Feature Articles

HY-RAIL, RYD-A-RAIL: Where did the flurry go?

Richard S. Prosser

About 7 years ago a real flurry of excitement and interest developed in combination rail-and-road vehicles assembled by 2 manufacturers under the names of Hy-Rail and Ryd-A-Rail. This was not the first time road-rail vehicles had been devised, even for transit, although it seemed to be. Since the cycle of these has exceeded one generation, each recurrence is hailed as a first. Many of the large U.S. cities received demonstrations of Hy-Rail and Ryd-A-Rail, but none of them implemented a system.

How did road-rail vehicles develop, and what is their current status?

A road-rail vehicle is born out of the concepts of flexibility and versatility. Actually, it is an intermodal form of conveyance that eliminates the need for transfer. A rail line, since it does not provide the accessibility of a street system, is used for the express line-haul portion of the route; pickup and distribution are on the streets.

Railways as facilities for private vehicles never caught on as a practical theory in the United States, though at one time the idea was explored in England. Under the doctrine of private property ownership, companies were not about to yield their rights-of-way to pleasure cruising by interlopers. Then as equipment for each mode evolved, the weight differential, coupled with safety regulations, solidified the mode separation.

Mr. Prosser, author of ***Rails to the North Star*** (a history of the Minnesota Railroad system), teaches business and economics in the Peralta College District, Oakland, California.

Early Versions

The instances of combination road-rail vehicles are many and widespread. The following are set forth as examples, with no claim that they are all-inclusive.

As early as 1872, 12 Lamarnjat locomotives were fabricated by Sharp, Stewart and Company of Manchester, England. These had flangeless drive wheels for road running and leading and trailing bogie wheels equipped with tires having center grooves for single-rail running (1, 2).

In 1931 a true commercial car emerged, the Ro-Railer, built by Karrier Motors, Ltd., for the London Midland and Scottish (body was by Cravens). It was convertible for either freight or passenger conveyance and had a seating capacity of 26 riders. Claimed maximum speeds would be remarkable even today: 75 mph (121 km/h) on the rails and 60 mph (97 km/h) on the roads (3, 4, 5).

At the same time, road-rail cars were evolving in France, where the Dunlop Company outfitted a 6-cylinder Hotchkiss car. Its trials highlighted problems of rough riding over switch points, safety at grade crossings, and traffic coordination (6, 7).

Road-rail buses and trucks in the United States may have begun in the early 1920s, although there is no clear description of their use (8). By 1932 the Twin Coach Company had developed a combination version of its Model 15 car (9), and in 1933 a combination car with Firestone-tired rail wheels was put to work on the Bessemer and Lake Erie (10). Also in 1933, the Long Island Rail Road was said to be testing an Austrian car capable of 90 mph (145 km/h) and 2 American types (11).

(These cars may actually have been all-rail vehicles equipped with tired wheels for the rails, such as the Austro-Daimler car, which was being tested about this time.) On the New Brunswick-Trenton Fast Line (New Jersey), 3 combination buses were used in 1934-37 (12). The St. Louis Southwestern (Cotton Belt) in 1935 was running converted highway buses between Pine Bluff, Arkansas, and Texarkana. These buses had seats for 27 passengers, and it was claimed they ran 5 miles (8 km) per gallon of fuel, equal to highway efficiency (13). Shortly after World War II, the Houston North Shore Railroad used Twin Coach cars. Others were tried on the Arlington and Fairfax and Narragansett Pier Lines (12).

Into the Recent Present

The next, and most recent, cycle came in the late 1960s, still fresh in the memories of most of us. Spurred by creation of the Urban Mass Transportation Administration and the new availability of federal grants, particularly for demonstrations, many cities exhibited interest in combination cars erected by 2 domestic manufacturers.

Ryd-A-Rail was the creature of W. T. Cox Company of Camdenton, Missouri, a subsidiary of International Systems and Controls. Two 4-wheeled trucks with miniature rail wheels were lowered from the vehicle by a hydraulic system operating on the vehicle batteries. Each rail truck had a hydraulic-pneumatic shock-absorbing suspension, by which it rode on a cushion of air, balanced with the regular vehicle suspension, in the manner of an airplane landing gear. Together the rail trucks weighed 2,600 lb (1179 kg). This was an adaptation of Cox's Standard Model 48 road-rail conversion and was added to a standard General Motors bus for demonstration.

In the latter part of 1967, Ryd-A-Rail gained the attention of the Port of New York Authority for possible service between the East Side airline city terminal and Kennedy Airport. The Queens Midtown Tunnel and a portion of the Montauk Branch of the Long Island Rail Road were to be used. Demonstrations were held in July, with much favorable comment by the media (14). By the end of the year it was announced that 15 road-rail buses would be performing the airport ground service before 1968 expired (16). Transit time would be cut in half, from 90 to 45 minutes during rush hours. A financial tab of $1.5 million was attached to the project. A more expansive plan, of $4 to $5 million scope, envisioned a fleet of 200 Ryd-A-Rail vehicles.

