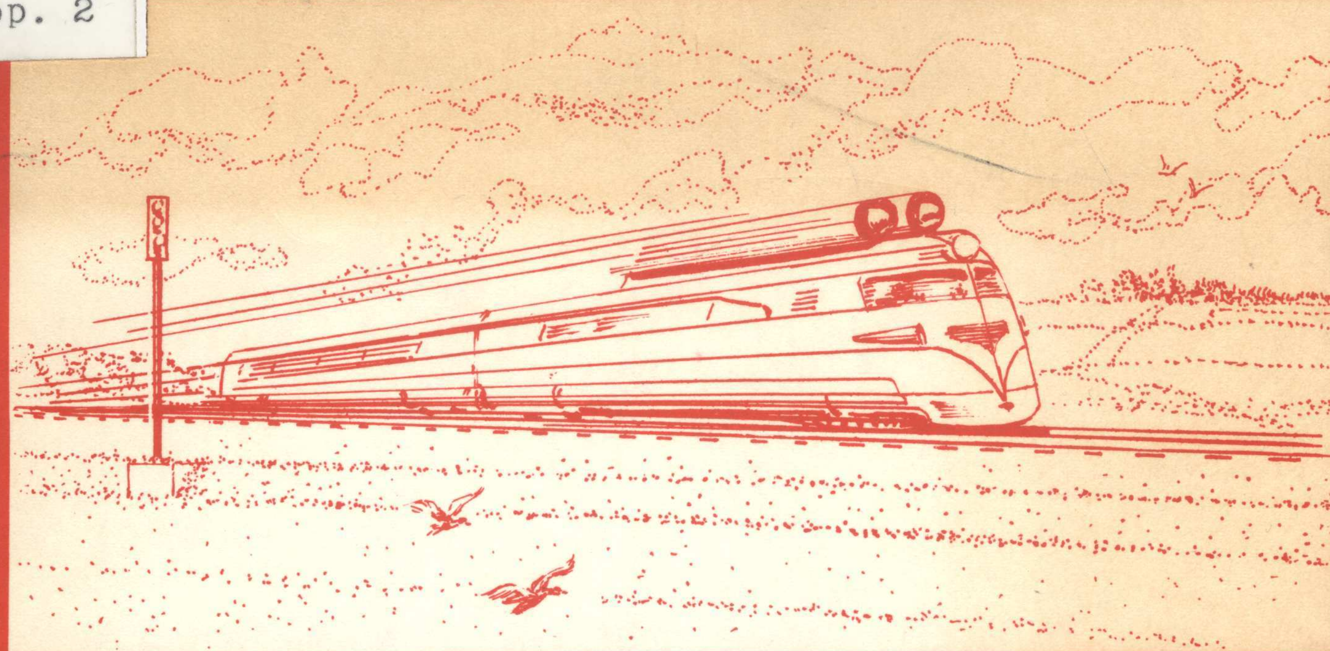

THE ILLINOIS HIGH SPEED RAIL TRANSIT COMMISSION

AND

THE CHICAGO ASSOCIATION OF COMMERCE AND INDUSTRY

PRESENTS PROCEEDINGS OF THE

MIDWEST HIGH SPEED RAIL TRANSIT CONFERENCE

January 12, 1967 • Pick-Congress Hotel • Chicago, Illinois

CHICAGO ASSOCIATION OF COMMERCE AND INDUSTRY

MIDWEST HIGH SPEED RAIL TRANSIT CONFERENCE

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Chairman of the Morning:

Thomas H. Coulter
Chief Executive Officer
Chicago Association of Commerce and Industry

8:30 a.m. - 9:15 a.m. Registration, Coffee & Rolls - Rendevous Room

9:15 a.m. - 9:30 a.m. Call to order. Welcome to guests - Gold Room

9:30 a.m. - 12:00 noon "EXISTING AND PROPOSED HIGH SPEED RAIL TRANSIT SYSTEMS"
Panel-Gold Room

a. "Planning for Regional Transportation Systems"
presented by Harold M. Mayer, Professor, Geography Department, University of Chicago

b. "The Role of the Pennsylvania Railroad in the Development of the Eastern Corridor"
presented by James Diffenderfer, General Manager, Special Services, Pennsylvania Railroad

c. "A Look Ahead - The Eastern Corridor in Operation"
presented by Robert A. Nelson, Director, Office of High Speed Transportation

d. "The Effects of High Speed Rail Transit on the Economies of Down-state Areas"
presented by Gene Graves, Director, Illinois Department of Business and Economic Development

e. "An Analysis of Present Concepts of High Speed Rail Transit"
presented by W.W. Hay, Professor, Engineering Department, University of Illinois

Chairman of the Afternoon:

Clair M. Roddewig
President
Association of Western Railways

12:00 noon - 2:00 p.m. Luncheon - Great Hall
"The Railroad's View of High Speed Rail Transit Systems"
presented by William Johnson, President, Illinois Central Railroad

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2:00 p.m. - 4:15 p.m. "PUBLIC POLICY FOR HIGH SPEED RAIL TRANSIT SYSTEMS"
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a. "Alternatives to and Economics of Balanced Transportation"
presented by Aaron Gellman, Vice President, Planning, North American Car Company

b. "Alternatives for Financing High Speed Rail Transit"
presented by John F. Fennelly, Chairman, Policy Committee, Flore-Forgan, William Staats, Inc.

c. "A Proposal for a Midwest Railroad Transportation Research Institute"
presented by C.H. Koenig, Principal, A.T. Kearney & Co.

d. "The Aerotrain Concept of High Speed Rail Transportation"
presented by Randall M. Dubois, President, Aeroglide Systems, Inc.

e. "CONFERENCE SUMMARY"
presented by Joseph Lanterman, President, Amsted Industries, Inc.

4:15 p.m. - 5:00 p.m. Viewing of Exhibitions - Rendevous Room

5:00 p.m. Cocktail Party - Rendevous Room

6:00 p.m. Dinner - Great Hall

Welcome to Delegates
presented by Honorable Otto Kerner, Governor of Illinois

"A Long View - The Federal Government's Policy for High Speed Rail Transit"
presented by Representative Henry S. Reuss (D.-Wis.) Chairman of the House Research and Technical Program Subcommittee.

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14. Ohio Brass Company
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16. Sylvania Electric Products, Inc.
17. Texaco, Inc.
18. United States Steel
19. Vapor Corporation
20. Westinghouse Electric
21. Westinghouse Air Brake Company
    Union Switch & Signal Division

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3. Railway Automated Machinery Company
   Subsidiary of Nationwide Industries, Inc.
4. St. Louis Car Company
5. Vapor Corporation
6. United Aircraft Corporation
7. Westinghouse Air Brake Company

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AMERICAN STEEL FOUNDRIES
AMERICAN TELEPHONE & TELEGRAPH COMPANY
ARTHUR ANDERSEN & COMPANY
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CANADIAN PACIFIC RAILWAY COMPANY
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CHICAGO COMMITTEE ON URBAN OPPORTUNITY
CHICAGO MOTOR CLUB
CHICAGO & NORTH WESTERN RAILWAY COMPANY
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CHICAGO SOUTH SHORE & SOUTH BEND RAILROAD
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CITIZENS TRAFFIC SAFETY BOARD
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CITY OF CHICAGO - DEPT. OF DEVELOPMENT & PLANNING
CITY OF MADISON, WISCONSIN
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DE LEUW, CATHER INTERNATIONAL
DOW CHEMICAL COMPANY
E. I. DuPONT DeNEMOURS & COMPANY, INC.

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STATE HIGHWAY COMMISSION OF WISCONSIN
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TRANSPORTATION CENTER OF NORTHWESTERN UNIVERSITY
TWIN DISC CLUTCH COMPANY

UNION PACIFIC RAILROAD COMPANY
UNITED AIRCRAFT CORPORATE SYSTEMS CENTER
UNITED AIR LINES, INC.
UNITED STATES DEPARTMENT OF TRANSPORTATION
UNITED STATES STEEL CORPORATION
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THE WILLETT COMPANY
WYER, DICK & COMPANY

MIDWEST HIGH SPEED RAIL TRANSIT CONFERENCE

"WELCOME TO THE CONFEREES"

Presented By
Thomas H. Coulter
Chief Executive Officer
Chicago Association of Commerce and Industry

My name is Thomas Coulter. I am Chief Executive Officer of the Chicago Association of Commerce and Industry. On behalf of that Association and the Illinois High Speed Rail Transit Commission, welcome to the Midwest High Speed Rail Transit Conference.

There is no better place to hold a conference of this nature than in Chicago. The city is a large center of transportation terminals, facilities, equipment manufacturers and suppliers. The freight rate advantage of Chicago stretches for hundreds of miles. The city is a unique link between the largest inland waterway system in the World to the West and the largest fresh water reservoir to the East which also serves as access to the Atlantic Ocean.

Our major airport, O'Hare International, has set records for passenger embarcations and air freight unmatched by any other air facility in the World. Last year, fifteen percent of all passengers boarding an airplane did so at O'Hare, where some 24 million passengers were handled with plane movements, as many as 2,000 a day.

Less well known is the city's record of railroad passenger service. Twelve percent of all passengers boarding trains in the United States embarked in Chicago during 1965. The city of Chicago was built around railroad transportation. It is the cornerstone of our success as an industrial and distribution center.

Our purpose here today is to pit the most advanced railroad technology against the growing problem of congestion on our highways and in our airports. It seems strange to most of us that America has virtually abandonned rail passenger service during the two post war decades. For reasons best left to the head shrinkers, the thrill of riding in an automobile or airplane has overcome many considerations of safety, convenience and comfort which are found in rail transportation. We are beginning to pay for that thrill. There is nothing very thrilling about bumper to bumper traffic on an expressway.

Some relief to the congestion can be found with the construction of new highways and airports. As a matter of fact there has been a great clamour in this city for a second major airport to relieve the congestion of the first, O'Hare Field. The Chicago Association of Commerce and Industry is supporting the recommendation for a third major airport. You might wonder why the Association is so positively interested in high speed rail transit at the same time. Let me remind you that O'Hare International airport opened its doors in 1955. In just eleven years, air passenger traffic has spilled over into Midway airport which became somewhat defunct during the first few years after O'Hare's inauguration. In other words, Chicago will need a third major airport by 1975. Chicago needs a viable passenger train service to create a third dimension to its passenger transportation.

You cannot imagine the gratification of the Chicago business community at the news that our railroads were beginning to look at their passenger service in twentieth century terms. Some of the leading exponents of the new look in railroad passenger traffic are located here. One of them, President William Johnson of the Illinois Central Railroad will address this conference at luncheon. In just a few months, the automated ticket taking machines of the Illinois Central has attracted the admiring glances of ticket experts from all over the world. The Chicago and Northwestern Railway, under the leadership of Ben Heineman has revolutionized commuter passenger transportation. Our own Chicago Transit Authority, under George DeMent, one of the members of the Illinois High Speed Rail Transit Commission, has introduced the novelty of air conditioned transit cars for over heated and hot tempered commuter passengers. I could go on and on about the exploits of Chicago railroads and the transit authority but my purpose here today is to welcome you and set the stage for the experts.

One of the unusual features of the Chicago Area in the context of this conference is that it is one of the least affected of the large metropolitan areas with constipated airports, highways and expressways. I need not dwell at length upon the horrors of commuting by car to downtown Los Angeles or New York. I need not remind you in detail about the paralysis to New York city during their subway strike. Granted, we have our share of frustrated automobile drivers when our expressways are iced up or clogged by an automobile accident or just plain crowded. But Chicago enjoys about the best flow and storage of automobiles of any of the major metropolitan areas. And we have accomplished this with only 26% of our city land area devoted to streets, highways and parking lots - not 45 or 50% like the city of Los Angeles - thanks to an efficient rail transit system.

One of the positive features of the Chicago Area as a balanced community is the cognizance by its leaders of early warning signals. Chicago does not wait until the disease is fatal or even critical before it takes constructive action to combat it. Chicago's population and commerce and industry is growing at a tremendous rate. We can look ahead five or ten years and envision the same traffic congestion currently afflicting New York or Los Angeles unless we plan now to prevent it. This is just another aspect of the "I will" spirit of this metropolis. Hence our current interest in the topic of this conference. High Speed Rail Transportation offers an important solution to the transportation problems envisioned a few years hence.

The inning of the railroads as passenger vehicles is overdue. The railroads can take grim satisfaction from the call for help which is issuing both from the major metropolitan areas and from the Federal government. The third dimension of passenger transportation - high speed rail transit - must take form if our cities are not to strangle.

"PLANNING FOR REGIONAL TRANSPORTATION SYSTEMS"

Presented By
Harold M. Mayer
Professor, Geography Department
University of Chicago

Chicago, as the primate city of the middle west, has a special interest in the prospective role of improved high-speed railroad transportation in relation to the future of mid-America. As the largest metropolis in the million square mile area between the Appalacians and the Rockies, the Arctic and the Gulf, and as the dominant transportation node of the continental interior, Chicago must be greatly concerned about the geographic shifts in the location of economic activity and population which, in part at least, will be brought about or facilitated by the prospective improvements in railroad transportation which may result from the success of the experiments now under way in the Northeast Corridor of the United States, the Toronto-Montreal axis in Canada, the Tokaido line connecting the principal metropolitan areas of Japan, and elsewhere.

As a geographer, I am especially interested in the reciprocal relations between transportation changes on the one hand, and the nature and patterns of urban and regional development on the other. The two are inextricable inter-related. Their inter-relations give rise to many problems of governmental policy and public administration as well as uncertainties relative to opportunities for private investment. Federal legislation, in the past two or three years, for example, makes mandatory as a prerequisite for various forms of financial aid in urban renewal, local urban transit, and highway development the comprehensive and integrated planning at the local and regional scale of all of these aspects of the future pattern of man's occupance of the land. The ambiguous situation of urban transit as between the two newest Federal departments is still to be resolved, and it can never be completely separated from either.

Civilization is characterized by functional specialization of regions, whereby each region develops an economic base which is reciprocally related to those of other regions, with which it exchanges goods, services, money and credit. At the metropolitan scale, each part of the metropolitan region, similarly, tends to develop specialized functions and characteristics reciprocally related to other parts of the metropolitan area. The complementary regions are inter-connected by transportation and communication networks without which interaction would be impossible. The interactions take two forms. On the one hand, establishments - commercial, industrial, residential - may be located in mutual proximity, in which case the manifestations are high population density, high traffic density, perhaps congestion, and high land values because the establishments bid against one another for that scarce resource, centrally-located land. Cities and metropolitan areas are essentially agglomorations of such interacting establishments, in mutual proximity to facilitate the transaction of business, including the processing and transfer of goods and services, and the development of society and innovations resulting from mutual interaction of people and organized groups. On the other hand, there are diseconomies of scale, including congestion and various forms of social and physical pathology which result from excessive densities, so that many activities and establishments seek locations on the urban periphery, but convenient to others with which they do business along transportation lines. Up to a point, the costs of proximity and of transportation, whether measured in dollars, energy, or time, can be substituted one for the other, and each establishment has an optimal location with respect to these two variables, subject, however, to certain constraints imposed by public authorities and the cultural and institutional traditions of the particular situation. In other words, there is usually a choice between low costs of transportation and high costs of proximity, or lower land costs resulting from lower density and higher transportation costs to overcome the additional friction of distance. The patterns and forms of cities and metropolitan regions, which from one point of view may be regarded as nodes on a transportation network, result from the balance between these certirifugal and centripetal forces.

How will the prospective developments of high-speed rail passenger transportation affect the balance between these forces, and the resulting patterns of differentials in city and regional development, especially in metropolitan Chicago and the midwest? Clearly, the answers to this question involve many variables, and considerable research and experimentation will be required. Nevertheless, certain aspects may generally be considered, and certain probabilities emerge.

We may start by considering the similarities among the several regions where experiments in high-speed rail passenger transportation are in progress, or are in prospect for the very near future. What have the Northeastern Corridor, the Toronto-Montreal axis, and the metropolitan axis of Honshu, Japan - the three most significant regions of such current experimentation - in common? Are there similar areas in the midwest to which the results of these experiments may be transferred, which are analogous to a significant degree?

All of these areas consist of strings of large or very large metropolitan regions, located essentially along straight lines, forming an axis, served by a lineal pattern of transportation lines. In each of these instances, the respective axes contain the largest city of the nation and a major proportion of other large metropolitan centers; they constitute the primate nodal region of each of the nations involved. In each case, the railroad traffic density, both for passengers and freight, is very high, the highest in the nation, as is also, in each instance, the volume of air traffic. Except in Japan, where the main inter-city highway is just now developing, highway traffic densities are extremely high. And, finally, each of these axes is served by highly developed water transportation, both inter-metropolitan and overseas. In each of these three instances, also, distances are roughly comparable. New York to Washington is 227 miles on the Pennsylvania Railroad; New York to Boston, 229 miles on the New Haven; Boston to Washington is thus slightly over 450 miles. Montreal-Toronto is 335 miles on the Canadian National. On the New Tokaido Line, the distance between Tokyo and Osaka is 320 miles, although the line is to be extended beyond these terminals in the next few years. On all of these lines, the principal cities are between roughly two hundred and 450 miles apart; or about three to seven hours by conventional passenger train. Both the Northeast Corridor and the Tokaido areas contain five metropolitan centers each with over a million population, in addition to many smaller intermediate cities; the total population in each of these two sets of five principal metroploises amounts to about 25 million. The Canadian axis, of course, has a much smaller population, with only two metropolitan areas of one to two million each and no large intermediate metropolitan centers. In all three instances, however, the proportion of the national population within a very few miles of the main centers, and hence train stops, along the respective axes is roughly the same.

In determining the possible applicability of the experience in high-speed passenger rail transportation along these three axes to the midwest, we must make certain comparisons of the geographic patterns with respect to population, economic activity, and lineal alignment and distance apart of the major urban centers. How does the area around Chicago compare? Are there any analogous situations in this region which may benefit from transfer of experience?

The patterns of rail lines and traffic flows centering on Chicago and other midwestern cities on the one hand and the regions to be and currently served by the aforementioned high-speed rail passenger experiments on the other exhibit some noteworthy similarities, but also some major differences. Any assumption that we can directly transfer experience from these other regions to the midwest must be significantly modified.

In each of the three regions where the current experiments are in process, there is a major existing transportation axis with extremely high traffic density, connecting very large metropolitan areas, the economic core areas of the respective nations. These axes are lineal, with the cities arranged like beads on a string; they are true "corridors". The main transportation lines, involving all modes, are closely parallel.

In the midwest, by contrast, the basic transportation pattern is radial, with no single set of parallel routes as dominant as those in each of the three other regions. Each major midwestern metropolitan area is a node in a network, rather than a point on an axis. With few exceptions, each of the radiating lines carries relatively lighter traffic than the respective axial lines elsewhere. There is a hierarchy of such nodes and gateways, with Chicago dominating the region, followed by the second-ranking nodes, such as the Twin Cities, St. Louis, Kansas City, Omaha-Council Bluffs, Detroit, Toledo, Cleveland, Indianapolis, Columbus, and Louisville, with a group of third-ranking centers in the hierarchy, such as Milwaukee, Des Moines, and Peoria. In terms of population size and distance apart - the two variables which are probably most significant in generating traffic - few pairs of these cities are comparable to the city-pairs in the three axial situations.

A possible exception is the corridor between the metropolitan areas of Chicago and Milwaukee. These two nodes are approximately the same distance apart as New York and Philadelphia. However, the combined population of the Chicago-Northwestern Indiana and Milwaukee metropolitan complexes is less than half that of the New York-northeastern New Jersey and Philadelphia-Camden metropolitan agglomorations, respectively. Furthermore, the intervening population of the former corridor is less than half that of the latter; there are no intermediate nodes comparable to Newark and Trenton. And, finally, Chicago so dominates the midwest that there are, because of the intervening opportunities offered by that metropolis, no extensions of the Chicago-Milwaukee corridor beyond those two terminal areas comparable to those of the Northeast Corridor northeast of New York and southwest of Philadelphia. In other words, the Chicago-Milwaukee corridor could perhaps be regarded as a watered-down version of the New York-Philadelphia situation without the added traffic generated by Boston, Providence, Hartford, New Haven, Bridgeport, Wilmington, Baltimore and Washington. Green Bay is no Boston and South Bend is no Baltimore or Washington in terms of passenger traffic potential.

The basic question, to which we seek an answer, is: What is the minimum threshold of traffic density which would justify a major investment in an experimental high-speed railroad passenger installation in the midwest?

The New Tokaido line, which is at this stage an apparent success, and the Northeastern Corridor experiment, if successful, will not necessarily furnish us with an answer to this question. Both of these are unique situations in their respective countries. There is no transportation axis in the midwest, existing or potential, which would produce a traffic density of as much as half of that of either of these two.

In spite of its uniqueness with regard to that national transportation pattern of Canada, the experiments of the Canadian National with high speed turbo-trains between Montreal and Toronto should - at least after the special conditions produced by the 1967 exposition in Montreal - constitute a more analogous situation to those existing between some of the larger cities of the midwestern United States, including Chicago.

The railroad experiment north of the St. Lawrence and Lake Ontario may prove to the midwest to be the one to watch most closely. In this part of North America, there are several city-pairs, with smaller intermediate cities, comparable in distance apart to Montreal-Toronto, but with greater populations and traffic potentials. Such situations are intermediate in magnitude between the Tokaido and Northeastern Corridor areas on the one hand and the Canadian area on the other; if all three are successful, we can justify greater confidence in our experiments between midwestern cities.

