

# The Next 25 Years In Transportation — It Is Our Choice

By JOHN F. SPENCER

What I want to point out to you is that the future in transportation can be good or bad, favorable or unfavorable, what we want or do not want, according to the directions in which we choose to go. Better is not inevitable, and neither is worse.

The choices will be crucial. Make no mistake about it. Civilization can exist only if there is adequate transportation -- in fact, all civilizations have grown up only when there was transportation, first by water, then by land, and in our time by air. That is because civilization can be defined as the way people organize their resources and their actions to satisfy their needs and desires. You cannot organize resources unless you can transport them. Crucial choices must be made when there is a radical change in the resources, or the needs, or the desires. We are now confronted with such choices, mainly because we are reaching a turning point in essential resources, and that turning point is one in which we must cope with new constraints.

This is a new experience in our era. If we go back only 200 years, just before the beginning of the 19th century, we find another such turning point, one that removed constraints. Until that time all the work that was accomplished in the world used only three forms of energy -- muscle power of men and beasts, windpower for mills and ships, and waterpower for mills. An overwhelming proportion of that energy was then muscle power, and I daresay that man contributed more than animals. Then we learned how to convert fuels into useful work, and this made energy cheaper and cheaper, and other resources cheaper, as we

advanced from reliance on wood as fuel to the fossil fuels, first coal, then petroleum and natural gas.

It was the progressive cost reduction of these fuels and consequently of energy that made possible our modern form of civilization -- and its absolutely essential transportation -- cheap energy. Cheap transportation gave us the power to produce metals and foods, the sinews of both peace and war, in unprecedented abundance.

We are now already well into a new era, one in which important resources, instead of being more abundant and cheaper, are becoming scarcer and more costly. I hope you all agree with me that our fuel situation is not contrived -- I would even argue that it is not being much exploited, either by the fuel producers, or by the OPEC nations, but that is another matter. Concede at least that the declining availability of energy is the condition of one of our resources.

We pay too little attention to other constrictions which confront us. Consider metals. The richest, most cheaply mined lodes of ore have been used; we must pay to tap less accessible sources, and often to apply expensive extraction processes and beneficiation.

Another resource which is dwindling is cheap fresh water. If we expect to maintain the standard of living to which we have accustomed ourselves we must face this problem because it puts limits on our industry and on our ability to produce food.

Yet another factor is land. The best measure of the scarcity of land is price, and in constant dollars the average price of American farm land has risen more than 50 percent in the last 70 years. That may seem moderate to you, but it gains meaning

when you learn that many other tangible assets and goods, including many foods, have dropped in real dollar price in the same period. Land is becoming a scarcer and more expensive resource.

A fifth dwindling resource is people who work. For two decades the proportion of workers has risen as a fraction of the whole population. This trend has almost come to an end, and it is predictable -- it is certain -- that the labor force will drop as a proportion of the whole population in North America. This is a firm prediction because about 20 years ago the birthrate began to drop -- there is no way to change the decisions which were made then and since.

So we now enter an era of diminished resources of energy, metals, water, land, and labor. This is where our choices come in. How do we deal with a dwindling of resources? Must we tighten our belts, be thinner, and have a poorer life? Let me cite two historical examples of reaction to resource exhaustion, which have to do with transportation.

One is in the civilization of the classic Greeks, more than 2,000 years ago. Greece had a maritime civilization, made possible because Greece was forested with trees which could be made into sturdy ships. For hundreds of years the Greeks built ships, traded all over the Mediterranean, and established colonies. Ultimately they exhausted their supply of timber. They found no substitute, and this contributed heavily to the decline of their power and civilization, which were eclipsed by Rome.

The British went through a very similar cycle of shipbuilding, trading, and colonization from the 16th century to the beginning of the 19th century. They too exhausted their supply of

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suitable timber. But the disappearance of this resource was not permitted to cripple their economy. They found two remedies. The first was to import the timber they needed from other countries. Even better, they developed first iron and then steel ships -- assuring themselves a preeminence in the world economy which lasted until after World War I.

