Integrating freight and passenger rail transport

Europe, centered around a reunified Germany, now faces the tasks of integrating its passenger rail system, and bringing freight up to speed with maglev. Part III of Ralf Schauerhammer's report.

In our previous installment on the railroad infrastructure required for Lyndon LaRouche's proposed "Productive Triangle," we discussed some of the details of high-speed transport, both rail-bound and non-rail, wheel-less magnetic levitation. We detailed the efforts of Germany, Japan, France, Italy, and Spain to address the problems of high-speed surface transport, including the special problems posed by topographical challenges such as the Alps.

Despite the progress that has been made, today's rail network is totally inadequate to handle the economic expansion that will result from the Triangle development program. Only by quadrupling the number of high-speed trains running per hour on some principal arteries, will it be possible to move Europe's expanded production in a timely manner.

We conclude our translation of this chapter of the report titled, in English translation, "The Paris-Berlin-Vienna Productive Triangle: A European Economic Miracle as the Motor for the World Economy." The report was produced by EIR Nachrichtenagentur of Wiesbaden, Germany. The chapter from which this series was drawn, was written by Ralf Schauerhammer, and translated by John Chambless.

An actual integration of Europe will mean that intermediate transportation distances, especially for manufactured products, will increase from national to European distances. With unchanged flexibility of production, that will necessarily demand the acceleration of transportation through improved loading and shunting equipment and through increased transportation speeds. Also, passenger travel within this economic space, which will extend beyond the European Community, will place increased demands on speed and capacities that, with a linear expansion of existing systems, will rapidly run into unsurmountable limits.

But new demands will also arise in smaller contexts. What, for example, will the infrastructural connections within a unified Germany mean? It cannot be merely a matter of reactivating the rail lines and roads that used to exist; rather, new routes will be established that will correspond to the general progress in production that has been introduced since the division. In the 1930s, with the train "The Flying Hamburger," the railroad attained peak speeds of 160 kph on the Berlin-Hamburg route, and covered the 287 kilometer stretch in 2 hours and 18 minutes; today it takes approximately 4 hours. Berlin and Frankfurt am Main used to be closer, when figured in hours traveled by rail, than they are today. From the standpoint of the general progress in productivity within the last half-century, it would be conservative for us to demand from a newly planned transportation system in Germany that it connect the two important cities of Berlin and Hamburg in not more than two hours.

Maglev is essential

The Berlin-Frankfurt connection, which incidentally belonged to the rail lines that Friedrich List proposed as fundamental to a German railway system, should be created today with stops in Leipzig, Erfurt, and Fulda (as the transfer point for the new ICE high-speed route from Hanover to Würzburg). If we subtract seven minutes for each of the three stops from the two hours travel time, we get a travel time of 99 minutes, which makes necessary, given the distance between Berlin and Frankfurt, an average speed of 450 kph, which thus means peak speeds of 500 kph. Considering economics and safety, that can only be realized with a new magnetic levitation (maglev) technology. The current plan for the ICE system would be therefore half as productive as we would need in a unified Germany. It was planned in a Germany still divided.

An important proposal was made by a group of Bundestag deputies, which boils down to immediately building a maglev connection between Berlin and Bonn through the Ruhr district. This train would connect the two German government centers and the two most densely populated areas in Germany, and would pay for itself in part by saving some of the estimated DM 100 billion costs for the transfer of governmental offices to Berlin.

In light of the fact that, within 10 years the 500-km stretch between Tokyo and Osaka in Japan can be traveled in a maglev train within one hour, while in Europe there are not even serious considerations of how important routes can be rapidly bridged with this technology, it must sound absurd—at least to Japanese ears—when German Chancellor Helmut Kohl again and again states that the next decade will be the decade of Europe, not of Japan. Despite the high-speed trains in various European countries, and despite the increased cooperation to overcome the fact that each nation developed its own rail system to operate within its own borders, this development in Europe will fall behind the Japanese by more than a decade within 10 years, precisely on the point of high-speed transportation.