Among these possibilities, we would apparently be justified in considering some of the following: Chicago-Minneapolis, approximately 400 miles, where the major experiments in high-speed railroad trains in the 1930's gave impetus to the aborted revival during the few years until World War II; Chicago-Detroit, just under 300 miles; Chicago-St. Louis, almost exactly the same distance; Chicago-Cleveland, 340 miles, where there is now not a single sleeping-car available between the two cities; and Chicago-Cincinnati, about 300 miles, where Indianapolis would constitute a significant intermediate source of traffic. Other possibilities in the midwest, not involving Chicago directly, include Detroit-Toledo-Cincinnati, Cleveland-Cincinnati, Cincinnati-Pittsburgh, St. Louis-Kansas City, St. Louis-Indianapolis, and St. Louis-Cincinnati.

None of these, however, approach the densities or potentials of the Tokaido or Northeastern corridors; whereas in those two situations the terminal cities are extremely large and there are intermediate cities of great size, only Chicago in the midwest is comparable, and the intermediate cities, for the most part are far smaller. The combined potential of all the city-pairs of the midwest which include Chicago, because the pattern is radial rather than axial, would probably not equal that of the Northeast corridor.

The aforementioned city-pairs have been listed as the major midwestern nodes situated between 200 and 450 miles apart, rather than city-pairs involving lesser or greater distances, because it is clear that railroads, even with major service improvements and technological advances, cannot compete with the door-to-door flexibility of the automobile over much shorter distances, or with the point-to-point time advantage of the airlines over much longer distances. However, each of these routes could, possible, constitute parts of longer routes for passenger trains, as they have done in the past, with service improvement including reductions in running times of 50 to 100 per cent or more. Thus, we cannot afford, yet, to write off the high-speed train on such runs as Chicago-New York and Chicago-Washington, if much higher speeds and higher-density accommodations such as sleeper coaches are combined with smoother roadbeds and closer connecting schedules. There are several more-or-less parallel urban-industrial axes between Chicago and St. Louis on the west and Boston-New York-Washington on the east, which geographers have long recognized as the core-region of North America and which the famous Greek planner, C.A. Noxiadis has recently termed the "Great Lakes Megalopolis." Along these axes, including the southern Great Lakes shores, the New York Central-New York Thruway route and the Pennsylvania Railroad-Pennsylvania Turnpike route, are many urban nodes with overlapping urban tentacles between, and with with cross travel and inter-city commuting as well as long-haul travel throughout the lengths of these axes. If the current and prospective technological advances in rail passenger transportation could so reduce the travel time that Chicago to New York or Washington could be traversed between close of business and late evening, or late evening to early morning, or during daylight hours, it is possible that the amenities of train travel could attract sufficient business travel to become again economically viable, while personal travel offers even greater possibilities, if articulated with good local transportation services and direct connections within the metropolitan areas. But this is a later stage, and would be contingent upon the success of experiments in the 200 to 450 mile range.

Finally, we need to consider the effects of high-speed rail passenger transportation upon the differential rates of development of the parts of the regions to be served. For such transportation to be feasible, high traffic volumes are needed; to produce such high volumes, high concentrations of population and economic activity are concommitant. Economies of scale operate in transportation as well as in urban and regional growth. Industry attracts more industry; population agglomorates into clusters; virtually all of the net population growth of the United States in recent decades has been within commuting distance of the large metropolitan areas. High-speed rail transportation will intensify these trends. Smaller cities cannot feasibly be served, and they will tend to become by-passed.

By-passing of smaller cities has occurred with virtually all forms of improved transportation. The Interstate Highway system has encouraged growth of more and more non-stop intercity bus services; smaller inter-mediate towns generally have less service now than a few years ago. The Federal government has a "use it or lose it" policy with respect to airline service to smaller cities. On the high seas, growth of massive bulk carriers and development of efficient container ships encourages calls at only the largest and most efficient ports, smaller ports have been losing out both relatively and absolutely. The prospective hugh new jet aircraft and the high-speed supersonic planes both dictate a relative improvement in service at very few but very large and efficient airports; smaller cities, though they may be provided with local air services, will decline in relative accessibility. Thus, high-speed rail passenger service will be of maximum benefit to only the very largest generators of traffic: the major metropolitan areas. At the same time, they will decrease the relative accessibility, and hence the locational advantages, of the smaller cities and towns, in spite of the possibility of improved service to them. The significant measure is relative accessibility rather than the absolute level of transportation service.

This trend is clearly demonstrated by recent traffic patterns affecting Chicago, the largest metropolitan area in the midwest. In spite of the increasing availability of express highways, Chicago retains its dominance as the major highway, bus, and truck node of the midwest. Combining the modes of merchandise transport in the form of TOFC and COFC has not diminished the dominance of Chicago in either rail or truck freight movement, in spite of an increase of through or overhead interline movements; in fact, a recent study of piggy-back indicated that the relative advantages of the largest cities over intermediate-sized ones in terms of through high-speed freight movement is increasing; Chicago is the nation's largest piggy-back center. The larger vessels entering the Great Lakes through the St. Lawrence Seaway cannot physicall or economically utilize the smaller ports; Chicago has thus reinforced its dominance as the outstanding inland port, even though some of the major competitive ports have also grown. In spite of an increase in over-flying by scheduled airlines, Chicago has reinforced its position as the overwhelmingly dominant airline center of interior North America, both in originating and terminating traffic and in transfer traffic. The large centers become larger, the medium sized centers may hold their own unless there are mitigating circumstances, and the small towns, even with improved over-all accessibility, may, in general, lose out in terms of relative accessibility. Over half of the counties of the United States are losing population, while nearly all of the metropolitan areas are gaining rapidly.

Chicago, and other major midwestern centers, thus stand to gain much in size, economic importance, and the cultural enrichment which comes from enlarged interaction with other areas if a technologically revitalized and high-speed rail passenger service should prove to be practicable. It will constitute another impetus for continued primacy of metropolitan Chicago in the midwest, and will significantly aid the midwest in holding its economic position among the regions of the continent and the world.

"THE ROLE OF THE PENNSYLVANIA RAILROAD IN THE DEVELOPMENT OF THE EASTERN CORRIDOR"

Presented By
J.W. Diffenderfer
Assistant Vice President, Special Services
The Pennsylvania Railroad Company

The Pennsylvania Railroad plays a vital role in the Eastern Corridor. I would enjoy discussing with you every aspect of this role, but our time today permits consideration of only a few of the passenger operations.

The mass transportation characteristics of railroads must be the governing factors in designing service in this or any other travel area. The term "railroad" connotes mass transportation. A primary ingredient for successful rail passenger service is a high density market, involving short or intermediate-distance intercity services. Another basic ingredient is a competitive environment in which the rail system can survive as private enterprise. Even with only one railroad, there is no longer such a thing as a transport monopoly.

Regardless of the mode, intra-regional distribution systems are essential for intercity passenger travel by common carrier. Many metropolitan areas, especially in the northeast corridor, passess excellent urban-suburban distribution systems consisting of subway, bus and suburban rail lines. These have been recognized as essential public services. In the east and other high cost areas, the public service nature of these operations and the role they play in the economic vitality of a community generally dictate the need for public contracts, to support the cost of operations, and public grants, to provide for capital improvements. I cite these factors because many experts consider that a good intra-regional distribution system would enable intercity speeds of 125 mph to meet the intermediate-distance travel needs of the northeast corridor for the next several decades, assuming the present rate of development and application of improvements for competitive modes.

The Northeast Corridor Demonstration Program on the Pennsylvania Railroad has been designed to meet an immediate need. Cooperating with the Department of Commerce, the Railroad is conducting a market research project, designed to measure and evaluate such factors as the public response to new equipment, higher speeds, variations in fares, improved comfort and convenience and more frequent service. The PRR's role is a most responsible one, designed not to experiment with new or unproved concepts, but to provide the high quality of continuing all-weather reliability required for such a market research program.

We are building on an excellent base. The market potential of the northeast corridor is tremendous, with the 25 million people crowded into the metropolitan areas between New York and Washington creating the most densely populated intercity corridor in the United States. At the northern end lies Manhattan, in itself a tremendous magnet and center of much of the nation's financial and commercial activity. At the southern end lies our nation's beautiful capital, an attraction for both businessmen and tourists. In between are densely developed areas, dynamic with commercial, financial, industrial and educational activities.

This type of market makes it possible to utilize the inherent advantages of the railroad, to provide a highly efficient, high-speed intercity passenger service at less total cost than by any other means of transport. The 225 miles of Pennsylvania Railroad electrified route, consisting of 3, 4, and 6 main tracks, provide the high capacity required to meet the freight and passenger needs of this growing area. For 120 miles between New York City and Newport, Delaware, the route is entirely grade separated, with only 23 public grade crossings in the remaining 100 miles. Over the years, the Pennsylvania Railroad has built into this facility an alignment, generally comparable with that which has been constructed for Japan's New Tokaido Line. Excluding tracks in the vicinity of the major cities, there are less than 5 miles of route with curves greater than one degree over a distance of 180 miles, and even those 5 miles consist of curves of less than two degrees. This facility represents an investment of $400 million in private funds. To reproduce it today would take more than $1 billion.

The beginning of the marketing research program is already underway, with origin-destination data being obtained for travelers at all major stations and with market surveys being conducted on New York-Washington trains.

We have undertaken substantial upgrading of this line, to prepare it for operation at higher than the presently authorized 80 mph speeds. This program has been based upon our years of experience with high speed, high capacity electrified operation. One year's work of upgrading has been completed. We have another year to go. Altogether, we are adding another 210 miles of track with welded rail to the more than 100 miles of welded track in service before this program began. Over one-quarter of a million ties will be renewed. Some 255 miles of track will be resurfaced and aligned to the close tolerances set forth in our contract with the Department of Commerce. Over 180 miles of heavy catenary contact wire are being strung. Major interlockings are being renewed. High-level platforms are to be constructed at Wilmington, Baltimore and Washington. Since highway grade crossings are primarily a highway problem, caused by the increasing magnitude of highway vehicles and highway traffic plus the human error of the motorist, we are seeking to cooperate with two states in the elimination of crossings where they still exist.

In addition to the work being done on the New York-Washington route, the Pennsylvania Railroad has provided a test track facility between Trenton and New Brunswick, New Jersey. This is the finest high-speed, grade-separated alignment of electrified trackage in the country for research, testing and evaluation of various kinds of rail equipment. This 21-mile stretch has been laid with continuously welded rail. The two intermediate interlockings have been renewed completely. Catenary contact wire was renewed throughout the entire length and regraded at the 11 overhead bridges. The entire stretch was surfaced and aligned to even closer tolerances and provides a facility for continual testing of high speed equipment designed for operation at 160 mph.

This upgrading work has been dictated by our rold of reliability, to provide the safest, strongest track structure known, developed from the Pennsylvania Railroad's experience with high speed, heavy tonnage rail transportation.

In spite of the constraints dictated by the market research nature of the demonstration program and the relatively short time in which we had to effectuate it, we have assumed a revolutionary role in specifying multiple-unit electric cars for this intercity service. This concept is being used on progressive railroads in Europe and Asia. For us, it has been the outgrowth of our experience with modern multiple-unit cars beginning structurally with the Pennsylvania's research program ten years ago including the lightweight tubular train. This is the only post-war lightweight train which has survived the test of time and is still in operation. From this evolved the six prototype lightweight, high-capacity, multiple-unit cars acquired in 1958 for experimental use. Experience with these cars enabled us to develop the 38 high-performance, multiple-unit, suburban passenger cars put in service on the Pennsylvania Railroad in 1963. We have been operating these cars over long distance in intercity revenue passenger service between New York and Philadelphia, Philadelphia and Harrisburg, and New York and Washington for the past three years. We have proved that this concept is the best for a high speed northeast corridor service. The multiple-unit electric car concept provides uniform power/thrust ratio regardless of train length, permits high performance in acceleration and deceleration, extreme flexibility in meeting load requirements, greatly reduces maximum axle loadings, and simplifies terminal operations and equipment servicing.

For the Northeast Corridor Program, we have ordered fifty stainless-steel multiple unit cars powered on each axle. These are designed to be the highest performance intercity passenger cars in the world, capable of speeds of 160 mph and of obtaining a speed of 125 mph from a dead stop in only 120 seconds. Each car has one control cab with the most modern equipment and controls, train radio, and intercom systems. Controls provide for automatic acceleration and deceleration, together with a speed maintaining feature, which operates the train without manipulation of controls at a speed pre-set by the motorman. Dynamic braking is provided with a fade out to an electro-pneumatic system below 30 mph.

The cars are designed to run on the Pennsylvania's present 11 kv 25 cycle electrification system, but are equipped for future changeover to a 25 kv 60 cycle system. Each car has a 1200 kva transformer, which only a few years ago was the size used by electric utilities to meet all of the power requirements of a small community. The tremendous power which can be obtained from compact electrical components makes possible the obtaining of such high performance with all of the propulsion apparatus located below the floor level. This also provides a very low center of gravity.

A new coupler design has been developed, the first of its kind in long-distance, intercity service, for coupling trains of 2 to 20 cars. It makes an instantaneous coupling or uncoupling of all electrical, pneumatic, and mechanical functions. Coupling operations are handled from the control cab. This coupler will become the Pennsylvania standard for all future intercity and suburban multiple-unit equipment.

The new high-speed cars will be wider, almost ten feet across the seat area, permitting the largest coach passenger seat available in public transportation today. There will be carpeting across the floor, up the side walls and in the ceiling. Twenty of the coaches will provide 76 seats. There will be twenty more coaches with the popular snack-bar counter. Ten parlor cars seating 34 will give a luxurious VIP-type service with meals served, tray-style, at the seats.

The cars also feature individual lighting, modern flush retention-type toilets; 12-tons of air-conditioning, providing complete air recirculation every 90 seconds; lower, more accessible luggage racks; and public telephones with direct dialing from the train to every part of the nation.

The demonstration beginning next fall will involve an increase of almost 50% in the number of passenger trains to be operated on our New York-Washington line, with about half of the regular New York-Washington trains being equipped with the new high-speed cars. Though capable of speeds up to 160 mph, these cars will operate initially at speeds up to 110 mph.

From early morning to midnight, the trains will run on one hour headways between New York and Washington; thirty minute headways, between New York and Philadelphia. Schedules between New York and Washington will be reduced as much as fifty minutes from present running times. In cooperation with the Department of Commerce, experiments will be conducted involving fares, food and beverage service, seating arrangements and other features of value in a marketing research program.

It is important to put the financial role of the Pennsylvania Railroad in this project in the right perspective. There have been some misconceptions about the magnitude of government money going into the program. Dr. Nelson has been very clear in his presentation of the facts. I commend him for this. As an educator, he would no doubt reaffirm my observations that we must learn by repetition. My repetition of the facts is just part of your learning process. Please bear with me.

Many people keep asking us what the Pennsylvania is doing with the $90 million it got from the Federal Government for this program. Let's have the record clear that the Pennsylvania is not getting any $90 million, nor anything close to that. I wish that we were, for that amount of money would go a long way toward enabling the Pennsylvania Railroad to provide the New York-Washington corridor with one of the most complete high-speed passenger operations to be found anywhere in the world. It looks like a lot of money to us, but we must temper that realization with the fact that $90 million would provide only a few miles of modern urban highway.

The fact of the matter is that the Pennsylvania Railroad is receiving only $9.6 million from the Federal Government toward the high-speed aspects of this program. We even have to pay that back to the government, if we have any incremental net gain in the results of our operations during the demonstration program. I do not know of any other carrier in recent times which has been given such a grant with the susceptibility of its being repaid.

In addition, there is about $1½ million going toward the upgrading of the test track. This total of $11 million is a long way from $90 million. The other $79 million is for research projects primarily unrelated to rail and which Dr. Nelson can describe more completely.

While Dr. Nelson and his men from the Commerce Department are very capable bargainers, I question that they are getting as much for their money out of any of the other contracts as they are out of this demonstration program on the Pennsylvania Railroad! Neither do any of the other projects involve the magnitude of private investment such as that made by the Pennsylvania Railroad.

We would not for one minute discredit the seed money planted by the Department of Commerce in getting this project underway. It represents more than the dollars involved. It represents more than the fact that it is the first significant grant in this century for railroad research and development, marketing or otherwise. To us, it represents recognition by responsible public authorities that the railroad is another mode of transport which can ably serve the public in high-density areas if given an opportunity and the proper competitive environment. For years, privately-owned railroads have been trodden under the heel of competitive oppression, as billions in public funds have been poured into airways, waterways and highways. To date, expenditures by all levels of government for airways, waterways and highways have totaled $240 billion, with half of this amount having been spent in the past nine years.

In the northeast corridor alone, the investment in one recently completed, limited-access highway system between Boston and Washington involved $2 billion in public funds. Another $2 billion in public funds was invested in the past decade in a network of airports and air navigation facilities serving this same area. All of these have paralleled and duplicated the privately-owned rail systems serving this corridor. And what has the public gotten for its money? Increasing air and highway congestion approaching the major metropolitan centers and a disruption of commerce and travel when well-known fog and bad weather conditions prevail on the eastern seaboard. At the same time, surplus capacity exists on the railroad.

In spite of this aid given competitive modes, the PRR handles a far higher proportion of the intercity travel in this corridor than the national average of only 2% traveling by rail. With over 20,000 intercity rail passengers daily, we account for 25% of the New York-Washington travel; over one-third of the total New York-Philadelphia travel.

It is a tribute to the efficiency and inherent advantage of rail systems that they have survived in a competitive environment of such imbalance.

But we should not consider the railroad's role in retrospect. Instead we are doing our best to rectify the public impression that the railroads are reluctant to make their full contribution and to work with government entities to achieve their potential. This impression has in part grown from pessimism and discouragement over years of passenger deficits, which have sapped the life blood of the railroads. The advent of public assistance and the promise of advanced rail technology combine to provide a rallying point for a new and progressive approach.

For the future, we see our role in a realistic realm, which will recognize that each transport mode has a definite role to play related to its inherent advantages. No longer should railroads be required to provide passenger service over long distances when the job can be done so much faster and more economically by air. No longer should the passenger mass transport capability of railroads be required to serve sparsely populated areas where passenger transport needs can be capably met by auto and bus.

Railroads are geared to handle large volumes of people moving in high-density travel corridors. This is true whether they render suburban passenger services in growing and rapidly congesting metropolitan areas, or whether they provide high-speed intercity service in our densely populated megalopolitan corridors.

This role, however, must be remunerative. Suburban passenger services are a public service. Where they cannot pay their way and the public considers them essential, public funds must be used to contract for these services. To support the expenditures of the magnitude required for the New York-Washington Demonstration Program, intercity rail passenger services must be highly profitable, far more so than they have ever been permitted to be in the past, unless they are to be underwritten with public funds.

We are playing a very rational role in the Northeast Corridor Demonstration Program. This demonstration project is not only a marketing demonstration to assist the Department of Commerce in determining the future course for design of systems and application of public funds to meet the transport needs of the nation. It is a practical demonstration of the Pennsylvania Railroad's passenger policy. This is a sound policy developed from years of experience as the nation's largest passenger carrier. Our goal is to produce faster, more convenient, more comfortable and more efficient passenger service, better suited to the needs of the public than what we are presently required to operate and under conditions that will enable it to return full cost.

We hold little hope for our long-haul passenger traffic. However, in a high density area such as the New York-Washington corridor, where there is a tremendous market and where we have the finest high capacity rail facilities in the country, the Pennsylvania Railroad is definitely interest in preserving and improving intercity rail passenger business, so long as it can be profitable and give us an adequate return on the investment that is involved.

We are writing some exciting chapters in the history of high-speed, high-capacity rail passenger transportation. We hope you will help us in this role by being aboard when the service starts next fall.

"THE EFFECTS OF HIGH SPEED RAIL TRANSIT ON THE ECONOMIES OF DOWNSTATE AREAS"

Presented by
Gene H. Graves
Director
Illinois Department of Business and
Economic Development

Mr. Chairman, members of the panel, and fellow guests.

We meet today to discuss whether we sail or lie still in the harbor. I'm for rocking the boat.

You have heard many times before, and it bears repeating, the expression: We are living in a century of change. We are also living in an intriguing and at the same time a perplexing age. It is a revolutionary age and an age of business. All of us at one time or another, think big. We know our forefathers did. If they didn't, we would not have a Panama Canal, an Empire State Building, a river that flows backward, or transcontinental railroads.

Today is an age of bigger thinking. An age in which the miracles of the laboratory are transformed into the tools of tomorrow.

Thinking big involves using tomorrow's tools today. Our discussions center on a tool already in production, which we must plan to use now. You have heard Mr. Diffenderfer describe what is already a reality in high-speed transportation. Last July, the New York Central Railroad began testing a Budd Company railroad car, equipped with two jet engines which propelled a car to a speed of 183 miles an hour.

Robert Shatz, Divisional Vice President of United Aircraft, which is developing high-speed railroad cars, has predicted a market for two or three hundred high-speed trains in North America within five to seven years. Just one year ago, I rode with Governor Kerner on the Tokaido Express, from Tokyo to Osaka, which cruised at 110 miles an hour. We were accompanied by officials of the Japanese National Railways and several of their engineers who explained the operations and success of the train. The Governor was so impressed that he asked for written detailed information to be sent to his office for study.

We are not talking of "pie-in-the-sky." We're talking about tempered steel on land and a constructive program for present and future generations.

