FARNBOROUGH

Triumph or Tragedy?

By GROUP CAPTAIN H. R. FOOTTIT

"It is unscientific to ask,
'Have we progressed?'"
—Gordon Childe

THE LINE of cars inched slowly down the hill. Away in the valley ahead is the airport, framed by the swaying trees and the stiff hedgerows of the English countryside. All around there is that bright, emerald green of English grass, with the earthy smell of a land that is continually refreshed by rain. Directly ahead is the main entrance. "Over this way, Sir." A cockney shout, and the cars pass quickly through the gate and fan out into the parking field. The Service Police are doing their traditional job of handling masses of cars and men that come each year to the Society of British Aircraft Constructor's show at Farnborough.

Once inside the gate you can feel the thrill of flying, and a glow of excitement wells up inside. A Hunter jet fighter whines in the distance; a Britannia transport lumbers down the runway with resounding throbs; a Fairey Delta screeches on the tarmac as it swings sharply into the flight line. People are everywhere. Saville Row suits, hat in hand, mix with sloppy gray "bags" and brown tweed jackets with leather patches at the elbows. Here a knot of "foreigners", in light summer suits and flashy American bow ties, put their heads together close to a Swift fighter in the parked aircraft display. Over there an RAF Air Vice Marshal holds court while seated on his portable seat-walking cane. And sprinkled through the melee is the sparkle of gold and silver as the uniformed manpower of the Commonwealth, and every nation, wend their way through the crowds.

The Big Show: Away on the hill to the left is the static exhibit. This is a huge canvas enclosure that houses the wares of the British aviation trades with a Toronto Exhibition atmosphere. The wide white steps leading up to the entrance are flanked by tall flag staffs and fluttering flags. And between there and the flying field are the caravans. These are the company's lunching and drinking tents. Here—if you can get past the guard—you can watch the flying show while you sip on an after-luncheon brandy. Like Nero in the royal box at the Roman Coliseum, you can see how the modern gladiators vie for the approval of the modern masses. To liven the show is a loudspeaker. Now it blares with suppressed excitement: "Here it comes! The English Electric P-1 fighter!"

I didn't go to this year's show. But I'm told that it was the same set up as other years, and staged with the superb showmanship that is the hall mark of Farnborough. Take-offs click on precise schedule; helicopters dance on call; fly pasts are a specialty in split second timing. Yet Bill Waterton, the former Gloster test pilot who was born in Canada and did the first flights on the Avro Canada CF-100 fighter, isn't impressed. In his new book, *The Quick and the Dead*, he calls the Farnborough show a fiasco, a "sham." He makes you think. Is Farnborough a triumph or a tragedy? Is it a parade—a feat put on for the sheer fun of flying, or is it a pattern of progress—a demonstration of future military and civil air power? Or is it really worth while at all?

stepping stones

I'M SURE that the average Englishman must ask himself these questions too. For the show is generally written up in the popular press each year as a succession of British stepping stones in the state of the aeronautical art. And there is always a vague undertone saying "Better Buy British." Farnborough too, gives me this impression. Maybe we Canadians have an inherited sense of bitterness from a colonial complex. Anyway, I've seen a lot of air shows in the U.S. and Canada, but none with the same stress as the SBAC extravaganza. It reminds me of Napoleon's dictum: "England is a nation of shopkeepers."

Old Stars, New Make-up: The 1956 aircraft showcase of these aeronautical shopkeepers, is typical of many of their displays in this post war era. The same stars are brought on stage with new make-up. These are the hardy performers from last year, or the year before, or maybe years before that. There are a couple of Canberra jet bombers that have been stellar performers at each show since the Canberra first flew in May, 1949. This year one has a Scorpion rocket motor installed, and the other is fitted with Rolls-Royce RA-29 engines. On the maritime side there's the latest mark of the lumbering Shackleton reconnaisance craft and the small and ugly Fairey Gannet. On the civil menu is the bigger and better Viscount 802, and the large, long nosed Britannia 301 whose predecessor, the 100, first flew three years ago and is just now starting in service with British Overseas Airways. And of course, there are many other veterans with new faces, mixed with the odd newcomer.

