

Discussion

Group Captain E Fennessy (*Member*) stated that as a radio engineer concerned with the development of navigational aids for helicopters, he had listened to Mr ROWE's paper with the greatest interest. He considered this concise statement on the operational problems to be of the greatest value in designing appropriate navigational aids. So often the problem confronting designers on these occasions is that while they are capable of exercising extreme ingenuity in production of devices, they are unable to obtain from the operators a clear statement on the nature of the problem to be solved. This is particularly true at the moment with regard to fixed wing aircraft. It is, therefore, particularly encouraging to find that, where helicopters are concerned, wisdom and foresight are being displayed, and that there is such obvious co-operation between the operators and the designers. What is true in his own field of activity, that is designing navigational aids, must be equally true with regard to the broader field of helicopter design. He was sure that designers of helicopters present would join with him in thanking the lecturer for the way in which he had summarized the operational problems.

There was one aspect of Mr ROWE's paper on which he would like to comment further and that concerned traffic control. Mr ROWE had referred to the problems of traffic control and expressed the hope that it would not be necessary to provide traffic control aids. He would agree with him that every possible attempt should be made to avoid elaboration. Fixed wing aircraft are at present beset with traffic control problems and are likely to be weighed down in the future by a mass of traffic control equipment, both in the air and on the ground.

If the helicopter is to be widely used and operated economically, this elaboration must be avoided, but we must recognise that the increasing use of helicopters will bring with it concentrations of traffic, and it may not be possible to avoid at least some simple form of control traffic.

The Decca Navigator Track Control will accurately define the path the aircraft is to follow, and will provide the pilot with all he requires to control the movement of his machine in both space and time. It must be emphasized, however, that there are collision problems to be faced, and he believed that we will find it necessary to develop some simple anti-collision warning unit. If this is so, then it is necessary to give early consideration to the design of such equipment, since if it is to be of adequate lightness and simplicity it may involve us in some basic research and the development of some novel equipment.

O L L Fitzwilliams (*Founder Member*) was not prepared to accept the lecturer's proposals for limiting control to the simplest form of navigation, and considered that traffic control would be a necessity. Though "sealed servicing" provided an excellent target to aim at, it was too early to insist on it yet and its premature adoption would have the effect of sterilizing design. With regard to the times given by the lecturer for maintenance operation, this could have been much reduced by utilization of spares. As regards navigational aids, some system such as "Teloran" would be ideal.

C G Pullin (*Founder Member*) congratulated Mr ROWE on a very excellent paper and disagreed with Mr FITZWILLIAMS on some of his points, and thought it should be the aim of helicopter constructors to try and make Mr ROWE's proposals come true in every detail. Mr PULLIN was interested in Mr ROWE's suggestions as to the use of turbines for helicopters but the investigations he had carried out so far suggested that such engines were not readily interchangeable with piston engines as the residual jet thrust after taking power from the turbine was quite considerable and could not be turned through 90 or 180 degrees with satisfaction. In view of this, Mr PULLIN suggested that it would be necessary to design the helicopter to suit the turbine, and, if possible, to arrange for the jets to discharge to the rear. Resultant thrust could be used to advantage for slow forward flights, and when crop spraying with multi-rotor helicopters, the control of the machine could be by differential collective pitch which would avoid wandering of the rotor slip streams and give more accurate coverage. Mr PULLIN asked Mr ROWE as to where the reserve power for emergency would come from as he understood that turbines were filled with limit speed governors, or, in other words, the rating of turbines were somewhat limited in the same way as that of piston engines.

A E Bristow (*Member*) deplored the fact that nothing had yet been done to develop "rotor-sites" or "rotor-stations". He did not accept the minimum sizes proposed by the lecturer and pointed out that parking needs, coupled with the advent of the multi-rotored helicopters of large diameter, made larger spaces essential. He argued that building and land costs made sites in the heart of cities prohibitive. Consequently, in practice, sites would have to be at a radius of two miles from the centre.

J S Shapiro (*Founder Member*) felt that Mr ROWE had certainly made a number of suggestions on which decisions needed to be taken, for example (a) night flying is essential, (b) no traffic control, (c) cheap rotorstations are required, (d) no navigator should be used, (e) maintenance should be sealed.

Mr SHAPIRO felt that these things can and ought to be made actual fact, and he would like to add the extra suggestion for the use of natural sites such as rail traffic centres. His suggestions for the desirable flying approach to rotorstations include vertical take-offs and landings, as well as independence of wind conditions, and he thought that helicopters would not really fulfil their function unless these targets were achieved. He thought the cost target of 4d per passenger mile was a relatively easily achieved goal, at present fuel and other prices, provided operations were laid out on an appropriate scale. In future this figure could be substantially lowered and it is then that in the comparison between helicopter and railway costs, fuel taxation should be taken into account.

Group Captain G H M Miles (*Member*) was enthusiastic in support of the lecturer's proposal for "sealed servicing". Resultant reduction in maintenance charges and replacements would be reflected in reduced insurance costs.

