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A NEW PATTERN FOR NATIONAL HIGHWAY DEVELOPMENT

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Although the particular date for this talk was fixed by a number of circumstances, it is a happy coincidence that the Golden Jubilee of the Automotive Industry is only a few days removed. It has been my privilege to know personally many of the great pioneers of that industry. They were men of unlimited imagination. When I first knew them they were intent upon laying the firm foundations of what has since become an industrial structure of world-wide dimensions, which even yet has not reached the limit of its service to world economy.

When the motor car was still a luxury available only to the favored few, they saw the possibility of its eventual possession by the many; and I was able to observe at close range the transformation of their vision into reality through the mass production made possible by the typically American innovation of the assembly line, first perfected by the automotive industry.

My association with these men of vision who knew so well how to make their dreams come true was, for me, a great educational opportunity; and I have tried, within my capacity, to emulate their imaginative foresight and practical wisdom. In so doing, I have paid my modest tribute to these men, some of them still carrying on the tradition of accomplishment, others now gone after fullness of years. Too many have left us when we needed them most, when they had reached their greatest usefulness,

not primarily in the service of the industry itself but in the larger service which the public requires to guide the development of highway transport along sound lines.

The accomplishments of those who are gone will be best honored, first by remembering what this country, and indeed the whole world, owes to the automotive industry for its contribution to the winning of a war in which our national life and our democratic freedom hung in precarious balance; and second, by recognizing the fact that the usefulness of the motor vehicle, as envisioned by pioneers in the industry, will be brought to full fruition by the highway improvement program of the years immediately ahead. For people of other countries the time will be longer, but gradually for these other peoples also the pioneers dream of a universal service of the motor vehicle will come to reality.

The pattern of our new highway program was set by the Federal-Aid Highway Act of 1944, which authorized a Federal appropriation of $500,000,000 in each of the three fiscal years following the end of the war, to assist the States in constructing highways designed to meet modern traffic requirements. It is a pattern that recognizes the essential functions of the principal classes of our roads and streets, and provides in reasonable proportion for the improvement of each class.

For primary highways included in the 232,000-mile Federal-aid system it authorizes annual appropriations of $225,000,000; for the improvement of Federal-aid routes in urban areas it earmarks $125,000,000 annually; and for the development of a Federal-aid system of secondary roads in each State it authorizes appropriations of $150,000,000 to be made for each of the three years.

Since the Federal funds generally are matched in equal amount by the States, the legislation made it possible for the States to undertake a three-billion-dollar highway program, with Federal assistance, in addition to work that will be financed entirely with State and local funds.

Thus, there is a well defined program for highway improvement to be effected where improvement is most needed and a definite promise of liberal financial support for carrying out the program. But, at the moment the highway building industry finds itself in much the same position as the motor vehicle industry as to prospects of early substantial production. It is not dollars or demand for its product that are lacking, but materials, labor and equipment.

Progress of the highway program is dependent upon industrial production and conditions in the labor market. The prevailing uncertainty among highway officials and highway contractors concerning the quantity of materials and labor that may be available in the months ahead has delayed the start of construction on many large projects requiring scarce materials, such as steel, structural concrete and lumber for concrete forms.

As of May 11, plans were ready for contracts involving work estimated to cost 864 million dollars. Plans are rapidly maturing for projects estimated to cost 2.6 billion dollars. The immediate approach to the letting of contracts invariably is conservative.

The mileage of projects approved for immediate contract offerings, plus the mileage advertised for lettings, plus contracts awarded, totals 9,400 miles of road work that will be completed at a cost of approximately one-half billion dollars. This approaches the average prewar annual Federal-aid program measured by mileage, but it is highly doubtful if

more than 50 percent of this total will be placed under contract in the next six months, because of the limitations I have mentioned.

For instance, the Public Roads Administration took bids this week for the steel superstructure of an urgently needed bridge which would serve around 16,000 vehicles per day. The lowest bid was far above the estimated cost, but the urgency of the need might have justified the payment of a premium. But we were told that, if the contract were let now, the steel would be scheduled for rolling next fall and delivery could not be made until sometime in the winter.

