

## Discussion

**A Davenport** (Westland Aircraft Ltd) *Founder Member* The request which had been made during the morning session for more money with which to develop the helicopter was not unusual, and the reason given, that the helicopter industry was not getting its share, was also not an unusual complaint. But some encouragement might be derived from the consideration that those who were concerned to buy helicopters would not always require that they be operated economically or at a profit. Sometimes a service was run at a loss in order to serve the convenience of the customers, and probably the helicopter would render the sort of service that could be run at a loss, or without profit, provided that the whole organisation of which it formed a part was run at a profit.

Mr PETER MASEFIELD, in his recent lecture, had suggested that the helicopter was not able to make journeys of more than 200 miles economically, at that stage the fixed-wing aircraft came into its own.

The installed power per passenger was rather low for it worked out at about 75 h p per passenger in the helicopter, whereas in its fixed-wing competitor it averaged 50 h p per passenger. That matter required attention, and improvement might well be effected by improved design and construction of rotor blades.

He disagreed with Captain LIPTRON that replacements were excessive in the helicopter, in his experience with the Sikorsky S 51 there was a major inspection at 400 hours, and the cost of replacements was less than £100. That was a remarkable achievement, because that particular machine had been doing demonstrations and intensive flying.

Another matter in connection with operation costs was that of the consumption of fuel, which for the helicopter worked out at  $3\frac{1}{2}$  m p g, whereas in the fixed wing it averaged 7 m p g. Thus, there was much room for improvement, and he suggested that designers of helicopters might pay a little more attention to streamlining, particularly if the machines were to cruise at more than 100 m p h.

He supported Mr SCOTT-HALL that designers should pay adequate attention to improving the stability of helicopters so as to make blind flying, map reading, and general navigation easier in adverse weather and other conditions. He also thought that the noise level in the helicopter at present was too high and should be improved, from the engine transmission, blades, and engine exhaust.

**Norman Hill**, *Founder Member* He was a would-be operator of British helicopters. One speaker had stated that there was no market for the helicopter, or if there were, that it was small. He suggested that if they concentrated on producing a marketable helicopter the market would then become apparent.

Under present-day conditions development and production was a slow and tedious business for the manufacturers, and even to-day there was no British helicopter available with a full certificate of airworthiness. Furthermore, the experimental prototypes demonstrated so far had only a moderate performance and a poor capacity.

The insurance underwriters, suspicious of the helicopter and its mechanical complexities, and lacking experience and knowledge of the type, quoted rates for insurance which could only be described as harsh.

At State airfields landing fees were heavily against the type, although the wear and tear at such airfields caused by the helicopter was negligible when compared with fixed-wing aircraft. All these things weighing so unduly against it might prevent the helicopter, with its unique capabilities, from being properly exploited.

He should suggest that designers and engineers engaged in the British effort should seal their designs immediately practicability in performance and cost was apparent, and then let the operators who had the vision, the enterprise and the money, put the helicopter to the proper operational testing it required, if it were to secure its rightful place in commercial air transport.

Those interested in insurance underwriting should make themselves familiar with the helicopter and all its possibilities. This promising aircraft should not be burdened with heavy insurance rates without regard to its safety characteristics—characteristics which were clearly to be seen when in the hands of airline operators with an appropriate technical and financial background.

To those who were to-day framing legislation for the helicopter he would say—have safety by all means as their code, but frame and apply regulations with wisdom and vision so as not to hamper this new vehicle in its free development.

**G A Ford** (B E A Helicopter Unit) *Founder Member* As a pilot in B E A, he would definitely like to see some form of manual over-ride control with which the pilot could cushion a vertical landing in a restricted area, and also increase the pitch to compensate for the lower air density and the loss of engine power with height.

The fixed-wing aircraft instrument panel layout was the result of a number of years practical experience, and the principles that governed that layout should be applied to the helicopter. In particular the blind flying instruments should be in front of the pilot and close together, even at the sacrifice of a little of the forward view. Any improvement in stability would be a great asset to a pilot flying blind or by night.

**H Roberts** (Department of Aeronautics, Imperial College of Science and Technology,) *Founder Member* There was a certain degree of over-optimism perhaps to be found in the Lecturer's approach to the problems of rotary wing aircraft. There were three main stages of development in any problem, investigation of the effect, the cause and the cure. The Lecturer's had said a lot about the causes of helicopter problems, e.g., the problems of stability and vibration, and the effects were fairly widely known. Thus excessive vibration led to discomfort during flight and fatigue failure of parts, while inadequate stability involved a higher degree of risk, and consequently reduced safety. What seemed to be lacking was that the Lecturers—particularly on the question of stability—had said little about the application of present-day ideas to provide improved answers to the problems.