P G Maselfield (*Guest*) said that Mr ROWE had set up economic targets which would be of the utmost value to forward planning for commercial use of helicopters. We must aim to hit those economic targets and we must not permit ourselves to fall short of them. In a new medium of transport such as is provided by the helicopter the economics must be founded soundly from the start. Mr ROWE had suggested that a desirable objective for size would be between 12 and 15 seats, certainly such a helicopter would be most useful. But it was not too early to look a stage further ahead. He was sure that a 20-passenger helicopter cruising at not less than 120 m p h would be needed as soon as it could be developed, if the economic and commercial potentialities of the helicopter were to be exploited as they should be. Mr ROWE had underlined the importance of cutting costs of air traffic control which were a serious economic embarrassment, on short haul services in particular. Fixed wing types flew with this economic millstone in their load in the form of reserve fuel. Helicopters must try to cast it out. In this connection the Decca navigation system offered real advantages because the expense of the chain was borne largely by shipping. He put in a plea for more visual and less radio aids in general—at least as a start, if they could get away with simple two-way R T communication so much the better on the overheads and for the payload.

Lt-Col F L Hodgess (*Member*) remarked that Mr ROWE had referred to a period of approximately four years before it will be possible to have organised helicopter services. He had noticed in the press recently that the Government is prepared to spend up to two million pounds on the Festival of Britain which is to be held on the south bank of the Thames in 1951. It had occurred to him that this would form an excellent opportunity to inaugurate helicopter services from the surrounding airports such as Heathrow, Northolt, Croydon, etc., and to transport the visitors direct from the airport to the exhibition. He would like to suggest that possibly in conjunction with Wing Commander BRIE, who for a long time has proposed the idea of floating river dromes, and who has had great experience in this country, services such as those mentioned might be investigated.

J A Cameron (*Member*) (*Contributed*) wished to congratulate Mr ROWE on his very excellent paper. He makes out a very strong case for the helicopter by comparing existing train times with a helicopter service from various cities in the North of England and the South of Scotland. To Mr CAMERON travel facilities seem to become more acute North of Glasgow and it is his contention that, at the moment, a helicopter passenger service anywhere south of a line joining Edinburgh and Glasgow would be a luxury. North of that line, such a service is most desirable, and would alleviate hardship on a people who have long endured inefficient means of trans-

portation Owing to the mountainous nature of the terrain, airfields in the north-west of Scotland are few and far between, and it is going to be with some difficulty that suitable helicopter sites will be found Taking Glasgow as a centre, the rail journey to Oban, only 61 miles away, takes 4½ hours The helicopter could do the trip in 37 minutes, thus saving 4 hours The journey to Fort William, 72 miles takes 4½ hours, and this could be accomplished in 45 minutes by helicopter, a saving of 3 hours 45 minutes When one starts to consider the time spent travelling to the Islands, the situation becomes ludicrous A journey to Tobermory (Mull) by helicopter would save 9 hours, the distance by air being only 88 miles If one travels from Glasgow to the Isle of Skye (Portree) by helicopter, a saving of over 10 hours can be effected Services to the Outer Hebrides will save anything between 15 and 30 hours Before the routes over long stretches of sea can be exploited, a twin-engined machine capable of carrying at least 14 passengers, and being able to maintain height on one engine in an emergency, must be produced

A McClements (*Member*) (*Contributed*) considered that the Association was very fortunate in having Mr ROWE's paper presented to it He says this because in it we have a clear statement of operational problems vital to the helicopter's commercial future No one interested in the helicopter can afford to neglect to-day's paper and the Association is, therefore, fortunate in having the opportunity of publishing it in its Journal Turning to the paper, one of the things which strikes him about it is that it brings home to us the fact that the problems associated with helicopter development are not limited to the evolution of satisfactory aircraft alone, but they have many ramifications, including a wide field, some of which is peculiar to the operator and much common to both operator and designer It is a good thing that this point has been ventilated because we all tend to think only of the aspect of development on which we are employed, and we are accordingly in danger of forgetting that integrated effort by both designer and operator is essential Mr ROWE has mentioned that he is sensible that many of his remarks are open to challenge and criticism This may be so in considering detail, but looking at the broad picture, Mr McCLEMENTS cannot find much he can challenge or criticise In putting the helicopter and its associated services on a par with more conventional short distance transport in respect of overall comfort, scheduling and complication, Mr ROWE is undoubtedly sound, and this is an aspect which we will do well to remember, since we all at one time or another think along very expensive aircraft lines Mr McCLEMENTS believed that unless we are intelligently austere in our outlook we will strangle the helicopter's future—a future which is so vitally dependent on economics One aspect in dealing with cost puzzled him somewhat, namely the high landing fees mentioned £10 or £2 10s 0s per landing seems high and he thinks we have scope here for applying methods more in keeping with short range conventional transport He does not know what is charged to a train when it calls at a station, but he does know of one pier which not so long ago accepted steamers up to 800 tons displacement at 1/- per time In any case, why should the helicopter completely support its landing station financially? Surely the helicopter will bring business to the district it serves and the municipality should accordingly bear some of the landing costs Turning to maintenance, Mr McCLEMENTS would just like to support Mr ROWE's plea for sealed servicing, by saying that it is vitally important to the operator to have helicopters which are dependable and not handicapped by a stream of functional modifications issued by the manufacturer and found necessary in the light of operational experience This is a little more aggravating and costly than continually declaring a vehicle unserviceable in order to modify it Sealed servicing would seem to be the answer to this as well as to the other points made by the speaker Finally, Mr McCLEMENTS wished to say a word about Fig 17 in order to ensure that a wrong impression about the S 51 is not gained It is correct that the 200 hours inspection in question "grounded" the aircraft for 9½ days, but it was not a truly representative inspection, since during it an abnormal amount of stripping was done to carry out functional modifications to the gear box These modifications entailed arranging for parts to be machined and accounted for quite a bit of standing time which would not appear in a normal 200 hour inspection This point does not, of course, affect Mr ROWE's argument, but he thought it should be understood