I need not stress the fact that we are living in an urbanized society. America's urban population has doubled within the last 40 years. In 1910 our urban population was 45 per cent. In 1960 our urban centers contained 70 per cent of our people. Two-thirds of America's population now live in standard metropolitan areas. With this urbanization, comes many problems--one being the mobility of people and the means to transport them.

Chicago enjoys one of the finest commuter transportation systems in the country, coupled with high-speed highway complexes and an unexcelled rapid transit system installed within the highway complex. Just six months ago, however, Robert Weaver, Secretary of the United States Department of Housing and Urban Development said that railway commuting has been cut in half and travel by rapid transit has declined by millions of customer's rides each year. "As a matter of fact," he said, "transit riding is less in 1966 than it was in 1907." I would guess such is the case for long-term rides.

As high-speed rapid transit technology expands, high speed facilities will be applied to the problem of moving people in rural and smaller urban areas to link them with major population centers.

Existing in Illinois today are hundreds of rural cities and thousands of their people almost cut off from large urban areas because the large cities are not easily accessible via mass transportation. Indeed, many workers move into the urban regions to better their employment opportunities, thereby, adding to the congestion of bigger cities and the consequent big city problems.

The complexity of modern living demands innovation. We are moving away from a society comprised of small independent, autonomous communities. Our major industries, notably manufacturing and agriculture, produce for state, national, and international markets. Securities and money markets have become predominately statewide and national in character. Technological and scientific information is disseminated and shared by each community throughout the state. Psychological attitudes of consumers and of business decision makers are quickly transmitted throughout the economy. So it is with people and their mobility. It is not a phenomenon that urban areas attract more and more people. It is not uncommon for workers to travel 40, 50, 60, or even 75 miles in one direction to their place of employment. It is not uncommon for people to travel from one large city to another whether it be for business or pleasure. As urban areas grow, the smaller cities and rural areas tend to be isolated unless plans are laid now for high-speed rail transit.

The basic concept of high-speed rail transportation is the movement of people and freight between areas of 100, 200, 300, or even as high as 500 miles in the fastest, safest, and most economical way. This involves corridor-type mass transportation which should be regional in concept and extent. The lack of high-speed rail transit is common to Illinois and the several adjoining states. It cannot be solved by Illinois alone. Because Chicago and East St. Louis form the hubs or crossings of the several intersecting corridors in the Midwest, it is proper that Illinois take the lead in initiating and directing far-reaching programs.

How might this work in Illinois? I would suggest that rail corridors be fashioned along the patterns of our expressways and tollroads--that is, the "extended hand" approach. Corridors could run northeast-southwest between Chicago, Peoria, Springfield, and East St. Louis; a south run from Chicago to Kankakee, Champaign, and Carbondale; and an east-west run between Chicago, Aurora and the Tri-Cities; and a northwest-southeast run between Chicago, Danville, Champaign, Bloomington, Peoria, Galesburg, and the Tri-Cities.

Downstate Illinois and the far fringes of our urbanized areas could become highly integrated both economically and socially. If high-speed rail facilities are developed to allow commuting distances up to 100 miles, many of the problems of urban sprawl can be mitigated. In addition, the possible compulsion of wage and salary earners to live in a station-city on a high speed system will tend to maximize their employment opportunities. Certainly, the lure of working in a high tax area and living in a lower tax community would be considered. At the same time, new problems will arise in fringe areas which may force changes in the operation of our governments and business institutions.

The effects of high-speed rail transit on many areas of the state outside of the metropolitan commuting zones of the near future will depend largely on the location of interurban high-speed corridors. Downstate economies on these routes that are served by high-speed transit will experience more rapid growth than would otherwise occur. This will be especially true when both passenger and freight services is available.

A high-speed rail network will allow the business community freedom and economies unknown today. Properly located industrial facilities will be able to service much broader market areas. In some industries this fact alone can have extreme effects on future cost as it will allow these industries to take advantage of economies of scale in the construction of future plants unthinkable without massive high-speed transit. At the same time, the needs for warehousing and storage will be radically changed. The changes in many areas of the state will depend largely upon how the business community takes advantage of this revolution in transportation. Not only are the limits of the range of economics of scale pushed back, but it will be more feasible to take advantage of the natural and comparative advantage of many locations more readily than ever before.

While rapid rail transit will mitigate some of the chronic urban problems, it could also bring some of these problems to rural areas. Problems arising out of the variation in the distribution of taxable property and population. Consider the frantic efforts currently in evidence of smaller cities to build airports and the economic exclusion of communities without airports.

The whole range of problems of environmental pollution and contamination, which are considered to be urban, will be put into perspective. Also retail shopping centers would spring up along station-city stops adding to the convenience of shoppers and increased tax revenue.

If rapid rail transit develops in the way most of us assume, the recreation areas of central and southern Illinois will be opened to the urban population as never before. This is especially true if we assume the possiblity of the inexpensive rapid transit of personal automobiles. Imagine, for example, driving onto a train in Chicago, driving off 45 minutes or an hour later in Springfield for a picnic with your family at New Salem State Park--relaxed and without the tensions of four hours behind a wheel.

One could take a trip to the Shawnee National Forest in two hours, relax for a weekend, a return rested--instead of feeling complete exhaustion following a hectic eight or nine hour drive! The tourist benefits to downstate economics would surpass the dream of only a few years ago.

It is, at this point in time, impossible to mention all of the effects that high-speed rail transit will have on what we are considered downstate economies, but one central point is reasonably certain--a rapid transit system will so interlock all of the economies of the state that their interdependence will be evident to all. We must recognize, however, that improved transportation must help create an environment we seek; that the principle is not how to move, but how to live. Perhaps a few years from now it will be highly unlikely that "downstate economies" will be considered separately, for by then, it will be acknowledged that all of our economic fates ride the rails together.

Let's get the wheels rolling. It is high time we accelerate--together--for the future.

Thank you.

"THE TECHNOLOGY OF HIGH SPEED GROUND TRANSPORTATION"

Presented By
W.W. Hay
Professor of Railway Civil Engineering
University of Illinois

This Conference is a recognition that we face a critical problem in transportation. If the problem has not yet reached a state of complete breakdown, it most certainly can reach that point within the next few years. There are indications that a breakdown can occur before any major steps can be accomplished to bring about a solution.

The broad scope of this problem is evident on every hand. We have automobiles that can cruise at 80-90 mph, faster than the law allows, yet traffic crawls through city streets at slower speeds than in the days of horse-drawn transport. Airplanes cruise only slightly below the speed of sound, but it takes as long or longer to go to and from the airport as to make the actual flight. We have a rail network with advanced technological capabilities that connects almost every community in the United States. Most rail journeys, nevertheless, are slow and uncomfortable; passenger schedules are few, inconvenient and undependable. I am by no means the first to wonder over our ability to put a man in space at 18,000 mph and even onto the moon, yet find extreme difficulty in moving a man quickly, safely, comfortable for distances less than 500 miles or of getting him to work on time.

We are, concurrently, faced with a growing population that places increasing demands on our transportation capacity. There are just an awful lot of people that want to go places. Our cities continue to expand outward from their centers. Suburban and intermediate communities are engulfed to become mere names in long corridor-like concentrations of urbanized land use. In 1900, 54 percent of our population lived on farms. Today in Illinois that number is only 20 percent. In 2000, the state will become 15-percent rural and 85-percent urban. We have already become an urbanized nation. Dr. Nelson has described such a corridor existing along the Atlantic Seaboard. We are hearing here today of others.

It is extremely doubtful if traditional methods will provide the answers for future situations. We can always build more highways...if our money holds out...but these will take more of the rapidly disappearing land area and will pour additional vehicles onto the already congested urban streets and expressways. A supersonic air transport is a likelihood within the next five to ten years, but its very speed will severely limit its economic range, flexibility and area of usefulness. It will offer small comfort to the traveler who is only going a few hundred miles. More airports can be built and airport capacity can be increased, but the long, slow journey to, through and from the airport remains. The use of helicopters for short-haul travel has been suggested. The proposal has merit, but the helicopter in its present state of development is not likely to be an acceptable occupant of the skies over our urban areas in the numbers necessary to provide the needed capacity. Objectionable noise and air pollution will limit their urban use. The same might be said for any proposed VTOL and VSTOL craft.

There is unevenness in our transportation system. Certain areas have experienced technological and financial progress bur form only one link in the total portal-to-portal travel requirement. All links in the door-to-door trip must be equally adequate.

What are the requirements for a transportation system that will meet the intermediate and short-haul needs of today and of the future? A reduction in the present over-all travel time is a necessary requisite. Direct access to small but important intermediate locations, a state capitol for example, is another requisite. An efficient, rapid, local transport system that is coordinated through suitable scheduling and transfer arrangements with longer distance systems is a third requisite. Safety, economy, comfort, and aesthetic qualities are pre-supposed for any solution. This is not to say we need no more airway and highway development. All modes will find their resources strained to meet the needs of the future.

The supersonic speeds of 1000+ mph are obviously for long distance travel. At the other end of the scale is the local system giving detailed access to home, store or office at average speeds of 20-30 mph. For certain portions of the local system that give access to regional airports or transportation centers or to satellite suburban communities, speeds of 70-80 mph, as on the BARTD system, may be in order.

For intermediate distances of 100 to 600 miles, the preferred speed will enable an in-town to in-town travel time equivalent to or better than the terminal-to-terminal-plus-baggage-wait-plus-terminal-to-town time of air travel. Excessively high speeds are not necessary, but sustained speeds of moderate amount plus well coordinated local facilities are needed. The total time of flight between O'Hare Field (Chicago) and Lambert Field (St. Louis), for example, is approximately one hour by today's jet service. To this must be added a minimum of one hour at each end (based on my own repeated experience) to cover check-in, baggage pickup and local travel time, a total of three hours to go from downtown Chicago to downtown St. Louis. The same in-town to in-town station-to-station time could be achieved by rail at an average speed of 100 mph...including a 10-minute local destination trip by taxi at each end of the journey. Flying time plus on-the-ground time and delays between the center of New York and center of Washington is approximately 1 hour, 58 minutes.

The proposed high speed Northeast Corridor trains will go from the Union Station in Washington to 34th Street Station in New York in 2 hours, 55 minutes (as compared with the present 3 hours, 35 minutes) with four intermediate station stops at an average speed of 77.4 mph and top speeds of 100-110 mph. Faster running speeds than these, 125 mph cruising and 150-160 mph maximum are projected for 1970. This speed will be competitive with center-to-center of town air time.

Faster door-to-door time can of course be had by higher running speeds. Speeds of 300-500+ mph are in prospect with new and exotic systems but are not presently available. Unusually high increases in speed are necessary to justify the enormous expenditures of money and effort required to bring high speed systems into operational use.

What technological solutions do research and development indicate? The possibilities are usually grouped under the general term, High Speed Ground Transportation. A transportation system consists of five major elements: (1) vehicles or passenger-carrying units, (2) motive power to move or propel the vehicle, (3) a roadway (sometimes called a guideway) to support and guide the vehicle or over which the vehicle travels, (4) terminal facilities for originating, terminating, transferring and interchanging traffic and for vehicle storage, servicing and maintenance...and (5) signals, communications, surveillance and information systems to control and monitor the operation and movement of the vehicles. Many combinations and variations of these elements are possible.

The vehicle may be supported by wheels on rails, by tires on paved surfaces or running pads, by air pressures with either high or low clearance between vehicle and support, by magnetic repulsion or by overhead suspension. Guidance can come from flanged wheels on rails, from laterally placed wheels bearing on center guides or against the sidewalls of the roadway, by jets of air, by inductive coupling to a center-of-lane cable or by guiding arms in grooves in the roadway structure.

Propulsion may be through conventional adhesion, by propellor action or by jets acting from the vehicle or from the roadway. Prime movers and motors can be chemically energized as in the gas turbine trains or electrically driven. The electric drive may be conventional or adopt the linear motor concept in which one-half of an induction motor is laid in the roadway, the other half attached to the vehicle. Electrical power may be supplied by slider contact shoe on a third rail or pantograph on an overhead wire. A practical limitation of 160-200 mph may feature this method. Or it may be transmitted by microwave without actual metallic contact. The linear motor can be energized through fixed connections to the roadway coils.

A seven-group classification of technological types has had some use. It is not mutually exclusive. An elevated system could, for example, use any of several guidance systems including the flanged wheel on steel rail. A brief consideration of these groupings and representative examples of each will indicate some possibilities.

1. The flanged wheel on steel rail includes conventional rail systems, subways and elevated transit lines and variations of these. This category will receive more discussion later.

2. Elevated systems include mono- and dual-rail suspensions, both overriding and hanging below. Pilot models have given successful demonstrations at

low and moderate speeds. The overriding type with speeds of 20-40 mph will be familiar to those who visited the Seattle Fair or Disneyland. The second, a suspended design using rubber tires on timber slabs, has been in successful demonstration on a one-mile test track in France. Speeds up to 80 mph have been attained but a potential capability with additional development of 150-200 mph is claimed. Overriding monorail systems have not completely solved the problem of high speed switching nor, for the suspended type, of side sway. An entirely new roadway structure would be needed wherever either design is u ed. Whether or not the elevated structures would prove aesthetically pleasing and acceptable is open to debate. Neither systems offers much opportunity for surface or underground location. The economics of high speed, intermediate distance travel with these systems have yet to be demonstrated in practice. Their probable field of usefulness lies in shuttle service between two major locations such as an airport and town center.

3. Auto transporters include rail ferries and various types of overhead conveyors for transporting automobiles or similar highway vehicles. The present experiments b railroads to carry passengers' autos on conventional trains are not included in this category. One proposed system would support street vehicles from an aerial cable using a hook-like device passing through a carrier tube attached to the top of the car.

One of the more technologically feasible of these proposals is the RRollway System designed originally by the late Deodat Clejan. It is proposed to haul automobiles placed transversely to the roadway in wide-gage cars running on tracks similar to conventional railroads. Speeds up to 150+ mph have been projected. This system is based on known technology but requires two vehicles to do the work of one and relieves congestion on the open highway where the problem is least severe while depositing large numbers of street vehicles at the terminal ends where the congestion of urban streets and expressways is a maximum. Complete new rights of way and construction are required. The vehicles would have to be designed for automobiles of a given time without regard to future changes in auto contours and dimensions. There has been no field demonstration of technological feasibility or of economic costs or consequences.

4. Multi-modal systems use the same vehicle on different roadways with possibly more than one propulsive system. One such design uses a vehicle resembling a small automobile that runs in normal fashion on city streets but can also enter an urban or interurban network where the car, under automatic guidance is moved in a slotted roadway to a designated place where it again takes to the streets under driver control to reach an ultimate destination. The concept can also be extended to buses capable of running on streets or in automated guideways. Very high speeds are not likely with this system. Its field of utility seems to lie in urban door-to-door movements.

5. Fluid suspensions apply to air cushion vehicles, ground effects machines, Hovercraft and the like. These are of several designs, but all depend on a layer of air of greater or lesser thickness to support the vehicle above the roadway. The frictional and impact effects of wheeled support are eliminated. The air

support may come from the roadway but more likely from the vehicle. The plennum, air-bearing and peripheral jet designs are variations. Hovercraft in commercial use today in certain special locations are slow speed (under 80 mph) craft, supported about a foot or more above the roadway. The craft can move with almost equal ease over land or water. A second system represented by the French-designed Aero-Train, is supported above the guideway by an air cushion of only an inch or so thickness. The guideway, itself, may be in the form of a trough or tube or the vehicle may have shoes that slide along a rail-like support with an air bearing of only a fraction of an inch separating the shoe from the rail. Such close clearances require minimum supporting power but are expensive to maintain. Power to support a vehicle by air above the roadway increases exponentially as the height of suspension. The saving in suspension power with close clearance is, however, offset by the increased costs of maintaining a high degree of smoothness in the roadway. A third type of vehicle receives support from air jets against the walls of a tube from pads that extend from the vehicle body. Very high speeds may be possible.

6. Tube systems are of several types but always form an essential part of the system. One design evacuates air ahead of a railed vehicle to reduce aerodynamic drag. A variation proposed uses the force of gravity during a deep descent underground for propulsion. Deceleration for a station stop would be secured through moving upward to the station at ground surface elevation. The Foa tube uses the ram jet principle. Whirling air jets are ejected to form a vortex at the rear of the vehicle. Speeds up to 1000 mph have been claimed as possible.

7. Conveyor systems make use of small cars placed on moving belts or a series of powered rollers. Access to and from the high speed vehicle units is via a series of slower moving belts at station points. These permit the passenger to step on or off the belt or the cars to be shunted from a belt of low speed to one of higher or accelerating ability. The speeds of this system are not likely to be high. Its greatest potential is probably within urban areas.

It is generally agreed that any very high speed system must be free of grade crossings and of any kind of possible obstruction including weather. Hence these systems call for a covered roadway. Further, with the scarcity of urban land and cost of gaining surface entrance into central areas, it seems likely that the covering will be that of a tunnel at considerable depth below the earth's surface. A tunnel location has two critical characteristics: (1) There must be a major break-through in the science and practice of tunneling technology and (2) whatever the system, there will be tremendous initial costs for the roadway. This latter is even more critical since a double track or roadway will be necessary to assure uninterrupted movement and capacity.

Other problems engendered by tunnels include the plunger effects of high speed vehicles entering and in narrow tubes and the effects of high speed and a confining environment on human physiological and psychological responses.

Despite these and many other initial obstacles, very high speed ground transportation has attractive possibilities. In order to know just which of these possible systems to develop and what combinations of components offer the best trade-offs in feasibility, performance and costs, systems studies must be performed to relate these various features to each other. The letting of a $2+ million contract for one such study was announced a few weeks ago in the trade journals by the Department of Commerce.

The foregoing indicates rather clearly that ground transportation at 300-500 mph speeds and with new modes of transport does not offer much promise for the immediate future. Technological feasibility is a long way removed from operational reality. None of the proposed exotic systems offers immediate operational capability at speeds above 100 mph. Yet a very significant increase in speed must be achieved to justify the large research and development expenditures that will be involved in making such systems operational. To the time required for research and development must be added a period of debate over which systems are to be encouraged and the amount of money to be devoted to that purpose. The recent argument over proposed designs for the supersonic transport is a case in point. Continuance of the war in Viet Nam gives little hope that extensive Federal funds will be forthcoming in the immediate future. Thus the time lag before any of these systems become operational at high speeds can vary from 10 to 20 years. One group of optimistic experts have suggested 1985 as the earliest date for an operational system. Their more pessimistic colleagues look to the year 2000. The year 2020 has a realistic sound to others.

The time lag for the San Francisco Bay Area Rapid Transit Development is something like twenty years. Actual planning began in 1950. The first public operation will probably not occur for another three years; certainly the entire system will not be complete before that time. Studies to develop a subway system for Washington may be considered as starting with the National Capital Planning Act of 1952. One would be foolhardy to predict that any trains will be running anytime before 1975, a lag of 23 years. The Toronto Subway had a lag time of approximately 15 years between the first proposals for study and the first operational trains. The Montreal Subway, scheduled for opening this year, began planning in 1951 -- sixteen years of lag. These systems, it should be noted, are using conventional equipment and methods that have required no extensive period of research and development. Excessive power requirements, relatively low vehicle capacity and high roadway costs for the exotic systems indicate that economic factors may increase the lag time by several additional years.

Happily, the situation for the next 5 to 20 years is not as dark as would first appear. Returning to the first category of systems...the flanged wheel on steel rail concept...one can find an answer in a tried and known transport technology system that gives every promise of being adaptable to a level of speed and service that will meet the needs of the next twenty years and probably for a much longer period. It is likely that this can be done by utilizing portions of the existing rail network thereby avoiding many of the high initial costs associated with completely new construction and right-of-way acquisition.

The flanged wheel on steel rail is a known and proven system that offers sure, dependable guidance, low susceptibility to weather, privacy in use of its roadway and freedom from potential disaster in the event of motive power failure. These characteristics give the railroad system a high degree of safety and dependability. To these can be added a low propulsive resistance at the lower high speed range and a traffic capacity that far exceeds that of any of proposed alternative systems.

Remarkable achievements in high speeds by railroads are of long standing. One first notes that on 10 May 1893 the New York Central's No. 999 (now on permanent exhibition in the Chicago Museum of Science and Industry) attained a speed of 112.5 mph near Batavia, New York. The Pennsylvania Railroad recorded over a three-mile distance a speed of 127.06 mph near Ada, Ohio, in 1905. As a climax to a series of 100+ mph tests, the SNCF in March 1955, using conventional equipment, attained a speed of 207 mph on their Paris-Lyon-Marseilles line. Finally, on 23 July 1966, the New York Central regained the United States rail speed record by reaching 183.85 mph with a twin-turbo J-47 jet propelled Budd car, on a 24-mile stretch of main line between Butler, Indiana and Stryker, Ohio.

These speeds were obtained on short-run tests. It should be noted that during the late 1930's and early 1940's, the Milwaukee Road, the Chicago-Northwestern and the Burlington attained with regular frequency the maximum authorized speed of 100 mph on their Chicago-Twin Cities runs. The Burlington has a scheduled run of 45.7 mph between Aurora and Rochelle, Illinois at an average speed of 82.3 mph, start to stop. The electrified eastern lines of the Pennsylvania had a frequently attained maximum authorized speed of ninety mph. That same speed is authorized and frequently attained today by the Santa Fe. Viewed in this light, the recent efforts of certain railroads, notably the Japanese Railway with their Tokaido Line and the Pennsylvania and the New Haven in the Northeast Corridor and also the Canadian National between Montreal and Toronto are not emphasizing any spectacular increases in speed. The spectacular part of their achievements is that sustained speeds of over 100 mph will be attained in providing faster schedules, now in effect or contemplated for early publication.

