

- (viii) The payload of a machine to be at least of 900 lb. A hovering ceiling at full load of 5,000 ft with a cruising speed of 100 miles per hour, and endurance of 2½ hours

It may well be that the jet propelled helicopter will come into crop spraying before it is suitable to be applied to passenger or freight services and the possible use of the convertible type must be considered

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## Discussion

**Wing Commander R A C Brie** (*B E A Helicopter Experimental Unit*) said that Mr HARPER had touched on several aspects of the subject which he himself had intended to mention, such as the number of flying hours that it was possible to get from the helicopter per day, the number of hours that the pilot could stand, and so on. There was nothing more valuable than user experience, which was factual and realistic and from which others could benefit.

There were one or two comments which Captain GREENSTED had made to which Wing Commander BRIE wished to reply. That the helicopter had arrived was obvious, one could hardly pick up a paper without seeing a reference to some helicopter activity. Those who had been associated with it, as he had been for a number of years, had not had an easy path to tread, there had been disappointment and frustration, but these were normal in any pioneering activity.

Whether a given operator should take part in developing the use of the helicopter was a matter for decision by the operator himself. Knowledge was necessary, and unless the pilots and engineers had the highest qualifications trouble could easily result. Given the right background of knowledge and experience, however, Mr HARPER's paper was an indication of what could be done. Furthermore it was unlikely that a company such as Pest Control would continue using helicopters in a specialised activity for six years unless it was convinced that there was money to be made out of it.

Moreover, similar activities on an even bigger scale were going on in other parts of the world. In British Columbia, for instance, Carl Agar and the Okanagan Company had interested the Aluminum Corporation of Canada in the use of helicopters in connection with their gigantic hydro-electric scheme. Using Bells and S 55s, they were operating at 5,000 to 7,000 feet with ease, and when they had loads too big to put in the fuselage they slung them underneath. It was a pioneering effort which would greatly help the development of a project of considerable value to many people in that part of the world.

The qualifications of the crews was a most important matter. The B E A standard for any pilot selected for helicopter conversion was a minimum of 1,000 hours of fixed wing experience. They then gave him 75 hours, dual and solo, before allowing him to undertake a helicopter job of any sort, and a further 25 hours before putting him on passenger work. That might be a little high, but a minimum of 50 hours was essential to make sure that the pilot had proper handling experience under all weather conditions, and particularly in strong winds. The qualifications of the engineers were of equal importance, and the "hard core" of the small Helicopter Unit organisation consisted of licensed engineers. The licence was difficult to obtain, since the engineer had to qualify for it at one sitting.

Captain GREENSTED seemed to be critical of the way in which helicopter experimental activity had been carried out in this country, and suggested that if it had been undertaken in some other way than by a Government-sponsored Corporation it might have been done very much better. Wing Commander BRIE had brought the B E A Helicopter Unit into being and could therefore claim to speak as an expert, and he felt that he must answer that charge to the best of his ability.

It had cost a great deal of money to keep the Unit going, but Captain GREENSTED was wrong if he thought that these costs were in some way hidden in the accounts of the Corporation. In the Annual Report recently issued by B E A two pages were given to helicopter activities, and it was there stated that the net cost of the helicopter research project for 1952-53 was £79,113, of which £72,133 was payable

by the Ministries of Civil Aviation and Supply under the terms of their financial arrangements with the B E A for experimental work. Those Ministries evidently thought that they were getting good value for money or they would not continue their support, but if other people wanted to undertake an activity of this kind, which could be extremely tedious and disappointing at times, he saw no reason why they should not do so. The sort of work which the Helicopter Unit was doing was the only way to keep the flag flying until the British aircraft industry produced something which operators could use easily, safely and economically.

There was still a long way to go. The helicopter still suffered from teething troubles. The knowledge and experience gained by the B E A Unit was made freely available to those who wanted to make use of it, and many visitors came to Gatwick and were welcomed there.

