

HIGHWAYS AND AIRWAYS

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All highways are essentially military highways and as such may have direct relation to the service, supply and guidance of military air activities. That is, if we are to accept the theory that the theater of defensive and offensive operation is no longer limited to strictly tactical areas. Probably the most compelling lesson of the late war is realization of the fact that these limits are coextensive with, and even may exceed national boundary lines. In this sense the potential military value of any particular highway is proportional to the economic service it offers as a connection to the various sources of supply, whether these be centers of manufacture, points of concentration for food stuffs or mining areas, and will even extend into the timbered areas of our national forests.

In the coordination of our Federal highway system the economic purpose to be served was a paramount consideration, but it is also interesting to note that all the important military connections shown on the maps prepared by the general staff of the army are included in the Federal Highway System. The

importance of this dual characteristic is obvious.

If we accept the premise that the military value of a highway is proportional to its economic value it will naturally follow as a corollary, that military flying is properly a concomitant of commercial aviation and it is in this sense perhaps that the relation between highways and airways can be most easily recognized.

Rivers and railroad lines, because they are readily identified, have long been recognized as invaluable guides to the air man. To a lesser extent this is true also of our highways. But with approximately 3,000,000 miles of Federal, State and county roads or very nearly one road mile to each square mile, crisscrossing the country in a close grid, it is obvious that if highways are to be depended upon to assist the aviator to determine his position or to guide him to a destination, some standard system of identifying, at least the major trunk lines, must be devised.

Five or six years ago the idea of painting a number or name on the highway surface as an aid to air navigation might have been considered fantastic, or perhaps to the more practical mind would have provoked such questions as : "Could such markings be read from the air and, if so, at what height?"

"Would they not require constant repainting and consequently be costly to maintain?" "Which, of all the 3,000,000 miles of roads or routes shall be marked", and having selected such routes, "That agency will, or is best equipped to undertake the marking and be responsible for maintenance?"

The first question has its answer in a practical demonstration. Between Bedford and Pittsburgh, Pennsylvania, on U. S. No. 30 several numeral markers have been painted on the road surface by local interests in accordance with instructions issued by the Aeronautics Branch of the United States Department of Commerce. The characters are approximately ten feet high and I have been told may be easily read under ordinary atmospheric conditions at from 3,000 to 4,500 feet elevation above the pavement. Obviously, range of visibility will be proportionate to the size of the markers and larger characters should be used when the pavement width permits. The practical utility of air markers has received official recognition in one State where the State Highway Department has been authorized to make an extensive survey to determine the approximate cost of a State wide system of pavement marking on its highways. Furthermore, this State has also required its several municipalities to paint their respective place names on at least one flat roof in each town. I do not know what progress has been actually made in

this respect, but official inauguration of the movement is significant.

The question of durability and maintenance of the pavement markings has received a great deal of attention during the past two or three years. The United States Bureau of Standards has made some exhaustive tests along this line, as have the officials charged with traffic regulation in several of our larger cities. As the result of these tests and in cooperation with the Standards Committee of the American Association of State Highway Officials the Bureau of Public Roads has adopted a specification for paints designed to mark traffic lanes, and approaches to railroad grade crossings. The idea of using a canvas fabric impregnated with white lead and designed to adhere to the pavement has also been taken up by several manufacturing concerns and subjected to severe tests. Obviously, the durability of the marks will depend upon the wear and tear imposed by traffic, character of the pavement and also upon weather conditions. On a road leading to the Oakland, California airport, however, markings placed a year ago are still clear, distinct, and easily read at an elevation of 3,500 feet and have not been repainted. Probably not more than two repaintings a year will be required after the initial marking.

We are presupposing that the pavement is dustless and impervious and of a texture that can be readily painted. There are a great many miles of construction on the Federal Highway System, however, of a type that does not present a surface capable of being marked economically and if our air markings are to be complete and continuous it may be necessary to devise some means of displaying a temporary marker, confining permanent display to hard surfaced roads, bridge approaches, and bridge floors where the trusses or guard rails will not cast an obscuring shadow. I have no doubt, however, that an adequate and economical marker for general use on the intermediate or inferior types of construction can be devised.

