THE BLUE RIBAND OF THE AIR

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WHEN M. Jacques Schneider offered the "Coupe d'Aviation Maritime Jacques Schneider" at the Gordon-Bennet Banquet of the Aero Club of France, on December 5th, 1912, in Paris, he little dreamed he was doing anything unusual, except showing a practical sporting interest in the progress of Maritime Aviation by giving a thousand pound (five thousand dollar) trophy for international contest. Since that supper party, however, it has cost several of the nations literally millions of dollars to gain possession of this trophy. Incidentally, the speed at which man can travel by seaplane has been raised to a mileage far beyond the wildest imagination of M. Schneider, and engineers have been given scope for building air engines of almost incredible horse-power.

As a result of M. Schneider's offer, two nations, America and France, competed for the Trophy in 1913, and the French machine, owned and piloted by M. Prevost, a "Deperdussin" twin-float monoplane fitted with a 160 h. p. Gnome engine, won at 45.75 miles per hour. Mr. C. T. Weymann on a "Nieuport," fitted with a 100 h. p. Gnome rotary engine, was the American competitor in this first Schneider race. The course was off Monaco, France.

Since that first contest, all nations have looked upon the Schneider Trophy as being the Blue Riband of the air. Strenuous efforts have been put forward by America, France, Italy, Switzerland, England and Germany to wrest it from one another. Over the subsequent matches it has been won by four of the nations; up to last year's contest, England had won it four times, Italy three, America twice, and France once. The speed and horse-power progress during these years have been colossal:—speed has increased between 1913 and 1929 from 45 to 328 m. p. h., whilst horse power has increased from 160 h. p. to 1900 h. p.

This incredible advance means merely a "high spot" in sport to the layman, who is thrilled as he sees these machines flashing like silver darts piercing the blue of heaven; but to the engineer and designers, and not least to the intrepid pilots, it means a mental and physical strain almost beyond human endurance. When in 1925 Lieut. James Doolittle won the Trophy off Baltimore, with a speed of over 232 miles per hour, on a Curtis Army Racer with a 465 h. p. Curtis engine, it was thought the limit had been reached.

Yet the following year America was beaten off Hampton Roads by an Italian monoplane travelling 246 miles per hour, with an 800 h. p. engine. Incidentally, this ended America's hopes of winning the famous Trophy right out at the third attempt. Thus future contestants would have to start level again.

With Italy the last winner, the choice of flying ground was at The Lido, Venice. Italy and England were the only competitors: Lieut. Al Williams, America, failed to get his racing machine ready in time. After a thrilling duel a young English air officer, Lieut. Webster, won the prize from Italy at a still higher speed, of just over 281 miles per hour, with a 900 h. p. Napier engine. On account of the great strain on engineers and pilots, and the mounting expense of these international air races, it was agreed to hold them henceforth at intervals of two years, instead of yearly. The choice of flying ground now being England's, the famous yacht-racing water—The Solent—was eventually chosen as the most fitting and safest place for the speed contest. Ten machines were entered for the match, but on the day of the race only six appeared, three each of Italy and England; the French and American machines were withdrawn. Whilst the Italians stuck to the Fiat engines, the English changed to engines made by the famous motor car firm of Rolls-Royce. In a contest watched by millions of people of all nationalities, England won the Trophy for the second time at the amazing speed of 328 miles per hour, with a Super-Marine monoplane and 1,900 h. p. Rolls-Royce engines.

Some aviation critics suggested that the utmost limit of speed power and human endurance had now definitely been reached in air racing. They reckoned without the slave god of ambition. England, like America previously, had two consecutive wins to her credit, and a third would give her the Schneider Trophy for all time. But during 1930 there was a great hesitation amongst all the nations as to whether another race in 1931 could be organized, as the expense had become enormous. However, France, Italy, America, and England kept alive the zeal for another contest, and European hopes were re-kindled when it was announced by the British Government that on account of the world trade depression, and excessive expenditure for other matters of greater national urgency, it could neither finance a British team for the 1931 Schneider Trophy Contest, nor lend any of its Royal Air Force pilots. In spite of pressure being brought to bear on the Government it was adamant, and when it was almost decided that England would not compete, a private person, Lady Houston, gave £100,000 (500,000 dollars) to bear the expense of the British team and two new machines. The Government accepted this sporting offer

immediately, and feverish preparation commenced to train a new team of young high-speed flying officers from the Royal Air Force. The Rolls-Royce firm was instructed to build two new engines. France and Italy challenged within the scheduled time, and it was hoped another challenge would come from the United States.

