CORRESPONDENCE.

To the Editor of the AERONAUTICAL JOURNAL.

DEAR SIR,—It is a matter of regret to me that I was unable to attend Major Hills' lecture on twin and single engine aircraft, the more so since it represents a valuable attempt to bridge the gap between designers and pilots, a gap due largely to a mutual lack of self-expression in common terms.

The primary point brought out in Major Hills' Paper is that the reaction of an aeroplane to a sudden change of conditions must be slower than the human reaction of the pilot to correct these new conditions, and as a corollary the man must have enough power over the machine to bring about the necessary correction.

Judging by Major Hills' Paper he considers that with a skilful pilot the first condition is fulfilled except in the case of one engine of a twin failing, when the machine will swing so suddenly that the man is liable to lose control; as to the second condition it is met at high speeds but not at low.

It would appear then that the problem before the designer of a twin is to reduce the rate of swing on one engine cutting out to a point at which it is manageable, not to sacrifice the fundamental advantage of a twin (ability to carry on with less one motor) by the use of mechanisms which arrange for both engines to cut out simultaneously.

Consider a twin aeroplane having inward turning screws and fin or rudder directional surfaces in the upper part of the slip steam; the rotational swirl of the slip stream will give an inward component of velocity to the air passing over these directional surfaces resulting in an inward force on each side at the tail pushing it to starboard in the case of the port fin and vice versa.

Under these conditions should the starboard motor, for example, cut out, the thrust of the port engine will tend to swing the tail round to port; that is, to move it against the force exerted by the slip stream of the port engine on the port fin, the effect of the latter being to reduce the rate of swing.

With outward turning airscrews the force on the fin will be in the same sense as the pull of the motor, and increase the rate of swing, while with airscrews of the same hand the effect will in one case be additive, in the other differential.

It would be of interest to have Major Hills' experience in the case of the Vickers Vimy and Handley Page o/400 machines, which fulfil the conditions indicated.

That the effect exists was shown in the case of a Vimy which proved capable of flying on the port motor (an inward turning engine) but had to be flown faster and so lost height when keeping a straight course on the starboard engine.

A strong case is to be put forward for the use of inward turning screws on twin-screwed aircraft; the fin effect can probably be increased (by the use of cambered surfaces on the inboard sides of the fins) to a point at which the machine can be flown straight at or below her climbing speed with one motor and little or no rudder.

Before proceeding to the question of control at low speeds, there is a point which appears to have escaped the lecturer in connection with four-engine machines such as the super-Handley or Breama. If the back engine of a pair suffers a structural breakage such as a crank shaft or a small propeller fracture, this engine cannot be stopped on account of the slip stream of the front motor.

The continued turning of a faulty engine may in these circumstances produce such vibration as to force a descent.

This is, of course, merely an argument in favour of making each pair of engines drive a single large airscrew by means of gearing; with such a layout it is possible to use engines all of one hand but at the same time to retain inward turning screws and a simple design of gearing.

The question of control at low speeds is certainly of vital importance. War machines have sacrificed this feature to the manœuvrability at high speeds necessary for fighting purposes.

There are certain aircraft to-day which have to be landed at speeds 5—10 miles per hour faster than necessary solely on account of poor control at the lower velocity. Observation of the slow speed tests in the Air Ministry competition lead me to believe that success in this test was far more a matter of control than of wing section or within limits loading.

For commercial work control at low speeds will become of great importance. I have been told that certain of the earlier machines built at Farnborough could out-manœuvre a scout if kept to a low speed and were very heavy and slow on control when flown fast. Major Hills' experience on this point would be of great interest.

Apologising for the length of this communication,

Believe me, Sir,

Yours faithfully,

B. THOMSON.

Combe Close,
Woldingham, Surrey.
10th November, 1920.

To the Editor of the AERONAUTICAL JOURNAL.

DEAR SIR,—The AERONAUTICAL JOURNAL for November, 1920, contains some "remarks concerning some fundamentals of the theory of blade screws" by Dr. George de Bothezat, in which the following statement occurs:—"In the so-called Cascade Theory of Mr. R. M. Wood, the existence of an inflow produced by the blade considered is denied, and only inflow produced by the other blades is admitted." May I plead "Not guilty," and in support, quote my actual words from Advisory Committee Report R. & M. 639:—"The disturbance of flow at an airscrew blade element consists of one part due to the local action of the element and to another part due to the remoter action of the whole airscrew. Only this latter part necessitates a correction being applied to the aerofoil coefficients assumed for the element; the local disturbance was equally present in the aerofoil tests from which the coefficients for the elements are derived."

I do not question Dr. de Bothezat's analysis of the flow and the values obtained for the inflow velocities, but I state that in using the ordinary aerofoil tests which have been made in wind channels in the analysis of the forces acting on an airscrew, this inflow must be regarded as composed of two parts only, one of which is to be taken into account, this part representing the interference due to the other blades and to the blade itself at angular distances of $\pm 2n\pi$ where n has every integral value *except* 0.

Dr. de Bothezat may conceivably obtain his aerofoil data in some other way than that I have discussed, in which case my criticism of his work requires reconsideration.

In conclusion, I believe in the approximate truth of the relation $a = \frac{1}{2}b$ for