Transportation by magnetic tracks is quite an old invention. In 1912, the Frenchman Emile Bachelet began with the construction of an experimental model based on electromagnetic principles. Practical applications failed, however, because of the very high energy consumption. Hermann Kemper proved in 1935 that magnetic suspension can be accomplished, with economical power consumption, and received German patent #643316 on Sept. 21, 1935 for a "suspended train with wheel-less cars that moves along iron tracks by means of magnetic fields." For a long time after that, however, nothing of importance took place.

Only when the West German Ministry of Transportation issued a contract for the "High-Speed Train Study" was research resumed on track-bound rapid transport. In the same year, the Krauss-Maffei firm introduced the first basic model with magnetic support and drive system and linear motors, and, in October 1972, the experimental train Transrapid 02, which worked according to the principle of electromagnetic levitation (EMS). In the same year, a magnetic test sliding carriage from the firm MBB was put into operation.

The principle of electromagnetic levitation, whereby the supporting magnetic field is induced in the vehicle, was also investigated. In 1973, the Magnetic Levitation Train Project Group, which was supported by the firms AEG-Telefunken, the BBC, and Siemens, began experiments with the Erlanger test carrier EET 01. In 1974, Krauss-Maffei and MBB joined together as the Transrapid-EMS Corporation for electromagnetic rapid transit systems, and began work on the KOMET, an unmanned, magnetically supported and driven experimental compound vehicle that, because the experimental track was so short, had to be accelerated by a steam drive system. Using this foreign drive, the vehicle reached a world record for maglev vehicles the following year (401.3 kph). Likewise, in 1975, the Transrapid-EMS firm began the construction of the Transrapid 04, which in 1977 set a world record for maglev passenger vehicles with linear motors at 253.2 kph.

In 1977, a decision was made for the development of maglev technology that was methodologically wrong and was to have harmful long-term effects on this technology in Europe. With the justification that there was insufficient means of research to pursue two important lines of development simultaneously, the electrodynamic levitation (EDS) line was abandoned. This decision was not only wrong because the wrong system had been chosen—the Japanese magnetic train we referred to was to be constructed on the principle of electrodynamic levitation—but rather because it was not possible to make that sort of decision, given the state of present knowledge, and it made no sense at all from the point of view of a serious, successful research program. To make matters worse, this first technocratic, wrong decision was joined by another to exclude freight transport from further consideration. Thus the development strategy was so narrowed that, from the beginning, it could not be put forward as a serious, qualitatively new alternative to the old wheel-track system (see **Figure 1**).

In the following year, the firms that had previously worked on developing the magnetic train joined in a consortium to establish and operate a major experimental facility in Emsland. Construction of this 31-km experimental track—which was in a figure 8 whose straight center section was 10 km long—was begun in 1979. At the 1979 International Transportation Exhibition in Hamburg, a maglev train—the Transrapid 05—was first publicly used. Over 50,000 people were carried in the 36-ton vehicle, which could, however, reach only 90 kph on the 908-meter track. The test vehicle Transrapid 06 attained a record speed of 412.6 kph on the track at Emsland in 1988, on the straight section that is only 10 km long. It achieved an average acceleration of 0.51 m/sec^2, and a deceleration from 412 kph to 207 kph of 1.35 m/sec^2. Two years before, however, the reconstruction of the test vehicle had begun because of positive test results, which led to the prototype Transrapid 07, which by 1989 and 1990 proved the operational readiness of the Transrapid for use. On Dec. 18, 1989, in a distance of only 15 km, Transrapid 07 attained a record speed of 435 kph.

