

DISCUSSION.

CAPT. W. H. SAYERS.—The lecturer has raised a large number of interesting points, and it is impossible to deal with them all. He has shown very clearly that it is not necessary to adopt certain standard practice in every case.

Regarding bodies, and the relative merits of the girder type and the monocoque, I certainly object to wire bracing in the ordinary fuselage, as it always stretches. I personally should favour the rigid type of bracing, which makes a continuous composite structure. In the case of a rigidly-braced fuselage it is either all wood or all metal, and not subject to stretching. It has the advantage of it being possible to replace the individual members in the same way as the ordinary fuselage, and it keeps its shape just as well as the correct monocoque.

With regard to detachable engine mountings, it is quite possible that our engine mountings so far have not been of much use for working purposes. They are not the correct type of detachable engine mounting.

There is a very strong case for the removable mounting, and with regard to control connections and petrol connections, these should be designed by the man who is responsible for the engine. There is not much to be said for the removable engine when each designer follows out his own ideas. The old original rotary engines were to all intents and purposes very good detachable mountings. They were very simple to take out and to overhaul.

By having standardised engine units designed by the engine manufacturer you get many advantages. You also have a mechanic who knows all about the engine.

MR. GIBSON-KNIGHT.—I think the great thing about this lecture is the number of interesting points raised, and the fact that there is no hard and fast rule for all types.

With regard to fuselage bracing, I am surprised the lecturer did not mention that one of the advantages of the girder type is that it can be repaired, while with the monocoque it is impossible to do this.

Regarding the type of fuselage, one is immediately up against the fact that the fuselage should be open. You do not want to carry any redundant weight. The girder type is therefore quite satisfactory. For other work the monocoque is best. The combined monocoque and girder type seems to get over the difficulty.

I think the idea of the Folland fuselage is excellent, and should not present any serious difficulty. Early in the war the Sopwith Snipe was designed with fittings which fastened on the longerons. There seems to be no reason why something similar should not be devised for other machines.

With regard to folding wings, I know one or two of Short's types in which I do not think I should have any difficulty in folding the wings single-handed. Machines having a winding gear present no difficulty, either in closing or opening the wings single-handed.

MR. A. F. HOULBERG.—With regard to the girder fuselage and production, it is somewhat doubtful whether the girder fuselage is any easier to manufacture in mass production than the monocoque type, particularly if the latter is more or less of a hybrid nature. That seems to be a type which is very simple in mass production and very satisfactory in practice. In connection with the girder type I should like to remark that I have seen a machine overstressed to such an extent when truing up that it was quite dangerous. That is a point which seems to be rather against this type of structure.

With regard to positioning internal members on the aeroplane with a monocoque fuselage, I see no more difficulty in this than with the ordinary girder type.

It certainly seems doubtful whether removable longerons are an advantage. If the longeron in any way gets damaged, it is highly probable that the fuselage will require to be completely overhauled.

With regard to the slide showing Mr. Folland's method of loading, it seems quite a good solution of the problem; but although the hind portion is completely braced, the last bay of the front portion is not. This is likely to be a source of difficulty in re-joining the fuselage afterwards.

With regard to the position of the carburettor on a modern engine, there does not seem to be any reason why the carburettor should only be fitted above the engine. Something might be done by way of an induction carried through the crank-case, with the carburettor kept low down, thus helping the gravity feed.

LIEUT. OLECNVITCH.—During the war I gained experience of the monocoque fuselage. I built an experimental machine and left it outside, and under the conditions of a South Russian summer the monocoque in a few days was twisted out of shape.

I think the monocoque fuselage is the best, but for military purposes should be constructed of all-metal.

MR. H. B. MOLESWORTH.—With regard to the girder fuselage, I consider that internal cross-bracing is absolutely redundant. If there is a solid bracing at each end, and the four sides are braced, cross-bracing is unnecessary. Take the case of a long box with two solid ends. Each side of the box being a girder as it were, there is nothing required in the middle to stiffen it. To use an Irish expression—any end in the middle is perfectly redundant, because the four sides cannot possibly twist if the ends are braced.