In this day of long development times and long budgets for prototype airplanes, it is unreasonable to expect that the British could do any more than bring out these old faithfuls year after year. But this business atmosphere to Farnborough, this undercurrent of British superiority, of progress and great expectations, always gives me the feeling that *everything* should be new. I can't be alone in this. Ask almost any Canadian if he's going over to the show and he'll invariably reply, "Oh, I don't know. Is there anything *new* over there this year?" Yet year after year these same Canadians will turn up to the Canadian International Air Show over Toronto's lakeside, or the flying displays at RCAF stations all across Canada on Air Force Day, without worrying about what's new. Although travelling time undoubtedly has something to do with it, I think that the Canadian and U.S. displays stress

the sheer fun of flying. The business-like British have somehow lost this touch.

Undoubtedly our expectations for new airplanes have taken root from the days when prototypes could be turned out in a year, at a reasonable price, and put on parade. The British were past master at this. Take the case of the world famous De Havilland Aircraft Company Limited. In 1910 Sir Geoffrey de Havilland, as he is now, wheeled out his first design from a shed in Newbury. This was the "Havilland No. 1". It was a big box-kite biplane, typical of the designs of its day. It was early April, and with the green grass of the flying field stretched in front of him, Sir Geoffrey opened up the throttle and started the take-off. When the aircraft was a few feet in the air, disaster overtook it. The port wing collapsed. The machine plunged to the ground, a total wreck.

Not Discouraged: Fortunately for British aviation, Sir Geoffrey was not seriously hurt. As the U.K. magazine Flight reported at the time, ". . . its designer and builder is a man of the type whose enthusiasm and determination is apt to increase rather than diminish after any preliminary set back." How true these words turned out to be. De Havilland joined the Royal Aircraft Factory, as it was called later, as an aircraft designer. By 1914 he left there and went to the newly organized Aircraft Manufacturing Company. Here started his famous "D.H. series" of airplanes, with the 2,000 lb. D.H. 1, a 78 mph. pusher with a Renault 90 hp. engine.

near thing

WITH THE signing of the armistice that ended World War I, the swaddling aircraft industry almost died from lack of orders. But again Sir Geoffrey's initiative came to the fore.

In September, 1920, he incorporated The de Havilland Aircraft Co. Limited. Using some 50 people from the old Aircraft Manufacturing organization he continued with his D.H. series commencing with the D.H. 29 which first flew in August, 1921.

In 30 years, from the D.H. 1 in 1915 to the D.H. 103 in 1944, de Havilland designed and built over 90 different types. Many of these, of course, were major modifications to existing models. Still, this staggering design record, which averaged three new types a year, in some cases was actually three new airplanes a year. In 1933, for example, de Havilland brought out the twin-engined transport biplane, the D.H. 84 Dragon; the replacement for the old Puss Moth, which looked very similar to it, the D.H. Leopard Moth; and the four-engined transport biplane, the D.H. 86.

Gone for Good: The days when de Havillands could have a mass turnout of new types every year is gone for good. But what a show it was while it lasted! With the other British manufacturers following the D.H. lead, any annual flying event was a parade of new airplanes. Moreover, there were biplanes, with straight, tapered or swept back wings; there were monoplanes, with low wings, high wings, or mid wings; there were single tails, double tails, triple tails, or even biplane tails, and an infinite selection of aeronautical oddities. For thirty years we lived with this exciting variety. But we should have known it would come to an end.

Now as speeds and payloads have increased, the precise aerodynamicist and structural engineer have come on the scene. For the margin of error between a successful design and an unsuccessful one is pitifully small. So today's airplanes look as though they have all been poured from the same efficient mold. The low wing, tricycle gear, metal monocoque, has become the standard. Now the Viscount generally resembles the Britannia which generally resembles the Comet. And the Swift looks like the Hunter which looks like the F-86 Sabre. And they all take years to design, years to develop, and can easily be outclassed.