That is to say, waning resources call for resourcefulness. Today there are many who are willing to tell us that we must be in a static or declining economy. I would like to make one more general observation before addressing the future of transportation specifically. Throughout the thousands of years when muscle power was the main source of energy, the general economic trend of civilized nations -- the trend of the standard of living -- was upward. This is true because in the main each generation of workers produces a little more than its generation uses up. Each generation leaves a legacy, of buildings, roads, bridges, dams, cathedrals, tools, and also a legacy of additional knowledge and technology, that makes life better and easier for the succeeding generations. That is, capital accumulates. Energy from fuels greatly accelerated this accretion, but even without energy from fuels we do not have to settle for decline. We may settle for less, for decline, but to do so is not foreordained or inevitable.

Suppose, however, we do settle for less, in transportation. We hoard energy, and metals, and all our resources. We give up our individual automobiles; we reduce our street and road network, maintaining only the most necessary arteries for commerce and common carriage. We abandon much of our rail network. We concentrate our industry and commerce in a few cities -- to minimize transportation -- and let our smaller cities atrophy to market towns. We end the long distance transport of food, forcing each region and area to subsist on what it can grow and what it can store in local granaries and root cellars. We close most of the ports of the world, and live behind our coastal

defenses. Fantastic? Hardly -- this was the pattern of life in China and Japan less than 200 years ago. It was the condition of the Western world after the fall of Rome. We are all in the stream of time, and if we do not make an effort to move forward into the future, the current will carry us backward into the past. That is what can happen in a static or declining economy, in a world where we no longer have faith in our own resourcefulness or inventiveness, in our ability to venture and gain from the venture.

Suppose, however, we strike out boldly to solve our problems. We accept the costs, in money and sometimes in safety and health -- as we have done in the past. We encourage the inventive, and the entrepreneurs, and allow them generous rewards when they succeed. Put another way, we create new capital. If so, can we continue to progress in our standard of living?

Obviously the costs are going to be greater, and if we are going to meet those costs we must be more efficient. Energy is one central cost. We must find ways to get more benefit from energy, per capita, with less expenditure of energy per capita. That goes right to the heart of transportation. Since more than half the fuel we use for transportation goes to the privately owned passenger car, we need to rearrange ourselves so we use that car less, and use it more effectively. It means we must live closer to the places where we work, and the places where we shop, and closer to public transportation. It may mean that light industries, warehouses, and terminals as well as people will return in great numbers to city centers. It may mean that suburban living will tend to concentrate more along arteries served by public transportation.

Intercity passenger service by surface common carrier will experience a renaissance. Within cities usage of transit systems will grow, more routes will be added, and frequency of service will improve. We can expect a return of the electric trolley and the electric bus; the latter is likely to be a hybrid, capable of either

rail or highway movement -- and capable of accepting power from an overhead catenary or running on its own batteries. Private passenger vehicles used in urban areas may be battery operated. We can also anticipate a change in the internal combustion engine to allow greater latitude in fuels; it is not yet clear what fuel will dominate, but do not discount alcohol, methane produced from organic wastes, synthetics derived from coal, and hydrogen produced by electrolysis of water. My own bet is on hydrogen, and also on the presence of one internal combustion vehicle and one electric vehicle in every two-car family garage by the year 2005 A.D.

Movements of cargo are another matter. There is certainly going to be a shift to modes which prove to be most efficient in energy expended per ton-mile. Sites for factories and warehouses which give access to energy-efficient modes are going to be sought. Let me avoid saying which modes -- it is more factual to say that under certain circumstances each mode is the most efficient for those circumstances, so every traffic and trade route needs analysis. I will make some comments soon about modes.