We might have been willing to pay a premium price for that particular bridge--perhaps more than was bid--because the bridge is greatly needed. But at the moment we have no certainty as to when we would be able, if we placed the contract now, to obtain the steel and other necessary materials, and in that respect, as I have said, our position is very similar to that of the automotive industry.

However, despite the difficulties of the present situation, I have complete confidence in the future of highway development under the new program, and I appeal to the representatives of the automotive industry and other industrial interests of this automotive capital of the world for their equal faith and confidence. We shall have to live in that faith and confidence for a year or so, but as soon as the present handicaps are overcome, your trust now reposed in your roadbuilders will prove, I am sure, to have been fully justified. My own confidence in the ultimate success of the program is rooted in the fact that highway officials at all levels of government--State, municipal, county, and Federal--know now exactly where they are going and why. Generally

they have learned the why before determining the where; but the answers to both questions they have found by careful studies begun years ago.

It was a question propounded by one of the chief executives of the automotive industry that started us on our studies. It was when the tax on gasoline was first advocated, and his question was: "What will be the impact upon the road user should the highway improvement program come to be financed largely from revenues derived from this source?"

At that time we had no answer, but we recognized that the costs that road users would be called upon to pay might easily become a ruling factor in the growth of highway transport, so we thought it important to try to find the answer. So, in 1922, we began our first traffic survey with the cooperation of the State Highway Department of Connecticut.

We didn't know exactly how to proceed; but, in a general way we thought it would be possible to start with a knowledge of the state of the highways, and by measuring their usage, determine the adequacy of the existing improvements and their probable life, and proceed from that to an estimate of the future cost of replacements and essential extensions of the improvement. Unfortunately there were two unknowns that at that time we found it difficult to evaluate with any degree of certainty. One was the probable future growth of motor vehicle use; the other was the kind and cost of highways that would be required to serve any estimated volume of traffic. Highway transport was then in its infancy. We now know that our assumptions on these two points were much too conservative and the conclusions of our study were correspondingly inaccurate.

But we didn't stop with our first survey. We went on to other studies, in one State after another, and finally, with accumulating

experience and improved techniques we found we could arrive at dependable answers to most of our problems. So, in 1934, twelve years after our first effort, on the recommendation of Public Roads, there was written into the Federal highway legislation a requirement that one and a half percent of the Federal-aid construction funds, as these were made available, should be expended for studies and research leading to advance planning.

This innovation resulted in the organization of a unit in every State highway department to carry on what we designated as "State-wide planning surveys." Thus was begun a nation-wide effort to determine the current status of road improvement and usage. State after State adopted the survey method as an administrative tool. Not every State has yet fully recognized the value of this approach to the estimation of future highway needs, but all States have created units in their highway departments to carry on some program of economic research, and the more experienced the administrators of the State highway departments, the more efficient this particular unit of their administrative organization has become.

The general surveys and special studies that have grown out of the initial program are characterized by the purpose to evaluate economic significance of a road system. This is a departure from our earlier conception of research as applying only to studies of physical materials, and design and construction methods. The basic idea of the surveys is that by study of the use that is made of existing highways--the nature and extent of that use--we can find the best guides to the improvements desired by the public. This is the antithesis of another type of

planning which first designs a facility and then hopes to regiment the public to its use. In other words, we are endeavoring to tailor roads to meet the needs of the traffic and not to tailor the traffic to meet the needs of the roads.

Perhaps that sounds like a generalization, but by a few examples I can illustrate some of the principles of traffic behavior which we have learned from our surveys, and which, in their application, set the pattern for our development of the highways.

One of the facts we have learned is that traffic converges on principal routes. Thus, the proposed interstate system of highways, consisting of our principal traffic arteries, will comprise only about one percent of the total rural road mileage but will serve about 20 percent of the rural vehicle mileage. All arterial routes in rural areas, including Federal-aid highways and primary State systems, comprise only about 12 percent of the rural mileage but serve about 72 percent of the rural vehicle mileage. Other roads which feed these arterials have 88 percent of the rural mileage, but only 28 percent of the vehicle mileage.

In cities, also, traffic tends to converge on arterial streets. But since the existing streets generally are inadequate to carry the accumulated movement some traffic dispersion results. Because of this inadequacy, the ordinary city arterial street seldom carries more than 25,000 vehicles per day. Where expressways of ample design are provided, however, traffic concentrates on them and volumes sometimes exceed 75,000 vehicles per day. For example, one section of the Lake Shore Drive in Chicago carried an average of 86,000 vehicles per day in 1936.