A look at what is being done today in the realm of updated conventional rail transport is heartening. The Japanese Railway's Tokaido Line usually comes first to mind and with good reason. It is an operational line, newly constructed to high standards of roadway and equipment. Its luxury-type trains cover the 340 miles from Tokyo to Osaka in 3.3 hours at an average speed of 103 mph with top speeds of 125 mph. It has reached 160 mph in test runs and will eventually cruise at 125 mph. An interesting feature of its operation is the use at night of the facilities for high speed merchandise freight service. The Tokaido Line embodies high standards of construction and maintenance and has local problems to overcome (such as the rise in interior car pressures when going through the many tunnels on the line) but it embodies no new principles or significant departures from established practice.

Even more challenging is the performance of the Canadian National's "Rapido" running with conventional equipment and motive power on its regular tracks between

Toronto and Montreal. Presently the 335.3 miles is covered in four hours and 59 minutes at an average speed of 67 mph and a top speed of 90. Early this spring the CNR expects to reduce that time by introducing streamlined gas turbined trains of United Aircraft design similar to those that will be operated at the northern end of the Northeast Corridor. One feature of these trains is the pendulum-like support of the cars which, the builders claim, will permit speeds of 160 mph on track maintained to conventional standards.

Of the Northeast Corridor itself, I need say little. Dr. Nelson has already adequately covered that. It is sufficient to mention that here again are no startling technological innovations. Minor changes in track and catenary structure, high standards of rehabilitative maintenance on track and bridges and equipment using conventional but improved brakes, suspensions, motors and comfortable interiors are the principal features. The outcome of this Federally-financed demonstration will give an insight into the technological sufficiency of these measures and of the public's reaction to modern high speed, comfortable, frequent service as well as to the technological problems such speeds engender. The returns from these tests will be available, fortunately, before the Midwest has to commit itself to any one design or system.

As in the Canadian National, New Haven and Pennsylvania situations, our own Middle West has railroad capacity that could be used advantageously for high speed purposes. The generally easy character of the local terrain should make a program of upgrading an existing line relatively simple. There are splendid locations and rights of way between Chicago and the Twin-Cities, Chicago and St. Louis, Chicago and Cleveland and Chicago and Toledo-Cleveland. Continuous welded rail programs would have to be accelerated. Curve reductions would be needed here and there. Signaling systems would probably need revision. Certain bridges would have to be strengthened. Some crests and sags would have to be removed. A problem of more serious nature, however, is the multitude of grade crossings with other railroads and highways. Any program of improvements would involve the elimination of the worst of these. Eventually all should be removed. Closely allied to this is the problem of rapid entry and exit from terminal areas. The high speed service would hopefully, be routed over those lines that already possess light curvatures and grade-separated routes through city areas regardless of corporate ownership. A joint effort of several railroads might be needed here.

Excessively high speeds are not required. At a top speed of 125 mph, the running time from St. Louis to Chicago can be reduced from the present 5½ hours to three hours; Chicago to Springfield, Illinois (192 miles) from 3 hours, 22 minutes to 1 hour, 45 minutes. Between the Twin Cities and Chicago the present 6½ hours of running can be cut to 4½ hours, the 5½ hours to Detroit to three hours and the six hours to Cleveland to 3½ hours. These improved times would all be competitive with modern jet air schedules. An improved system of high speed rail travel would fulfill a real day-to-day need and take the railroads out of the category of stand-by facilities to protect poor weather conditions for airways and highways.

A necessary feature of fast door-to-door travel time is improved urban transportation. The improvements being made in existing transit systems, well exemplified by the CTA here in Chicago, is a forward stop. The future may, in addition, especially in the smaller cities, see such modern innovations added to the local systems at the StaRRcar street-guideway system or the operational Transit Expressway. This latter system uses automated light-weight cars supported on rubber tires that run on narrow concrete pads. The guideway can be either at grade or supported on a light-weight aerial structure. Guidance is had by laterally-placed wheels bearing against a center guide beam.

Emphasis has been given thus far to what might be accomplished with relatively moderate increases in average and maximum speeds. What can the flanged-wheel-on rail concept offer in the way of very high speeds? The question can be answered only in part. As earlier mentioned, trains have already passed the 200 mph mark in tests. Most railway and other engineers will, however, admit to a lack of knowledge on what happens in the 200+ mph range, especially at sustained speeds. There is, for one thing, a great increase in propulsive resistance fron aerodynamic drag and in the power necessary to overcome it. There is an increased tendency toward loss of adhesion for tractive force delivered through the wheels and a tendency for the equipment to plane or take off from the rails. Acceleration and deceleration pose problems of horsepower, passenger comfort and brake design. Rapid acceleration and deceleration are needed to reduce overall running time but mph/second seems to be a limit for human comfort. Kinetic energy varies with the square of the speed. Four times as much energy and force are required for braking at 160 mph as at 80 mph. For electric operation, power pickup becomes a problem. Catenary wires develop harmonic motions that cause loss of pantograph contact, arcing and threaten the stability of the structure. Adverse weather may introduce problems that would require partial inclosure of the roadway. There is uncertainty as to the ability of steel wheels to sustain the intense centrifugal forces developed at speeds of 200 mph or more of the rails to sustain high speed slip and impact.

These problems will surely yield to research <u>if that research be forthcoming</u>. The rail solution can then be extended into the higher speed ranges, permitting a longer time for the development of second and third generation transport systems... if these be really needed. At the same time an improved right of way will have been made available for future modes and uses. Fallouts from such high speed studies will benefit not only passenger service but will make important contributions to freight operation as well.

In summary, the solution to our corridor-regional transportation problems cannot await the 15 to 20 years or more development period for new and exotic modes, attractive as these might be. An immediate solution is technologically at hand through the use of upgraded conventional rail services operating at moderately higher speeds and combined with thoroughly modernized, flexible and expanded systems of local urban transport. The real challenge is to the public and its representatives and to railroad management to combine their abilities and resources to provide the necessary interest, financial support and effort necessary to bring these things to pass.

"THE RAILROAD'S VIEW OF HIGH SPEED RAIL TRANSIT SYSTEMS"

Presented By
William B. Johnson
President
Illinois Central Railroad

As many of you in this audience know full well, invitations to speak sometimes come to a company president like snowballs in a school yard on the first good day of "packing" snow. Frankly, some of the time you would like to find graceful ways of declining such invitations. But this is one invitation that I was glad to receive and to accept. It is not only that it comes from a member of the Illinois Central's board of directors, one of my bosses, Joe Lanterman. That indeed would be enough to bring me here. But even if Joe were not involved, I would have welcomed this invitation, because I have an intense interest in this subject. As has been mentioned, I am a member of the Advisory Committee on High Speed Ground Transportation. Furthermore, this subject is one with particular public interest and challenge. And of course the Illinois Central is a major passenger carrier.

The subject of transportation is probably in the public eye today more than at any time since the great era of railroad expansion of the 1880's and 90's, when the excitement over railroad progress as well as railroad transgressions was at its peak. Today, the subject of transportation is seldom off the front page. Only a few months have passed since President L.B. Johnson signed the law creating the Department of Transportation, which may prove to be one of the most eventful acts in his administration. We of the rail industry believe this law will help the government to coordinate its many different transportation policies into a consistent pattern. More than 30 federal agencies now are collecting data of one kind or another. The new Department ultimately will survey and coordinate these activities, some of which pertain to high speed transit systems. This is just one of the reforms that have been needed for a long, long, time.

Because of the complexity of the national transportation scene, this correlation is of genuine significance. We have a triple layer of transportation, a dizzying melange of planes flying high and low over a crisscross of railroads, highways and waterways, with a network of pipelines the third layer below the ground. The operation of these forms of transportation is complicated by varying degrees of private and public control.

To put the matter in a nutshell, the new Department has a magnificent opportunity to help guide American transportation to a rational economic future, one that reflects a coordinated and balanced national policy.

So much has been said and written about the problems of moving humans safely and swiftly these days that I am not going to spend much time outlining the difficulty and complexity of those problems. Few city planners today still believe that more highways will solve the problem of urban traffic. I doubt that anyone challenges the statement that rail is far superior to highway for moving large numbers of passengers, as measured by the space and money required by each.

Joe Lanterman has reminded me that, pressing though it may be, the commuter problem is not the main concern of this conference. Let me in passing, however, mention some hopeful signs in the commuter world. The citizens of San Francisco could have had millions of dollars in federal funds to build a downtown expressway. They turned down those highway millions. They had seen what had happened to their sister city to the south, Los Angeles. That city is the world's greatest parking lot, where taxes are now paid on less than one-fourth of the downtown property. The honest burghers of San Francisco voted to increase their own property taxes nearly a billion dollars to build a rapid transit system. Every other large city is watching San Francisco and its BART program with keen interest.

You will be interest to know that BART engineers are greatly interested in our own Automatic Revenue Control System, or ARCS, as well call it. ARCS is part of a new Illinois Central effort to cope with one of the major problems of the commuter business, namely, selling and collecting fares. We are pioneering in the development of computerized gates and magnetically coded tickets, using techniques developed by Advance Data Systems, a subsidiary of Litton Industries. Both ADS and we would be delighted to tell you how successful our pioneering is. Unfortunately, like most pioneers, we get lost in the woods from time to time. Nevertheless, we know we have to find ways of reducing costs, and we are making real progress. Interest in what we are doing is world-wide. I can't even pronounce some of the names of the transportation experts who have come long distances from far-away countries to see our encoding machines, our tickets and our gates.

With all our magnificent advances in science and technology, we Americans are less mobile today than formerly. At least this is true for short to medium-length trips. It is this distance that the committee on which Joe Lanterman serves here in Illinois and the parallel commission on which I serve in Washington find of great challenge and promise. Intercity rail travel began to seriously decline after World War II with the development of improved highways and the production of larger, more comfortable and faster automobiles. Today, more than 90 per cent of all Americans use their cars in making intercity trips. But the very success of the automobile has created many problems.

Most of the time the automobile moves swiftly over our highways, but it has problems when it reaches the metropolitan areas. As a result a regular Rube Goldberg collection of inventions has come into being for intercity travel by rail. Particularly overseas there has been great interest in new techniques. A short while ago the French tested a train that ran on a cushion of air rather than on wheels. And when I say ran, I mean ran fast. It reached about 170 miles an hour. The French are now building a bigger one to run even faster. You will recall the British led the way to this type of propulsion with their successful experiments with "hovercraft" several years ago, which produced boats that travel with great speed while only partly touching the water. Engineers have calculated that trains that expect to hit 200 miles an hour will require some frictionless method such as air cushioning. By 1968 the French expect to have a full-size experimental line in operation, using the air cushion principle. With this "aero-train" they hope to link up cities of from 60 to 100 miles apart with high speed service.

You may have seen, too, that the French government is going forward with a system of overhead monorail lines. We have not utilized the monorail in our country except as a short distance carrier to attract attention to expositions and fairs. We have not considered the monorail either fast enough or flexible enough for switching equipment, but the French apparently are finding answers to these objections.

I have referred to French and British experiments, but of course one should mention the fantastic Tokaido Line in Japan, the most successful intercity rail experiment thus far. One of our I.C. officers who rode on it recently said it was "smooth as silk."

The Tokaido Line has two main features that deserve to be remembered. First of all, it is above street and road traffic. Grade crossings are almost entirely eliminated. If you could see the reports of accidents where our trains hit automobiles that stop on our tracks, or where autos hit trains by going around gates of by refusing to honor warning lights, you would know how important this fact is. Secondly, the Tokaido Line is a computerized railroad, which means that automatic controls have greatly reduced the element of human failure.

Are foreign railroaders ahead of us? In some ways they are. Basically, however, technology on American railroads is as high as on the best foreign roads. The application of our technology simply is different. One major difference is that their land space is so much at a premium they cannot afford such a luxury as our federal interstate highway system of 45,000 miles, involving as it does vast expenditures of space and money. The older countries simply do not have the space or the wealth to permit private automobiles to perform 90 per cent of their total intercity travel. For example, the Japanese National Railways get 60 per cent of their income from passenger traffic. Only 5 per cent of the revenue of American railroads is from passenger operations.

Not yet is the New World as congested as the Old World. Nonetheless, the problem of moving people is fast catching up with us. It is estimated intercity travel will more than double in the next 20 years. The highway death rate already is nearly a thousand persons a week. New Jersey Highway Commissioner Dwight Palmer recently warned that we must reverse the trend toward making our metropolitan areas "one, big spaghetti bowl of highways."

Delays in automotive and air travel are becoming more common between cities. Coming into the city our car slows to a crawl, or we remain "stacked up" in the sky above that city, waiting to land.

The federal government is making an effort to improve the intercity movement of people. Two years ago President Johnson got approval for a three-year, $90 million program to promote high-speed ground transportation. The money is to be used primarily to sponsor research. There are a number of interesting experiments going on, but certainly the most important and the one that has caught the public eye is the Northeast Corridor Project. The Commerce Department is cooperating with the Pennsylvania Railroad in an experiment in high speed rail service between

Washington and New York. By next fall trains will be hitting 110 miles per hour and the running time between New York and Washington will be cut to less than three hours.

High speed train service demands more than experimental new cars. It starts with improved track. The Pennsylvania is upgrading one of its four tracks between Washington and New York for 150-mile-an-hour operation. Although the present line is an excellent one, the new line will be much better. It will have heavier ballast, welded rail, and fewer curves. To give you an idea of what high speeds mean, at 110 miles per hour a one-degree curve has to have 5½ inches of super-elevation. In other words, high speed trains call for high speed track. By 1970, trains on the straightaway will be traveling at 170 miles per hour.

Note that although the federal government has allocated $12 million for the Northeast Corridor project, the Pennsylvania expects tp spend $35-40 million on the same project. If the 2-year experiment is a success, all the grade crossings will have to be eliminated. The costs may well reach $150 million if that improvement has to be made.

The 50 new Budd cars for the new service will be all electric. Twenty of the cars will be coaches, 20 will be snack cars and 10 parlor cars. John W. Diffenderfer, Pennsy's director of special services, claims these Budd cars are the finest rail cars anywhere in the world. They, and the new, fast schedules, will test the public's reaction to modern train service.

As I have said, the Northeast Corridor Project is a joint experiment of the Department of Commerce and the Pennsylvania Railroad. This type of arrangement seems to be evolving as a pattern. When demonstration runs begin in October, 1967, the Pennsy will also be involved in another project. At about that same time a fleet of 50 new electric commuter cars capable of top speeds of almost 100 miles an hour will be placed in service on the Trenton-Newark-New York line. With the cooperation of the State of New Jersey, this new fleet will replace outmoded cars. It is hoped this commuter run will help increase traffic on through trains by bringing passengers from smaller stations to larger stations where through trains stop. Note these cars are to be purchased by the State of New Jersey with the help of federal grants and then leased to the Pennsylvania Railroad in lieu of cash subsidies.

Incidentally, the states of New York and Connecticut recently proposed to lease the commuter facilities of the New Haven in those two states. The railroad will operate the commuter service under contract. I think we are going to see more and more of this pattern of private operation of public service.

The experiments I have been describing will make use of the most modern electric trains. However, many experiments are going on with less conventional forms of power. In late July the New York Central made its now-famous test run over 24 miles of main line on which a single Budd car with two turbo-jet engines set a new speed record of 183.85 miles per hour. The use of this aircraft type of engine represents a technological breakthrough in thermal engines. A further development in the use of jet turbines will take place this coming summer. The

Canadian National is building an all-new turbo-jet train that will be christened on June 1 for service between Montreal and Toronto. The best time for the 335-mile run between those two largest Canadian cities is now five hours. The new turbine train will make the run in four hours, and even less later on.

In addition to all these proposed intercity runs, there is great ferment in the field of rapid transit. They Bay Area Rapid Transit program of San Francisco is the best known of these programs, but all over America and in Canada too, cities are making plans for rapid transit. Philadelphia, Atlanta, Boston, Los Angeles and Washington in our country; and Toronto, Montreal and even little Edmonton out on the prairies of Canada, have new programs that voters have approved. In addition, New York, Chicago, Cleveland and Pittsburgh have plans for extending and improving their present transit systems. In all, an estimated $6 billion is projected for new or modernized transit systems. These projects have one common denominator - they require public tax funds to subsidize construction.

The urban Mass Transportation Act of 1964 provides funds for financial assistance in the development of mass transportation. This Act calls for the cooperation of private and public transportation companies, but it provides funds only to "state and local governments and their instruementalities." The authorization of funds for 1966 was $150 million, and the same amount has been authorized for 1967. These funds can and should be used to solve mass transportation problems.

Within the last decade we have moved steadily toward recognition of the fact that privately operated railroads cannot compete successfully with modes of transportation subsidized by public funds. My career as a railroad man began in the Law Department of the Pennsylvania Railroad. We saw our subsidiary, the Long Island Railroad, steadily go downhill as it attempted to compete with the personal automobile and with the subsidized subway. Year after year the operation of the Long Island was like a hole in the pocket of the Pennsylvania. Many plans were tried to save the Long Island, including a whole decade when the railroad was permitted to invest in new equipment and facilities in lieu of paying taxes, but all to no avail. The Long Island now is an agency of the State of New York.

For some time now, the American public has acted as though it no longer needed trains for the transportation of passengers. It apparently believed the private car and the airplane were to be the transport forms of the future. Now the public is beginning to have second thoughts. It thinks it may need trains. True, the future of the long distance train is uncertain. But there seems to be no reason to doubt the city of tomorrow will have more, not fewer, commuter trains. And there definitely is a growing belief that trains have a promising future for distances in the 200-300 mile range.

I believe there is a place for the passenger business in the future of privately owned railroads, but the place must be newly defined - and specifically defined. I believe railroads can do the job of operating transportation properties more economically and more effectively than can political agencies. I am equally convinced that a tax-paying railroad cannot successfully compete with a public agency that pays no taxes, whose capital improvements come from the public treasury, and whose rates are lower than the true cost of providing passenger service. Competition is a meaningful term only as the competitors operate under the same rules.

Therefore, if there is to be progress, there must be close cooperation between private enterprise and public authorities, and a real, planned coordination of their respective services. No man in recent years has done more for the commuter or received more justified praise than Ben W. Heineman, chairman and president of the Chicago and North Western. Recently he had these wise words to say: "We must have unified planning in this community. If, for example, the state and federal highway engineers, independent of the railroads and the transit authority, lay down their expressways - and if independent of the highway people and the railroads, the Chicago Transit Authority proceeds on its own merry way - we are all going to be in trouble."

Mr. Heineman's warning is one that is clearly understood by all railroad executives involved in passenger service. It deserves to be equally well understood by all members of the public interested in the health of the transportation industry and in the continued performance of good transport service.

In the discussion of this whole subject, we need to remember that the railroads have a low rate of return. Only once in the last decade has the railroad rate of return risen as high as 4 per cent on invested capital. In the passenger end of the business, only a handful of railroads make out-of-pocket costs. Not a single railroad in the whole country is able to show a profit on the ICC's formula of fully allocated costs, and I see nothing wrong with measuring a private enterprise business by its ability to pay its full way.

Therefore, as the railroads move into the new era of experimentation with high speed, it is important that the element of risk be controlled as much as possible. William L. Hopper of the office of science and technology, a member of the White House staff, discussed this point of risk a few weeks ago at the annual meeting of the Transportation Research Forum in San Francisco. He said that little has been done by government up till now in conducting transportation experiments or demonstrations that will give managers of business the kind of information they need to make sound decisions. Once the results of experimentation are available, said Hopper, all transportation companies can use those results to determine the wisdom of investing in new and sometimes revolutionary forms of transport.

I am sure you know this is substantially what has happened in other fields of transportation in recent years. Government underwrote much of the research that went into the development of the aircraft industry and the highway industry. The unfolding Space Age has been made possible by government research. Now in the field of high speed train research there is a prospect of a shift in the federal role from one of the passive interest to one of the active interest. I think this is good.

In summary, then, I see three main developments:

1 - An exciting future for the railroads in high speed ground transportation, particularly for medium distance travel in well populated areas.

2 - A growing amount of government experimentation in the search for economical ways of moving people quickly and safely both within and between our major cities.

3 - A trend toward ever-increasing cooperation between municipalities and private carriers, as well as between public and private carriers.

I see no threat from these three developments to the concept of private operation. Government research on behalf of the aircraft, trucking and waterway industries did not mean the demise of private operation of those modes of transportation.

In short, we can look forward to some exciting and rewarding days in the field of high speed rail systems.

"ALTERNATIVES TO AND ECONOMICS OF BALANCED TRANSPORTATION

Presented By
Aaron J. Gellman
Vice-President, Planning
North American Car Corporation

By "balanced transportation" we mean transportation which is responsive to the legitimate needs of all the people, a transport system sensitive to the demands of the public. At the same time "balanced transportation" refers to a system which promotes the optimum allocation of resources in the region or area served. Finally, "balanced transportation" implies an appropriate mixture of public and private ownership and operation of the region's transport facilities.

There are several things which "balanced transportation" should not convey. For example, by no means should the term be used to promote a transportation system which is designed explicitly to permit the several major modes of transportation to participate in it. There is no magic in having a variety of modes of transportation incorporated in a transport system and indeed, modal mix for its own sake is nonsensical. The role to be played by each mode of transportation should be determined entirely on the basis of the public's needs for transportation and the resource allocative results and effects of the transport system provided.

