

PUBLIC ROADS ADMINISTRATION

Date December 26, 1939 19

Memorandum to Mr. Tuttle

H. S. Fairbank

Herewith the paper prepared for ENGINEERING NEWS-RECORD on the subject "Fitness of the Interregional Highway Plan for War Transport" and also the article prepared by Bowman for the same issue of the magazine.

Figures 2 and 3 of our article are ready to send to the magazine. Figures 1 and 4, also attached, are to be replaced by Mr. Siegle with clean and unfolded copies bearing the same legends as are now affixed to those figures. When you return the article please return with it all figures unfolded and in good order ready for transmission with a letter that I will prepare today.

H.S.F.

*OK'd by
Cal. [unclear]
12/26/39*

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War and the Interregional Highway Plan.

**Fitness of the Interregional Highway Plan
for War Transport**

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In its report, "Toll Roads and Free Roads", prepared in the spring of 1939, the Public Roads Administration suggested the designation and progressive improvement of a system of direct interregional highways designed to facilitate movements of motor vehicles engaged in travel over relatively long distances. Such a system, limited to one percent of the total rural highway mileage of the country, would provide connections between all of the more important cities of the United States. To illustrate its proposal, the Administration included in its report a map showing a system of 26,700 miles tentatively selected as approximating the desirable routes. This tentative system has since been revised, with the aid of the State highway departments, to include the routes shown in figure 1. The new additions increase the total length of the tentative system to 29,300 miles.

This system is obviously not designed as a complete answer to all highway needs. Joining by direct courses the major cities of the country and passing centrally through all significant regions, its limited purpose is that of accommodating the important traffic of longer range that moves between such large cities and regions. In virtually every section of the country the lines of the interregional

system are those over which there is now moving the heaviest traffic to be found on any main roads in the respective sections, as shown by figure 2; and collectively it is estimated that all of the routes of the system would serve not less than an eighth of the total traffic moving over all rural roads.

The map presented as figure 3 shows how closely this system is identified with the major concentrations of population. Its importance in this respect is further evidenced by the fact that the homes of approximately 60 percent of the total population of the country are within the counties directly traversed; and this close relationship to population distribution is, of course, indicative of a similarly close agreement with the distribution of important industrial activity.

Relation of the Interregional System to the National Defense

The foregoing is written in terms of the relation of the tentatively proposed system to service of the peace-time needs of the population and industry of the country; and certainly the form of the system is primarily determined by its intended peace-time uses. Fortunately, however, the same system, with few exceptions and additions, is similarly important for the marshalling of men and materials that would be needed in case of war for the national defense. But again it must be noted that, just as the interregional

system is only a partial answer to the highway transport needs of peace, so it would meet only in part, though in most important part, the requirements of war-time transport.

The Public Roads Administration has been constantly advised by the War Department of the highway needs of the national defense since 1922. It was in that year that the War Department, anticipating the designation of the Federal-aid highway system, first indicated the desirable priority of improvement of the country's roads from the military standpoint; and all of the routes then indicated were included in the designated Federal-aid system. In 1935 the War Department made some revisions in the system and established priorities of route improvements within the designated system; and again, at the present time, revisions are being made which will result in a system of some 80,000 miles, to parts of which priorities of the first, second, and third orders will be assigned.

The selection of these routes and the assignment of improvement priorities rests upon certain general principles agreed upon by the War Department and the Public Roads Administration as far back as 1922. These principles were:

First, that the highways essential for peace-time commerce and national development would, in general, be identical with those required for military purposes.

Second, that the location of highways and the priorities of

construction are normally a matter for determination by the Public Roads Administration and the State highway authorities concerned. This being the case, the War Department ordinarily will refrain from recommending specific highway routes except in the most critical strategic areas.

Third, that a general network of improved roads, connecting important depots, mobilization and industrial centers, has more strategic value than transcontinental roads that merely cross the country from coast to coast or from north to south. In this connection, a system of high-standard roads connecting the principal centers of production with vital strategic areas has considerable commercial, as well as military, value.

Fourth, that the War Department's primary interest is that of insuring adequate highway facilities between important strategic points and vital areas.

From this it is evident that the road system for war transport is not a system set apart from the roads designed for peace-time transport. If an interregional system is necessary for peace-time use, it is also necessary, and in almost equal degree, for the national defense.

Logging the Condition of the 80,000-Mile System

The Public Roads Administration, with the cooperation of all State highway departments, is now investigating in detail the condition of the more than 80,000 miles of main highways in which the

War Department has indicated a special interest. This mileage includes more than 90 percent of the routes of the tentatively selected interregional system, and a group of other main roads next in importance from the standpoint of military use in connection with war-time mobilization. Particular attention is also being given to the need for certain other improved routes providing access to military cantonments, arsenals, depots, concentration points, and certain special defense areas. This group has an aggregate length of less than 2,000 miles.

The detailed study of the first group of routes, includes more than 30,000 miles, representing the largest single undertaking of the current studies. The State highway departments have already forwarded to Washington detailed information concerning each mile of this extensive network; and the Public Roads Administration, as rapidly as possible, is compiling this information in the form necessary to permit an estimate to be formed of the adequacy of existing improvements and the need of additional construction. Figure 1 is an example of the charts that are being drawn to record the conditions observed on every section of the investigated highways; this one being for a section of road in Florida between Miami and a point near Tampa.