Captain GREENSTED referred to the complexity of the helicopter, but basically its internal layout was not very different from that of an automobile. It was possible to take liberties on the ground, however, which could not be taken in the air, and with the need for lightness the life-hours of components and necessarily to be somewhat low. While criticising complexity, Captain GREENSTED was not being consistent in suggesting that there should be some automatic means of controlling rotor speed in the event of power failure. It would be interesting to know what he meant by that. Also what he meant when he spoke of improving and simplifying the control system. Did he refer to control procedures in leaving and entering an airport, or to the control of the helicopter itself, and what had he in mind?

Wing Commander BRIE was not in a position to answer for Mr MASEFIELD or the members of the M C A Interdepartmental Helicopter Committee who had made certain recommendations which had been valuable, but which had not yet been put to the acid test. Probably the B E A Unit would be the first to determine rotor-station requirements when they had multi-engine helicopters. They would be "sticking their necks out" to think of going into London or other big cities with present equipment. Progress was, however, being made. In 1941 there had been only two helicopters in America, but to-day six firms were turning out helicopters as fast as they could. The stimulus there had been the war in Korea. This country was able to benefit by American experience, and big efforts were now being made and encouragement being given to British manufacturers. If they could get through the next five years they would find thereafter that the operational field was so vast that B E A and Hunting Air Transport and Airwork and everyone else could come into it without crossing one another's paths, and he hoped that they would all participate and make a good thing out of it.

**Mr G W Stallibrass** (*Director of Aerodromes, Technical, Ministry of Civil Aviation*) prefaced his remarks by what he described as the "ritual declaration" that it would be the wildest coincidence if anything he said revealed in any way the views of his department. Helicopters, he said, had had a tremendous amount of enthusiasm devoted to them, but it was worth while to see how big the job was that lay ahead of anybody who tried to develop a successful helicopter and make practical use of it and what lessons could be learned from the developmental period of the fixed wing aircraft, which took much longer than the eight years for which there had been helicopters in this country.

There were two schools of thought on the application of the helicopter. One looked to its application as an improvement on fixed wing aircraft for what might be termed air line service, and it was with this that the report of the Interdepartmental Committee had been largely concerned. The routes from Glasgow to various other cities which had been suggested were very similar to the routes which had been started, unsuccessfully, by fixed wing operators in the late 1920s and 1930s. He had been very interested therefore, to read the papers by Mr REES and Captain GREENSTED, and to hear what Mr HARPER had had to say about pest control work, because these indicated that at present, and perhaps for some time, the true field for the helicopter lay elsewhere, *i e*, in the field of original application.

If it could be said that the helicopter had arrived, it was only in that field that it had done so. In the U S A there had been great military interest in its use, even before Korea. Impressive figures could be quoted to show what the helicopter had done, but its success had been in fields where it had an economic advantage over any other form of transport, not because it was cheaper but because it was the only method of doing something without so great an expenditure of money and resources that it

became a question not of cost but of practicability. The impressive operation by Okanagan Airways which Wing Commander BRIE had described was an example of this.

Looking at the helicopter from the point of view of air line replacements, there were certain problems which had to be overcome.

*Range* A circle with its centre in London and a radius of 200 nautical miles would take in Paris, Brussels and the Channel Islands. Without an effective range of 200 nautical miles it would be impossible to bite appreciably into the present fixed wing traffic.

*Pay load* Earlier estimates had been 10 to 26, and Mr MASEFIELD said 40 passengers. It was at any rate bigger than anything flying in this country and bigger than some of the machines which were said to be flying in the U S A.

*Noise* This problem was well known but would be more difficult for helicopters operating in city centres.

*Cost* The helicopter was expensive to maintain.

*Reliability and maintenance* These would have to be at least as good as for proven fixed-wing aircraft.

There seemed no possibility of all these problems being overcome in a single helicopter quickly enough to make a big bite into fixed wing traffic for some years, but for original operations of the kind discussed that evening it was not essential to overcome them all. There was no need for a minimum range of 200 nautical miles or for a 40-seater, if Arabs on their camels were scared by a loud noise they would not write letters to *The Times* next day. Those were the operations, therefore, to go for at the moment.

