John M. Swihart  

Richard T. Whitcomb  

Comments on proposed design  

1. In answer to your request for comments on the drawing you sent me, the following is offered:

   (a) The wing-thickness ratio appears to be far too small for a realistic airplane configuration. The lowest thickness ratio ever utilized previously for a panel similar to that of this wing outboard the pivot is about 10 percent. Any reduction beyond that thickness should result in very severe weight penalties. The principal factor determining the thickness is not static structural strength, but the stiffness required to eliminate flutter. At the present, there is very little information on the effect of the freedom inserted into the system by the pivot, but rest assured, there is a freedom inserted. This freedom will normally increase the flutter problem. This adverse effect imposed on the known flutter problems of a thin, high-aspect-ratio panel, will probably result in flutter being the dominant factor in design of variable-sweep, high-aspect-ratio panels, even for reasonable thickness ratios.

   (b) The relative tail thickness for the configuration is even less than for the wing. The tail operates well within the pressure fluctuation field of the jets. The mechanism required to change the incidence and dihedral of the tail will obviously have not only mechanical problems but will add freedom to the flutter problems. This should be even more severe than in the case of the wing. It is probable that not only should the tail-thickness ratio be greatly increased, but the aspect ratio should also be substantially reduced to alleviate the above-mentioned problems.

   (c) It is noted that the horizontal surface is rotated down to provide additional directional stability for the high-speed conditions, I assume. It has been our experience that a tail large enough to provide adequate directional stability for the low-speed conditions will provide plenty of directional stability for even the highest supersonic Mach numbers contemplated. I don't think we are going to need the additional directional stability associated with such a movable horizontal tail. Our problem is somewhat different from that of the B-70. In that case the landing lift coefficient is relatively low. When we force the landing lift coefficient to two or three times the corresponding coefficient for the B-70, the dynamic pressure at landing will be so low that the vertical tail similar to that on the B-70 will just not be adequate. It appears that you have recognized this problem in designing such a large fixed vertical surface. In fact, you probably have too much fixed vertical surface.
(d) The problems associated with the engine installation have probably been covered very thoroughly by the other commentators. I would merely like to add that with this arrangement the flap deflections of the wing, particularly for the sweptback condition, would be severely limited.

(e) While the problem of storage of a landing gear is not one of the major items that we should consider completely at the present time, some thought should be given to how you open a landing gear with the engine arrangement you indicated. As you know, it is probable that the FAA will require a substantial tread to the wheels.

(f) The upward-turned nose to the fuselage will undoubtedly improve the aerodynamic performance and trim characteristics of the airplane. It would be very nice if we could incorporate things like this into the design. However, I just don’t see how a feasible visibility scheme acceptable to the FAA and airlines can be built into such a design. Most manufacturers’ designs incorporate, as I feel that our NASA design should, a nose sloped downward to provide visibility over the nose as in present airplanes.

(g) A wing leading-edge sweep of 60° or 65° is incorporated in the root sections. This particular angle probably is not great enough to provide any favorable aerodynamic effect at supersonic speeds, and yet is great enough to provide substantial adverse effects on the stability for the low-sweep conditions.
TO: Dr. Whitcomb

FROM: John M. Swihart

SUBJECT: Comments on enclosed design

In line with the meeting we had in Nichol's office on 7-17-61 I would like to have your comments on the enclosed design. The ground rules for its design are:

1. Variable sweep wings
2. 4-podded STF102F engines

All other ground rules are same as we have had for the transport for some time.

I would like to have your comments in writing by October 6, 1961. They will be reviewed, the design modified (if possible), and then a meeting held to discuss the concept further if it appears to be of sufficient interest to warrant a more detailed design.