As to what routes shall be numbered.

As far as the Bureau of Public Roads for the moment is concerned, I feel that the numbers should be restricted to the system of interstate and transcontinental highways selected by the American Association of State Highway Officials and approved by the Secretary of Agriculture to be uniformly numbered and known as United States Highways. This system aggregates approximately 98,000 miles and includes all of the main arterial highways, as well as many miles of less important lateral roads and crossovers. The system to be so numbered has been adopted by all of the States and shield markers carrying the appropriate U. S.

number and State name are in place on about 90 per cent of the mileage. The various routes are identified by number on State highway maps, on official maps issued by the Bureau of Public Roads, the United States Department of Commerce and on some of the more recent maps published by the United States Geological Survey.

In addition to air marking the designated U. S. highways, the States should place supplemental markers carrying the appropriate State route number, near all trunk line intersections, thus giving the aviator two rectangular coordinates by which to definitely fix his location.

This brings us to the question of the marking agency and responsibility for maintenance.

As with the highways, the airways and air transport must make their bid for public support. There are many instances where local chambers of commerce, the National Exchange Clubs or other unofficial organizations have, out of fullness of their civic pride, done much to inculcate a spirit of air mindedness by painting the names of their respective towns on the roofs of conspicuous buildings and to a lesser extent, the route numbers on their adjacent highways. In a democracy such as ours, local pride in public activities should receive every commendation and encouragement. In our initial experiences we were much indebted to civic organizations, unofficial trail associations and

the like for their manifestation of interest in establishing a harmonized interstate road system. When, however, the inevitable conflicts between local interests reached proportions that threatened to becloud real economic needs and destroy systematic coordination and need of authoritative and official designations became obvious and resulted in the adoption of the U. S. numbered system as we have it today. With this experience in mind I urgently recommend that marking the pavement surface be not left entirely to local civic interest, potent as this may be. Under the terms of the Federal Highway Act the Bureau of Public Roads may, upon the initiative of the State Highway Departments, participate in the cost of erecting highway markers and signs of the standard design approved by the American Association of State Highway Officials on the same basis as any other item in a project construction agreement. I feel, therefore, that the responsible agency through which air marking may be carried on is already created. The interstate and transcontinental highways are already designated by number. A committee of the American Association of State Highway Officials on Traffic Control and Safety, whose function it is to prepare drawings for signs and pavement marking for adoption as standard design, is active and apparently the only further requirement is official cooperation on the part of the several

State Highway Departments.

There is another phase of highway construction that may, at a relatively small expense, be adopted to assist our increasing air activities. This is the construction of emergency landing places in the highways. Supplementing the service now provided by existing airports and regularly established army fields, many municipalities throughout the country are proposing to build permanent flying fields. These municipalities are all on the Federal Highway System and the fields will be served either directly or indirectly thereby, but conveniently located emergency landing places are essential to the safety and assurance of our constantly increasing number of air transport passengers. Several fields of this character are already provided; some of them elaborately equipped with floodlights or beacons, but I refer more specifically to safety landings located within the highway right-of-way lines.

If anything of this nature is undertaken, it should not be left entirely to the sporadic efforts of local agencies, but should have all the elements of National and State authoritative cooperation and thus be brought directly under official control. Briefly, I might urge as a preliminary step, the creation of a joint board to consist of representatives of the various Federal Departments interested in air transport, engineers from the State Highway

Departments and of the Bureau of Public Roads to formulate a general policy which should obviously be sufficiently broad to adequately deal with our great variety of topography, temperature, and general atmospheric conditions.

The details can be worked out readily and I have no doubt that with able cooperation of our Federal departments having to do with air navigation and particularly with our army aviators who are perhaps the pioneers in the air, we would soon have a lay-out of emergency landing fields in our highways that would be of incalculable value as a safety factor for the aviator.