

MAINTENANCE



Problems of Maintenance versus Design

AN ALL IMPORTANT problem today, both for commercial and military aircraft, is how to keep our airplanes serviceable with the minimum amount of time for inspection and maintenance.

The aircraft designer, particularly as regards to military aircraft, has today developed a beautifully aerodynamic and scientifically sound aircraft, but, in the majority of cases, at the cost of more headaches for the field operator.

Much time has been saved in engine overhauls by the introduction of quickly disconnected couplings

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between the airplane and the power plant for power plant changes, but a considerable amount of servicing is still required without the necessity for engine change, such as the functional failure of an accessory drive pump.

To remove and change one of these units is usually a long and patience-testing task due to the proximity of other accessories. Also, as usually

happens, the job is further complicated by the limited amount of space between the rear of the engine, and its fireproof bulkhead.

Facilities for maintenance on the airframe, in the writer's opinion, could be greatly improved. There are too many small openings, and gaps through which tools, nuts, bolts etc., can drop and become inaccessible. Often these are carelessly forgotten or ignored, and later work their way into such a position that they foul vital controls causing serious accidents.

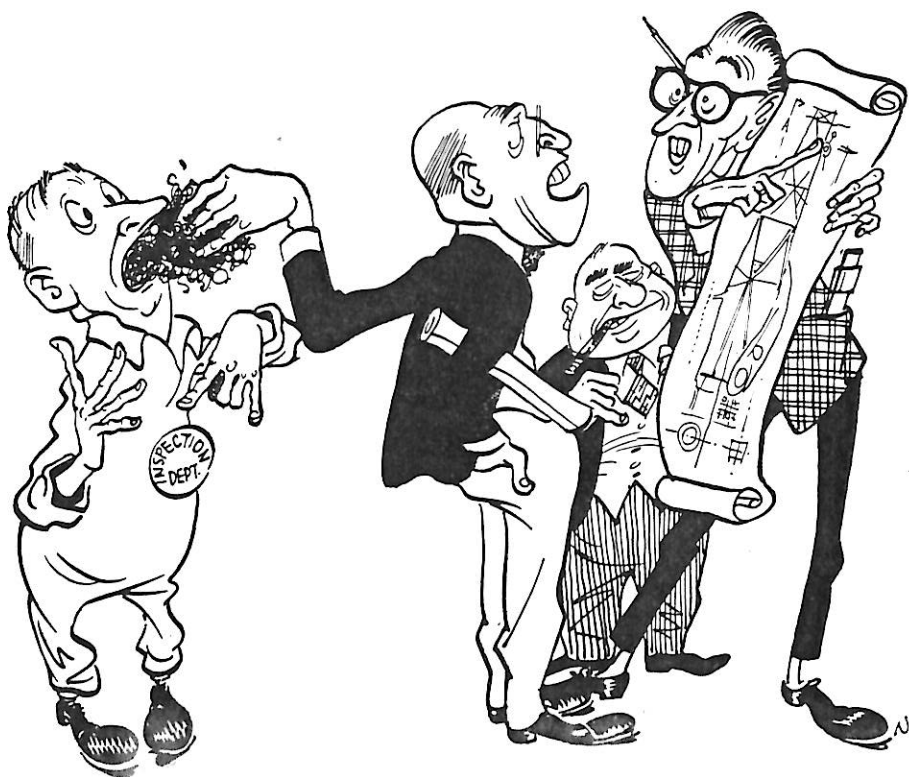
I agree, that from the designer's and draftsman's point of view it is practically impossible in many cases to visualize from their drawings, the snags that develop later for the servicing personnel. This situation could be improved considerably by devoting more facilities for conferences during the mock-up stage.

An important factor that I know has often been overlooked in the preliminary design stages, is the consideration of various regulations laid down by the different government authorities on inspection requirements. The minimum distance permissible between the rear of the pilot's instrument panel and the adjacent forward structural member, is one example of this oversight. I know of several instances, where the Inspection Dept. has never had the opportunity to voice its views at the mock-up discussion.