In the summer of 1954, for instance, the English Electric Company flew the first supersonic British day fighter, the P.1. In spite of the fact that the USAF's North American F-100 fighter was already doing supersonic speeds, the U.K. press hailed the P-1 as another major milestone. The P-1 went slightly over Mach 1.0 on its early flights, and rumours were rife before Farnborough that year that the P-1 would be there. But the Ministry of Supply declined the honour.

Small Batch: The following year the P-1 did make a brief fly-past parade appearance, and the same thing happened this year. For security reasons, the Ministry have again decided not to put their latest product in the static display for inspection. This airplane, of course, is typical. The specification for it was issued years before its first flight. Then the British proceeded with their usual caution, no doubt due to the expense, and limited the prototype batch to a small number stretched out over a long period of time. As a result, you can count the P-1's flying today on the fingers of one hand. And it will literally be years before the production version will be delivered to RAF squadron pilots. In the meantime the F-100's are already in wide operational use with the U.S. Air Force.

failure of an industry

AGAINST a backdrop of proven production—which is what really creates civil and military airpower, regardless of the numbers or novelty of prototype airplanes—Farnborough is indeed a "sham".

In fact, the British aeronautical analysts, Aviation Studies (International)) Ltd., have tagged the whole U.K. aircraft effort as the "Failure of an Industry." In the ten year period, from 1945 to 1955, according to their report, the English embarked on 166 aircraft projects. Of these only 9.6 percent have been produced in quantities over 100, and 4.8 percent in quantities up to 500. It is only this last group of less than 5 percent that Aviation Studies calls "successful".

I don't know how this record tallies with those of other countries. But with such a record, in any country at any time, it is unrealistic to put on an air show that seems to highlight British superiority, with a constant undertow of "Better Buy British." It is long past the time when the SBAC should turn out publicity releases, like one for this year's show, which concludes with, "Finally, a Britannia, Herald, Twin Pioneer, and the new President (civil version of the Pembroke), all aircraft with great overseas appeal, will be available to give certain guests the opportunity of experiencing for themselves *the quality of Great Britain's transport aircraft.*"

Long Development: This is an era of long development times and correspondingly long evaluation periods. Ask Bill Longhurst, Chief Test Pilot of Canadair, or Don Rogers of Avro, or S/L O. B. Philp of the RCAF's test unit, how many flying hours must be racked up to really evaluate a modern airplane. And how much time must

be packed into analyzing the test flight results in the engineering department after the flying is over. When this time can easily run into a year or more, such statements as "experiencing for themselves the *quality* of Great Britain's transport aircraft" don't make sense. Any prospective purchaser could well spend a month with his feet behind a desk in the engineering department, and he may still not be sure of this elusive "quality". For quality, in the cut-throat commercial air carrier business, must hinge heavily on competitive, revenue-earning ability. And a Farnborough flight is a hopeless way of trying to determine this factor.

Even at the static display, where the products of the supporting industries are on view, there is only so much you can glean from the publicity folders. Real engineering and test data are often lacking. There appears to be such a thing as "proprietary rights". I asked Ian Hamer, top man in Dowty Equipment of Canada Limited, about this some time ago. "Contrary to the assumption of many that 'proprietary rights' are very broad in their protection of products and processes," he said, "the legal profession points out that the law provides only one means of exercising proprietary rights — through patents."

He then goes on to point out that anyone can copy anything that isn't patented, "provided legitimate means are used in securing the necessary working data." Thus "trade secrets" are the stock in trade of any accessory manufacturer. And even though you may have a Ministry of Supply clearance to see certain items, the industry themselves will put a security clamp on showing you the working parts. For their product may sweep the field if they can keep the details a secret to themselves.