Another significant fact revealed by the traffic surveys is that the drivers of most vehicles approaching a city want to go into, and not around, the city. Of traffic approaching cities of over 500,000 population, only about six percent is destined to points beyond the city; 94 percent is headed for the city. You can readily see what a shock that was to all of us who originally thought we could solve the problem of traffic congestion in cities simply by building by-passes.

A relatively high percentage of traffic converging on small cities also has the city as its destination. The surveys have shown that only 41 percent of the drivers approaching small cities want to go around. So, you see, the city or town is the point of destination for most of the traffic on our highways, and we cannot eliminate congestion on city streets by building by-passes; we have to carry traffic into the cities.

In cities, we have learned, there is inevitable conflict between the needs of local and through traffic which makes it impossible to serve well both classes of traffic with the same facilities. This determined fact is the basis for the fast multiplying plans for express highways. It is basic also to proper solutions of the parking problem, and explains particularly the need for belt lines around the business sections of cities to attract and remove from the congested business streets a large volume of through traffic which has no destination in the central area.

In three cities where parking surveys have been made we have found that a large proportion of traffic in the central business district is only passing through the district and has no desire to stop there. In

Baltimore, a city of 860,000 persons, the volume of "through" traffic was 58 percent. In Providence, a city of 254,000 population, the volume was 48 percent, and in Pawtucket, a city adjacent to Providence and perhaps influenced to a large extent by Providence, "through" traffic amounted to 58 percent.

In other words, a lot of the congestion in downtown business centers is due to the fact that our antiquated street system still leads traffic to the downtown district and does not permit it to go around. The only way we can prevent drivers from going through the business district is by providing superior facilities in the form of an interior circulation system around the center of the city.

In this connection, I'd like to state that there is a great need for a careful study of parking requirements in most of our cities. We have found that in some sections of a city there may be an excess of parking accommodations, while in other sections the available parking space is overloaded. A parking survey in the central business district of Baltimore showed that during the peak hour of parking, from 1 to 2 P.M., 95 percent of the 12,310 spaces available for parking at the curb and off the street were used. This was found to be the situation in the area as a whole. When different sections of the area were considered, however, somewhat different relations were found to exist. In the northwest section, where retail shopping is dominant, the number of cars parked represented 110 percent of the number of parking spaces. This was made possible by crowding vehicles into the aisles in parking lots and garages and by a large turnover in the number of vehicles parked at the curb within the hour period. In another section of the city, largely a

wholesale district, the number of cars parked during the peak hour was only 74 percent of the number of parking spaces. It is apparent that the space that has been provided is not adjusted to the need for space.

Traffic volume, as we have studied it, has trended constantly upward. During the 20-year period from 1921 to 1941 the number of vehicles registered in the United States increased more than threefold--from 10-1/2 million in 1921 to nearly 35 million in 1941. During the same period the total annual mileage of travel by motor vehicles increased slightly more than sixfold--from 55 billion vehicle miles in 1921 to 334 billion in 1941.

This remarkable increase was brought about by a steady rise in the average annual volume of travel per motor vehicle. The average annual mileage of motor vehicles in 1921 is estimated at 5,230 miles. By 1931 this average had risen to 8,330 miles, and in 1941 it was approximately 9,570 miles per year. In 1943, when gasoline rationing and other wartime travel restrictions were in effect, traffic volumes were 42 percent below the 1941 level, but by January 1946, the volumes had again increased to a point slightly above the 1941 level.

The use of highways is preponderantly for short trips. This was demonstrated by an analysis made in 1939 of the travel characteristics of passenger cars and trucks in 11 States, with particular attention to the length of trips that extended beyond city limits or were entirely rural in character.

We found that 38 percent of all trips made by passenger cars were less than five miles in length. Trips of less than 10 miles accounted for 65 percent of the total number, and 94 percent of all motor trips were

less than 40 miles in length. Trips of 100 miles or more accounted for only 1.5 percent of the total number.

In terms of miles traveled, rather than number of trips, 41 percent of the mileage of passenger cars was accounted for by trips of less than 20 miles; 59 percent by trips of less than 40 miles; and 77 percent by trips of less than 100 miles.

