

## CORRESPONDENCE.

*To the Editor of the AERONAUTICAL JOURNAL.*

SIR,—I have found Lieutenant-Colonel H. W. S. Outram's lecture on "Ground Engineering" very interesting. Since he invites constructive criticism I venture to send you my views.

To begin with, the name "Ground Engineer" seems to me neither handy nor happy. "Test Engineer" would be better. Clipped short to "Tester" it would, at least, convey some idea of the fellow's duties. And being similar to "Test Pilot" would suggest that he might occasionally take the air instead of implying that he should never venture off the ground in one of the machines for which he is responsible.

There is to be one ground engineer to an aerodrome it seems. And he is to sign a daily certificate in respect of each passenger-carrying aircraft which flies from his aerodrome on any day. By his certificate of airworthiness the ground engineer has to pledge himself that the craft "is fit in every way for the flight proposed."

Too great a burden of responsibility is laid on the ground engineer. "Fit in every way" involves the solution of complicated questions of fact and opinion. An aeroplane is a structure fitted with an engine. Its fitness for a journey depends on the due design, proper construction, and skilful maintenance of the component parts of both structure and engine. But it also depends on the suitability of engine to structure, on the proper installation of the engine in the structure, on the due distribution of fuel, cargo, passengers and pilots; on the due provision of petrol and oil, and of instruments and accessories and on a thousand and one other matters of fact and subjects of opinion. No single ground engineer on a busy aerodrome (when aerodromes get busy) will have either the time or the ability to give proper attention to all of these matters. But he will be compelled nevertheless as each craft takes the air to certify it "airworthy." In practice the impossibility will be achieved by some form of delegation. A good ground engineer will rely on the engine mechanic for the running of the engine and on the rigger mechanic for the condition of the machine, devoting his own energies to general supervision and the resolution of problems of policy, opinion and doubt. The bad ground engineer will leave practically the whole of his job to the mechanics and reserve his own energies for the task of shifting the responsibility for accidents on to some one other than himself.

From Colonel Outram's Paper it appears that prospective ground engineers can be grouped in two classes and in three ways:—

CLASS I.—Woodworkers, riggers, aerodrome workers.

CLASS II.—Metal-workers, fitters, shops workers.

But at each aerodrome there is not to be more than one ground engineer, who will only be really an expert in one of these six ways. He will always be less expert in at least some of the other five than the mechanic whose trade it is and whose work it will be his duty to certify and supervise. A bad state of affairs.

What possible alternative is there? One ground engineer is an expense, two would be an extravagance and six an impossibility.

The answer is that the profession of test engineer, like every other profession, must be graded with regard to qualifications, ability and pay. The lowest grade will be mere mechanics, do mechanic's work and receive mechanic's pay. The higher grade will be engineers in fact as well as in name, and will be paid as engineers and do engineers' work.

Test engineers of all grades will be paid by the company which employs them, to whom they will also be responsible for the maintenance and safety of the machines. The lower grades will work on the machines with their own hands.

But what about the certificate of airworthiness? Which of the grades is to be legally qualified to sign it? And how will the grading enable the certifier to be equally expert with regard to construction and maintenance, engine and machine, woodwork and metalwork?

Here again I think that the development of the subject is not proceeding along quite the right lines. There is a confusion of thought involved in the requirement that the ground engineer shall certify that the aircraft is fit in every way for the flight proposed. Airworthiness is a composite quality made up of facts and of opinions. The revolutions to be got from the engine are a matter of fact, and reducible to definite figures. The safest position for the petrol tank, the provision of life-buoys for passengers on sea trips and similar problems are a matter of opinion to be decided by experts. Matters of fact can properly be classified in tables and certified by mere mechanics. Matters of opinion are not reducible to figures and must be left to be certified in general terms by the trained and qualified engineer.

My proposal is therefore this :—

Instead of a single certificate of airworthiness made out for each machine every day by the sole ground engineer I would substitute—

- (a) A formal certificate of airworthiness to be signed by a senior tester in respect of each machine at regular intervals; which might, perhaps, be based on the flying hours of the machine. The certificate will state that having inspected the log books and the machine he is of opinion that the machine is airworthy, either "in every way" or for such and such a flight, or with such and such qualifications, or subject to such and such precautions being taken or extra fittings being added.
- (b) Informal log book certificates in respect of each flight (or each flying hour in a case where a series of short flights is being made); these will be signed by junior testers on stock forms, and will certify *facts* not *opinions*.

Suppose now that an accident happens and it becomes necessary to allocate responsibility. The present airworthiness certificate is of little, if any, legal value. The oath of the ground engineer that he found the craft airworthy would shift the burden of proof on to those who denied it. But the piece of paper which certified this would not, as a rule, be admissible as evidence at all. This should be changed. The certificate of a senior tester (holding an Air Ministry licence at the time) should be made admissible in any court as *prima facie* evidence of the airworthiness of the craft according to the tenour of the certificate. Similarly the certificate of either a senior or a junior tester of any fact relating to the airworthiness of a craft should be admissible as *prima facie* evidence of the fact so certified. False certification would have to be made an offence, and

the putting in of a certificate would entitle the other side to give notice to cross-examine. The certificate of a tester who was dead, or for other good reason could not be called as a witness, would be admissible *de bene esse*, but would not operate by itself to shift the burden of proof.

Reverting to the subject of the test staff at an aerodrome, it will be seen that my proposal involves :—

- (i) A senior tester in charge. He is a junior tester who has risen through having acquired an expert knowledge of the shops and the aerodrome, of the trades of rigging and of fitting and woodwork and metalwork. He has shown that he has ability and can inspect as well as test. He gets an engineer's pay.
- (ii) Junior testers of varying experience and ability. They start as mechanics. Some in the shops and some on the aerodrome. Some are experts in wood, others in metal; some riggers, some fitters; some will rise, others not. They work on the machines and get mechanic's pay of varying amounts.

Set over the testers are the Air Ministry inspectors. They are relatively few in number, are not attached to any aerodrome and were previously testers themselves. They are chiefly concerned with licensing, supervision and the investigation of accidents. They do not sign certificates.

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