unless the British Government bought it also and so shared the development costs, while the Admiralty could not afford it unless the Germans had it. The result of this vicious circle was the abandonment of the half-completed prototype of the 177, and when Saro test pilot John Booth was killed in a take-off accident in one of the two SR.53s, the whole project seemed to die with him. A few more flights were made with the other prototype, but these were merely to log the number of hours under the development contract.

The concept of a rocket-powered fighter had been overtaken by the rapid development of guided missiles for attack and defence; but Saunders-Roe was not outpaced by progress. A key item in Britain's defence plan at that time was the de Havilland Blue Streak, a mighty ballistic missile with

a performance far superior to that of its foreign counterparts. But Blue Streak would be a practical weapon only if a technique could be perfected for bringing its nuclear warhead back into the atmosphere over the target without burning up like a dying Sputnik.

Saunders-Roe was given the task of designing and building a single-stage liquid-propellant research rocket as the vehicle for developing and testing the warhead and other features of Blue Streak. This rocket received the code-name of Black Knight, and the public learned of its existence on the last day of the 1958 S.B.A.C. Display when it was announced that its first firing at the Woomera Rocket Range had been entirely successful. Equal success marked the four subsequent firings, which took Black Knight to a height of more than 500 miles - a record for a single-stage rocket and Britain's most significant space-age achievement to date.

From then on, Saunders-Roe's aircraft activities were restricted almost entirely to helicopter development and production. Its Helicopter Division had been formed on January 22nd, 1951, when the company took over the premises, current design commitments and technical staff of the Cierva Autogiro Company. Main asset acquired was a tiny two-seat helicopter known as the Skeeter. When re-engine with a 200 h.p. Gipsy Major engine and refined in various ways, it became such a fine machine that it was ordered for both air observation post duties with the British Army and training duties with the R.A.F. Nor was that all, for the West German Government also bought Skeeters for its army and navy.

Having evolved a good basic design, the company set to work to develop it further. Improved performance resulted from fitting the new and more powerful 215 h.p. Gipsy Major 215, and an experimental installation of small Napier blade-tip rocket units demonstrated how the vertical rate of climb could be increased to as much as 1,400 ft./min. With these rockets installed, payload went up from two to four people, with the extra pair bedded down as casualties on stretchers at each side of the cabin.

Far more important was that, by utilising many Skeeter components, Saunders-Roe were able to design, build and fly in a period of only six months the prototype of a bigger five-seat helicopter, with a 425 h.p. Blackburn-Turbomeca Turmo shaft-turbine engine. Known originally as the Saro P.531, but since named the Wasp, this helicopter has been evaluated by the Royal Navy for anti-submarine duties from frigates at sea, and will almost certainly enter large-scale service with the Navy and the Army in its production form with a 968 h.p. Blackburn Nimbus shaft-turbine.

With the Skeeter and Wasp, and the revolutionary SR.N1 hovercraft which Saunders-Roe built in 1958-59 for the National Research Development Corporation, the company entered a new world of transport, almost as far removed from flying-boats as were the flying-boats themselves from Moses Saunders' steam launches. With these aircraft, too, the story of Saunders-Roe as an independent company came to an end, for in 1960 it was combined with Fairey Aviation Limited and the helicopter interests of Bristol Aircraft Limited to form a united British helicopter group, under the overall control of Westland Aircraft Limited. At the same time Saunders-Roe (Anglesey) Limited and Saro Laminated Wood Products Limited were incorporated in the de Havilland group.

Soon even the name of Saunders-Roe may be but a memory, but this is not sad, for the two men who gave it that name would have realised full well that in the new unity lies strength for even greater achievement in the years ahead.

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