

Need for Making Airfield Condition-Evaluation Surveys

PHILLIP L. MELVILLE, Civil Engineering Branch, Engineering Division, Military Construction, Office of the Chief of Engineers

●SYSTEMATIC surveys are needed for military and civil airfield pavements to obtain information on their functional value and their service behavior. Thus the need is twofold: first, to establish the suitability of a pavement to perform its function of carrying loads without distress, and second, to analyze the condition of a pavement from its surface appearance and smoothness. Both parts are important because they test the validity of the design procedure.

In other words, it is from the ability of a pavement to perform as anticipated or currently desired that the airport engineer will place a value which will reflect not only the condition of the surface, subjectively or objectively noted, but also what traffic it can carry efficiently, economically and safely.

Condition and evaluation surveys are interrelated. An evaluation report is made from the analysis of each layer of a pavement structure. It is needed to furnish information on the magnitude and frequency of loading that can be permitted without distressing the pavement. For example, at a given military field, how many cycles of operation can be applied to a given item of pavement by a KC 135 jet tanker weighing about 300, 000 pounds without causing distress or requiring excessive maintenance? If no cycle can be applied, what reduction in load is necessary to keep the item usable? Can the aircraft be serviced on a given parking apron? At a civil airport what will be the effect on pavement life from a change by airlines to a heavier airplane and/or to more frequent service? Evaluation surveys are therefore primarily pointed at determining the strength of the materials.

A condition report also provides information on the strength of materials but it is primarily pointed toward appearance, smoothness, and incipient and localized defects or failures. The information is needed because it affects both the traffic from the point of view of safety and convenience and the pavement from the point of view of appropriate "housekeeping."

In fact, the report correlates the following factors:

1. Traffic volume.
2. Tire pressure.
3. Wheel distribution.
4. Weights and overloads.
5. Jet blast.
6. Fuel spillage.
7. Maintenance.
8. Safety.
9. Physical properties of each pavement layer.
10. Climatic factors.

The information is used by the design engineer to make improvements in:

1. Design method (geometric and structural).
2. Construction control.
3. Materials testing.
4. Maintenance methods.

A special case for condition surveys is the failure survey which is needed when a

pavement cannot safely carry traffic. At such a time the cause of the failure, remedial action, and necessary steps to prevent recurrence of the same or similar failures are determined from a series of tests. The several variables measured are compared with those used at the time of design and construction to determine if the pavement has performed as it should. Another kind of condition survey is in the detailed follow-up on an experimental section or a section subjected to special traffic.

The engineer needs to know the physical state and strength of a pavement for a check of his design and to be able to furnish guidance to using agencies on how to use available facilities. The using agencies include the airlines, airport managers, pilots, and their military counterparts.

The information obtained from evaluations and condition surveys includes normal operations, emergency condition, and special conditions such as those resulting from frost. The evaluation is given as a set of numbers which include allowable load, tire pressure, configuration of the loading gear, and allowable number of load applications before failure is anticipated. These numbers are obtained by working the design method in reverse and not by "measuring" past or future maintenance. This requires testing each of the existing pavement layers for thickness, strength and compaction as input and deriving the load-carrying ability.

It will be noted that such factors as riding quality and safety factors, which are so often brought forward as items the highway engineer must give great weight to in his survey, are also of concern to the airfield paving engineers especially where jet airplanes are used. But it may be that with the much greater weights of airplanes than of highway vehicles, the major significance of the airfield pavement surface can only be considered in relation to the entire pavement structure. This results in a greater need for the airfield engineer to evaluate the surface solely as a part of the entire structure.