Aero Engines: Turning from accessories to aircraft engines, the members of the august Society have undoubtedly earned a world wide reputation. In their Farnborough News Letter they point out that they have achieved a "pre-eminence in the aero-engine field." It is not surprising, either, that engine exports alone brought home the equivalent of some $1,500,000 per week during the first six months of this year. In turboprop power plants Farnborough features the new Rolls-Royce "Tyne" of over 4,000 hp., and the

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The Amphibious Otter

The DoT has granted a C of A to the new Otter Amphibian, it has been announced by The de Havilland Aircraft of Canada Ltd.

The amphibious feature is achieved by fitting DHC-developed amphibious floats to the standard landplane Otter. The amphibious gear — basically similar to that developed some time ago for the Beaver — comprises a pair of Edo floats modified to accommodate retractable main and nosewheels. A slight lengthening of the float gives sufficient increase in buoyancy to add 33 lb. over the gross weight of the standard seaplane (7,967 to 8,000 lb.; basic weight is boosted 550 lb. to 5,365 lb.), at the same time making it possible for the wheels to be almost entirely enclosed within the shape of the float in their retracted position.

The main wheels are installed immediately aft of the step and retract into wells in the float, while the nose wheels rotate through 270° to lie in wells on the deck of the float. All wheels and brake assemblies are made of aluminum instead of magnesium to ensure maximum corrision resistance.

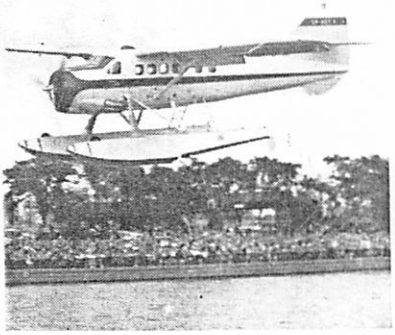
Retraction of the wheels is achieved hydraulically. The selector control and unit is installed in the cockpit within easy reach of the pilot. Actuation of the retraction mechanism may be obtained either by the standard hand pump, or by an electro-hydraulic power unit, which is available as optional equipment and which is operated by switch selection. The wheel landing gear position indicator is installed on a plate on the instrument panel which also carries the switch for the particular unit when fitted. All wheels are fitted with hydraulic lock-pins during retraction.

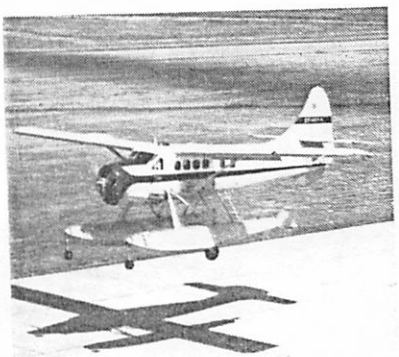
Standard landplane single disk brakes are fitted to the main wheels and hydraulic shock struts used throughout. Nose wheels are full swivelling and have self-centering devices to prevent misalignment during retraction. Twin contact nose wheel tires eliminate shimmy.

As a landplane, the Otter amphibian is said to be appreciably easier to handle than the standard landplane version, since tricycle technique is used. Landing distance is somewhat shortened (about 3%) as more brake may be applied without fear of nosing over. On the other hand, take-off distance of the Amphibian is about 10% more than that of the standard landplane.

On water, the Amphibian is reported to be virtually the same as the standard seaplane. An improvement in lateral stability is claimed to result from the floats being placed slightly wider apart.

Flight tests of the Amphibian have shown that its performance in most categories is almost identical to that of the standard seaplane. Cruise speeds are 3 mph lower.





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Bristol "Orion", which is an 8,000 hp. engine governed to produce 5,000 hp. up to almost 20,000 feet. Both these engines have been adding up time on the test beds, and are shown installed in a Lincoln and a Britannia repectively.

It is noteworthy that the SBAC makes no mention whatsoever of any production figures on any engine built in England. This may be for security purposes. But they take pride in pointing out that "more than 6,000 Sapphires have been built in the United States as the J.65," and, "another large military engine, the Orenda, made by an overseas member company of the Society, will be featured in the Exhibition. More than 3,000 of these engines, powerplant of the Avro CF-100, have been manufactured so far." These are the only production numbers in the four-page summary of August 21st on the superiority of British engines. Somehow this has a hollow ring.