These three nations commenced to work in real earnest to produce men and machines by September 12th, the day of the contest over the Solent waters. Claims, some fantastic, of miraculous new speeds were rumoured from Europe, and the English machines were said to be faster than those used in 1929. The stage was beginning to be set for a miracle of speed, and a veritable triumph of man as master and controller of racing air craft. A month before the actual date of the contest, the air over an area of thirty miles in every direction from Calshot Castle, the 15th century training quarters of these high speed men, was tense with excitement, and all one could hear was "Schneider", "speed", "nerves"! Into this excitement would burst now and again, on the few fine days when visibility permitted high speed flying, the thunderous roar from one of the racing planes in practice flight. Everyone stopped, electrified at the terrific noise, astounded at the speed of the tiny silver speck and its mad dance through the air.

Disappointment came with the last days of feverish preparation, when it was known that both Italy and France had withdrawn their challenges, and England was left to "fly over" the 217 mile course to claim the Trophy for all time. Whilst the eagerness of international competition had taken some of the very keen edge out of the contest, it nevertheless was by no means an absolute certainty that England would achieve her cherished ambition to win the prize with a speed far greater than her pilot registered in the 1929 race. Anything less than this speed of 328 miles an hour would have been viewed as failure on the part of England's three young air aces, and it was agreed she could not accept the Trophy as won right out if she failed to achieve this purpose. Absence of other competitors did not slacken the efforts of the British team, who were practising on their machines up till the day of the great race. In spite of the fact that the first machine to fly the course might achieve absolute victory, the other two were fully prepared, and pilots waited on the morning of September 12th.

Of the three machines, two were new, named "Fanny" and "Lucy" after the names of Lady Houston whose money gift had made their building possible, indeed had made the British entry possible, and the other was the Super Marine Rolls-Royce winner of the 1929 contest. The new machines were modelled on the lines of the successful Super Marine monoplane of 1929, although con-

siderably improved on account of the alteration to the racing rules, which had been made far more arduous for the 1931 contest. In previous competitions the reliability tests had to be undertaken the day previous to the actual racing, but this year's rule enforced them on the same day, and they had to be undertaken within half an hour of the gun for the race. This new rule made new claims upon both the plane and the engine, and added very considerable anxiety to the racing pilot, because he had to take off, climb to about 150 feet, land again, and then race away over the starting line into the speed course.

The chief features of these new racing monoplanes, designed for this year's Schneider Trophy Contest, are of considerable interest to sportsmen, as showing the marvellous co-operation of designer, engineer, and pilot, working as one in the conquest of speed.

The entire upper and lower surfaces of the wings, and the upper surfaces of the floats constitute water radiators. These surfaces are built of a double skin of duralumin, the hot water from the engine cylinder jackets circulating in the space between, and being cooled by the flow of air over the exterior. Lubricating oil is carried in the tail fin, and moves between the engine and the fin through three oil coolers extending along most of the side of the fuselage. Extensive research work at the Royal Aircraft Establishment, Farnborough, and at the Supermarine Aviation Works, has made it possible to increase the efficiency of the oil coolers by about 40 per cent. while retaining the same external area and arrangement of cooling surface as was employed in the 1929 machines. The secret lies in a special form of internal construction of the coolers which conveys heat from the oil rapidly to the outer surface, where it is dissipated. If the engine is to keep running at normal temperatures, no less than 40,000 British Thermal Units of heat must be dissipated each minute from the water and oil cooling surfaces, equivalent to approximately 1,000 h. p. in heat loss from these surfaces. No problem is more difficult in the design of modern racing seaplanes than the provision of sufficient surface for cooling purposes. Practically all the external surface of the aeroplane is used for heat dissipation; in other words, the radiator surface provided is nearly equivalent to the entire external surface of the aeroplane-wings, floats, tail fin and the fuselage sides.

Fuel is carried inside the floats, and is forced by engine-driven pumps to a small pressure tank in the fuselage which feeds the engine directly with fuel. On steeply banked turns the sudden application of severe centrifugal loads, equal to five or six times the force of gravity, prevents the fuel pumps from operating, and the small pressure tank carries just sufficient fuel to keep the engine running

during each turn. Immediately the turn is concluded, the pumps begin to operate once more and the pressure tank is replenished. The starboard float carries considerably more fuel than the port float, the difference in load balancing the tremendous turning moment of the engine, particularly during the take-off. Full engine torque has the effect of transferring a load of approximately 500 pounds from one float to the other, a factor so important that it is doubtful whether the air craft could be persuaded off the water with a very light load of fuel on board.