As will be noted, these charts record the condition of both roads and bridges on the routes studied, and also the amount and kind of the normal traffic presently using each section. For its bearing on the design of bridges, there is noted uniformly at the

bottom of the charts the gross weight of the heaviest vehicle passing over the road with a frequency of at least once a day, and also the less frequent heavier load that represents the approximate maximum weight that must be supported by the road and its structures. The frequency of application of this heaviest load is shown on the charts, enclosed within a circle, immediately above the horizontal line indicating its weight.

In other sections of the charts the diagrams indicate the number and location of bridges of design capacity less than 30,000 pounds and the capacity of the weakest bridge in each mile; the number and location of vertical clearances less than 18 feet, and the number and location of horizontal clearances less than 30 feet for 2-lane roads, 40 feet for 3-lane, and 50 feet for 4-lane roads, and the deficiency of the minimum clearances below these respective criteria. These data, relating mainly to the character and dimensions of bridges, are recorded in the lower part of the charts. In the upper portion a series of diagrams similarly indicates important information concerning the character and dimensions of the roadways; including the width of right of way available at all points, the width and type of the existing road surface, the number and location of excessively sharp horizontal curves, excessive grades, and restricted sight distances; the number and location of fatal accidents where such information is available for a year period; and, at the top of the chart, a profile of the traffic volume for the entire road.

Study of these charts for the whole mileage investigated will permit a judgment to be formed with regard to the adequacy of the existing improvements and the need of further improvement to serve the developed traffic. By comparison of the limiting conditions with any desired standards, it will be possible to determine very closely just what amount and kind of work will be necessary to make the conditions of the system consistent with the needs of an assumed future traffic. It is by such a comparison that the fitness of the existing system for purposes of military use will be determined.

On the road in Florida for which condition information is presented in figure 4, it will be observed that the maximum gross load to which the greater part of the section is subjected with a frequency of once a day is 35,000 pounds; once in ten days a gross load of 40,000 pounds may be expected on these same sections; and both of these limits are exceeded on a short section of the route near the towns of Sarasota, Bradenton, and Palmetto.

Comparison of this normal heaviest loading with the rated capacity of bridges on the route, as indicated in another part of the diagram, shows that throughout nearly half of the section there are bridges almost every mile of the way of designed capacity substantially less than the maximum loads to which they are subjected with considerable frequency by ordinary peace-time usage; and they

would be similarly overtaxed by military loads. The bridge condition on this particular section of the interregional system is less favorable than the average; but throughout the system it is generally true that inadequacies of bridges, rather than those of road surfaces, are the cause of the most serious limitations upon the utilization and capacity of the routes, either by peace-time or war traffic. This does not mean, however, that there are not numerous deficiencies of the roadways proper. There are; and such deficiencies are relatively more serious, as a rule, in the vicinity of the larger cities, where traffic is heaviest. It is mainly in the vicinity of the larger cities that there is important deficiency of surface width, and there also that narrow rights of way, closely hemmed in by property developments, present the greatest difficulties to adequate improvement. Quite generally, also, it is near the larger cities, especially in the east, where faults of alignment, sharp curvature, and short sight distance, are most troublesome—a condition due to the earlier improvement of these sections of road which from the beginning have been the more heavily traveled sections.

To determine the degree and location of inadequacy within the system for service of war-time traffic, the existing physical conditions of the routes are being examined in the light of a knowledge of the characteristics of critical military vehicles and mobile units as described in another article in this issue; and on all routes in the system on which addition of the military movement is likely to swell the normal volume of traffic to a total above the normal

capacity of a two-lane roadway, special effort is being made to anticipate the amount of the war-time traffic increase. In the main this condition exists on routes in the vicinity of the larger industrial centers; and the location of military depots, cantonments, arsenals, and concentration points. Until the studies now in progress are completed, it will be impossible to indicate the extent of the improvement that will be required to fit the existing or relocated sections of the interregional system for completely satisfactory service in time of war.

Effect of Defense Needs Upon the Future Highway

Improvement Program

The principal effect of a consideration of national defense needs upon the future highway improvement program is likely to be an acceleration of the rate of improvement of the more heavily traveled routes. The effect of war would be a sudden increase in the total volume of highway transportation by an amount that would normally develop over a considerably longer period. Significant increases in traffic, such as would affect the design of the roads, would be expected, however, upon a rather restricted mileage in the vicinity of the important centers of industrial and military activity. Relatively minor effects, because of the limited mileage involved, will be the inclusion in the program of a certain amount of new road construction in the vicinity of new cantonments, air bases, and other permanent and emergency posts and reservations of the military establish-

ment. The location of such new reservations, made possible by the enlarged provision for national defense, in most instances requires the closing of existing roads, generally of the secondary classification. The reopening of the communications thus interrupted and the construction of the new access roads required for the service of the reservations will be essential elements of the highway program in the years just ahead. In large part work of this sort will not be dependent upon the contingency of war, but will be required for the service of the permanent establishment of the military forces and ordinary civil traffic.

The designation and improvement of the interregional system should take definite account of the contingency of war; but, in a measure the improvement of the roads of this system also will be affected by the highway requirements of the army in peace time. In peace as well as war we may expect a materially increased use of the highways by newly mechanized military forces, and the maneuvers being conducted this winter in the southern States will afford an example of what may be expected more frequently in the future.

Arrangements are being made for the assignment of representatives of the Public Roads Administration to observe the principal highway movements in connection with this large southern concentration. The purpose of these observations will be to ascertain directly the effect of existing highway conditions on the efficiency of the operations, and determine what changes in existing road locations and designs may be

desirable to fit the road system, and especially such major roads as are included in the interregional system for the combined efficient uses of both civil and military movements.