The European Productive Triangle

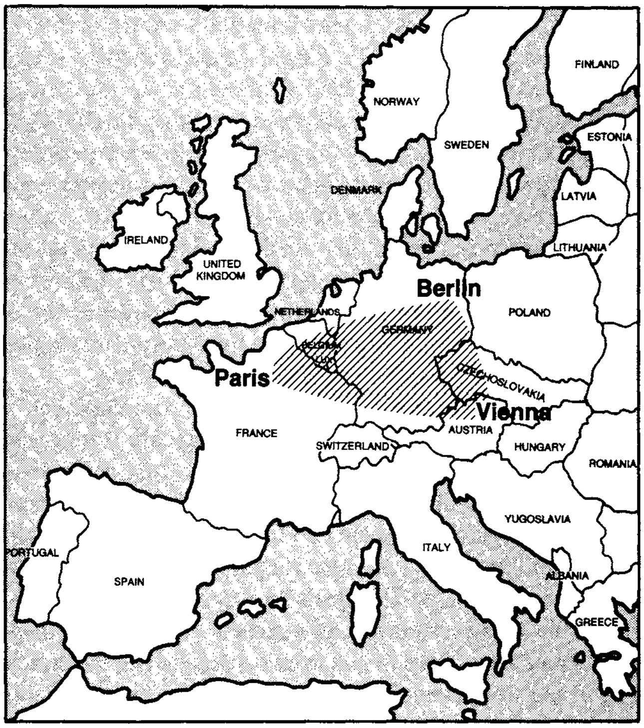
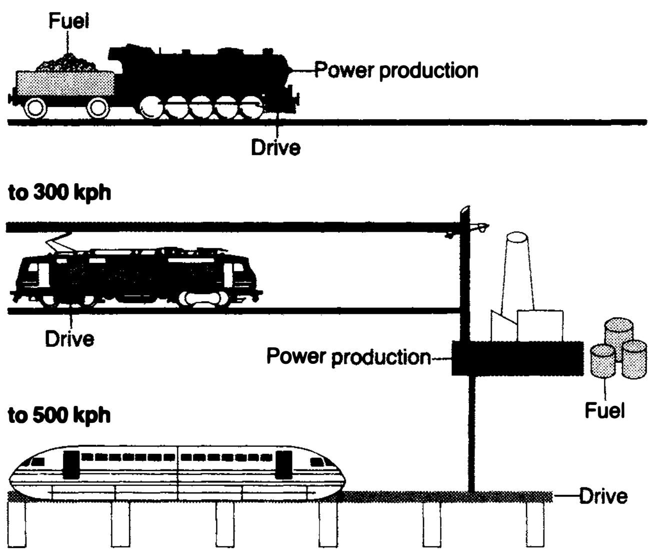


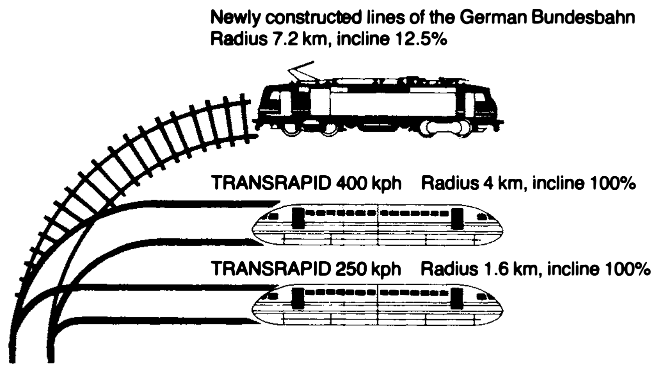
FIGURE 1

The efficiency of rail grows as a result of progress in drive technology

a) Range of economical application for coal power, electrical, and maglev



b) Comparison of radii of curves and inclines of tracks



Magnetic levitation is a logical progression from rail-bound vehicle to the "active rail." Since electrification, the locomotive need not drag around its power supplies, and, with the maglev train, the drive is no longer in the power vehicle. Given the parameters of track siting, the maglev train presents great advantages.