The particular problem of vibration seemed to be getting the attention it deserved, and he congratulated the designers on their various ways of alleviating vibration troubles. But the "solution" to the stability problem offered by Mr SHAPIRO was far from new, having been handed down by the earliest pioneers. Dr BENNETT'S solution, involving the use of a fixed tailplane gave stability only at forward speed, and was merely an adaptation of fixed-wing concepts. The Bristol machine apparently could only be stable over a limited range of forward speed. It seemed that all these so-called solutions were not really genuine solutions in the sense that they enabled them to achieve stability over the whole speed range without extreme complication or difficulty.

During the discussion it had been said that stability would be provided when it was required by the customer. He did not know whether or not it was proposed to provide it from a hat, like the proverbial rabbit, but stability would certainly not be provided just like that. Its achievement called for really hard work by a lot of people. In Great Britain there were a certain number of experts, but nothing like the number that the situation required. In contrast to their own limited resources, in the United States there was intense activity by a large number of design and research organisations and it was probable that advances there could be more substantial than in this country, he could not help feeling that they were likely to be behind for a long while.

One of the roots of the trouble was that the teaching facilities in Great Britain for training engineers in this field were far too limited. The new syllabuses of the "Aircraft Design" paper for the Associate Fellowship Examination the Royal Aeronautical Society, for the first time, was proposing to include specifically the rotary wing aircraft. He hoped that this, together with the activities of the Helicopter Association, might provide a filip to the teaching organisations to extend their activities and facilities in this direction, so that eventually they might produce that body of designers and research engineers needed.

Whereas Mr FITZWILLIAMS had said that the function of the helicopter was to deal with the low speed end of the speed-range, Dr BENNETT had said that his machine was designed, not so much for the low speed end, but for a high cruising speed. Perhaps they might be able to resolve that slight inconsistency.

Mr TYE had said that he did not know of a solution of the general layout problem which gave reasonable fuselage shapes. If a fine fuselage were required there would be no difficulty in providing it. But the solution which looked best, so far as aerodynamic lines were concerned, was not necessarily the best solution for the overall aerodynamic performance. The morning discussion seemed to exaggerate one side of the picture.

In Mr HAFNER'S first graph he had very high values of  $\mu$ . The symbol  $\mu$  did not generally exceed 0.5 or 0.6 and he would like to know what was meant by values of  $\mu$  of 1, 2, 3 and 4.

In Mr HAFNER'S equations there appeared a term which allowed for the deflection of the induced flow as it approached the disc, so that the effective angle of attack of the

disc was altered. He was under the impression that deflections of this sort were not substantiated experimentally and there was a fair amount of argument—and it was very much a matter of opinion—as to whether there was any justification for using the deflection angle on a parameter.

Stability had been recommended in forward flight, but not necessarily in hovering flight. It seemed to him that the problem of achieving stability in forward flight was not difficult, and he did not think that anyone had said that it was. The difficulty was to achieve it in hovering flight, and he felt that it was rather begging the question to suggest that people really did not want it.

**Pierre Renoux** (S N C A S E, Paris). A flying model had been made of a family of new helicopters developed by the S N C A S E which included some unorthodox features. A picture of it had been published. It had two tail rotors, which had advantages in connection with the control of the pitching and yawing components, and very good damping in pitching and yawing motion was secured.\*

**G E Clair** (Aviation Underwriter, The London and Lancashire Insurance Co Ltd). He welcomed the remarks of Mr NORMAN HILL on insurance and noted that Mr HILL hoped underwriters would enquire more closely into the helicopter situation. That request, to some extent, had already been met by the presence of two insurance representatives and much of value had already been learnt.

If underwriters could have information as to the possibilities of autorotation in the event of engine failure, the loss of height necessarily involved and the heights at which any such failure could be handled safely it would be helpful. For example, he had gathered from Mr HAFNER's remarks that there was a possibility of landing the Bristol 171 with only a 50 yards landing run which seemed quite good.

Mr HILL had referred to harsh rates, he assured him that in the present competitive state of the market, underwriters did not charge more than they could help. Harsh rates were the result of bitter experience during the past few years, mainly on the Continent of North America, and some underwriters to-day even refused to look at the business. But whatever proposition was put forward, provided that the safety factors mentioned were clearly brought out, it would be found that the insurance market, instead of being rather nervous, would do all that was possible to help, by covering the new and interesting development in aviation.

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\* Mons Renoux had brought a cinematograph film showing the operation of the model, which he was asked to leave with the Royal Aeronautical Society so that it could be shown at a later date.

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## THE CHAIRMAN

This afternoon we have had but a very short time available for discussion. The meeting will now adjourn for tea, but at 5 o'clock we shall again meet and continue the discussion both of this morning's and this afternoon's papers and the problems that arise from them.

I would like to point out that if there is anybody here who has wished to take part in the discussion and will be unable to be present this evening, if they will submit their comments in writing to the Secretary of the Royal Aeronautical Society these will be answered by the Lecturers and will be included in the published discussion.