It is instructive to consider just what the public demand of a regional transportation system:

A. Flexibility--both as to frequency and as to origins and destinations.

B. Convenience and comfort; easy access and safety.

C. Immunity from congestion.

D. Relatively high speeds; short transit times.

E. Accommodation of the goals of the cities, areas and regions into and through which the system operates.

F. Low fares which imply either low capital and operating costs or subsidy, or both.

This is a tall order--one which cannot usually be fitted either completely or precisely. These goals are not entirely consistent and some may even be mutually exclusive. It is in the pairing off of these requirements and in making the proper analyses and decisions that the most difficult job of all is presented to transport planners and entrepreneurs.

It is painfully clear that very little is known about what people really want in their metropolitan and regional passenger transportation services. Some decision-makers, usually politicians, say that they know the level and character of the demand, but it is too often painfully clear that they do not. For example, we are presently seeing along the East coast of the United States sizeable initial expenditures on "corridor" rail transportation based primarily on the judgement of some politicians and government officials that a regular, high-speed service will alone and of itself generate the extremely large demand necessary to make such a system economically viable. Is it too much to hope that the politicians will show restraint in jumping to conclusions about the public demand for such capital-intensive, long-lived transport systems when they are based on scanty and often inappropriate data? It is certainly tempting for politicians and others associated with government to be in the front rank of those instrumental in cranking up and carrying through on major public works projects and, unfortunately, the temptation is often too great to resist. Yet, in the long run, the public often pays a very dear price for the politicians dream of glory, and the price is exacted in the form of haphazard regional growth and development and in terms of the wasteful use of the region's necessarily scarce resources. Conscientious and truly public-spirited politicians and government executives must therefore beward of falling into a trap of this sort since because the commitment of vast quantities of public capital to a transportation facility is not a reversible phenomenon and the waste associated with wrong decisions of this type plagues a region for a very long time--far beyond the tenure of power for most political leaders. In the final analysis, of courst, it is up to the public to monitor its political leadership and assure that the opportunities for short-term political benefit, and even graft, flowing from incorrect decisions relative to the transport systems do not cause politicians to make bad decisions relative to government involvement in transport facilities construction and operation.

It being recognized that a high volume of traffic is necessary to sustain a capital-intensive, high-speed regional rail transit system, it is clear that in all but a few areas of the United States the demand necessary to support such a facility must include both the inter-city, intra-regional demand and a significant portion of the daily long-distance, communiter demand as well. (In contrast, in the high-density Boston-Washington "corridor", the rail system makes economic sense, if at all, without heavy reliance upon norman, daily communiter traffic.) Necessity to tap various resources of passenger transport demand makes for the most difficult sort of system planning and design job. For example, in the planning design and operation phases of such transport systems, it is critically important to recognize that the level and character of the demand eminating from each class of traveler is substantially different. The Milwaukee-to-Chicago passenger displays demand characteristics very different from that of the Waukegan-to-Chicago daily commuiter. The St. Louis-to-Chicago traveler responds very differently from the stock-broker who makes an "enforced" daily trip from Aurora-to-Chicago. And yet a Midwest system, to be anything like efficient, must serve the needs of both classes of travelers.

In this context it is easy to see that one of the critical areas in establishing an advanced high-speed regional rail passenger transportation system is associated with providing what may be referred to as the "ribs" joining the "spinal column" high-speed rail system. Certainly there is insufficient demand located within easy distance of the "spinal column" railroad to support such an expensive rail facility. Therefore, if sufficient demand is to be attracted to make it a wise investment either for public or private capital, it is necessary that gathering and distributive transport services be established offering a level of service consonant with that of the "spinal column" high-speed rail system. Certainly there is insufficient demand located within easy distance of the "spinal column" railroad to support such an expensive rail facility. Therefore, if sufficient demand is to be attracted to make it a wise investment either for public or private capital, it is necessary that gathering and distributive transport services be established offering a level of service consonant with that of the "spinal column" railroad itself. This is a difficult task but one that must not be shunned as, regrettably appears to be the case in the Northeast corridor project. In fact, for the Midwest, ignoring the requirements for such rib-like feeder and distributive services would be far more serious than the Northeast Corridor since in the latter a far greater percentage of the demand is based upon trips between city centers within the densely populated corridor.

Relative to the sharp difference in the character of the demand for passenger services within a region, it is interesting to note that peak passenger movements within a region are increasingly taking place at the start and end of long weekends, which are times when business-oriented and daily communiter travel is typically not very great. At the same time, however, the character of the transportation required when the peaks reach their very highest on such weekends differs materially from that which commuter demands. Simply put, the former is heavily oriented to the automobile with its capabilities of providing unparelleled flexibility to the family both as to time of travel and as to origin and destination. On the other hand, the business traveler is more likely to accept, if not enthusiastically embrace, less flexible and more precisely scheduled transportation which gets him to and from central business areas of the region. This great difference in the level and character of demand for intro-regional passenger transportation gives rise to the question of whether a rail-based system is warrented at all, since the rail system will be very much under-utilized just when the peak passenger travel demands are at their very highest, on the weekends. On the other hand, properly conceived highway transport systems might well meet the peak loads imposed both by normal commuter demand and by abnormal personal, recreation, weekend demand. This is something to think about especially in a region such as the Midwest, where a maximum of all such demand must be channeled through the base transport facility if it is to be economically viable.

In planning any regional transport system, particulary one which is inherently expensive of capital and relatively inflexible as to origin and destination, it is critically important to recognize several facts of life as they have developed in modern America. For example, there has been a sharp trend downward in the public reliance on public transportation in the United States, including privately-owned common carriers such as the inter-city railroads. The private automobile has dominated the scene increasingly and there is a real--but often ignored question as to whether this phenomenon can be reversed.

Again, there are increasing signs that there will be a sharp increase in the establishment of "new towns" along the lines of Columbia, Maryland and Reston, Virginia. Indeed, the Administration's "Demonstration Cities" program is biased in favor of such relatively isolated but integrated communities and, should this become widespread phenomenon, the implications for regional transport requirements are very great, indeed.

One goal of a regional transportation plan is to allow future incorporation to the extend appropriate of transport innovations which flow from the continuing progress in science and engineering. This is a difficult task, at best, and requires, among other things, a high degree of skill at technological forecasting.

It is also important to retain in the regional plan all possible incentives to private entrepreneurs to exploit advanced technology to tap new areas of demand, and to provide services which are responsive to public needs and desires. For example, it is increasingly clear that a whole new range of transportation services will be provided in years to come by air-supported vehicles such as the Hovercraft and other ACV's. It is my view that in a few years, perhaps five, a service could be offered along the shores of Lake Michigan between downtown Chicago and the high-income northern suburbs which would attract sufficient patronage--even at a high fare--to make such service attractive to a private concern in business to make a profit. It may be this service would be established by a commuter railroad which stands to lose traffic from such a development. On the other hand, if the rail carrier chooses not to provide such service, there should be minimum barriers placed before some other enterprise wishing to operate the service, either experimentally or on a total commitment basis. Put another way, it should be a cornerstone of public policy relative to regional transport systems that there should be an absolute minimum of barriers to innovation with respect either to established fixed plant or relative to wholly new capital investment programs involving right-of-way equipment. Only in this way can the region benefit speedily from development such as the British Hovertrain, the French Aerotrain, General American's RRollway, the various tube train proposals now abroad and the STOL and VTOL systems about which we are hearing so much these days.

One of the most critical aspects connected with establishment of regional transport facilities either by private or public capital, relates to the timing of capital investments. Every effort should be made to assure that investments are made only slightly ahead of the development of sufficient demand to make the investment decisions pay off. On the other hand, it is also clear that insufficient transport systems capacity can stifle a region's growth and development and cause it to suffer far more than is the case where the transport systems capability is made available too early. Once more, the notion of "balance" enters, and again, achievement of the appropriate optimum balance is not by any means an easy task.

Among other things, I hope that we have shown that transportation systems planning is a most difficult task. Moreover, the remifications of such plans and of investment policies are very great and affect all aspects of the lives of literally everyone in the region. Those responsible for transport planning construction, development and operation must have the benefit of skilled analysis of myrid complex variable and require forecasts of many difficult factors such as technological possibilities, patters of regional growth and development, changes in public attitudes and wants.

Given the complexity of the task at hand, it would seem appropriate to establish on a regional level a facility devoted entirely to carrying out the studies necessary to support the decision-makers at work in both the public and private sectors. Through the cost of establishing and maintaining such an organization would be considerable, the payoffs would be very handsome. Moreover, in the absence of such analyses, avoidable mistakes will certainly be made which are not only directly expensive but also inhibit regional growth and development, a very onerous result indeed. As a by-product, such a research organization could also serve as a nucleous for overall regional planning--something which has been sorely lacking especially in the Midwest for a long time.

MIDWEST HIGH SPEED RAIL TRANSIT CONFERENCE

"A PROPOSAL FOR A MIDWEST RAILROAD TRANSPORTATION RESEARCH INSTITUTE"

Presented By
Charles H. Koenig, Jr.
Principal
A.T. Kearney and Company, Inc.

Gentlemen:

It is a pleasure for me to participate with you in this Conference on High Speed Rail Transit Systems.

At the outset, I must explain that I am not appearing before you as a member of A.T. Kearney and Company except as part of our efforts to make voluntary contributions to the Railroads and other modes of transportation we have served and to community groups such as the Chicago Area Research and Development Council which I am representing here today.

The Area Research and Development Council is dedicated to the advancement and growth of technology in the Midwest. The Council represents a large number of technology in the Midwest. The Council represents a large number of technically oriented activities, as shown on this display of its members in the Chicago area. Its Board of Directors consists of scientists, educators, and business executives; most of whom qualify in more than one category. They are affiliated with our leading universities, research institute, industrial firms (many of which are suppliers to the railroad industry), utility companies, banks, and a management consulting firm.

I was asked to present this proposal because our firm, A.T. Kearney and Company has done a great deal of work in the transportation industries. I have personally served as consultant to several major railroads and I have served many industrial companies in the area of management of engineering, research and development. Being neither a scientist nor a banker, it was felt that I could impartially present our proposal and suggestions.

The Council has been interested in various aspects of transportation, but perhaps this interest has not been sufficiently demonstrated. About a year ago the proposed RRollway concept for high speed transit was presented to the Council by the late Deodat Clejan of the General American Transportation Company. The concept was endorsed as a possible rapid transit passenger car connection between Chicago and St. Louis and as a prototype system to take cars off the highway. We have been looking forward to hearing more about the progress of this plan.

Another example of delayed acceptance of ideas is seen in a proposed systems concept that was developed by A.T. Kearney and Company in 1958, through our own research, for the Chicago Association of Railroad General Managers. We proposed an interroad communication and data handling system which would speed up the movement of freight cars through the Chicago Terminal. The problems were such that no railroad could do it alone. Although starting as a local installation, the study visualized its growth to a national system which could eventually be extended to car control, interroad accounting and an industry information clearing house.

The study also forecast that if such a system was not developed collectively, the forward looking roads would develop their own systems for internal use. This would result in greater total cost because of the duplicative effort involved, and the industry would still face the need for an industry-wide system at some later time. This is exactly what happened and railroad leaders are today trying to find the solution to this need.

The R & D Council fully realizes that acceptance of ideas is sometimes slow, and, often, there are many obstacles to overcome. However, it seems to us that the process might be accelerated, at considerably lower cost, if there were better mechanics, in the form of an institute, through which cooperative research could be performed.

The Conference today has offered an interesting confirmation of the need for cooperative research. It has served admirably to bring out the many facets of high speed rail transit. It has demonstrated that the problems involved are not purely technological in nature, but they are social and economic as well. I might add, in passing, that anyone connected with a railroad is quick to point out that, if the social and economic problems could be solved, tremendous motive power and impetus would be given to technological development. In addition, the Conference has accentuated the necessity to organize public attention and support for the effort which research demonstrates to be necessary.

The speakers this morning illustrated that many highly competent individuals, companies and institutions are gravely concerned about the need to develop new concepts of transportation. They are working individually to develop important contributions to that national, regional, local and industry problems. Their voices are insufficiently heard until a forum like this Conference is provided. Unfortunately, too little is accomplished through presentation of views in a forum unless there is acceptance of the views, and somebody goes to work on turning them into reality.

Mr. Nelson illustrated that where individual or industrial effort is insufficient to solve major national development needs in transportation, the national government can and will support the investigative effort. The Department of Commerce, and especially since Dr. Plowman's tenure as Undersecretary for Transportation, has increased its support for such efforts. Mr. Nelson illustrates that the Department of Transportation will provide increased impetus to the definition, investigation and solution of major problems.

This afternoon's speakers revealed additional facets. First, there is growing awareness that rails must be considered as a part of a balanced transportation system and, even more important, there is a need to define what is a balanced transportation system. After these points, we have to determine how the results of transportation innovation can be financed.

Collectively, these speakers present a fine picture of the individual efforts that are being put into finding solutions to rail transit and other problems. The picture is supported by a recent survey of Railway Age Magazine which found that 32 railway supply companies (out of much more than 100) had budgeted about $30 million for R & D in 1966. The same survey found that 22 railroads (out of 75) reported budgets of more than $48 million for R & D in 1966. The latter amount also included marketing research, rate and pricing analyses and related matters. It is presumed that the companies not reporting also had budgets for innovation. Obviously, the amount of individual effort that is being made is tremendous.

We certainly have no wish to be critical in any way of the efforts being made by or for the rail industry. The amount of progress that has been made in the past ten years has been most dramatic. Critics might point to aircraft, aerospace, electronics, atomic energy and perhaps other industries and argue that their progress has been more dramatic because they have a larger R & D establishment, more drive, and quicker acceptance of innovation. But, to be fair, they must also note that a good deal of such R & D is publically sponsored.

We recognize that the railroad industry has done a tremendous job of innovation in the past ten years. But there is so much to be done yet just to catch up with needs that have been defined. And then, how about the additional needs that would be defined if we had time and resources to concentrate on them? Must we wait until, step by step, we make progress and get time to do these things?

The subjects of high speed rail transit and mass transit are examples. Isn't it regrettable that, in our environment of exploding technology, we have to wait until problems reach emergency proportions before we can marshall our collective abilities to face up to the need, investigate possible solutions, and then organize the financial, technical and human resources necessary to get the job done.

It has been said that the railroad industry is spending one and seven-eights of its income on R & D, and that this compares favorably with industry in general. Well, perhaps it does. But this doesn't prove anything. How much should be spent on R & D cannot be defined in terms of per cent of sales. It can only be defined in terms of what needs to be done to accomplish defined objectives. The computer manufacturers were not content to spend 1 to 2% of their sales as an R & D. They had new frontiers to open and in eleven years they introduced sufficient innovation to obsolete themselves at least three times...and the users were happy to pay the bill.

We believe that R & D budgets must be established in terms of the job that needs to be done although, realistically, it must be limited by what you can afford to spend. The most important thing is to have a coordinated plan for the direction of the research effort so that the limited resources can be most profitably applied.

With such a plan, ranging as far as visibility permits, it is sometimes possible to leap-frog some of the current technical problems and more profitably concentrate on more basic concepts that may be further down the road.

Let me offer you an example of leap-frogging from the freight side of rail operations. As you know, piggy-back was a major innovation only a few years ago and is now making new records every year. Yet, in our opinion, it is already headed for obsolesence because of new concepts of containerization and the move toward balanced and coordinated transportation involving rails, trucks, and marine carriers. It is a longer story than I can tell here but I would be happy to forward a copy of our study on the subject to anyone who might be interested. When it came to rails, we found it necessary to develop the concept of a new type car, as shown in Chart 3. It is 88' in length. It has no center sill and allows the lower tier of containers to ride only one foot above the track. This picture shows two standard 40' trailers on the car. In our opinion this is an obsolete payload.

The next slide shows the same car carrying six 20' containers or the equivalent of three 40 foot trailers. This is a 50% increase in cube over piggyback. Here are five 24' containers on the car, also yielding a 50% increase over piggyback. It is intended for the western style truckers. Here are four 28' containers on the car, which result in a 40% increase in cube over piggyback. This provides for the largest size that can be run double in 23 states. Here are three 35' containers on the car. This size is currently used by the largest pool of containers in the world. This configuration yields a 31% increase in cube over piggyback. Obviously, when you keep the same car weight and length and increase its capacity by 50% you have a significant breakthrough in cost reduction opportunity.

We would like to suggest that some change in the current approach to research and its implementation might be very beneficial to the rail industry in terms of accelerating the progress now under way.

We suggest that a Railroad Research Center of a different type should be established, preferably in Chicago, which would be dedicated to the timely investigation of many problems not previously established, the development of solutions and assisting the companies and communities affected to successfully implement the results of the research.

We recognize that proposals for rail science and technology centers are not new. During the past five years, as the acceptance of R & D on railroads gained greater momentum, there has been a lot of good thinking concerning the need for cooperative research effort.

For example, late in 1961, a Vice President of the Canadian National Railway suggested that the industry should set up a cooperative research effort with an initial budget of $10,000,000 per year.

The following year, one of today's speakers, Mr. Gellman, offered a plan to activate a rail carrier research activity. It was a well thought out proposal, if I may say so. He pointed out that there were five approaches to performing necessary rail research, including dependence on the government, contracting with outside agencies, dependence on suppliers, following other industries and single or cooperative effort by the roads themselves. All of these prospects still exist.

In 1963, the National Academy of Science made a survey for the Department of Commerce. As I recall, some 75 railroads and more than 100 railroad supply companies participated in this study. The results of this survey showed that railroads R & D efforts had not increased substantially between 1960 and 1963, but that considerable headway had been made in the acceptance of R & D in the previous few years. Much of the R & D effort was made by the suppliers, something like two to three times the effort made by the railroads themselves in that year. There is nothing wrong with that; it illustrates that the competitive value of R & D was better recognized by the suppliers. However, it is also noteworthy that rail management acceptance of innovation was changing substantially, thus making the supplier's effort worth while.

No doubt there was resistance on the part of the many railroads to accept innovation as compared with other modes of transportation. There are many explanations of this resistance; financial, tax treatment, calcified management at lower levels, and a host of others, not the least of which were the facts that regulation inhibited change and that the government had given substantial support to the acceptance of R & D by the railroads competitors.

Today, there is much more visible need for cooperative research effort. This picture shows that in 1927 the average box car was rolling 9.0% of the time, and idle 91.0% of the time. What do we have 40 years later? Take a look at 1966. We have made great progress. Now the cars are rolling 10.0% of the time and idle 90.0% of the time. One per cent improvement in 40 years.

The N.A.S. report in 1963 pointed to the need to concentrate on systems analysis for the industry, and I interpret this to go beyond hardware systems. The report said that the industry "must develop a body of fundamental knowledge concerning the performance of mechanisms in railway operations and define the parameters of service environment."

We feel that the industry is making great progress in this direction. As this Conference illustrates, a number of agencies and individuals are doing what they can to develop this "body of knowledge" and define the parameters of service environment.

-There are agencies like the Railway Systems and Management Association and the Transportation Association of America that provides forums for the exchange of information on progress and innovation in many fields.

-Our universities are making many contributions.

-Professional, technical, transportation, trade, commerce and civic associations are doing what they can to make contributions in these areas.

-Rail management itself is changing with dramatic swiftness eagerly seeking higher level technical and management people.

-The journals of the industry among them--Modern Railroads, Traffic World--and especially Railway Age, being a weekly, do an outstanding job at reporting technical progress and accentuating need to continue the effort while recognizing the great progress that has been made in the past decade.

-There are agencies like the AAR Research Center that has made a fine contribution since it was established but is limited by too small a budget.

-There are private consulting firms and research institutes, who make sponsored and unsponsored contributions to this body of knowledge and the parameters of service environment.

-Finally, there are the people who pay the whole bill--the users of transportation--shippers and passengers. Many large shippers and many communities are making substantial research contributions and, especially, in the area of mass transit, every community in the country has a stake in higher speed, lower cost, more dependable transportation.

-I have already noted the efforts and the budgets for R & D of the railroads and their suppliers for the industry.

It is based upon this tremendously broad public and private need that the Chicago Area Research and Development Council feels there is a need to establish a different type of Railroad Research Center in Chicago which will encompass the full scope of research and investigation necessary to further accelerate innovation in the railroad industry and, where possible, to help secure public and regulatory acceptance of the results of the research.

We would suggest that the statement of the NAS report might be a good start in developing a statement of the missions and objectives of such a center.

As a management consultant, I would stress that there is much more to the management and acceptance of technology than the development of the physical and scientific concepts and their interpretation into hardware.

I feel there is also a need to develop corresponding management skills to employ the new technology.

-There is a need to know and understand the social and business impact of the technology with special concentration on economic factors.

-There is a need to project the trends of the market for rail services, community needs, and the direction of the national economy, and to develop concepts for meeting the needs before they assume emergency proportions.

-There is a need to look down the road to visualize the possible direction that railroad technology may be going 5, 10 or 15 years from now.

-There is a need to look ahead to define the efforts necessary to obtain relief from restrictive or short sighted social policies that have grown within our system, some of which may have been timely answers to problems of earlier generations.

With these considerations in mind, the missions and objectives of such a railroad research center might be stated as follows:

1. To assess and predict the scientific, engineering and other technical problems of railroads.

2. To direct and coordinate research efforts of carriers, suppliers and shippers in the performance of mechanisms and systems and in the establishment of service and performance parameters. (We would not visualize however that such coordination will be used to have any effect on or control over proprietary research efforts of any railroad, supplier or shipper.)

3. To promote the development of management techniques and practices necessary to obtain the anticipated return from technological developments.

4. To promote the economic and sociological investigations necessary to obtain public acceptance of technical and managerial innovation.

