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SPECIAL REPORT 4

Accidents

STATISTICS OF THE BUREAU VERITAS

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Special Rpt. 4

STATISTICS OF THE BUREAU VÉRITAS*

By André Volmerange

Statistics are indispensable factors for the amelioration of safety. Through the reconciliation of accidents which may appear isolated to interested parties, they permit tracing of typical causes of accidents; conversely, they can prevent, after a serious accident due to some fortuitous cause, the taking of incautious measures under the pressure of public opinion, which always inclines to gauge the gravity of the causes by that of the results. Lastly, they permit appraisal of the efficacy of rules in force.

We should add that statistics provide an agency of prevention for future accidents. A careful inspection of all signs of malfunction of matériel quite often prevents the occurrence of an accident. In this respect, many a pilot's report, perfectly normal in every way as far as operation is concerned, can reveal much more interesting technical data than an accident, although it does not diminish the importance of statistics. Therefore, from the inception of its aeronautical service, at the end of 1922, the Bureau Véritas has kept annual statistics of all accidents which occurred in French civil aviation.

In order to correctly perform their proper function, the statistics must be exact and sufficiently explicit and complete. To be exact, they must bear on all pertinent events, and on these alone. It is a matter then, first of all, of defining the accident in such a way that no sinister detail bearing on the definition may escape control.

The consideration of accidents to personnel only has appeared too limited. One of the essential qualities of statistics is to permit the taking of averages and in consequence to apply them to a sufficiently large number; such is happily not the case in accidents to personnel.

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*"Les statistiques du Bureau Véritas." Premier Congrès International de la Sécurité Aérienne, Vol. I, 1930, pp. 23-24. Pt. I

It was therefore decided to take into consideration the purely matériel accidents as well as those to personnel.

But among these we must fix a limit. We have excluded all damages of minor importance, capable by the terms of the classification, of being repaired without the assistance of an expert. We thus admit by agreement that there would be an accident when the amount of damage reached or exceeded 10 per cent of the value of the airplane. Under these conditions no accident could be omitted since it is obligatorily the object of a declaration of the owner and, moreover, a permanent control obtained over the principal airdromes and repair shops.

The census of accidents being thus considered as numerically exact, it remained to collect enough data on each accident to permit of a correct interpretation. This is an important step, for lack of which a humorist may well say that the statistician is a juggler of the truth, more dangerous than the liar and perjurer.

The two principal difficulties in this connection are: consideration of the relative significance of accidents and the correct diagnosis of their causes.

It is evident that we would obtain purely arbitrary figures, giving only an incomplete idea of the actual degree of safety if we simply added the number of accidents or victims, attaching the same importance to a poor landing as to the crew and cargo of a large transport plane, or to a death and a slight injury.

To avoid this stumbling block, we divided personnel and matériel accidents into two distinct categories (which practically include all accidents to personnel). In order to give an analytical idea of the loss in personnel, we set up an index of losses obtained by counting each fatality as one unit, each serious injury (where life was endangered or where the injury resulted in permanent disability) at 0.6, and lastly, slight injury at 0.1 (method reckoned by certain insurance companies).

As for matériel, each accident was designated by a certain coefficient corresponding to the percentage of matériel loss. The determination of this percentage at first presented some difficulty, but the practice of numerous insurance experts familiarized us with these estimations and the majority of them may be designated by a figure

close enough for the statistics to be summarily figured at one trial. This result has been facilitated by the use of "decompositions of value" of each type of airplane in terms of the value of the principal parts, annexed to most insurance policies.

The determination of causes is a much more delicate question. It is not always possible to hold an inquest at the scene of the matériel accident; the only witnesses are generally the pilot or owner who often have reason to be discreet or who, being implicated in the accident as participants, have not always been able to observe accurately all the circumstances.

On the other hand, it is rare at the present time for an accident to be imputed to one single cause. Usually the disaster is provoked by a series of unfortunate circumstances. If the statistician is the least bit partial, or if he makes an incomplete analysis of the contributory causes, he is apt to formulate conclusions lacking in objectivity or even significance.