He had been extremely interested in Mr REES's reference to the operations at Shell Mera. It was the air which had revolutionised South America, not the railway. It was clear from what Mr REES had said that there was a role for the helicopter in carrying out survey and reconnaissance work for the main operations which would follow when an air strip had been provided. That was what Okanagan Airways were doing, but they also conveyed prefabricated houses and equipment for the labour force who would build the industrial installation.

Captain GREENSTED spoke of conditions where the helicopter did not offer anything like the same advantages, in an area where there was less difficulty in laying out airstrips, and he pointed out that the helicopter would have to have quite different characteristics from those which had to be accepted to-day if it were to compete effectively with the fixed wing aircraft.

That again raised the question of whether its true application was not in roles which were its own exclusive field, and Mr HARPER's account of what Pest Control were doing was a very good illustration of something which could not be touched in any other way but which was, with enormous skill and care, being done with the present type of helicopter. Even this could be done much better, with less drain on finances and nerves, by helicopters with better characteristics than those of to-day.

From 1919 onwards fixed wing airline operators in the U K had gone through the cycle of adventure, strain, near bankruptcy, amalgamation, and subsidy. Some operators never got beyond the stage of near bankruptcy. That cycle ended with the creation of the two splendid Corporations that this country had to-day. Were helicopter operators to go through the same cycle? Either helicopters must be operated at a profit by adventurous enterprises such as Pest Control or they would have to depend on a subsidy because their services appeared of supplement advantage to the community. The day might come when a type of helicopter arrived that would enable the subsidy to be withdrawn, but they had not yet happened with subsidies to fixed wing aircraft.

Helicopters could not be made to pay in regular services at the moment, but they could be made to pay, in the wider economic sense, in the sort of enterprises undertaken by Pest Control. There had been, for example, inquiries into the practicability of applying certain soil foods from the air to poor land in this country, where it would be too expensive to employ tracked vehicles or the ground was inaccessible. Lime would be too heavy to be dealt with in this way, but for phosphates the weight per acre was comparatively light. There were many possible uses of that kind, but whether there were enough to provide a market for helicopters for that sort of work was a different matter. It seemed a possibility that the helicopter designers might well investigate in consultation with potential operators.

**Dr G S Hislop** (*Member—Fairey Aviation Co Ltd*) remarked that it was always an amusing exercise to go through earlier documents and compare what people said in 1950 with what they said in 1953, and he did not blame Captain GREENSTED for doing so. It must be borne in mind, however, that the report of the Interdepartmental Helicopter Committee represented a first shot at an assessment of the place of the helicopter in this country, and was actually drawn up in 1949. Since then there had been an astonishing increase in knowledge of the subject and of the problems to be faced, and some realignment of ideas had been inevitable.

Captain GREENSTED had rightly said that direct costs of helicopter operation in inter-city applications had to be competitive with those of fixed wing and surface transport, and had mentioned a figure of 4d to 6d per capacity passenger mile as desirable and that the Bristol 173 could not do much better than 9½d. There was, however, every prospect of getting the costs down (in fact they *had* to come down) with the type of helicopter which would have to be used for inter-city work, to about 3d on a 100 nautical mile stage. The aircraft must be big and reasonably fast, and also capable of giving regularity in service, because it would be a short-stage vehicle and without good regularity and punctuality passengers would not travel by it. With the winds experienced in this part of the world, that meant that it must have a good cruising speed.

The biggest opportunity for savings was in overheads, in Captain GREENSTED'S view, and he considered that the B E A estimate of overheads for the helicopter of 70% of operating costs was excessively high. It would be interesting to know where he thought that savings could be made, because Dr HISLOP was now in the design field and would like to see how designs could be altered to take advantage of any suggestions. Captain GREENSTED might have in mind simple and quick turn-round facilities, with strictly limited ground staff, or that inter-city passengers should carry their luggage and handle it themselves, so that stops could be short. Would he please amplify this interesting suggestion?