We visualize that the organizational thinking for such a center would begin with the establishment of a Board of Governors consisting of 4 or 5 railroad presidents representing major geographic areas of the country. Possibly it would be desirable also to have a rotating international representative on the Board to tie it in more closely with technical research in other countries. The Governors would establish policy guidelines and approve the budgets for the operation of the center. Elections to the Board could possibly be held through the auspices of the AAR.

The Research Center would be under the management of a Director who would be selected by the Board of Governors.

The major technological functions of the Center would be carried on by three centers namely:

1. A Systems Technology Center

2. An Equipment Technology Center

3. A Materials Technology Center

Two additional units would fill out the line organization of five research centers:

1. A management research center.

2. An economic and social research center.

Finally, we visualize that eventually six staff offices would be helpful in carrying out the mission of the research center:

1. An Extramural Contracts and Grants Administration office.

2. A technical information office, for which we would suggest a high priority.

3. A government liaison office for non-scientific subjects.

4. An office to perform scientific liaison with government agencies.

5. An international technical liaison office to monitor progress in Europe, Japan and other countries, and possibly to advise less developed countries.

6. An office for support services--primarily project management and the business and administrative functions of the Research Center.

The suggested functions of each of these units are outlined in greater detail on the organization chart attached.

As we indicated, the size of the budget to operate such a center cannot be set until its tasks and objectives are agreed upon. We would be hopeful that the railroad industry would be able to financially support this Research Center. I don't think it should have a short view about accepting grants and contracts to perform research for governmental agencies, or similar contracts from state and regional agencies, especially in the area of transit research development. It could also function as prime contractor for such research, coordinating a number of subcontractors such as universities and research institutes where diversified skills would be required.

Now, why do we suggest that such a center be established in Chicago? That is an easy one to answer.

First, because the technological skills are already here. Unlike some other areas of research, Chicago is bountifully endowed in the field of rail transport.

It is the major center of railroad operations.

It is the major center of railroad suppliers.

It is already the center of universities that contribute to railroad technology.

It is a natural center for railroad customers.

This map which I borrowed from Railway Age, tells the story most completely. Chicago is the focal point of "Where the Trains Roll."

Harking back to my earlier point as to how much research is needed, I don't think that any one really knows. We do know that the problems are formidable. Intermodel balanced transportation systems, interroad systems development, mass transit, shippers demands and public demands for high-speed low cost reliable service are examples. Possibly the job could be done for $5 to $10 million per year, but this would have to be determined by a committee which would define the initial program and objectives.

We therefore suggest that a formulating committee be established, possibly under the auspices of the AAR or some other group that is held in high regard by the railroad industry, such as the Railway Systems and Management Association. No doubt several of those who should be on such a committee are present in this conference. The committee might include representatives from the supply industry, and possibly public representation.

Those of you who would wish to support or participate in this proposed formulating committee should communicate with Mr. John Coulter, Secretary of the Research and Development Council. He is located at the Chicago Association of Commerce and Industry in Chicago.

The Area Research and Development Council would be most pleased to participate with such a committee and to assist in this effort in any way possible as, I am sure, would all of the other institutions in our area. We would also welcome the Railroad Research Center to membership in the Research and Development Council.

"THE AEROTRAIN CONCEPT OF HIGH SPEED RAIL TRANSPORTATION"

Presented By
Randall M. Dubois
President
Aeroglide Systems, Inc.

The Aerotrain is not science fiction from the land of Jules Verne, it is the product of years of engineering and research.

Wome 10 years ago Jean Bertin organized the Bertin Company to specialize in applied research in aerothermodynamics. Today, one of the foremost research companies in Europe in its field is divided into several departments:

1. Mechanics related to external fluids,
2. Mechanics related to internal fluids,
3. Atmospheric and space physics,
4. High energy generation,
5. Fluid commutation and amplification,
6. Propulsion and silencers,
7. Measurements and regulation.

In the early sixties, Bertin's staff began experimenting with plenum chambers to create an air cushion vehicle. By 1962 Bertin developed the use of several planum chambers within a flexible skirt made of rubberized fabric, and this was Bertin's principal innovation in the field of air cushion vehicles. In the film you will see the application of this principle to a marine vehicle.

Although both the land and water vehicles have great manoeuvrability, a built-in guidance system was considered necessary for high speed ground transportation. In order to develop a guideway which would use air cushions for sustension as well as guidance, Bertin developed the most efficient section, namely, the inverted T. This allows the air cushions to operate on both sides of the vertical plane and on both sides of the horizontal surface.

Only a year ago last spring the Aerotrain Studies Company was formed for the purpose of developing a ½ scale prototype to undergo tests on a 4.2 mile track outside Paris. This development company was backed by a broad cross-section of the aircraft, electronic, engineering and construction industries, as well as the French National Railways and a number of French banks. Although capitalized at over 1 million dollars, this new company received additional funds from the Government in the form of a reimbursable loan. It also enjoys the full cooperation of the French Government agency concerned with planning and land use. This assures a place for the Aerotrain system in the long-range interurban planning being done in France.

In the record time of less than 6 months the prototype had been completed and enough test track had been laid to operate the vehicle at 47 miles per hour. That was in December, 1965, and one year later, at a demonstration held on December 23rd, with the aid of a rocket booster, the Aerotrain attained the record speed of 188 miles per hour.

Some 2,000 passengers, mostly VIPs from all over the world, have ridden in the vehicle. It has traveled over 4,000 miles on its test track with every conceivable recording instrument to measure its performance under as many conditions as can be simulated.

The prototype rather resembles the fuselage of a snub-nosed airplane. Overall it is 32 ft. 10 inches long and 6 ft. 7 inches wide. The fuselage height is 5 ft. 3 inches except for the 4 ft. high propulsion engine pylon at the after end. The propulsive power is generated by a 250 HP standard aircraft engine, a 6 cylinder horizontally opposed Continental engine with a 3-bladed, constant speed propeller. The power for the air cushions is provided by two 4-cylinder, 70 HP, R. 8 Renault Gordini automobile engines normally operated at 50 to 55 HP each.

As indicated earlier, the vehicle astride the vertical rail is held and guided by air cushions, 4 for the lift and 4 for the guidance. The pressure is about .4 psi and the maximum air flow is about 35 cu. ft. per second. The braking system on the experimental model is efficiently achieved by means of the reverse pitch propeller giving negative thrust. Additional brakeage can be achieved by brake pads that grip the vertical track section, similar to the pads of a conventional disc brake.

With respect to passenger accommodation, the prototype has 2 seats in the forward part of the vehicle, one for the driver, the other for the test engineer, and behind these are 4 passenger seats installed face to face.

The 4.2 mile test track has been built on an unused railroad right of way which, although mostly straight, has a curve at one end. The test vehicle may be turned around at either end of the test track by means of a steel extension of the vertical member which moves on its axis like a turntable. This would not be required for the full scale model as we envisage the use of a self-propelled guiding wheel similar to a retractable landing gear, one in the forward section and on aft. These 2 wheels will act as casters when the vehicle is in levitation and thus provide even greater mobility than a conventional bus.

The track itself is made up of 20 ft. of conceret inverted T sections, precast and prestressed, laid on footings up to 3 ft. above the ground. There are expansion joints every 7th member, that is every 140 ft. The upright section of the inverted T is 1.85 ft. high and the horizontal base is 6" wide. These dimensions will be greater in the full-scale model, with the width across the wings of 11.3 ft. and the vertical guide rail 3.28 ft. high. The thickness will be 8" in the wings and 16" for the guide rail. The full-scale glideway will be mounted on 15 ft. concrete pillars spaced at intervals of 50 to 80 ft. with continuity achieved by post-tensioning.

The emphasis during the past year has been on achieving high speeds without sacrificing passenger comfort. The speeds that have been obtained on the test track have been limited by the length of track and the type of propulsion used. Although speed has been emphasized, we believe that the vehicle is eminently suitable for intraurban transit systems as it could be powered by electricity as well as turbo prop jet engines as is envisaged for intercity runs. As an intracity vehicle, there would be no wheel noise or vibration even on steel elevated structures. Electric propulsion would eliminate pollution.

The French Government has recently authorized an appropriation of funds for a full-scale model and some 15 miles of track as the beginning of a link between the city of Orleans and Paris. This 60 mile run would be an elevated double track, high speed transportation system having a cruising speed in excess of 200 miles per hour.

In this country we believe that there are many applications of the system to high speed transportation between airports and metropolitan centers. In fact, the aerotrain has applications wherever high frequency service is desired as the aerotrains can follow each other 30 to 100 lengths apart if given suitable means of electronic control and signalization along the line. The simplicity of the concrete guideway makes it inexpensive compared to the high precision rail lines required for high speed wheel borne trains. Our company believes that an aerotrain system consisting of a dual track can be operational for between $600 and $800,000 per mile, excluding the cost of right of way. As you know, there are many factors in estimating the cost per mile of a conventional railroad line, but the French estimate that it might be between 2½ and 3½ million dollars per mile. We do know, however, that many highway arteries cost one million dollars per mile, and as the aerotrain could be built in the median or within the right of way, we could provide rapid transport on an existing right of way.

The full-scale vehicle as planned will accommodate 84 passengers, and although several vehicles could be coupled, the designers believe that it would be preferable to have a series of electronically controlled vehicles following one another at short intervals.

In conclusion, we believe that the aerotrain offers the following advantages:

1. It is a less expensive structure, the wheels and the heavy and costly suspension system are eliminated.

2. The vehicle is lighter than any conventional train.

3. There is a maximum stability with lower lateral and yaw oscillation at high speeds.

4. Derailment is virtually impossible due to the height of the vertical guide rail.

5. There is a great reduction in the body noise level and certainly a reduction in maintenance cost since the vehicle is supported on air cushions instead of on

beams running between the wheel trucks.

6. There are no vibrations to be transmitted along the track and the expansion joints produce no shocks themselves or in the vehicle.

7. Wheel noise is eliminated and the danger of "hotboxes." If all power failed the vehicle would slide harmlessly along the guideway on its skids.

8. High braking capacity by 3 available methods. First by propeller reversal with deceleration of 0.15 to 0.4g possible. Secondly, by "linear disk brakes" which grip both sides of the guide rail. Thirdly, by eliminating the sustention which causes the vehicle to slide on its skids with a deceleration of 0.5g. If all three braking methods are used simultaneously decelerations of 1g are possible.

Finally, if we add to passenger safety and comfort, the advantages of high speed and frequency plus all-weather capabilities, we believe that the Aerotrain offers more than other advanced techniques in its field.

"A LONG VIEW--THE FEDERAL GOVERNMENT'S POLICY FOR HIGH SPEED RAIL TRANSIT"

Presented By
Rep. Henry S. Reuss
(Dem-Wis)
Chairman
House Research and Technical Program Subcommittee

A couple of weeks ago, in preparation for today's meeting, I was privileged to inspect what seems to me the world's most marvellous transportation system. And I hope every breast here will swell with pride when I report that it was built by Americans, with 100 percent American materials, for Americans.

I refer, of course, to the 3,250-mile-long, 24-foot wide Royal Road of the Incas, built through the Andes of Peru a century before the arrival of Columbus. And when I saw that magnificent transport system - every stone still perfectly joined after half a millenium, in a straight line up and down the highest peaks in the hemisphere - I said: this is something I've got to share with my friends at the Midwest High Speed Transit Conference.

The ancient Incas solved their high speed transit problem. They even did it without the wheel, which wouldn't have worked on those grades, anyway. So my message tonight is: if the Incas could do it, <u>we</u> can do it. What's more, we <u>have</u> the wheel. We can do even better.

So it is good that we are talking about high speed transit, and particularly good that we are talking about it in the Midwest. Too often, high speed rail transport seems to be a subject of interest only in the East, with its well-publicized megalopolis between Washington and Boston; or in the far West, with all the attention in the San Diego - San Francisco area. As one who comes from Milwaukee, the northern pivot of the Midwest heartland which stretches through Chicago to Cleveland, this is what we ought to be talking about.

There is another reason why it is appropriate to discuss the subject here: the Midwest is the place where steel and railroad equipment and machinery are made. The list of sponsors for today's meeting reads like an honor roll of transportation-oriented industries. It's time the Midwest came into its own again in solving the nation's transport problem - within cities, and between cities. And whatever the solution, you can be sure that high-speed rail transit will play a leading role in it.

Until a few months ago, it would have been polite to invite a representative of the federal government - polite, but slightly irrelevant. For until very recently, it was a fact that Uncle Sam had nourished lavishly just about every other type of transport except rails.

Take transportation by sea. The very first United States Congress, in 1789, enacted a tarrif that gave a ten percent reduction in customs duty to goods imported into the United States on American vessels. In 1845, Congress authorized mail subsidies to United States steamship lines. Since the Merchant Marine Act of 1936, we have been providing liberal subsidies for both the construction and the operation of our merchant fleet. In recent years, we have been awarding close to $300 million a year in these subsidies, not to mention tax benefits, cargo preferences, and the sale of surplus ships at bargain prices.

Take inland waterways. From the original land grants of the last century to our present policy of building inland waterways and letting the users use them for free, we have built up the world's leading public inland waterway system. In the last decade alone, $5.6 billion in federal money has been spent on these waterways.

What about automobiles and trucks? We started our federal road-building program with the Cumberland Pike, completed as far as Vandalia, Illinois in 1838 at a cost to the federal government of $7 million. In 1956, the federal government accepted almost exclusive financial responsibility for the 41,000-mile interstate network. To date, federal highway expenditures have exceeded $40.5 billion. An additional $20 billion will be spent before the I-system is completed.

Or air travel? More than $6 billion of federal funds have been spent for air travel, more than $750 million in subsidies for local service airlines alone. We are now engaged in allocating an additional $1-2 billion for the supersonic transport, designed to lift you, complete with sonic boom, from Chicago to Paris in three hours instead of seven. But until very recently--and I'll come to this in a moment--Uncle Sam's research interest in how to get you from O'Hare airport to your home, or how to get someonw who lives in the central city to his job in a suburban factory, or someone who lives in a suburb into the central city, or how to get someone to another city 300 miles distant--was nil, null, and nonexistent.

What about United States aid to the railroads? Well, if you go back 100 years, one never tires of pointing out that between 1862 and 1867 alone over 100 million acres of federal lands were turned over to the railroads to permit them to build. And build the railroads did, until as the great Wisconsin historian Frederick Jackson Turner said, they bound the nation with bands of steel...

But now it is 1967, not 1867. The rail transport industry could well be pardoned if it turned to Washington and asked, "What have you done for us recently?"

To its credit, our rail system is not asking for a handout. But as citizens, we have a duty to ask: "What are we doing about new systems of transport, within cities and between cities?" And when you talk about that, you aren't talking about supersonic jet transports, or canal boats, or ocean liners, or even primarily the internal combustion automobile, for we cannot endlessly choke our cities and foul our air with more automobiles. You're talking about entirely new systems of transport. And high-speed rail transit must be an integral part of these new systems.

Because our metropolitan area transport system has broken down, we cannot fully and agreeably use our marvellous airplane service and our interstate super highways.

We cannot make a forthright attack on poverty, because the poor who live in the central ghettos cannot link themselves to job opportunities elsewhere in the metropolitan area. The McCone Commission, reporting to the Governor of California on the Watts riots, pointed out that the despair which pervaded the area was "intensified by what may well be the least adequate network of public transportation in any city in America." As the McCone Commission pointed out, jobs, shopping, and medical care were inaccessible to the residents of Watts without an automobile. And so the Watts residents found themselves overextending their credit to buy automobiles, because they were the only means available to them to break out of their circle.

Nor can we begin the necessary rebuilding of our cities if we rely solely on automobile transportation. Already there are revolts against the automobile. In San Francisco the other day, the county government stopped construction of the Embarcadero Freeway because the people revolted against feeding more of the city to that universal dragon, the expressway.

In my city of Milwaukee, one of our classically beautiful downtown buildings was the Layton School of Art, built in the 1880s by a meat-packing philanthropist. It was torn down ten years ago, to make a needed parking lot. Happily, a new Layton School of Art was built, a jewel of a modern building on the bluff above Milwaukee's lakefront. Now the expressway people want to tear down the new Layton in order to build an expressway, without so much as a "sorry about that!"

I have said that until very recently, rail transit as a method of solving our transportation problem was effectively disregarded in the councils of Washington. I am now happy to be able to report that times are changing. Let me tell you what is happening.

1. The bill establishing a Department of Transportation was signed into law by President Johnson on October 15, 1966. The President gave it what he rightly called "a mammoth task -- to untangle, to coordinate, and to build the national transportation system for America that America is deserving of." To be sure, there are large gaps in the transportation authority of the new Department. The Maritime Administration, for the present at least, remains outside. But the new Secretary of Transportation will have under his wing transportation by air, by rail, and by highway, as well as the administration of the High Speed Ground Transportation Act.

2. The high speed ground transportation program, enacted two years ago and to be administered by the Department of Transportation, is focusing primarily on the Northeast Corridor between Boston and Washington. Two of its demonstration projects are expected to become operational next year -- high speed trains running between Boston and New York, and New York and Washington, to run at speeds of around 125 miles per hour. The program also sponsors basic research to investigate unconventional transportation systems, such as 300-mile-per-hour vehicles operating in tubes

or tunnels, and vehicles operating on air cushions. The know-how developed from these projects can help us in other crowded metropolitan areas, such as here in the Midwest.

The federal government is in the high speed ground transportation business because the job to be done not only crosses state lines, but transcends state and local fiscal resources as well. But the federal funds so far devoted to this program have been meager. The entire authorization for the three-year high speed ground transportation program was $90 million. But the appropriations have been much less -- $18.2 million for fiscal 1966, and $22 million for fiscal 1967. Compare this investment, if you will, with the government's recent investment of $80 million in the biological satellite which was literally lost in space!

3. The new Department of Housing and Urban Development came about because of the congestion of our city streets and slums, the movement of the more affluent to the suburbs, mounting air and water pollution, increased crime and juvenile delinquency. The question of transportation within the metropolitan area is now in the Department of Housing and Urban Development. Within a year, the President must sort out whether urban transportation stays in HUD, or goes to the Department of Transportation. I suggest as the criterion of whether HUD keeps it, or DOT gets it, should depend on whether HUD's 1967 approach to urban transport is vigorous or lackadaisical. If the job is being well done by HUD, and coordinated well with DOT's <u>intercity</u> function, there should be no reason for a change.

4. HUD continues to administer the Urban Mass Transportation Act of 1964. This authorized $375 million in federal grants to states and localities over a three-year period to assist public and private transit companies in providing adequate mass transport in the nation's cities. The 1966 amendment to this Act authorized an additional $300 million for two more years.

Much of the federal help under this Act has gone to patching up existing inadequate systems of urban transport. In Peoria, Illinois, HUD saved the local bus system with a loan to make possible guaranteed seats and improved schedules. It has helped the Washington, D.C. minibus, a 138 horsepower vehicle which provides short rides for a nickel. Atlanta, Washington, and Boston are pressing ahead with plans for new or extended subways. In the San Francisco Bay area is the largely self-financed $1 billion Bay Area Rapid Transit (BART), where electronically-controlled, lightweight aluminum commuter cars will carry passengers at an average speed of 150 miles an hour within three years. In Pittsburgh, again with some HUD help, Westinghouse Electric Corporation is testing its new sky bus, consisting of 30-passenger, rubber tired cars on an elevated guideway.

About $349,000 in federal aid helped put a five-mile extension in operation between Chicago and suburban Skokie. The number of daily commuters has climbed sharply from the original estimate of 1,500 a day to its present average of 7,000.

And without any federal aid, the Chicago and Northwestern Railway, led by Ben Heineman, is turning a losing commuter operation into a highly profitably one, by making the trains prompt and attractive, giving you a place to park when you board in the suburbs, and getting you to your Chicago office, by boat or escalator, when you get there.

R & D on intra-city transportation must complement R & D on inter-city transportation. Commuter traffic often flows not only within cities, but between cities and across state borders. Yet our commuter trains too often come to a dead end in major cities. Commuters and long-distance travelers alike are dumped upon congested streets. Some Europeal countries are showing us how to connect inter-city and intra-city mass transport. In Paris, work is proceeding on an electrified railroad tunnel called the Rapid Railway Express Network. Trains in this tunnel will connect both with the older Metro subway, and with long-distance lines on the fringe of the suburbs. In Stockholm, two lines of the Swedish State Railways cross in a central station in the heart of the city, directly above one of the main downtown stations of the 40-mile electric train subway system.

5. The trouble with the Urban Mass Transportation Act is that, by and large, it has helped out by providing for new buses and subway cars, but has done little or nothing to provide for wholly new systems of transportation. Without wholly new systems, I believe our cities are doomed.

I was unwilling to settle for the idea that the people who split the atom and are about to put a man on the moon are incapable of working out their transportation destinies here on earth. With this in mind, I have for the past two years pressed for legislation which would require the federal government to show the same research leadership in urban transport that it showed in the Manhattan District Project for splitting the atom, and in our space program. I asked that the Administration pull together the best brains from industry, government, and the universities and foundations, and block out a moonshot-type of program for urban transport, and then come back to Congress in a year and tell us what private industry and local, state, and federal governments need to do to translate research, development, and demonstration, on a systems analysis basis, into a solution "that will carry people and goods within metropolitan areas speedily, safely, without polluting the air, and in a manner that will contribute to sound city planning"--in the words of my bill. I am glad to say that the bill was co-sponsored by almost every Midwestern Congressman and that, despite an enthusiastic lack of enthusiasm by the Administration, it became law last October 15.