"Drag", or air resistance, of the floats has been markedly diminished, and the take-off characteristics improved in the 1931 machines. Extensive tests with models in the Vickers Experimental Tank at St. Albans, and the wind tunnel at the National Physical Laboratory, have produced a form of float which combines most efficiently the required aerodynamic and hydrodynamic qualities. Construction of the new float was complicated by the necessity of fitting water-cooling radiators on the whole of the upper surfaces. When filled with water from the engine at a temperature near boiling point, the radiators expand nearly half an inch, and to prevent buckling of the outer skin the designer was obliged to devise an ingenious elastic framework able to take up this expansion. It was also found essential to insulate the fuel tank from the water cooling surface to prevent evaporation of the fuel. Numerous tests of models of the new machines, with airscrew running, were made at the National Physical Laboratory with the objects of reducing air resistance and of ascertaining their aerodynamic characteristics. Airscrews for the new craft were specially designed and constructed by the Fairey Aviation Company.

The day of the great race arrived. The Solent and Spithead were crowded with all sorts of craft, from the Giant Liner "Homeric" down to small sail and motor boats, all anchored in position around the speed course. But what a day! Visibility was reduced to about a mile owing to a blinding rain and mist, and the wind rose at times to half a gale. A more unfriendly day for high speed racing could not be imagined—and it was still summer in England! As the rules provide for unfavourable weather, the racing officials consulted together, and it was found necessary to abandon the race for the day owing to the terrible weather. The following day might prove suitable. Sunday, September 13th—unlucky number— turned out to be a magnificent day, sun-flooded and very warm, and allowing a visibility of fifteen miles. In anticipation of the race, the disappointed crowds of the previous day returned in double numbers, and the shores around the speed course were black with folk of all ages.

At West Wittering on the Sussex Coast, a few hundred yards from one of the pylons around which the competitors had to turn an acute angle, Sir Henry Royce was at home, the designer and builder of the powerful 2,000 h. p. engines. Owing to a breakdown in health, Sir Henry could not go out to witness the race, but he was propped up in a bed drawn near a window from which he could see and hear the materialized ambition of his life flash past the pylon on its mad speed quest. One imagines the feelings of this aged and sick engineer, who as a boy of eleven had sold newspapers in the streets of a large town, when he saw the triumph of his engineering ideal and his life's work.

One o'clock came! An English Sunday, through the caprice of the weather, was to be rudely awakened from its age-long, traditional peace by the maddening roar of seaplanes in the world's greatest air race. As a compromise with religious feeling, the race had been deliberately timed for the hour when all the church services were over. On account of the elaborate preparations for patrolling the speed course by destroyers, and the stoppage of all shipping in and out of Southampton and Portsmouth, it was impossible to risk Monday's being fine.

There is a remarkable, tense stillness everywhere. In the preliminary testing area between Cowes and Calshot Castle, in Southampton Water, three silver seaplanes wait on the starting line. Uneasily they rise and fall on the short, choppy waves, like chained animals waiting to be released. A gun booms! A dull roar follows immediately, and a great splash of spray tells that Flight Lieut. Bootham, England's first choice, had literally been "waiting on his toes" for this signal. All his pent-up nervous excitement, intensified probably to breaking point since the race had been postponed, is let loose, and his mighty engine sensitive to the light touch of his fingers roars like an uncaged lion as his seaplane takes off with a full load of oil and fuel, leaps into the air, circling at about one hundred and fifty feet, then lands gracefully, skimming the shimmering blue water like a seagull hunting fish. It is a magic moment. The crowds within sight gasp as they watch the seaplane rise suddenly with a terrific noise when Bootham opens his engine to full throttle and rushes over the starting line into the speed course.

The race had begun. What appeared to be a silver bird dancing in the sunlight was the seaplane banking round the first pylon off Bembridge. Across the open sea it dashed to West Wittering, rose higher, swooped down around the next pylon, and on along the fourteen-mile leg of the course fringing Southsea and Portsmouth beach towards the pylon at Ryde Middle buoy, so

well-known to racing yachtsmen. Bootham flies even higher when turning this pylon, using the weight on his machine to increase his speed as he passes over the Ryde starting line to finish the first of the seven laps which constitute the race, a mileage of approximately two hundred and seventeen.