I think we will also establish computerized clearing houses for all freight movements, to minimize empty backhauls. To be specific, at this moment a loaded vehicle is leaving New York bound for Chicago, and a loaded vehicle is leaving Chicago bound for New York. Both those vehicles will return empty. We will use the computer as a matchmaker, to insure that such opportunities are not missed, and we will also discover triangular and quadrilateral and even pentagonal movements which get us better use of our rail and highway facilities. We have hardly begun to apply the mathematics and the data processing and the communication required to get the most from our transportation capital.

In the next 25 years we will also change our right-of-way limitations. Over the most heavily traveled routes we may see special roads and special

rail installations to accommodate more efficient movement. Both for rail and highway there will be more effort to provide clearances for much larger loads. Larger loads are less expensive to haul and they lead to intermodality. Transportation is, in one view, a special case of material handling, and every material handling expert knows that a larger load unit cuts handling costs.

The first thing to say about specific modes is that true intermodality is the answer to many problems. By land, as well as by sea, a combination of modes can improve transport in many situations -- providing a better result, in terms of service or cost, than rigid adherence to a single mode. In the United States this has been hampered because we have made a fetish of separating the modes economically; in Europe state ownership of railroads has had something of the same effect. A restructuring of our transportation system, to permit companies in the field to offer transportation service rather than rail service or highway service or air service or domestic waterway service might bring many beneficial changes. Indeed, it could permit us to restore some of the benefits of genuine competition -- benefits which vanished for a large part of the U.S. rail system in consequence of the debacle which produced ConRail.

We can begin with what exists and is most representative of the future with applications of ingenuity, resourcefulness, and capital that will make transportation more efficient.

In the next section of this article I will list and discuss several modes of transportation we have now or we are developing for future use.

We start with the intermodal container that allows shipowners to keep their equipment in motion and to minimize loading and unloading time. It is a lesson other surface modes should study.

Another approach is LASH, a ship equipped with barges so it can serve where there are no advanced container facilities, can use inland waterways, and also can load and

unload rapidly. There is another smaller version of LASH, built for float-on float-off barge handling. To these illustrations we could add roll-on roll-off vessels, and large bulk carriers, and the barge tows of the inland waterways. The trends are to larger ships and to larger tows. There is a great deal we must do to get the most from water transport. Domestically all our inland waterways need larger, better locks and in some cases deepened channels. Probably, like Europe, we could use more canals. All of our seaports need improvement, and we should bring many up to the standards of Rotterdam in facilities for accommodation of larger vessels. In the United States we are now a decade behind, or more, in port development, and we will need to spend the next 25 years catching up.

The air mode is sure to be deeply affected both by its own technology and by energy costs. I think that by 2005 there will be no scheduled air movements much under 500 miles, and that surface modes will be much better equipped to feed into air facilities -- there you have a right-of-way assignment! Air freight is a difficult matter. Years late we finally got a practical air cargo container, which is to some extent suitable for intermodal use. Designers continue to dream of true air freight equipment. Boeing has two ideas on the drawing board. One is a double-barreled piece of equipment that would load and unload intermodal containers efficiently. The other is a nuclear-powered flying wing.

To summarize, I think that the important developments will be larger aircraft, to be used chiefly, as they are now, to carry passengers, with freight continuing as a lucrative sideline. Short hauls by air will vanish. --- the reasons include airway congestion, airport congestion, time required for travel between city center and airport, and the impossibility of adding new airports.

The next examples suggest that the trucking mode is a low common denominator activity in its technological aspect. Leaseaway is offering convertible truck bodies so an

operator with a major investment in tractor and trailer chassis can adapt to a variety of loads including a tank option. International Harvester has a design that will make the truck more economical to operate. Strick suggests a way to get more capacity within the dimension limitations with the driver's cab at the bottom.