Today, under the vigorous leadership of Assistant HUD Secretary Charles M. Haar, HUD is well launched on the first phase of Operation Breakthrough. Universities, research institutes, corporations in the fields of transportation and aerospace and electronics, are now competing for contracts to show us how to improve present modes of urban transportation, and how to evolve radical new technologies and then combine them into entirely new systems.

Space-age techniques can help in Operation Breakthrough. Solid state circuitry can enable us to schedule and control vehicles to an extent far beyond our capacity a few years ago. Our new knowledge of aerodynamics and propulsion systems can tell us much about ground operations at high speeds. Lighweight equipment for space vehicles can be applied to surface vehicles, thus substantially increasing the payload.

By the time the second session of the 90th Congress convenes next January, I am looking for HUD to table before the Congress a five-year breakthrough program which will make our space and atomic efforts look earthbound and old hat!

So belatedly, Washington is moving on the transportation front. We have two new departments, concerned largely with the safe, swift, and pleasant movement of people and goods. We have a Northeast Corridor high-speed rail program, and a dramatic new research and development program which can lead to entirely new systems of transport within metropolitan areas.

A federal investment in high-speed transportation, big enough and imaginative enough to stimulate America's transportation industry, is surely on the way -- just as surely as that one of these days we shall shake off our backs the Old Man of the Sea known as Vietnam under which we are staggering.

And when that day comes, I want the Midwest to be ready for a fruitful participation, with the federal government, to solve the high-speed transit problem of the entire Midwest corridor -- the megalopolis that stretches from the Twin Cities and Milwaukee through Chicago to Gary and Toledo and Detroit and Cleveland.

The planners of the Boston-Washington high-speed rail corridor are finding that their biggest obstacle is governmental. From Boston to Washington some 150 separate and independent political jurisdictions have responsibility for transportation planning. What shall it profit man to build a world-beater of a new high-speed system from Boston to Washington if it turns out to be incompatible with new local systems of scores of communities along the way?

If the Midwest wants help from Washington in the months and years to come for its inter-city and intra-city transport, it will not do for us to ask that 1970 technology be handed out to 1870 administrative and governmental arrangements. Specifically, I would like to see the Governors of Minnesota, Wisconsin, Illinois, Indiana, Michigan, and Ohio recognize the work of this conference by forthwith convening a Midwest Corridor Authority. Let that Authority plan with the states involved, and with all their metropolitan areas along the corridor, the governmental mechanisms necessary to produce coordinated planning and action for better transport from one end of the Midwest corridor to the other.

Why not, for a change, have the Midwest tell the federal government what the federal government ought to do for its people? And what better time and place is there from which to launch such a campaign than tonight, here in Chicago, the railroad center of the world?

Thursday, February 2, 1967

THE CHRISTIAN SCIENCE MONITOR

Businessmen question use of fast trains in Midwest

By John Allan Long

Staff correspondent of The Christian Science Monitor

Chicago

About the fastest a Chicagoan can get to downtown St. Louis is three hours by air. That's one hour in the air and two on the ground going to and from the airports.

It takes two hours to jet from New York to Washington—230 miles. And that, too, includes time on the ground.

So, how does one make these and other 200-to-500-mile trips more efficiently, if not faster? High-speed rail transit is the most publicized answer these days.

But doubt as to the desirability of high-speed trains still persists among many transportation leaders in the country.

Speed discounted

Chicago businessmen held a conference to explore the Midwest need for very fast trains, which would have sustained speeds above 160 m.p.h. They invited prominent experts in the field of transportation.

These conclusions emerged:

• Excessively high speeds — above 160 m.p.h.—are not necessary.

"At a top speed of 125 m.p.h., the running time from St. Louis to Chicago can be reduced from the present 5½ hours to 3 hours," says Dr. W. W. Hay, professor of railway civil engineering at the University of Illinois.

That would be competitive with the modern jetliner schedule.

• Little is really known about what people want or need in public transit on 200-to-500-mile trips—those too short for the plane and too far for the automobile.

There should be more research on frequency of stops, comfort, safety, congestion at terminals, transit times, and fares.

There should be quicker transit to small, but important, intermediate locations between the major cities. These include state capitals, medium-size cities, and major recreation areas.

"With all our magnificent advances in science and technology, we Americans are less mobile today than formerly," says William B. Johnson, president of the Illinois Central Railroad. "At least this is true for short- to medium-length trips."

• Costly high-speed rail transit, similar to that being planned with federal support for the populous Boston-to-Washington corridor, may not be practical for the Midwest.

The reason: there is no single high-density corridor in the Midwest.

The East Coast axis is lineal, with one large city after another arranged "like beads on a string," observes Dr. Harold M. Mayer, eminent geographer at the University of Chicago.

But the Midwest transportation pattern is radial, extending out in all directions like spokes from the major cities.

The major corridor, from Gary, Ind., through Chicago to Milwaukee, has only half the population of the New York-Philadelphia axis. When the corridor is extended, Green Bay, Wisc., is no Boston and South Bend, Ind., is no Washington.

• The isolation of small towns and rural life would be intensified with high-speed rail transit.

Like the plane, expressway, and inter-city bus, a rapid train would link major urban centers. Small, intermediate towns generally have less service now than in the past, and this trend would continue.

• "The solution to our . . . transportation problems cannot await the 15 to 20 years or more developmental period for new and exotic modes, attractive as these may be," warns Dr. Hay.

"An immediate solution is technologically at hand through use of upgraded conventional rail services . . . ," he says.

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Evening Circ. 598,802

JAN 12 1967

Railroad Research Unit Urged

O-110

A multimillion-dollar railroad research center should be built in Chicago, an executive of a management consultant firm told a rail conference here.

"The technological skills are already here," said Charles H. Koening Jr., an executive of A. T. Kearney & Co., 135 S. La Salle.

"Unlike some other areas of research, Chicago is bountifully endowed in the field of rail transportation.

"It is the major center of railroad operation. It is already the center of universities that contribute to railroad technology."

KOENIG SAID it might cost from $5,000,000 to $10,000,000 a year to operate the research center.

He did not estimate the cost of the center or spell out how it would be financed.

The center would aid cities in developing better transportation facilities, in addition to helping railroads in modernization, he said.

KOENIG said that the Chicago Assn. of Commerce and Industry, which co-sponsored the conference with the Illinois High Speed Rail Transit Commission, should try to determine how much interest there is in establishing such a center.

ANOTHER speaker, William B. Johnson, president of the Illinois Central R.R., told the conference in the Pick-Congress Hotel that as highway congestion increases the use of commuter trains will grow.

"For some time now, the American public has acted as though it no longer needed trains for the transportation of passengers," he said.

ANOTHER speaker, Gene H. Graves, director of the Illinois Department of Business and Economic Development, proposed the building of a network of rail lines crisscrossing the state.

Graves said they would serve as an economic stimulant and for high - speed transportation of Chicago - area resident to Downstate recreation areas.

Such a system, he said, would allow commuting up to distances of 100 miles and solve many of the problems of urban sprawl.

ANOTHER speaker described a train without wheels that runs on a cushion of air fast enough to go from the Loop to O'Hare Airport in 10 minutes.

He is Randall M. DuBois, president of Aeroglide Systems Inc., a New York-based subsidiary of a French concern that recently won a $10,000,000 go-ahead from the French government to build a 15-mile experimental layout near Orleans.

MIDWEST NEWSCLIP, INC.
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Daily Circ. 41,000

JAN 12 1967

High Speed Rail Use Is Conference Theme

O-110

An examination of existing and proposed high speed rail systems and a close look at public policy regarding them will be the central themes of the Midwest High Speed Rail Transit Conference on Thursday, Jan. 12, at the Pick-Congress Hotel.

Presented by the Chicago Association of Commerce and Industry and the Illinois High Speed Rail Transit Commission, the Conference will feature thirteen speakers, three slide presentations, two movies and seven exhibits.

Gov. Otto Kerner will welcome the conferees at the six o'clock dinner meeting when Congressman Henry Reuss (D-Wis.), chairman of the House Research and Technical Program Subcommittee, gives his address, "A Long View — The Federal Government's Policy for High Speed Rail Transit."

The luncheon speaker, William Johnson, president of the Illinois Central Railroad, will define, "The Railroad's View of High Speed Rail Transit Systems."

The conference will last from 9:30 a.m. to 8 p.m.

Exhibit models of four high speed rail systems, those of the United Aircraft Company, General American Transportation Company, the St Louis Car Company and the Budd Company will be shown.

There will be a news table where news information, luncheon and dinner tickets will be available.

MIDWEST NEWSCLIP, INC.
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Intelligencer
Edwardsville, Ill.
Evening Circ. 6,666

JAN 12 1967

High-Speed Rails Urged for Midwest

By Roger A. Stafford
Lindsay-Schaub News Service
Chicago

Development and location of high-speed rail transit lines in Illinois may depend on the outcome of current experiments in the northwestern part of the United States, Japan and Canada. O//O

Midwestern industrial and transportation leaders in Chicago today heard that forecast from Harold M. Mayer, University of Chicago professor of geography.

Speaking to a High-Speed Rail Transit Conference, sponsored by the Chicago Association of Commerce and Industry, and the Governor's Commission on High Speed Rail Transit, Mayer said: "There are no areas in the Middle West comparable to the Philadelphia-Boston corridor now being developed by the Pennsylvania Railroad with federal aid."

Only the Chicago-Milwaukee corridor has great enough population and can only be considered a "watered-down version" of the Northeastern U.S. corridor, Mayer said.

But pending other experiments which do not rely on such great population densities, Mayer suggested five Midwestern corridors:

—Chicago-Minneapolis
—Chicago-Detroit
—Chicago-St. Louis
—Chicago-Cincinnati
—Chicago-Cleveland

Illinois Route

Another speaker, Gene H. Graves, director of the Illinois Department of Business and Economic Development recommended that the first corridor run from Chicago to St. Louis through Peoria and Springfield.

Graves said such a route connecting "the Midwestern industrial hubs" of St. Louis and Chicago could have an effect on "lessening the urban sprawl" around those two major cities.

Graves also suggested that high-speed rail lines follow the pattern of present and planned Interstate highways in the state and mentioned specifically, the Chicago-Peoria-St. Louis route, the Chicago - Kankakee - Champaign-Carbondale route, and an east-west route through the center of the state.

Robert A. Nelson, director of the U.S. Office of High Speed Transportation, told of the government's role in the Northeastern corridor project.

He said the largest share of the $90 million in federal aid is being devoted to research in the field of high-speed transportation.

IC Head Speaks

William B. Johnson, president of the Illinois Central Railroad said that "for some time now the American public has acted as though it no longer needed trains for the transportation of passengers."

Johnson told the conference that the public apparently believed that the private automobile and the airplane "were to be the transport forms of the future."

"Now the public is beginning to have second thoughts," Johnson said. "It thinks it may need trains. True, the future of the long distance train is uncertain. But there seems to be no reason to doubt the city of tomorrow will have more, not fewer, commuter trains.

"And, there definitely is a growing belief that trains have a promising future for distances in the 200-300 mile range."

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Chicago, Ill.
Evening Circ. 598,802

JAN 13 1967

Midwest Link

6-State, High Speed Rail Line Proposed

D-11 C

Creation of a midwest authority to plan high-speed rail lines from Minneapolis to Cleveland, including Chicago, has been urged by Rep. Henry S. Reuss (D-Wisc.).

Reuss said the governors of the six affected states should organize the authority.

He assured more than 300 persons at a transportation conference at the Pick-Congress Hotel Thursday that federal aid for fast rail transit "is surely on the way."

Biggest obstacle in developing a fast rail line between Washington and Boston has been co-ordinating the many transportation planning agencies in the heavily populated eastern corridor, Reuss said.

"It's time," Reuss said, "the Midwest came into its own again in solving the nation's transport problem — within cities and between cities.

He urged action now by the governors of Illinois, Indiana, Ohio, Michigan, Wisconsin and Minnesota.

"We cannot endlessly choke our cities and foul our air with more automobiles," the congressman declared.

THE FEDERAL government has poured money into other forms of transportation while ignoring rail transit, according to Reuss.

He called for the same massive research in urban transportation that has been used in developing atomic power and the space program.

"Because our metropolitan-area transport system has broken down, we cannot fully and agreeably use our marvelous airplane service and our interstate superhighways," Reuss declared.

He said urban transportation was important for the war on poverty so the poor of central cities could get to jobs.

The conference was sponsored by the Chicago Assn. of Commerce and Industry and the Illinois High Speed Rail Transit Commission.

The association expects to try to organize a national rail research center in Chicago as a result of the conference.

A proposal for such a center was outlined by C. H. Koenig, a management consultant and spokesman for the Chicago Area Research and Development Council.

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Metro-East
Journal
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Evening Circ. 34,089

JAN 12 1967

Rail Transit

High Speed Link Between Chicago, St. Louis Urged

C-110

By Roger A. Stafford
Lindsay-Schaub News Service
Chicago

Development and location of high-speed rail transit lines in Illinois may depend on the outcome of current experiments in the northwestern part of the United States, Japan and Canada.

Midwestern industrial and transportation leaders in Chicago today heard that forecast from Harold M. Mayer, University of Chicago professor of geography.

Speaking to a High-Speed Rail Transit Conference, sponsored by the Chicago Association of Commerce and Industry, and the Governor's Commission on High Speed Rail Transit, Mayer said: "There are no areas in the Middle West comparable to the Philadelphia-Boston corridor now being developed by the Pennsylvania Railroad with federal aid."

Only the Chicago-Milwaukee corridor has great enough population and can only be considered a "watered-down version" of the Northeastern U.S. corridor, Mayer said.

But pending other experiments which do not rely on such great population densities, Mayer suggested five Midwestern corridors:

—Chicago-Minneapolis
—Chicago-Detroit
—Chicago-St. Louis
—Chicago-Cincinnati
—Chicago-Cleveland

Illinois Route

Another speaker, Gene H. Graves, director of the Illinois Department of Business and Economic Development recommended that the first corridor run from Chicago to St. Louis through Peoria and Springfield.

Graves said such a route connecting "the Midwestern industrial hubs" of St. Louis and Chicago could have an effect on "lessening the urban sprawl" around those two major cities.

Graves also suggested that high-speed rail lines follow the pattern of present and planned Interstate highways in the state and mentioned specifically, the Chicago-Peoria-St. Louis route.

Robert A. Nelson, director of the U.S. Office of High Speed Transportation, told of the government's role in the Northeastern corridor project.

He said the largest share of the $90 million in federal aid is being devoted to research in the field of high-speed transportation.

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Christian Science Monitor
Boston, Massachusetts
Midwestern Edition
Weekly Circ. 62,000

JAN 5 1967

The car and plane are the two favorite forms of transportation.

Yet journeys of 300 or 400 miles are not efficiently spanned by either, according to the Chicago Association of Commerce and Industry. The car must fight city traffic. The plane needs airport transportation.

So the association is sponsoring a conference in Chicago Jan. 11-12 on rapid interurban mass-transit systems. Cosponsor is the Illinois High Speed Rail Transit Commission.

D-110

Conferees hope to find better ways to shuttle people between Chicago and other Midwestern cities even as Eastern experts talk of high-speed trains between Boston, New York, and Washington. Similar problems prevail in both areas.

Some experts say the 150-mile-an-hour train is the answer. But those attending the Chicago meeting will look at other proposals, also.

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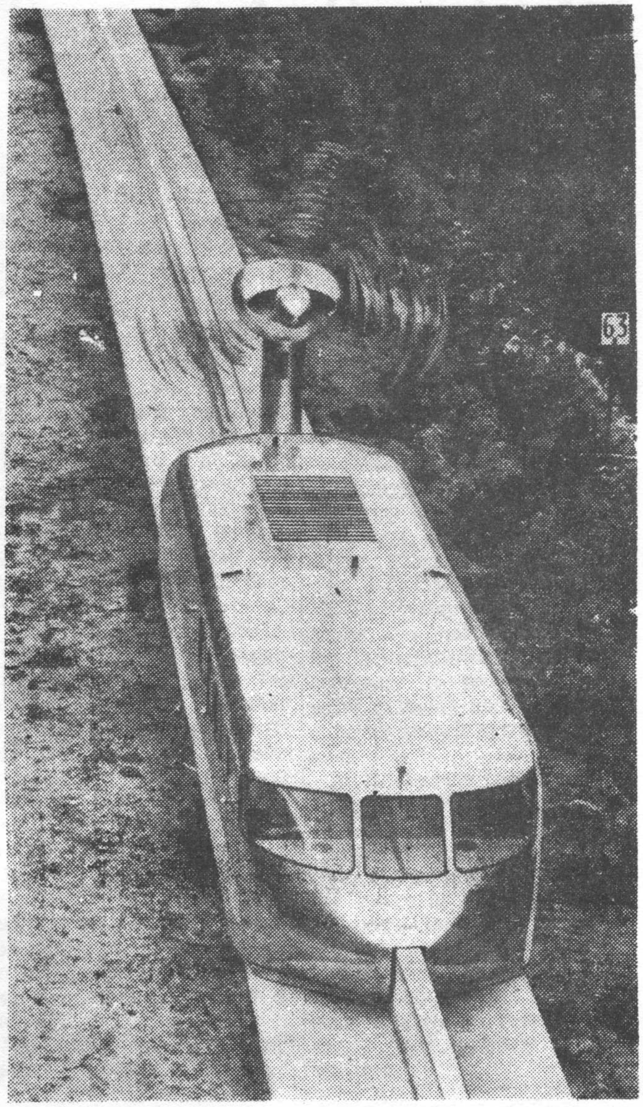
Box 1359, Chicago 90, WEbster 9-5497

News
Chicago, Ill.
Evening Circ. 598,802

JAN 1 8 1967



The Aerotrain, a rapid transit vehicle without wheels that could go from the Loop to O'Hare Airport in 10 minutes, according to its builders. France plans to put the Aerotrain into service on an experimental basis. The car, which rides on an air cushion along a concrete rail, was described to Chicago business at a conference on rapid transit systems.

The 'Aerotrain'

Loop-O'Hare In 10 Minutes

Businessmen were told here of a new concept in ground transportation, fast enough, its proponent said, to carry travelers from the Loop to O'Hare Airport in 10 minutes.

The system, called an Aerotrain, consists of a car without wheels that runs on a cushion of air along a concrete rail shaped like an inverted T.

A roof-mounted airplane engine provides the thrust, Randall M. DuBois told a conference on high-speed rail transportation sponsored by the Chicago Assn. of Commerce and Industry.

DuBois is president of Aeroglide Systems Inc., a New York subsidiary of a French concern that recently won a $10,000,000 go-ahead from the French government to build a 15-mile experimental layout near Orleans.

A FOUR-passenger model car has attained speeds of 188 miles an hour, DuBois said, and it could go as fast as 250 miles an hour. He added:

"The Aerotrain is not science fiction from the land of Jules Verne. It is the product of years of engineering and research."

DuBois said conventional wheeled trains also could achieve ultra-high speeds, but the costs in engineering and maintenance would be prohibitive.

"We could build a system for $800,000 a mile, exclusive of land acquisition," DuBois said, and maintenance costs would be much less than for conventional railroads.

This, he said, is because the Aerotrain requires no roadbed or tracks to maintain, and has no wheel carriages to go awry.

MIDWEST NEWSCLIP, INC.
Box 1359, Chicago 90, WEbster 9-5497

Tribune
Chicago, Ill.
Morning Circ. 833,610

JAN 13 1967

Transit Authority Is Urged for Midwest

BY KENNETH ROSS

Formation of a "Midwest Corridor authority" to plan and coordinate intercity transportation in the midwest was urged yesterday by Rep. Henry S. Reuss [D., Wis.]. 0.110

Reuss, chairman of the House research and technical program subcommittee, made his comments in a speech last night in the Pick-Congress hotel at the Midwest High Speed Rail Transit conference. The one-day conference was sponsored by the Chicago Association of Commerce and the Illinois High Speed Rail commission.

Government Big Obstacle

"The planners of the Boston-Washington high speed rail corridor are finding that their biggest obstacle is governmental," Reuss said. "From Boston to Washington some 150 separate and independent political jurisdictions have responsibility for transportation planning."

He said that beyond the new department of transportation and the northeast corridor [Boston to Washington] project, a big federal investment in high speed transportation is on the way.

"And when that day comes," Reuss said, "I want the midwest to be ready for a fruitful participation with the federal government to solve the high speed transit problem of the entire midwest corridor—the megalopolis that stretches from the Twin Cities and Milwaukee thru Chicago to Gary and Toledo and Detroit and Cleveland."

Suggest Governors Act

He suggested that a midwest authority be convened by the governors of Minnesota, Wisconsin, Illinois, Indiana, Michigan and Ohio. The authority should develop a plan with the states and metropolitan areas for "governmental mechanisms necessary to produce coordinated planning and action" for a better transit system, Reuss said.

At a luncheon session of the conference, William B. Johnson, president of the Illinois Central railroad, said there is a place for passenger business in the future of privately owned railroads "but the place must be newly defined."

He said that to progress in transportation there must be close cooperation between privately and publicly owned services.

MIDWEST NEWSCLIP, INC.
Box 1359, Chicago 90, WEbster 9-5497

American
Chicago, Ill.
Evening Circ. 446,603

New Rail Era Ahead, Says I.C. President

The president of the Illinois Central railroad today predicted "an exciting future for the railroads in high-speed transportation, particularly for medium distance travel in well-populated areas."

"I believe there is a place for passenger business in the future of privately owned railroads," said William B. Johnson. "But the place must be newly defined—and specifically defined."