Boothman is flying superbly, his machine as steady as a rock hurtling through the air. What has been his first lap time, all the air experts of the world were asking at that moment, and long before he had finished the second lap, employing the same clever manoeuvres to regain his speed as he slowed to turn the pylons, it was announced by loud speakers. Three hundred and forty-three miles an hour! He had shattered the world's lap record in the first round, and exceeded the fastest lap by another twelve miles an hour.

Almost before we realized this truly amazing speed (which would be about 360 miles per hour, had Boothman not to slow up in turning the three pylons around the course) he had flashed by a second time, flying lower so that his figure could be seen crouching in the cockpit as if urging his machine faster and faster. The crowds cannot realize a fraction of the colossal strain on this lone pilot as he races through the air faster than any man has ever flown in a distance flight. Should he be tempted to put his head around the wind screen to get a larger view of his course, his neck would be broken immediately; or if a more innocent temptation prompted him to put his hand beyond the screen to "feel the rush of wind", his wrist would be snapped like a stick. No, he must remain strapped to a 2,000 h. p. engine, his will and hand compelling its speed and its caprice, at the most concentrated job ever undertaken by a human being. Should his mind mis-fire, or lose control for a fraction of a second, he would be dashed to pieces on a sea surface rendered as hard as steel by the speed he is travelling.

His next lap time is 342.7 miles per hour. Marvellously consistent flying! Bootham has broken the 100 kilometre world's record during the first two laps. So far everything is working with passionless precision, machine and pilot in complete harmony. Except for the uncontrollable excitement as the seaplane passes us with its terrifying speed, the deep roar of the engine almost makes the race now seem monotonous. Yet we are hypnotized, eyes straining and fixed on these silver wings as they dance on the sun-flooded air. Round after round we watch. The speed is slightly less, by a mile or so per hour, but this is not noticeable to the mighty crowd of breathless, sporting people. On comes the seaplane, rounding the Ryde Middle Pylon on the seventh and last lap, flying very low, engine full throttle again, for the finishing line.

The race is over. Boothman, realizing his task is done, slackens speed, and leaping high into the air with his wonder machine, much like a schoolboy jumping in ecstacy after shooting a goal, flies over the fleet of ships which are thundering an ovation on syrens and hooters, drops on to the harbouring waters of the Solent, and taxis towards Calshot Castle. A fleet of swift motor boats surround his machine, taking it in tow. The gallant airman is carried ashore on the shoulders of burly Air Force mechanics. On the Calshot beach he stands unsteadily, smiling, though his face is deathly white, and testifies to the gruelling nervous strain he had to endure. As the mechanics retire, his mother, his father, and his wife come down and take him by the hands. This human reunion must have been the supreme moment of his young life; he had won the Blue Riband of the air for his country, and was back safely amongst his own folk. His average speed for the whole course of seven laps was 340.8 miles an hour, a most amazing achievement when it is considered that he had to make twenty-one turns around the pylons. The time he took to do the course was 38 minutes twenty-two seconds. If it were at all possible for Flight Lieut. Bootham to fly his Schneider machine at the same speed from London to New York, he would complete the journey in about nine hours. Rather a contrast to the Pilgrim Fathers who took 110 days to do the journey!

Not contented with making such speed records, the British Royal Aero Club decided to attack the world's three-kilometre speed record of 357.7 m. p. h., held by the captain of the English high-speed flight team, Squadron Leader Orlebar. The sister seaplane of the machine that had just won the Schneider Trophy, still waiting on the starting line for duty if Lieut.Bootham failed to beat the world's record for the Schneider course, was towed in position. Another young Air Force officer, Lieut. Stainforth, wedged himself into the cockpit, the great engines droned, and within a few seconds he was circling high in the air, like a giant hawk waiting to swoop on its prey. Five times he dived, flying the measured mile, attaining the colossal speed of 404 miles in one hour and making an average of 386.1 m. p. h., easily eclipsing the world's record. But this intrepid young airman was still not satisfied, for a few days later he made another attempt and actually created a new world record by flying at the terrific speed of 415 m. p. h. Over the measured mile course he actually attained an average speed of 407.1 m. p. h. during the five test flights. Thus Britain created a world record for air speed, and retains the Blue Riband. But for how long?