Japan's magnetic-levitation rail program

In Japan, the development of maglev technology began later than in Europe, and even today, specialists assume that Europe has a developmental leap on Japan. That will probably change soon, and Japan will be the first country to build a magnetic railroad for commercial use. In Japan, both magnetic rail systems were developed independently of one another. Japan Airlines concentrated on the principle of magnetic levitation, and the Railroad Research Institute worked on the system of electrodynamic levitation.

Japan Airlines began work in 1974 on development of the High-Speed Surface Transportation (HSST) system, and in 1975 produced the first levitation drive for the vehicle HSST-01, which in 1978 attained a record speed of 307.8 kph. In the same year, drive tests began with a further experimental vehicle, the HSST-02.

Between 1985 and 1987, a levitation carriage developed on this basis and, equipped with 50 seats, carried 1.4 million passengers at three world exhibitions. In 1988, there followed the demonstration of the 24-ton HSST-04, which was equipped with 70 seats, at the Saitama Expo. In the following year, a demonstration was conducted of the HSST-05 on a 515-meter track. In 1991, an HSST line in Las Vegas, Nevada on a 7-km stretch will be introduced for commercial passenger travel. To be installed by the Japanese, it will reach 200 kph even on this relatively short stretch.

Three systems are planned in Japan for the further development of the electromagnetic levitation system: 1) the HSST-300 rapid transit system for the commuting between cities and airports; 2) the HSST-200 as feeder in the medium-speed range; and 3) the HSST-100, as an intercity transportation for commuters. The introduction of the HSST-100 for Nagoia is being prepared.

The development of electrodynamic levitation (EDS) in Japan was seriously begun only after the decision in West

Germany had been made to drop research in this area. The unmanned test vehicle ML 500 (with an EDS system) reached a speed of 515 kph in December 1979, and, a year later, the MLU 001, a manned vehicle with two or three sections, began drive operation on a 7-km track. When the Japanese Railroad Corporation was dissolved by the government into six corporations, the Railroad Research Institute took over the further development of the EDS system. That year, the MLU 001 reached a velocity of 400.8 kph. The MLU 002 vehicle, which was equipped with superconducting coils, was made operational the same year.

The experimental vehicle MLU 000, which was close to practical operation, reached a maximum speed of 354 kph in December 1988 on the test track in Miyazaki, with an average acceleration of 2.42 m/sec^2 and an average brake deceleration of 2.1 m/sec^2. The effective height of levitation was 110 mm, and is thus greater by a factor of 10 than that which the competing EMS system must maintain.

Planned for the year 2000 is the operation of the electrodynamic levitation train from Tokyo to Osaka (bypassing Kofu and Nagoia). The 500-km route will be covered in one hour. The train will have 12-16 cars, and up to 10 trains per hour are to travel on this route. The planned capacity is 15,000 persons per hour. Compared with the quite efficient Shinkansen route on the wheel-track system, the new route will save 71 million hours of travel time each year.

Freight transport in Europe

The defenders of rail transport do not seem to be entirely clear themselves as to just what role trains will play in the future of freight transport. Of course, they admit that the railroad "in the past used too many resources in the 1:1 preservation of outmoded structures." Even failures are conceded. But then this same behavior is extrapolated into the future, since it is asserted that "the total market in freight transportation will only grow by a small amount," and moreover, the "financial-political limits" of infrastructure and of political measures "allow the recognition of no additional margin." From the beginning, a framework for planning is used that guarantees that the railroad will succeed in preserving into the next century the same "proven" basic structures that they were able to preserve from the last century to the present. If that context is accepted, the railroad will not achieve operational success and the national economy will not be served.

Long-distance freight traffic via highway is now at its limit. With the population in Europe at its most dense, land for road construction is no longer economical, a fact that led in the last decade to the decrease in construction of highways. The capacity of the road network is increasingly being exhausted. In the last five years, the average density of truck traffic on the highways of West Germany increased by 13%. Meanwhile, trucks travel at following distances of 385 meters between them on the highway. If we also consider automobile traffic, we see that this amount of traffic can occur only if even the minimum following distance is not observed over broad stretches of the road. The result is accidents, whose cost must really be added to the national cost of transportation. For each kilometer of truck transportation in Germany, 7.5 pfennigs [roughly $0.01 per mile] should be added to the cost of transportation to account for accidents, which represents 15% of truck transportation.