In the same way, I should think there would not be the slightest difficulty in designing one of the sides of a girder fuselage so that you could leave out

a bay of cross-bracing completely, in order to have a door and yet not interfere with the strength of the complete fuselage.

MR. HOWARD-FLANDERS.—I should like to remark on the Aviatik fuselage fitting. I cannot see that there is anything to take the longitudinal sheer.

It seems to me it is necessary in any sort of fitting to have them definitely located in the length of the fuselage. I have always thought that from that point of view it is much better to carry the wires through the fuselage member instead of bolting it through. You can make a very light fitting with the modern type of butted wire. The fuselage will remain true much longer than if one uses any form of eye in a wire, which must result in an alteration in shape under stress.

MR. HILL'S REPLY TO THE DISCUSSION.

There is very little to say, except to thank the various gentlemen who have spoken.

(Capt Sayers.) I quite agree with him with regard to rigid bracing. As far as my experience goes, the only rigid bracing adopted in this country has been on all-metal, tubular-construction fuselages, a type to which it is particularly applicable. I avoided mentioning metal construction deliberately, as it opens up a field for discussion quite extensive enough for a whole evening's programme. I am in agreement with him when he says that this type offers one of the best solutions. While upon this subject I also endorse Lt. Olecnovitch's suggestion that an all-metal monocoque is superior to a wooden one, from the point of view of warping due to weather effects. Here again the discussion of wood versus metal is too wide to include in this evening's paper.

With reference to Capt. Sayers' remarks on detachable engine mountings, it is certain that there is room for improvement in the design of them, and it is quite possible that with more thoughtful design they may still prove to be of considerable use. It appears, however, that this will have to be accompanied by a fairly wide alteration in aircraft designing procedure, that is, the engine designer will have to assume responsibility for other parts which up to now have always been considered to be the aeroplane designer's field.

(Mr. Gibson Knight.) I do not think that there is a great deal in his point regarding the monocoque that it cannot be "re-trued up" whereas the girder type can be, except possibly in the case of gradual deformation due to warping of the wooden members, when it can be counteracted by adjusting the bracing wires in a girder fuselage. Even then this operation would need to be carried out only under highly-skilled supervision to avoid over-stressing.

I agree with his remarks upon the possibility of single-handed folding

of wings, upon the machines that he mentions, but I had in mind rather the very much larger ones which we may visualise as the future types.

(Mr. Houlberg.) I agree with his remarks upon the possibility of overstressing a girder fuselage when "truing up." I have already emphasised this point in my reply to Mr. Gibson Knight.

I always imagined that Mr. Folland's proposal in his folding fuselage was to build the cabin portion of the monocoque type. As far as I can see that is the only way of leaving an open door at the rear end of it.

(Mr. H. B. Molesworth.) I believe that the reason for using internal cross-bracing is that, taking equivalent weight for strength, this gives a lighter construction than making the four outsides stiff enough to refuse to twist. If it is imperative that a cabin space be provided, the extra weight necessary in the sides, owing to the absence of internal bracing, gives it the monocoque's disadvantage of weight, without its other advantages.

The same remarks apply to his suggestion of leaving out a complete bay of bracing to accommodate a door. This is done on military type girder fuselages on the top side to allow for the openings into the cockpits for the pilots, etc., but the extra stiffening up of that portion again puts up the weight and robs the girder fuselage of still one more of its principal advantages.

(Mr. Howard-Flanders.) With reference to the question of longitudinal shear, the tendency to "creep" is usually counteracted by using a fairing strip, cut out to locate each fitting. This is quite a general way of doing it, and, as far as I know, is effective.

A hearty vote of thanks to the Lecturer, proposed by Mr. Manning (Chairman) and seconded by Capt. Sayers, brought the meeting to a close.