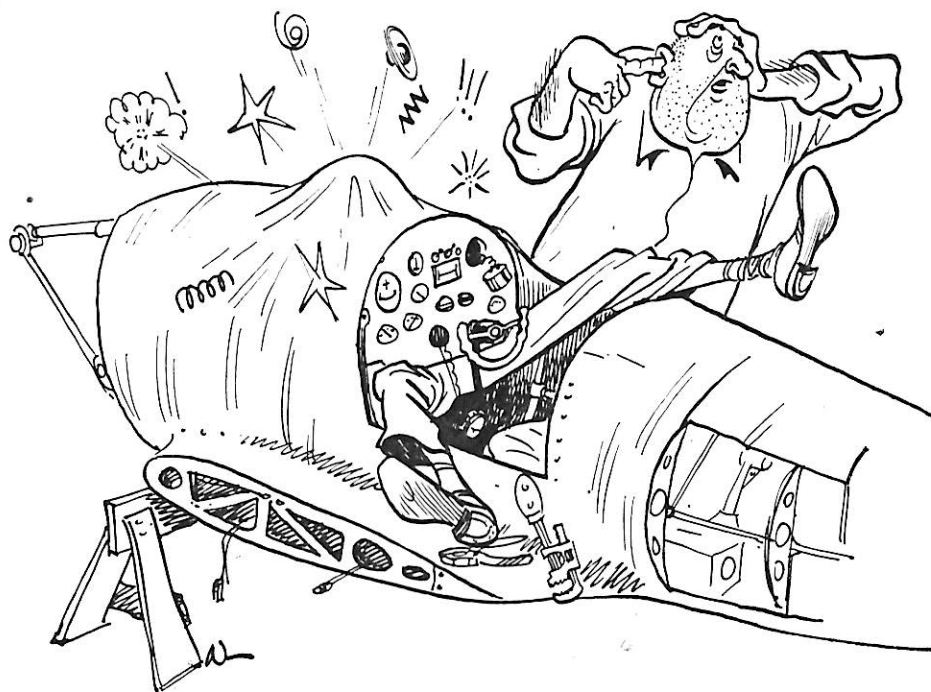
A great number of complaints could be thrashed out at this stage, if the discussion also included an authority from the Flight Shed.

During the development of a prototype airplane, my experience indi-

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cates that maintenance difficulties incurred in the later stages is not so much due to a lack of co-operation between the parties most concerned in the problems, but to the lack of facilities for a get-together on the subject.

With respect to the drawing office, I have noticed that many cases of later manufacturing difficulties, have been due to mishandled checking of drawings. Some aircraft companies select the checking personnel from their Engineering Office Staff. This, in many cases, defeats its own ends, inasmuch as the checker may have no practical experience in the manufacturing process or operation of aircraft.

It is often overlooked that correct and thorough checking of drawings is of vital importance. Permitting a checker to have access to the aircraft during the development stage, to be free to discuss maintenance problems with an authority on the matter, would delay the release of drawings to the manufacturing division. However I feel sure that a few more man-hours spent at this stage, is preferable to allowing the manufacturing process to continue to a point where rejections, redesign, and modifications, must be incorporated.

The modern airplane has reached the stage where it has become a very scientific and complicated piece of machinery. It combines the ideas of many specialists such as aerodynam-

cists, stress analysts, structural designers, electronic engineers and so on. For one or two persons to completely service an aircraft, as was possible in the 1920's has become an impossibility. There are too many specialist trades now involved.

It appears feasible therefore, considering subsequent operating time, that units or systems liable to have occasional breakdowns or periods of regular inspections, should be quickly and easily accessible.

This should be taken into consideration and thoroughly investigated during design and development stages.

Consideration could also be given to the application of standard bolts and attachment fittings which now require special tools. It is within the bounds of possibility that sometime the aircraft may be forced to make a landing due to some mechanical defect at an airport where these special bolts or special tools are not available, and much valuable time may be lost. More standardization of equipment liable to require periodical changing should be considered.

In small aircraft and some military machines I have found the rear of the instrument panel bad for accessibility. Some improvement has been made in latter years by incorporating the retaining nuts, if any, in the body of the instrument casing, so that the screws may be removed from the

front of the panel without difficulty. Nevertheless, due to crowding the panels with so many instruments today, the couplings for the leads at the rear of the instrument are often practically unattainable.

Is it not possible to hinge the instrument panel, allowing it to swing toward the control column and thus give better access to the rear of the instrument?

If more designers, particularly during the layout stage, were to adopt the following idea, a far more amicable attitude would be felt between the "spanner and screwdriver gang" and the designer.

A drawing should be thoroughly reviewed before it is broken down into detailed components (particularly for systematic and control installations). At this point the designers and draftsmen might well ask themselves these questions:

"If I have to change this component, which is the simplest and quickest way of getting at it?"

"If I place this component as now drawn, what structural member is likely to interfere with its accessibility?"



The modern airplane is a very scientific and complicated piece of machinery, and servicing methods of the 1920's are now an impossibility.

The designer's problems end usually when his drawing is approved and sent to the manufacturing division; but to the personnel who are responsible for keeping the airplane operating and proving that it is a good design, troubles are usually just beginning.

Let us have more get-togethers, hear each other's viewpoints in an amicable manner, and thereby simplify maintenance problems for the man in the field.