RL. 853-1957

11 January 1957

Sir Sydney Camm, C.B.E., F.R.Ae.S.,
Hawker Aircraft Limited,
Canbury Park Road,
Kingston-upon-Thames,
Surrey, England.

Dear Sir Sydney :-

I was pleased to receive your letter, and have asked my people to collect together some data on titanium, and I am enclosing herewith a short note on our experience on fabricated parts in titanium, and also a note on the metallurgical side, prepared by Mr. Smallman-Tew, our Chief Metallurgist.

In addition to these summaries, I am sending over a fairly thick and heavy volume of a complete summary of a survey which we carried out on the processing of titanium and its alloys. I believe that this will be really useful data for your people. You should have the large report fairly quickly, since we are sending it Airmail.

If there are any other areas in this regard on which we can be of assistance, we would be only too pleased to do so.

I have been watching with interest the announcements on your new fighter and want to wish you the very best of luck with it. We have now issued the complete design for our first five CF-105 aircraft, and the components are approximately half built. We still hope to fly in the summer of this year. I will keep you posted.

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J C C
V/P ENG

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RL. 853-1957

13 September 1957
Mr. F. T. Smye
J. C. Floyd
HONEYCOMB CONSTRUCTION

I am attaching a write-up from Fred Mitchell on our investigations into honeycomb and, while this is self explanatory, Crawford did ask for a single statement and it may be worthwhile to summarize our thoughts.

First, I want to say that we have been, and still are, carrying out investigations on the use of honeycomb in Arrow development, and have kept very close to the work that Avro are doing in the U.K. (through Ashley) and Convair in the States.

The advantages of honeycomb construction are mainly in resistance to noise fatigue, improvement in surface smoothness, and usually some saving in weight. These are advantages which are, of course, all worthwhile, provided the disadvantages don't outweigh them, which we felt they did in the case of the Arrow.

On the B-58, where the engines are ahead of a considerable portion of the structure, noise fatigue due to jet impingement is a really big problem. The Avro 730 had the same problem. On the Arrow, where the nozzles are behind all structure, this problem does not exist, except for the fin trailing edge, and we are looking into this at the moment.

The B-58 has to operate at supersonic speeds for long periods, with consequent soaking of the structure at high temperature. Honeycomb provides some degree of insulation for the interior. On the other hand, the Arrow is supersonic for a much shorter time (Spec AIR 7-4 calls for 5 minutes combat) and the insulating value of honeycomb is not required.

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The wing on the Arrow is extremely thin and we have been hard pressed to find space for all the fuel required. The use of honeycomb would cut this space down even further.

The smoothness of the skin on the Arrow is adequate, especially on the inboard wing, which uses milled skins.

With regard to weight, our investigations showed that, due to the position of the Arrow undercarriage, etc., and the large cut-out in the wing at this region, the concentrations of loads in certain areas would require peculiar joints to collect and re-distribute the loads, and this would obviate to a large extent any saving which might be made by using honeycomb structure, since this is not compatible with highly concentrated loads.

Another very important facet in our shying away from honeycomb, unless the advantages were considerable, has been the fact that we have attempted, between Engineering and Manufacturing, to use existing methods of production to cut down manufacturing costs and capital investment, and also to avoid structure which was difficult to inspect (it is almost impossible to accurately assess whether an internal honeycomb joint is 100% and allowance has to be made for this by increase in size of skin, etc.).

We have, between Engineering and Manufacturing, set up a Pilot Plant group which is investigating not just honeycomb structures, but all new types of structure and materials, and are trying not to miss any bets where a type of construction may show distinct advantages in our aircraft development. The case of honeycomb construction is no exception to this.

J. C. Floyd,
VICE-PRESIDENT, ENGINEERING.

JCF-kas
att'd