Cleveland looked at Ryd-A-Rail and Hy-Rail (17). Miami also looked at both types, for possible employment on a 45-minute run from the Cutler Ridge district to downtown (18). New Orleans tried Ryd-A-Rail between Union Station and International Airport, a trip of 25 minutes compared with 45 minutes for all-road in rush hours (19). Kansas City likewise entertained Ryd-A-Rail as a possibility between downtown and the new Mid-Continent International Airport (20). Still another demonstration was held between Denver and Brighton, Colorado, for the 1969 National Seminar on Urban Transportation for Tomorrow (21).

So what happened when tomorrow rolled around? In New York, the $1.5 million planned for a road-rail system was plugged in as part of the funding for a comprehensive East Side-airport transit system. Cleveland decided the idea had too many bugs. Each city held back, waiting for the other to take the initiative, to become the "test tube" wherein the others could study the experiment without the dangers of exposure.

Shortly after World War II, Fairmont Railway Motors developed the machinery for road-rail conversion of inspection and maintenance cars. Similar to the Ryd-A-Rail method, Hy-Rail provided 2 rail trucks raised and lowered hydraulically. Acceleration and braking on the rails were acomplished mainly through the tires; it was possible to apply brakes on 10 wheels. A special feature was a closed TV circuit by which the driver could watch action of the wheels on the rails (22).

Philadelphia Suburban Transportation Company was first to become intrigued by Hy-Rail, and it furnished a Red Arrow Lines bus (GM) for outfitting by Fairmont (23). In November 1967, the Hy-Rail ran from Minneapolis via highway to New Prague, Minnesota, where it swung onto the rails of the Minneapolis and St. Louis (C&NW) for a 34-mile (55-km) inbound run to suburban Hopkins. Riding comfort was pleasant enough, though speed and transit time certainly were not factors of the demonstration. The bus also was tested on the Great Northern main line from Minneapolis to St. Paul (24).

But as fall blended into winter, the climatic elements

Hy-Rail Test bus backs onto the Chicago and North Western railroad tracks at New Prague.

did not mitigate in favor of Hy-Rail service. Favorable tests were reported on the Reading in the Philadelphia area and on the Atlanta and West Point for a convention of the American Transit Association in Atlanta. But a snowstorm was injected into the plot for tests in Washington, D.C., on November 30.

As a result, the demonstration run was a disaster. The Hy-Rail test bus took 2 hours to cover the 6 miles (10 km) to Silver Spring, Maryland, with wheels spinning and sliding on the clogs of snow and ice that had built up under the wheels. A maximum speed of 9 mph (15 km/h) was reached going downhill. Four hours and 21 miles (34 km) after leaving Washington, the bus was removed from the tracks to make way for regular rail traffic.

Because of these difficulties and because other problems had been encountered with rapid tire wear caused by rail joints and sharply edged rail sections encountered on curves, the Philadelphia Suburban Transportation Company reassessed its position (25). Despite further tests, the city officially abandoned its experiments with road-rail equipment early in 1969.

Hy-Rail also was viewed in Cleveland and in Miami (with Ryd-A-Rail), where the climate is much more benevolent.

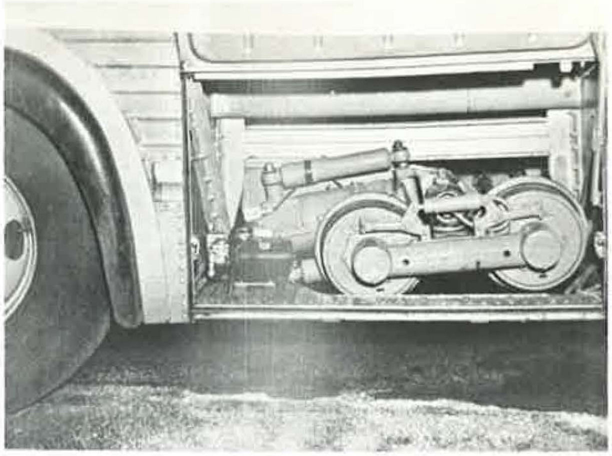
The Capital Region Planning Agency largely echoed these sentiments, venturing the opinion that the location was wrong and that a Hartford-Manchester route would be better (34).

Final disposition of the Hartford case was "no further action taken." Federal funding depended on approval of the project by the Capital Region Planning Agency, which elected not to approve and thereby "killed" further activity in this direction. Various interests, including the Greater Hartford Chamber of Commerce, still feel that the decision was an unfortunate one. With closure of the Hartford case, road-rail activity in American urban transit became dormant.