When we add this engine display to the flying show and the accessory manufacturers booths in the static exhibit, I believe that even the British would agree that there's not much change, nor much that can be really evaluated, as one year follows another in this age of complexity. Development times are long, prototypes are expensive, and there is always a heavy cloak of trade secrets, or security in this cold war era. Professor V. Gordon Childe in his book *Man Makes Himself*, pointed out some time ago that it is unscientific to ask "Have we progressed?" since, as he says, "A question so formulated can have no scientific meaning . . . Very few people will come to the same conclusion." Yet the atmosphere of Farnborough, and the SBAC's write-ups on their annual air show, seem to continually pose this question and then answer it with a positive, "Yes" in a heavy English accent.

A Tragedy: In this respect Farnborough, to me, is a fiasco, a tragedy. It is not a pattern of progress, as the English infer. For progress—real aeronautical advancement for all people, civil and military—can only come from a precise evaluation of production products. It is almost impossible to evaluate anything at an air show. And

there is little evidence to indicate that Britain has the stock on her shelves that she so glibly portrays in her showcase.

But as a plain parade, a flying show with a static exhibit that rivals the Canadian National Exhibition, the SBAC event is a sell-out. As a get together of all the people in the world that have the awe of aviation in their blood, the British can pat themselves on the back. Farnborough is a triumph. So it's time the SBAC started simply playing hosts to their guests, and stopped playing the super salesman. For Farnborough is fun. Yes, I'm all for having it every year, if only for the people you meet. See you there next September.

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that can be pulled in a turn, since, like the low-speed stall, the onset is accelerated by an increase in wing loading—the effect of this is that in a turn near the limiting Mach number there is a loss of lift at the tips and the sweptwing airplane "digs-in". Fourth, the incidence available for lift (and manoeuvre) is strictly limited. All four troubles are greatly accentuated at high altitude, near the ceiling.

No Separation: The forward and downward extension of the leading edge meets the airflow over the wing as it rises and so prevents leading-edge separation. The vortex generators, small vertical airfoils set at slight angles to the airflow, are mounted some way back from the leading edge where the vortices re-energize the boundary layer as it becomes sluggish, so that it carries the wing shockwave back to the trailing edge as speed rises, thus allowing the airflow to accelerate smoothly to higher Mach numbers.

These considerations are the reason why the production Avro Vulcan has an extended (crescent style) leading edge plus vortex generators, while the production Handley Page Victor has a line of generators only. One reason for the crescent wing is to meet the troubles just described, so one presumes that the cruising speed, or altitude, has been raised. The DH-110, Supermarine N.113, and Supermarine Swift have leading-edge extensions outboard of their wing fences. These modifications meet the needs of manoeuvring, i.e., increased wing loading and angle of attack, rather than of continuous higher cruising speed—which is what one would expect for fighters. The slightly reduced sweepback on the outer part of the Gloster Javelin's wing raises the critical Mach number simply by reducing the thickness/chord ratio. These modifications also improve the airflow near the low-speed stall and help to counteract the tip-dropping propensities of highly-swept wings—and the pitch-up due to lift loss of the delta under similar conditions.

The Supermarine N.113 was newly fitted with an anhedral tail plane, suggesting an attempt to overcome cross-coupling control problem. This airplane also flew with four large underwing tanks. It has a droopable leading edge and, in production, will have blown flaps.

Hunter for Two: The Hawker Hunter T.7 has a much-enlarged cockpit fairing to improve the airflow at transonic speeds. With the original fairing the canopy shockwave formed at about Mach .8 and did not move aft until the speed rose above Mach .9—which was a rough and unpleasant ride for the crew. The T.7 also has a neat "hood" fairing over the jet pipe for a brake parachute. A Hunter F.6 was shown with a permanent wingtip tank