J S Shapiro (*Founder Member*) (*Contributed*) wished to remark in connection with Mr ROWE's suggestion in his reply that it is up to the constructors to produce

machines capable of reduced cost of operation, and pointed out that in his Company's estimates large helicopters now undergoing flight testing will make it possible to attain a direct cost of around 2d per passenger mile, and that it is the operator who is mainly responsible for the remainder

The Author's Replies to the Discussion

Mr Rowe (in reply) said he was glad to hear Group Captain FENNESSEY's remarks on the statement of the problems involved and that precisely was what he had tried to give. On the question of traffic control, it was desirable to operate helicopters without any, and to put off having it as long as possible, this was to be preferred to an immediate introduction, but it might, of course, be necessary in certain areas and under certain circumstances. Mr FITZWILLIAMS had said that sealed servicing would result in stultified design, on the contrary, such a method would actively stimulate design, bringing out hitherto ignored problems. Utilization must be planned with a background of proper testing. On the question of whether partial sealed servicing was preferable to complete sealed servicing, there was no doubt that the former would achieve a great deal. Mr ROWE agreed with Mr FITZWILLIAMS' remarks on the question of the 9½-day overhaul. Replying to Mr PULLIN, who said that turbines could not be used without a complete redesign, Mr ROWE said that this may be so, but unless we examine this form of propulsion, difficulties on large highly-powered aircraft are likely to arise. Mr ROWE disagreed with Mr BRISTOW who had said that a greater radius is required for rotor sites, this is not necessary, since London does not require them and the provinces would not have the traffic to justify them. The cost of construction is too great to make rotor sites very large. Elevated sites were not essential. Replying to Mr SHAPIRO'S comments, Mr ROWE believed that railway stations were not suitable locations for rotor sites since in any emergency a blockage of railway traffic may well result. The elimination of wind as a factor controlling rotor site design is a good idea. Fourpence per passenger mile is good, but we look to the designers in order to achieve it. Mr ROWE was pleased to hear Group Captain MILES say that insurance would be low if maintenance were of a high standard. Mr ROWE agreed with Mr MASEFIELD that it was desirable to think in terms of larger sizes of helicopters. He thought that Mr HODGESS's suggestion in connection with the 1951 Festival of Britain was a good one.

Replying to Mr J A CAMERON'S contributed comments, Mr ROWE said the savings in time he mentions on various journeys from Glasgow to outlying parts of Scotland and the Islands are most interesting. Whilst not agreeing with him that a helicopter passenger service anywhere south of a line joining Edinburgh and Glasgow would be a luxury, he agreed that we must envisage services as early as we can with a suitable type of aircraft on routes such as he suggests. He was sure Mr CAMERON would wish to see helicopter passenger services a commercial success, hence, questions of total traffic and possible utilisation of the aircraft must be considered and might lead to a rather slower development of services. These factors must be carefully weighed in establishing services and giving priorities.

Replying to Mr A McCLEMENTS' contributed remarks, Mr ROWE agreed with him that we must be, as he phrases it, "intelligently austere" in developing helicopter passenger services, since the economics of operation is so very important.

We know very little about probable landing fees, but the experience of the authorities concerned with airfield charges, for which landing fees meet only a very small proportion of the total cost of operation, made him think that the policy will be to make rotor stations pay their own way. Hence, charges might be high in the opening phases when utilization of the stations is low.

VOTE OF THANKS BY MR O FITZWILLIAMS, B A

Mr Chairman, Ladies and Gentlemen. It is a great privilege to propose a vote of thanks to Mr ROWE. I have read the lecture twice and have also heard it read, but there were so many ideas in it that I have still not yet absorbed it completely. I would like to compliment Mr ROWE on having presented the first indication on the true value of the helicopter to the community. Mr ROWE has marshalled his facts with his usual skill and had handled the discussion most admirably. It is with great pleasure that I call upon you to signify your appreciation in the usual way.