A Biased Critique of Road-Rail

Rather than claim an unbiased viewpoint, I will say this is an attempt to be impartial, recognizing that my lean-

1967 experiment with a Ryd-a-Rail bus in the New York City area.



Rail wheel mechanism for the Hy-Rail bus is concealed within the coachwork when the bus is on the highway.

ings are to the pro-rail side. Since any discussion of urban transit inevitably gravitates to pro-highway and pro-rail camps, I hope my bias will make the pro-rail arguments more substantive than they often are.

The road-rail bus is a member of that family tree of motored light vehicles that bear the genes of both pavement and rail-and-tie operation, and it may be the most exact blend of the 2 modes. (Other members of the family are company inspection and maintenance cars, and the whole spectrum of passenger-carrying rail motor cars that are the subject of a forthcoming publication.) As stated earlier, it is an intermodal vehicle that requires no transfer. This intermodality brings it straight into the age-old conflict of who (and how many) shall operate it while on the rails. Brotherhoods are unlikely to relinquish control of vehicles to bus drivers no matter whether road-rail becomes a new service or replaces existing trains. Existing safety and train-operation regulations can also be a hindrance.

One possible solution is an emerging movement toward city, county, or state takeover or subsidization of little-used railroad lines, which if employed for road-rail service might be operated under a code of rules divorced from railroad tradition.

The arguments put forth in favor of road-rail projects characteristically are applicable to transit in general. What are not stated are specific advantages of the road-rail plan or why it is best for a given situation. Some more specific claims have been the relatively low capital cost involved ($12,000 to $15,000 apiece) for adaptation of existing buses, no problem of excess crews, and an ultimate area system should include road-rail as one element. A survey taken at Vernon, Connecticut, found that 88 percent of respondents said they would use road-rail if available.

Street grade crossing safety is a paramount concern. For highest speed, ideally a transit route should be free from grade crossings. Yet, it is easily seen that, since road-rail vehicles come onto the rails at grade crossings, a line free of such crossings is inaccessible to such vehicles! Having only crossings needed for ingress and egress would be perfect, but a rail line with 1 or 2 crossings usually has many. A road-rail bus has little weight compared with a normal railroad car, and the issue of its hitting or being hit by automobiles or trucks becomes critical indeed (35). The matter of avoiding collisions with trains also must be recognized.

One of the prominent arguments for road-rail service is small first cost. As stated before, in 1967-68 conversion equipment costs were given as $12,000 to $15,000 and costs of buses alone as $35,000 to $40,000. But this also becomes a shortcoming of the system, since it is such a little change from regular bus service. For many persons, including road-rail proponents, there is always a romance to riding on a railroad; but many others do not care what right-of-way is beneath the wheels as long as it feels smooth and gets them where they want to go. The Bay Area Rapid Transit system in California, for all its

The Hartford Experience

Perhaps the most complete study and evaluation of the entire concept of road-rail service, one that extended as late as 1971, evolved in Hartford, Connecticut.

For openers, the city acquired a Hy-Rail bus during the period of peak interest in 1968 (26). A "proving ground" was selected, lying between the Bloomfield-Windsor town line and downtown Hartford and including an 8.4-mile (13.5-km) single-track unused line of the Penn Central for line-haul carriage (27). In 1968 a 2-phased study was made on the alternatives of converting the rail line to an exclusively bus road and equipping it for road-rail vehicles. Five state and 3 federal bodies participated in this study, which concluded that converting to a bus road would cost $6,109,123 while equipping for road-rail would cost $1,817,244 (27).

In September the community of Vernon also became interested in a Hy-Rail service to downtown Hartford (28).

The next stage was application to the federal government for $270,000 as the federal share of about $400,000 to finance an 18-month demonstration project that would employ 17 Hy-Rail buses (29). Considerable delay ensued in a hassle between preliminary and final applications, so it was December 1970 before the U.S. Department of Transportation announced that some $300,000 was earmarked for the project (30).

By this time hard questions were beginning to be asked. The questions split the project followers into 2 definable groups: those who viewed the project as a prestigious national first, a regular road-rail transit service, and those whose concern ran to a comprehensive transit improvement plan for the wider Hartford or even the Hartford-Springfield area.

In October, the Greater Hartford Mass Transit District queried whether the real purpose was to solve commuting problems or iron out technical bugs. Doubts about the project's economic viability as an isolated operation were raised, and it was claimed that the reputation of all transit would suffer should the project fail (31).