We do not believe, moreover, that it is possible to avoid all discussion of statistic results, but these should at least clarify one aspect of the question when each accident is systematically studied. We shall evaluate the principles of the Bureau Véritas so as to avoid all misinterpretation of results reported by it.

The causes of accidents may be classified as of three kinds, relating respectively, to personnel, matériel, and external circumstances, especially atmospheric conditions. A first method of discrimination between these causes is based on the idea of responsibility. The accident is imputed to an error in piloting or judgment of the commander on board, or to defective matériel, or to an act of God.

We have set this method aside as insufficiently objective.

When an unstable airplane loses speed in bad weather, or when a fragile plane fails during evolutions, it is always allowable for the pilot to say that the accident would not have occurred with a better airplane, and for the designer to say there was an error in piloting. We shall add that in the discussions which follow serious accidents, the debate is unfair; the pilot is often no longer alive to defend his point of view.

We have a different notion: We have gathered together under a certain number of headings, the various circumstances which seem to us to have been the most typical in the genesis or importance of accidents. Then we placed each accident under the heading corresponding to the circumstances which have determined in decisive manner, the seriousness of it. The headings are 12 in number:

1. Accidents at take-off or landing;
2. Loss of speed;
3. Stunting;
4. Failure of airplane;
5. Failure of engine;
6. Fire;
7. Fog;
8. Weather conditions other than fog;
9. Collision;
10. Errors in navigation;
11. Sea hazards;
12. Accidents outside of evolution.

To these is naturally added a thirteenth: "causes unknown," to which it is seldom necessary to refer, at least as far as public carriers are concerned.

The investigation of responsibility which is beyond the normal activities of the Bureau Véritas, is not considered.

Now let us give an example of the application of this method. Imagine an airplane taking off too hurriedly, with a too low water or oil temperature. The engine misses and the pilot is forced to land. In order to avoid an obstacle, he makes a half turn and stalls at 100 meters. The plane drops and pilot and airplane are burned on the ground. We may, at first, attribute the accident to two

errors in judgment (hurried take-off and half-turning and stalling); to an error in piloting; to stalling, pure and simple; to a defective heating system; to poor stability of the airplane; or simply to fire. From all these we eliminate the errors in judgment and piloting, the defects in heating and stability, and retain only stalling, since, apparently, that is what precipitated the accident, whatever may have been the other causes.

This choice is obviously arbitrary, but it is the arbitrariness of the statistician, and the method is as definite as it is possible to make it.

Obviously, the "global" statistics thus established cause more interesting elements to disappear. In the example cited, it is no longer a question of heating system, nor fire, conditions quite necessary to safety. We bridge this gap by means of statistics annexed to all points of general interest: for instance, fires (What was their effect on the seriousness of the disaster?) We eliminate, on the other hand, all trivial matter, such as statistics on heating incidents since it would have been remedied by the defects which caused it.

There remains to ascertain the frequency of accidents in terms of accomplished services. For that purpose we should select these services as criterion. The most natural thing would be to choose the flying hours for matériel and the flying hours of the pilot for personnel, the risks being evidently proportional to the time spent in the air. This was not done, however, for public carriers, for two reasons: first, companies do not keep a record of the total flying time; second, and more important, the risk which is of interest to the passenger is that which refers to the distance covered. A passenger would prefer a slight risk per kilometer although the hours are raised, to the contrary case.

Under these circumstances we have taken as basis of evaluation of the services of the transportation companies, the number of kilometers flown and the number of passengers carried per kilometer. On this last point, the correct statistics have been published by the official sections only since 1928; hence, our figures are for the last two years only.

For the other branches of civil aviation, we use the

flying hours as unit, but we have not been able to secure the exact information on the length of services except for schools and training centers.

Such are the main principles which have been in force in the tabulation of accident statistics of the Bureau Veritas since 1923. A resumé will be given in another article.

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