Combined transportation

"Freight belongs on the train" is something that is constantly emphasized. But if transportation efficiency is not to be decreased, then that can only happen if the railroad develops in new directions. The first successful step was taken with "combined transportation," which has sharply increased in the last year. In this mode of transportation, whole truck-trailers, semi-trailers, truck tractors, or freight containers are loaded onto special rail cars. When whole truck-trailers are loaded, the tractor of the truck cannot otherwise be used during the entire trip, for which reason this form of combined transportation demands special loading vehicles or cranes in the loading stations.

Currently, 22 trains, "rolling highways," (**Figure 2**) travel on weekdays between 18 locations in Germany, Switzerland, Austria, Italy, and Yugoslavia with a total of 357 stops (Flensburg, Neumünster, Hamburg, Hanover, Bochum, Cologne, Mainz, Regensburg, Freiburg, Munich, Wels, Rielasingen, Basel, Graz, Lugano, Ljubljana, Milan, and Ala). The utilization of these trains in some cases is only 50%, but reaches up to 80%, however, especially on Alpine routes. Overall, however, utilization of combined-transportation trains is still too low. There are hopes for improvement, since the yearly rate of growth of this form of transportation is between 12.8% and 25.5%. Combined transportation is certainly an appropriate means to work against the overflowing truck traffic on the highways; it can hardly be characterized as the end-all solution, however.

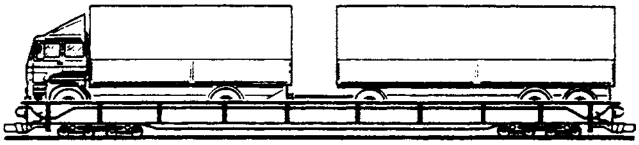
Cargo 2000

Since 1982, the German national railroad, the Bundesbahn, developed a study under the name "Cargo 2000," for future rail transportation technologies. It was recognized that the question of containers is of decisive importance, and development of a "family of containers" is projected that can optimize sorting. As experience from the beginning of container transportation shows, however, it is extremely important that a container form be determined and adopted as a general standard. At any rate, the importance of containerization for the future has been recognized.

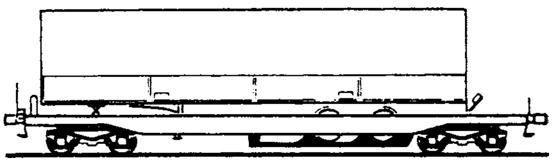
Also, the importance of efficient transfer stations is increasingly moving into center-stage of investigations. An example of a network station as proposed in the Cargo 2000 study, consists of two parallel rail tracks A and B, along which there is sufficient large traffic area present for handling

FIGURE 2
Piggy-back techniques for truck to rail container transport

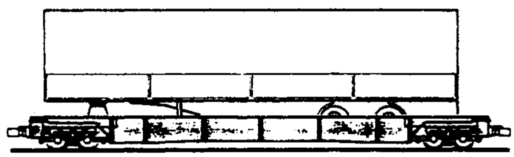
Piggy-back Technique A, "The Rolling Highway"
The driver drives trucks and semi-trailers in a forward direction over an end ramp onto a special, very low rail car.



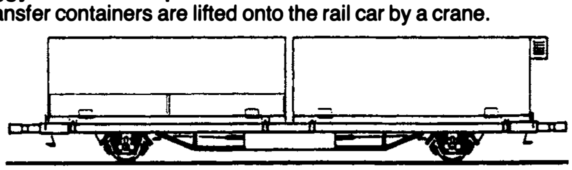
Piggy-back Technique B
Semi-trailers equipped with grip-rims are lifted onto the rail car by a crane.