The range of truck travel is somewhat greater than that of passenger cars. In the 1939 survey it was found that 34 percent of the trips made by trucks were less than 5 miles in length; 80 percent were less than 20 miles; and 98 percent were less than 100 miles.

These figures may be changed somewhat in the future, but actually the motor vehicle is a short-haul vehicle, and the area of conflict with other forms of transportation is very small.

Now, as to speed. The average speed of motor travel shows an upward trend. Speeds on rural highways immediately prior to the war averaged 47.1 miles per hour. During the war period when the 35-mile speed limit was in effect, the average speed on rural highways dropped to 36.4 miles per hour, but in recent months has returned to an average of 45.5 miles per hour, which is only slightly lower than the prewar average. Top speeds of 70 to 80 miles per hour, however, have not shown any tendency to increase since 1934.

We believe that, with the development of urban expressways and controlled-access highways which will eliminate delays now caused by traffic signals at frequent intersections, drivers will be content to maintain a reasonable average speed to reach their destinations, whether they are going from the suburbs into the city, or from city to city.

When it is possible for drivers to enjoy the free use of main highways, without having to stop for cross-traffic, we will have provided a utility that will be much safer to use, since it will encourage a normal driving speed that is within the capacity of the average individual. That, certainly, was a characteristic of the driving speed upon the German autobahnen prior to the war. People did not need to drive at a speed of more than 50 to 55 miles an hour to make as fast time as most of them wished to make from city to city.

Through our traffic surveys we have discovered another interesting fact. It is that given the proper highway facilities, road users will sort themselves and take the most direct routes to their destinations.

For example, on the Virginia side of the Potomac River, just outside of Washington, we provided an integrated system of highways to serve the Pentagon Building and the three bridge-approaches to the city. These integrated facilities give drivers an opportunity to choose the bridge that will take them nearest to their destinations. We have found that the actual distribution of traffic to the three bridges is nearly the same as the distribution calculated from traffic origin-and-destination studies to result from a general choice of the most direct routing by all drivers.

Traffic piles up in peak loads on the highways. That, as a generalization is a widely known fact, but our surveys have told us much about the magnitude and frequency of the peaks. Good highway design should accommodate nearly all peak loads and allow for future traffic increases, but it cannot economically allow for the maximum traffic load that is likely to occur during the life of a facility.

Safer highways demand improved design standards. In the early stages of highway design, a 500-foot sight distance was considered adequate to meet the demands of the low-speed, low-volume traffic that utilized the highways at that time. Design criteria today require continuous unobstructed vision for 600 feet for safe stopping at speeds of 70 miles an hour. In addition, sight distances up to 2,600 feet are required at frequent intervals for safe passing on high-speed highways. These standards are essential to improve the efficiency and reduce the hazards of traffic flow.

The bulk of our highway system is composed of two-lane, two-way traffic. If fast-moving traffic cannot overtake and pass slow-moving vehicles safely because of insufficient sight-distance, the road becomes inefficient. If passing is accomplished where sight-distance is restricted, hazards are introduced. The provision of adequate sight-distance for high-speed traffic requires limitations in gradient and curvature.

Rural highways with hourly traffic volumes exceeding 800 vehicles require two traffic lanes for each direction of travel. It is essential to provide a sufficient number of lanes for the estimated traffic demand on high volume facilities. Design standards must contribute materially to the efficiency of motor vehicle operation, and only by providing sufficient sight-distance and traffic lanes can hazards be reduced and efficiency increased.

These findings, obtained through long years of research, are indicative of the background of established fact that is now determining what we should do in the future.

I have discussed at considerable length the facts revealed by traffic surveys and planning studies in order to give you a clearer understanding of some of the highway problems we hope to solve in the near future. The Federal-aid program, as it has recently been authorized by Congress, is patterned along lines indicated by our studies as most likely to provide an effective solution. It is a road building program. It is not an unemployment program. The purpose of the legislation is to aid in the development of our highways in a manner commensurate with modern traffic requirements. I repeat, it is not an employment program and it is not a program that can be deferred until there is a need to offer relief employment in the way of public works. The need exists today, and only the lack of labor and materials, together with other exigencies which I have mentioned, offer any reason for delaying the program.