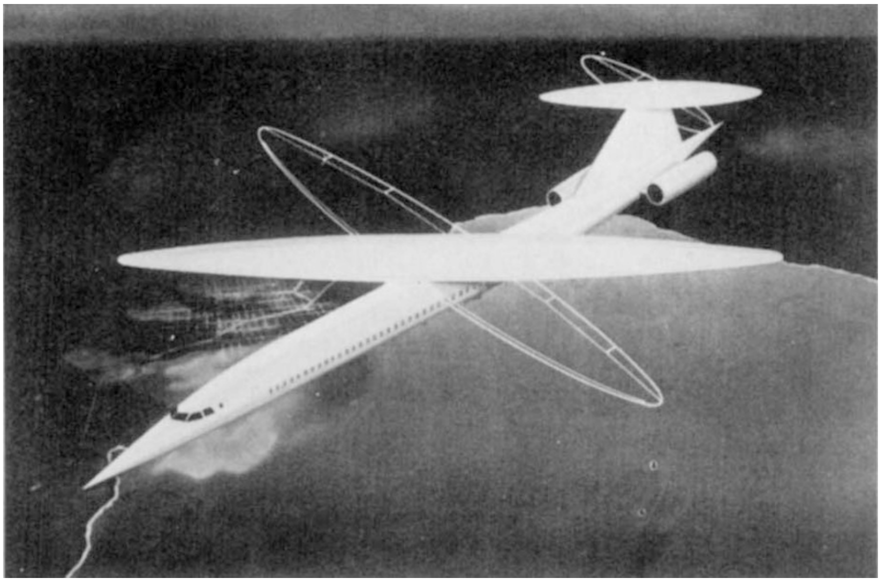
AERODYNAMICS

Swing Wing or Swivel for SST?



R. T. Jones's concept of a supersonic aircraft with an asymmetrical wing. The wing outline shows the wing's position at take off.

According to R. T. Jones, of NASA's Ames Research Center, the designers of supersonic transports such as Concorde may be mistaken in their tacit assumption that a symmetrically swept wing is the most efficient. Jones, who was one of the pioneers of the development of swept wing aircraft, now believes that a single oblique wing will be more efficient at supersonic speeds, because this produces less drag than the symmetrical swept wing which is now fashionable.

Any practical aircraft developed from these ideas would have to incorporate variable geometry, because the asymmetrical arrangement produces instabilities at low speeds. So Jones envisages a transport something like that shown in the figure here, which has a swivelling wing mounted on top of the fuselage. As well as the aerodynamic advantages of such an arrangement, the swivelling mechanism is simpler to construct, and imposes less strain on the wing, than the movable joints in conventional swept wing aircraft such as the ill fated F111.

In support of his idea Jones quotes the example of two conventional swept wing aircraft flying at supersonic speeds. If the aircraft fly side by side, the drag of each aircraft is twice that felt by a single aircraft; but if the aircraft fly in a staggered formation, with one slightly ahead of the other, the total drag on the pair need be no more than that on one such aircraft flying alone at the same speed.

This improvement in efficiency results from the favourable interference of waves along lines for which the normal component of velocity is subsonic. Taking this to its limit, the wave drag of a long narrow wing tends to zero if the wing is swept behind the Mach cone, with the further advantage that by suitable choice of wing angle and speed cruising above Mach 1 can take place without any sonic boom being heard on the ground.

A great deal more work is necessary before even a prototype of this new kind of aircraft reaches the drawing board, let alone leaves it. But the attractions are, on paper at least, so great that it seems likely that progress will be pushed forward. With the wing in its conventional position, such an aircraft would require only one quarter of the take off energy of a comparable delta winged aircraft, reducing runway requirements and takeoff noise. Once airborne, the wing would be rotated for cruising at up to Mach 1.2 with no associated sonic boom and with a fuel consumption comparable to that of present subsonic aircraft, and with the option of still faster speeds if sonic booms can be tolerated.

The only prototypes widely available at present are 9¾ inch span asymmetrical flying wings made from balsa wood, supplied to journalists by NASA. In spite of its improbable appearance the model flew well when tested in *Nature* office and proved stable even at the low speeds appropriate for a glider of this kind.

MEMBRANES

A Case of Hydrophobia

from our Molecular Biology Correspondent

One does not have to swallow any of the more feverish theories about the nature of membrane proteins—such as that they are inverted globular proteins with the polar residues on the inside—to acknowledge that they must be possessed of structural attributes of their own. Many membrane proteins are insoluble, have strong aggregating tendencies, and are devoid of biological activity in the absence of phospholipids. It is doubtful whether these properties can be explained simply in terms of a superabundance of non-polar side chains, for the amino-acid composition is most often, at least on superficial inspection, unremarkable.

It is faintly surprising that an analysis of published data on amino-acid compositions has in fact only now been made. Capaldi and Vanderkooi (*Proc. US Nat. Acad. Sci.*, **69**, 930; 1972) have collected data for thirteen putatively constitutive membrane proteins, such as cannot be extracted without recourse to detergents or organic solvents,

Chloroplast Membranes and Photosynthesis

Mutant strains of the green unicellular alga, *Chlamydomas reinhardi*, have been used to obtain significant information about the primary mechanism of photosynthesis. A great deal of this work has been carried out in Paul Levine's laboratory at Harvard University and in next Wednesday's *Nature New Biology* (June 7) Levine and two colleagues, Burton and Duram, outline some of their recent work involving this organism.

Levine *et al.* have investigated the nature of membrane polypeptides which can be isolated, using gel electrophoresis, from *Chlamydomas* and also from spinach chloroplasts. These polypeptides seem to consist of two fractions which are associated with either photosystem one (S1) or photosystem two (S2). This was shown by using mutants deficient in S2 activity and then analysing spinach sub-chloroplast particles, rich in either S1 or S2 activity, treated with 'Triton' or digitonin.

It is not yet clear if all the polypeptide fractions are intimately involved in photosynthetic activity, but Levine and his colleagues show that at least three of the polypeptides, with molecular weights of about 30,000, are very specifically associated with S2. From studies with *Chlamydomas* mutants it seems that this specific relationship is with the reducing side of the S2 trap. Levine *et al.* are unable to say if the S2-associated proteins are acting in a structural or functional manner.