Piggy-back Technique B
Semi-trailers are backed via end ramp onto a low-floored rail car.



Piggy-back Technique C
Transfer containers are lifted onto the rail car by a crane.



vehicles. Each of the traffic areas will additionally be traversed by three buffer rails—I, II, III—parallel to A and B. Buffer rail II serves for the transfer between two trains, while Buffer rails I and III handle exchanges with the attached elevated storage magazine. The different loading areas and the elevated storage magazine are connected by conveyor belts that run perpendicular to the direction of the tracks. Additionally, trucks can be loaded from the outer side of the elevated storage magazine.

In France, similar but more far-reaching transfer concepts are being investigated. The stopping time of the train in the network station is to be minimized while, simultaneously, as many cars as possible are loaded and unloaded. Before the train enters the station, the loading vehicles and cranes, using computers, position the freight palettes in such a way that, after unloading freight destined for the present location, they need only be put onto the rail car.

In both cases, shunting in the traditional sense no longer occurs; rather, the freight train consists of fixed car groups onto which the goods to be transported "climb." The demands of this type of system, which previously existed, of course, only on paper, are considerable.

If the rapidity of highway transportation is to be attained on routes of 300 to 400 km, freight trains must reach 160 kph, and the route so formulated that the freight will remain in network stations for at most one hour. Additionally, a storage facility must exist in the vicinity of every major city to and from which freight can be channeled through the system.

What are the demands of a high-technology transportation network?

Given the developments that have already taken place on a small scale, we can estimate how a flexible freight transportation system will look for the Europe of the future. It is already possible, using computer-assisted design/computer-assisted manufacturing—or CAD/CAM as it is better known—in the design and construction of rail lines, to store such relevant data for later operation as switches, crossings, the radius of curves, or the rise of inclines. That is the precondition for the train-steering system, the operational system and the safety system—which will replace today's signal system—becoming unified. In planning the rail system of the Thyssen Steel Works plant, for example, that sort of rail-technical planning system (Pro-plan) was used.

On the basis of the electronic data base (EDB) operation of the whole network, a flexible form of schedule will be possible with which it can immediately be determined whether a planned transport that conforms to all safety measures can be carried out within the desired timeframe. Together with the referred transfer technologies, very flexible planning possibilities will be produced.

The total transportation network will then function as a "rolling warehouse," and similar to what had been realized for a long time in large, modern, automated warehouses. With such a system, the location of any freight at any moment can be determined and tracked. Shunting and transfer takes place through the automated scanning of magnetic identification cards on the cars that are written to during loading. The loading system will have information from the central computer on the routing of the train together with its cars, and the loading will be arranged such that freight being offloaded last, will be load first. A further step in the development will allow the optimal route to be set from the different possible routes, according to the utilization of the transportation system at the moment.

At any time, the customer can request, by means of his computer terminal, when and in what time he can ship a given freight from point A to point B at a given rate. On demand, he can even order the transportation at the terminal. The network of the points A, B, and C must be close enough together that truck delivery or pickup can take place in less than 90 minutes. That will work, of course, only if generally standardized containers are used since, otherwise, transportation on the train, by road, and in the air or by water cannot be integrated.