Trucking companies number in the thousands. They are even less ready than the railroads for high technology equipment. We can help them achieve a much higher efficiency in a number of ways. One is to provide special roads, so they can make more use of double bottoms, and triple bottoms, and even quadruple bottoms as long as they are on the limited access road. Another is to relax, not tighten, antitrust activities, so truckers can work together to eliminate as many empty backhaul movements as possible. Another is to make them partners, through financial arrangements, with other modes, so they and the other modes have real incentives to make the best use of intermodal opportunities. Concurrences including provision of quarterly or year-end profit-sharing, based on volume of intermodal business, might produce some most interesting results. The highway sector of my crystal ball happens to be marked "Closed pending deregulation" so I can only add this: we are going to continue to need truckers, and we'd better keep them in good shape, even if it costs us something.

On one aspect of highway transportation I must make additional comment. This is a production line for electric vehicles. These are suitable for urban use in commercial applications, and they are beginning to look economical, as fuel prices rise. I think you will find more and more electrics in use in the next five years, and possibly a predominance of electrics for pickup and delivery in cities by 2005.

The railroad industry has made some progress. The most important thing about the railroads is that in the next 25 years we will need them as never before, and that they can do a wonderful job for us if we encourage

them and give them the tools they need to work with. They need the faith of the public to assure their future because only a promising future will attract the men of vision who can make that bright promise a reality.

Railroads have a coal hopper car than can carry 100 tons of energy. Santa Fe has a new "6-Pack" that uses the intermodal concept of piggy-backing. A "Road Railer" has an extra set of wheels so that it can operate on tracks or a highway. A drop center car allows the railroad to carry two rail cars stacked. All of these ideas reflect the fact that the railroads are reaching out for more business and that they now accept the premise that intermodalism can benefit rail volume.

Yet, there is an appalling amount of work to be done. For instance, systems must be restored to first class physical condition. New high speed operations must be established. The use problem must be solved. Altogether new concepts may be required to end the delays in classification yards. Possibly a large part of the rail network needs to be electrified. It will take brains, Herculean effort, and a treasury of capital.

Let me add one footnote. At their present low ebb railroads think in terms of abandonments. I am in agreement with the abandonment of unprofitable services. It seems to me very unwise,

however, to abandon rights-of-way -- if these strips of land are sold off, or are allowed to revert to heirs or to the state, they can never be retrieved economically. We may be entering a period when many, many of them will be needed again. I say, hand onto be needed again. I say, hang onto those ribbons of land, as long as you breathe.

Pipelines are yet another mode, and there is one proposed to carry packages or dry bulk -- with a transfer station, the carriers would run about 20 m.p.h., at 5 second intervals, or in trains of 6 every 30 seconds. This exotic unit does only partial justice to illustrating the importance of an already very important mode. There are some of us who suspect that pipelines are under-used mainly because of our policy of keeping the modes economically compartmented. That is, we suspect that if there were a set of all-mode transportation service companies, already in possession of rights-of-way for surface movement, those companies might frequently elect to move bulk materials by pipeline rather than in wheeled vehicles. Two facts seem evident: first, under proper conditions pipelines offer advantages in lower operating cost and low energy consumption. Second, the scale of these advantages is not great enough

to overwhelm competitive obstacles economically. The situation might be expected to change if we restructured transportation generally, or if the cost/benefit ratios for pipelines improved markedly.

I have tried to tell you that we have choices. Our resources are not as abundant as they once were. On that account we can, if we choose, wring our hands and say, "we will have to do with less, we will have to cut our standard of living -- we must accept decline." That is one choice.

Another is to say, "We can continue to progress if we apply ingenuity, good sense, and hard work -- and make the capital improvements needed." This is especially pertinent to transportation, which is a major user of energy, of metals, of labor, and an essential factor in production of energy, and of metals, and in the production and distribution of food. Our situation calls for moving greater volumes of cargo -- especially fuels and ores -- over greater distances, and for that we need to renew and improve our transportation systems. That is the way forward, that is the choice which leads to a better future, and if we have the good sense and guts, that is the direction in which we will go in the next 25 years.



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