The outlook for long distance trains is "uncertain," he added in a luncheon speech before an Illinois High Speed Rail Transit commission conference at the Pick-Congress hotel.

More Commuter Trains

"But there seems to be no reason to doubt the city of tomorrow will have more, not fewer, commuter trains," Johnson said. "And there definitely is a growing belief that trains have a promising future for distances in the 200-to-300 mile range."

The I. C. official said trains "will be hitting 110 m. p. h." by next fall between Washington and New York in a joint government-Pennsylvania railroad experiment. By 1970 they may be traveling at 170 m. p. h. on the straightaway, he added.

In addition to a high-speed train already operating in Japan, Johnson said other innovations are planned or proposed in Canada and France. And American cities are planning to spend a total of 6 billion dollars for new or modernized rapid transit systems.

Tax Subsidies Required

"These projects have one common denominator—they require public tax funds to subsidize construction," he said.

The new government interest in high-speed train research is "good," Johnson said, just as it was in underwriting much of the research that went into the development of the aircraft and highway industries.

While there should be close cooperation between public and private transportation interests, Johnson said he believed railroads can do their job "more economically and more effectively than can political agencies.

PHOTOGRAPHS FROM MIDWEST HIGH SPEED RAIL TRANSIT CONFERENCE

1. Harold M. Mayer, Professor of Geography, University of Chicago, addressing the morning delegates at the Midwest High Speed Rail Transit Conference. Seated at Speakers Table are Thomas H. Coulter, Chief Executive Officer of the Chicago Association of Commerce and Industry, and W.W. Hay, Professor, Engineering Department, University of Illinois.

2. Paul J. Randolph, Chairman of the Illinois High Speed Rail Transit Commission, and Clair Roddewig, President of the Association of Western Railways, listen to William Johnson, President of the Illinois Central Railroad at luncheon.

3. RAMCO (Railway Automated Machinery Company) exhibition booth in Exhibit Hall at High Speed Rail Transit Conference.

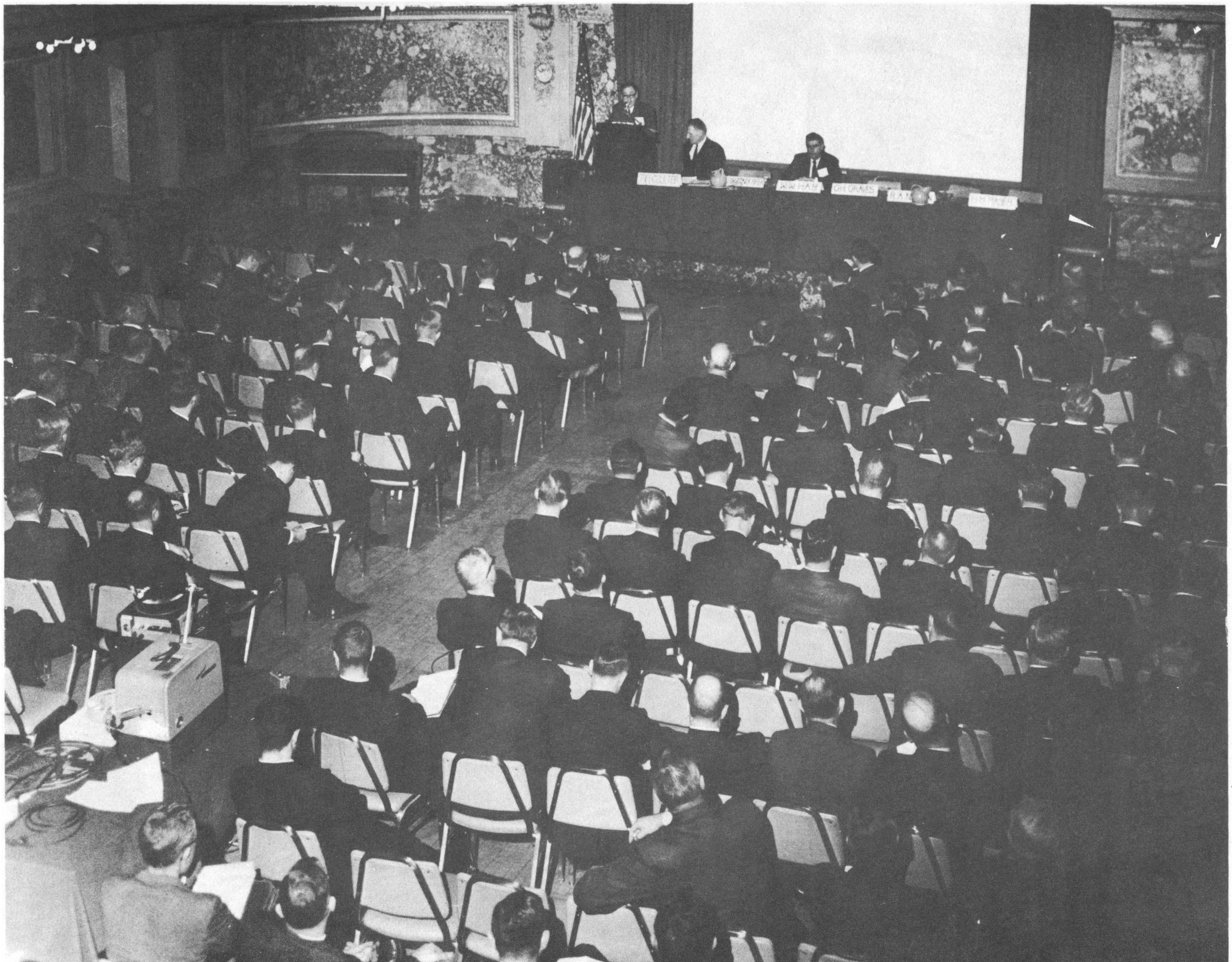
4. Crowd scene in the exhibition area after the early afternoon sessions at the Midwest High Speed Rail Transit Conference.

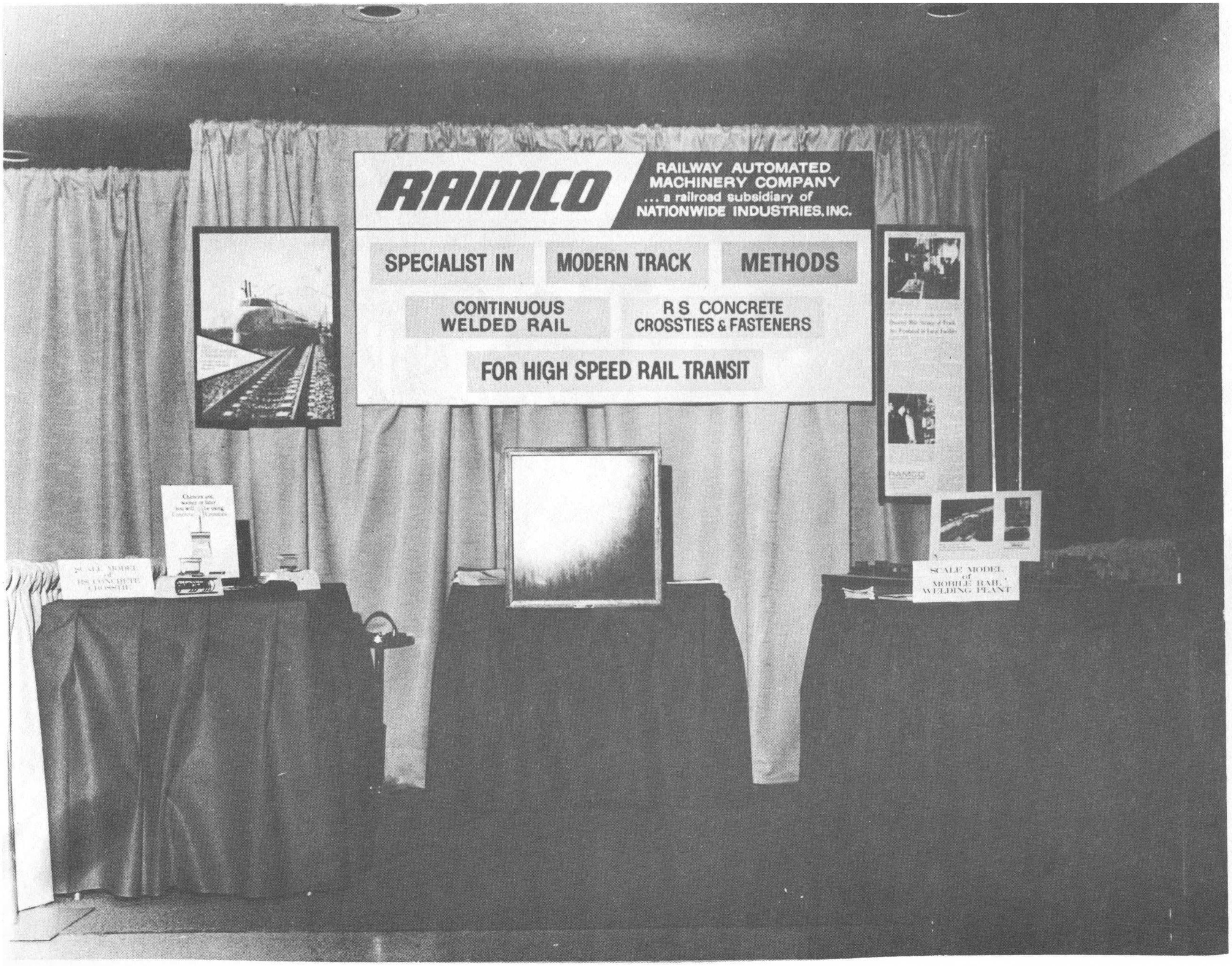
5. The St. Louis Car exhibit depicting high-speed trains at the High Speed Rail Transit Conference.

6. Thomas H. Coulter, Chief Executive Officer of the Chicago Association of Commerce and Industry, Governor Otto Kerner, and Congressman Henry S. Reuss discuss article of exhibition with a United Aircraft delegate.

7. Honorable Otto Kerner, Governor of Illinois and Thomas H. Coulter, Chief Executive Officer of the Chicago Association of Commerce and Industry seated at Speakers Table listening to Congressman Henry S. Reuss address the dinner session at the Midwest High Speed Rail Transit Conference.

8. The Budd Company's exhibit at the Midwest High Speed Rail Transit Conference.

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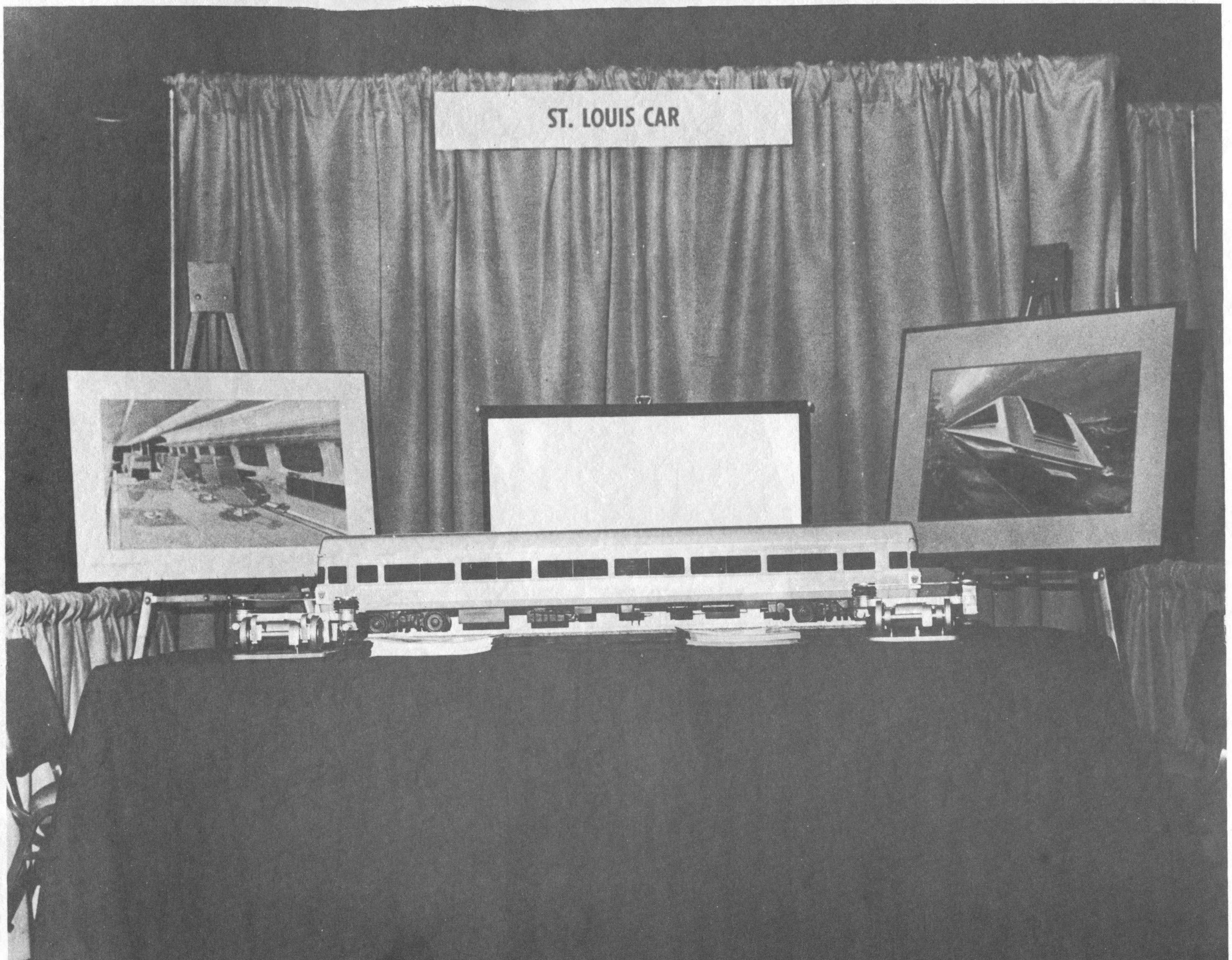
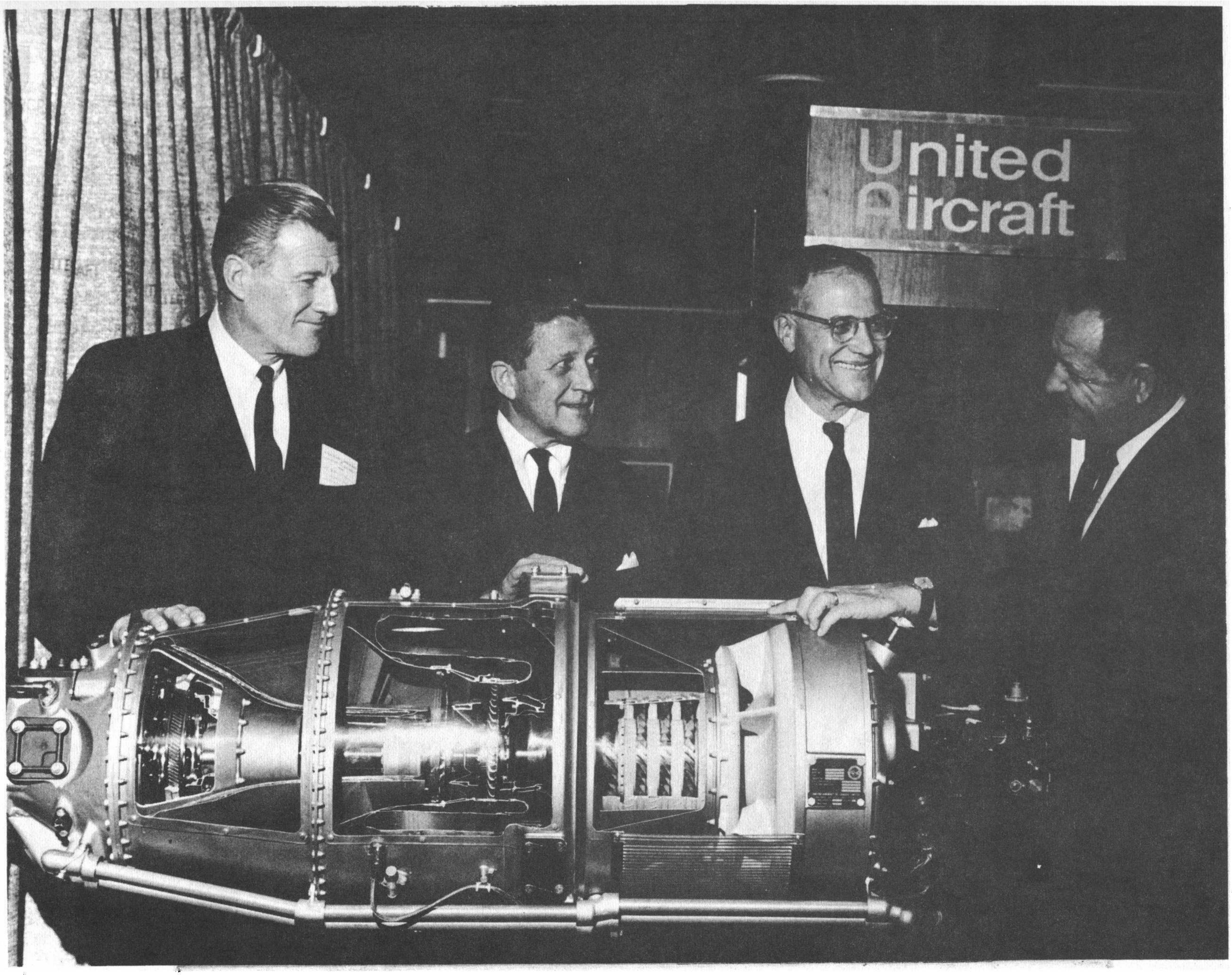

ST. LOUIS CAR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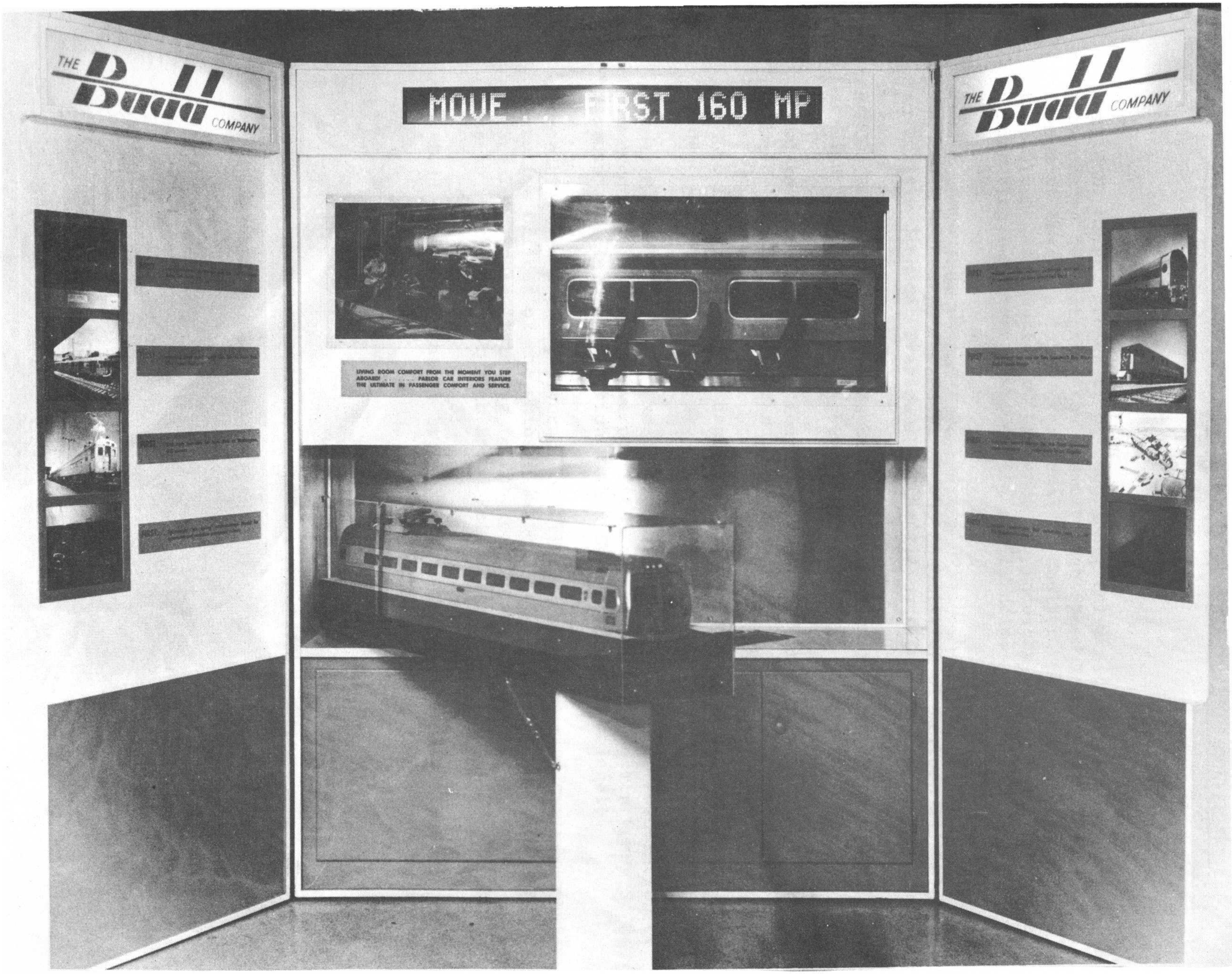
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