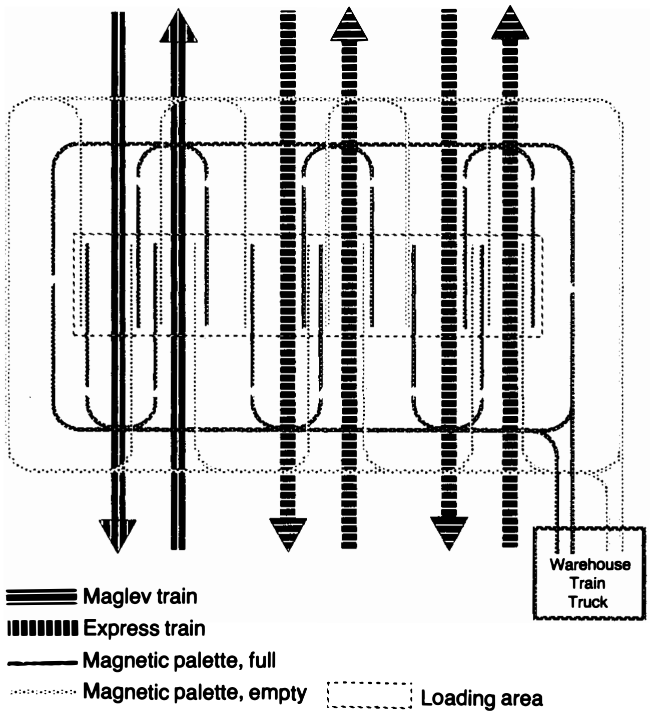
Transportation quantities

One thing must not be overlooked. The precondition for all such EDB operations is sufficient "hardware," which, with today's amounts of freight traffic, is already insufficient. Although the railroad has lost in importance compared to other transportation systems, it nonetheless has very little free capacity, since shipments are concentrated along main routes which are currently overloaded in fact. If the expected increase in freight is transferred to rail, then that means a more than doubling in the required transportation capacity within a few years.

Today's rail network is totally insufficient if we take into consideration the economic development to be expected within the Productive Triangle. On the European rail network outlined in this region, high-speed freight trains must travel on each route at 30- to 60-minute intervals. That means that, on some principal routes, the number of trains per hour will be four times what it is today. Only in that way will it be possible to move the expected 250 to 300 million tons of semi-finished and finished goods with a delivery time of 36 hours.

If we calculate the national economic costs that would be incurred for that level of capacity with an effective, rail-bound transport system, it will emerge that overall, the least expensive solution is the apparently greater investments in the coming years for the construction of the high-speed network and the loading stations.

FIGURE 3
'Magnetic palette' transfer station



Freight traffic on the "Productive Triangle" network will use modern transfer stations operated according to the principle of "magnetic palettes."

Modern transfer station with 'magnetic palettes'

An efficient transfer station based for long-haul containerized freight transport will attempt to minimize the layover time of long-distance trains (see **Figure 3**). What will such a transfer station look like?

As soon as the train arrives, an empty unloading palette will be coupled to the train adjacent on the left of each container that is to be unloaded. These unloading palettes will be magnetically steered and powered, and by means of sensors, will be guided precisely into position. On the right site of the corresponding empty or half-empty, long-haul rail cars are coupled magnetic palettes that carry the containers to be loaded. In this way, the train need not be positioned for the loading and unloading equipment, and no time is lost, because the loading and unloading equipment must be brought to the train. Fundamentally, the total loading process could even take place while the train is moving.

The transfer process thus takes place by merely unfastening the container on the car or on the magnetic palette and moving it to the left the width of one track. On the assumption that this sideways movement occurs at a speed of 1 meter per second, the process of loading and unloading of the entire train will take place in approximately 15 seconds.

Connected with this unloading track is a dispersal or concentration track, to which the magnetic palettes with the unloaded containers move or from which chains of magnetic palettes are dispersed for loading, at the intervals necessary for the loading process.

Joined to that will be a sorting area arranged around and above a flat area that essentially consists of two ring-conduits for the magnetic palettes. The empty palettes will travel to one ring-conduit and then flow out counterclockwise at branch points to all tracks. In case palettes are still needed for the next arriving train, a local controller removes the palette automatically from the ring-conduit. The full palettes are carried around on the second ring-conduit in a clockwise direction. They, too, pass the branch points to all tracks. By means of machine-readable identification codes on the containers and the priority allocations of the central computer, the local controller in the transfer station can prepare the local containers quickly for the departing train in the dispersal area of the corresponding track. Otherwise, the container is placed in the warehouse and then sent by the central computer again to the ring-conduit as soon as the arrival of the corresponding train is announced.