Captain GREENSTED suggested that the Interdepartmental Committee had been wrong in suggesting that taxi services were unlikely to pay, but they had been thinking of the London area, and there was an essential difference between the London area and New York, to which he had also referred. Public transport facilities in New York, and particularly between the outlying areas and Manhattan, were not very good, and the congestion extreme, whereas in London there was a good electric train service south of the river and a good tube service north of it, so that there was much less scope for a taxi service.

Dr HISLOP thought that there were great possibilities for helicopters in inter-city traffic within a 200-mile range, because they would tap entirely new traffic, if their fares were really competitive, by offering a much faster service. On the London to Paris route there should be a saving of 12 hours compared with fixed wing transport, and on fixed wing services a saving of time of 20 minutes on a 3-hour run had proved sufficient to draw traffic from the slower to the faster schedule.

It was very instructive to note that there should be an opening for both large and small helicopters in helping, for example, in oil exploration work. It was alarming to think that it was necessary to cater for high air temperatures and high altitudes and at the same time use gas turbines. Gas turbines did not like hot weather, and one tended to have to install oversize engines for the purpose. In some cases where only a small proportion of stage time was spent in hovering or at slow speed, water/methanol injection might be used. If a lot of low speed flying or hovering was required then some alternative method of getting high power without the penalty of having over-size engines was needed.

**Captain Bryan Greensted**, replying to the discussion, said he was distressed to find that Wing Commander BRIE had interpreted his remarks as an attack on the B E A and on the magnificent development work which they had done. What he had said was that if all British operators had been given a chance to participate in the development and experimental work under a development contract "it might be done more cheaply, and perhaps result in the eye being kept more firmly on the ball." He had not said that they would do it better, because he did not think that they could, but in his view it was perhaps not giving the development of the helicopter as good a chance as it might be getting to pay for the development work being done by one operator concerned with one set of problems. The independent operators had a different outlook on operating aircraft, whether fixed or rotating wing, from that of

the Corporations, and if money was to be spent on helicopter development it would be of value to obtain the views of the independent operators as well

In referring to the simplification of control systems he had had in mind the aircraft control systems. He spoke as a fixed wing pilot with only two hands and one pair of feet, but it had always seemed to him that there were in flying a helicopter too many things to worry about at the same time. It was possible, he thought, that the twin rotor helicopter had, initially at any rate, proved more of a headache so far as controls were concerned than the single rotor machine.

In reply to Dr HISLOP, they thought that the B E A figure for overheads of 70% of the total aircraft operating cost was far too high, and that probably much of it was attributable to head office expenses and not so much to the equipment used to handle the aircraft and passengers. That strengthened his plea that the independent operators should be given the opportunity to undertake some of the development work, which they would be delighted to do, because if they simply relied on B E A's assessment of the total operating cost they would not necessarily get the whole scope of the answer.

He had said in the paper that the surface transport situation in New York differed from that in London, and he agreed with what Dr HISLOP had said about that. He also agreed that if a helicopter service cut the time between London and Paris by 12 hours it would attract passengers, but the point was that it would be attracting passengers from the fixed wing services, not new passengers. What was necessary was to expand the market, and the only way in which that could be done was by bringing the fares down. People did not mind taking a longer time to go somewhere if the fare was low, as had been shown by the Tourist and Colonial Coach class services, there were many people who would put up with a lot of what first-class passengers would regard as inconvenience if the fare was £10 cheaper.

**The Chairman**, on behalf of the Association, thanked the lecturers for the great amount of trouble which they must have taken in preparing their papers and for coming to the meeting to present them. Both the papers and the discussion, he said, had been of a severely practical nature, and it had been an education to listen to the sound, practical promoter's outlook which had been expressed. The design section of the Industry should take particular note of the very practical points made by the Lecturers.

The proceedings then terminated.