Joined to the warehouse will be different loading docks for trucks, as well as the connection to a freight station to make possible the transition to the normal freight transportation network.

The tracks of the long-distance trains are double track in both directions. It is unimportant for the structure of the transfer station whether the long-distance trains are wheel-on-rail or maglev system trains. Both systems can exist in parallel at a transfer station. The palettes must, in any case, be steered and driven magnetically, since the rapid and safe positioning, as well as the necessarily short switching time and the high motion dynamics of the palette will be attained only in this way.

Maglev freight transport

Since 1977, no research worth mentioning has been done on the use of maglev trains for freight. Nonetheless, it is obvious that Transrapid, even in the form developed today, is appropriate for any freight that is now sent by air. The capacity of 0.2 tons of payload per vehicle-meter is not sufficient for most freight transport. With a further reduction of the maglev vehicle's air gap, which could possibly lead to a lower speed, the transportation capacity can be increased. A European research program for electromagnetic freight transport, however, should be unconditionally started. This program should start from a realistic statement of the tasks, that within the next 20 years the volume of freight that might be transported in Europe in accordance with the standards that are today only attained by air freight, will increase by 70-80 million tons per year.

At the end of May, the press reported that France had offered East Germany favorable financial terms to build a TGV connection between Berlin and Dresden. [*Train à grande vitesse,* or TGV, is the name of France's national high-speed passenger rail system—ed.] That is a wonderful development. It would be better if this route were immediately extended to Prague, and a TGV connection of Berlin-Hamburg can possibly be made by East Germany before the German Bundesbahn wakes up. It is important to act rapidly to exploit the potential that has been created by political developments. If the officials of some national railroads cannot be awakened from their dreaming of the last century, and they continue to skeptically oppose anything new, then opportunities must be created for those who want to develop new activities. If the principles of physical economy presented in this program are kept in mind as basic ideas, then those activities will also be profitable. Friedrich List and Heinrich Harkort would attempt today to found a new European Rapid Train Corporation with entrepreneurs who are ready for production. Exactly such an initial activation is what we need for the acceleration of individual national programs.

Book Review

How to sow terror with statistics

by Margaret Sexton

Currents of Death: Power Lines, Computer Terminals, and the Attempt to Cover Up Their Threat to Your Health
by Paul Brodeur
Simon and Schuster, New York, 1989
333 pages, $19.95

The trouble with Paul Brodeur's book, which claims that there is a danger to human life and health from electromagnetic radiation from power lines and computer terminals, alleged to cause cancer, is that it is incompetent. If you are an expert in manipulating statistics, or in the methodology of "risk assessment," you might be able to make some sense out of the mishmash of studies and statistics Brodeur cites.

The key to confusion here is risk assessment. In this form of statistical manipulation, someone somewhere fed animals, such as rats, physiologically unrelated to human beings, huge amounts of toxic substances. Then, an extrapolation is made to determine the risk to humans, often so small as to be parts per billion or parts per trillion. In other words, you'd have to eat a ton of "X" to show signs of toxicity, but a part per billion of "X" is deemed to put the ingester of "X" at risk.

The way Brodeur uses this to stir his pot can be seen in a random example: "The reason why people living in towns adjacent to the PAVE PAWS [phased array] radar are developing cancer at a rate far higher than other people living on Cape Cod . . . may not be found for some time to come. Moreover, because of the Air Force's policy of dumping millions of gallons of aviation fuel and other toxic waste into the sandy aquifer, scientists trying to solve the mystery will have to take many factors into consideration. One such factor . . . will be the question of whether chronic exposure to low-level radiation from PAVE PAWS has acted to promote . . . cancer in people who are already at risk because they have been exposed to cancer-producing chemicals."

Brodeur then goes on to discuss how a protein enzyme found within human lymphocytes is a receptor for cancer-producing phorbol esters, a carcinogenic plant. What does