An engineering study by the University of Hartford, published in May 1971, found the project wholly unsuitable as a transit enterprise. The principal favorable arguments ran as follows: (a) To upgrade the track and eliminate or adequately protect grade crossings would cost vastly more than the 1968 study estimate; (b) the single track would allow only 1-way road-rail operation; (c) no direct access to Union Station was provided; (d) the nature of the route would preclude short trip time, an indispensable ingredient for successful transit; (e) the braking ability of the bus was inadequate; (f) three times as many buses as the 17 contemplated would be required to provide proper service frequency in the rush hours; (g) costs of the project might escalate several times over, Philadelphia being cited as an example; (h) the project was insufficiently inclusive, thereby being doomed to failure and detrimental to the reputation of transit. Professor Adrian Forestier called the system "unworkable" (32, 33).

tremendous expense, continues to attract riders and curiosity because it has been imbued with glamour. Hy-Rail and Ryd-A-Rail in 1968 were curiosities, but never managed to attain a status of glamour that might have sold them.

The usage of a normally vacant railroad line is integral to the system. Yet, undoubtedly, road-rail buses ride best on smooth welded rails and at best speeds on a line free from grade crossings. An incongruous situation is created. Rail lines with no traffic are precisely those least likely to have welded rails and least likely to have few crossings.

An alternative, probably preferable, to extensive track upgrading on many lines is improvement of the vehicle technology to allow a smooth ride even on rough track. No doubt the conversion machinery cost would be stretched vastly, but the money not expended to upgrade railroad lines should be considered an offsetting saving.

Calculations of a schedule for the vehicle must include road-rail-road conversion times. Promoters have claimed that conversion can be effected as quickly as 1 minute. Assuming no-hitch operation, 2 minutes of each trip will be consumed in conversions. There is also likely to be some "slack" time used in getting to and from the particular grade crossings where conversion takes place, since these must be on little-used roads fairly free from other

Hy-Rail test bus leaves the station at New Prague, Minnesota, on the Chicago and North Western railroad in 1967.

traffic. Any hitch in conversion of course adds to total trip time. The shorter the trip is, the greater is the impact of any delay, as the following comparison of trips of 10 and 30 miles (16 and 48 km) shows.

Trip Length (miles)	Trip Time (minutes)	Avg Speed (mph)	Decrease (percent)
10	20	30.0	
	25	24.0	20
	30	20.0	33
30	45	40.0	
	50	36.0	10
	55	32.7	18

On this consideration alone, it is better to operate road-rail buses on longer routes. But at the same time, on trips out from downtown, average speeds on highways increase as traffic becomes sparser in the farther reaches of longer routes. Road-rail trips thus lose their time advantage, especially if held to moderate speeds by condition of the right-of-way.

Operating speeds for road-rail buses should be higher than those for highway vehicles, more than enough to offset the time lost in conversions. To be economically viable, road-rail service must offer an attractive trip time saving to travelers. How much is "attractive" cannot be defined universally. Cutting travel time in half would be attractive in itself, but often impossible. Saving 15 minutes over an hour's trip would be somewhat attractive. Assuming that road-rail facilities are suitable, the rush hours offer the best opportunity for trip time saving. The ideal setting usually envisioned puts the road-rail bus gliding rapidly along on its rails past immobile highway traffic; this setting clearly exists only in limited times and limited areas. A metropolis contemplating use of road-rail buses must consider how to use them in off-peak hours: keep them idle, run them in highway service, lease them, or find other uses.

The question of particular areas of service suitable for road-rail has not been explored to any depth. Cited previously have been routes to and from downtown and routes to and from airports. Other possibilities for road-rail are connecting a military base and a nearby city, connecting a city and a fairgrounds, and providing service to resort areas.

Conclusions

Let me suggest a Utopian stage for a road-rail service. A large metropolitan area is plagued by heavy highway congestion, lasting at least 2 hours in each rush period. Paralleling a freeway is a new rail line, complete with welded rails, laid to service a particular industry that closed its doors and moved immediately after the line was laid, leaving no patrons along it. The line has no grade crossings whatever. The city exercised the power of eminent domain to appropriate the line for public use, thereby insuring that there would be no interference from train service. Special access ramps that have been built in strategic locations allow almost instant interchange between the rail line and a nearby high-grade road. Because of population concentrations at both ends, only 2 stops for pickup and two for distribution are needed. The result of this ideal arrangement is that travelers can make the journey via road-rail vehicle in half the time required for an all-road trip. The climate is favorable, snowstorms are unknown.

It is regrettable that the interest aroused in 1967-68 has died out with scarcely a murmur. The theory of using a rail line in lieu of a crowded highway is a valid one, even though there are many obstacles. The theory of increasing the versatility of a rail vehicle by making it capable of road running (or of a road vehicle making it by rail running) also is valid. There is now a movement toward more positive thinking about transit. We have not had enough experience with road-rail service to determine how it may fit into present-day thinking. Road-rail itself is unlikely to be a total transit system; but as a service for a specific route or specific area within a multimodal system, it could be beneficial.

Road-rail service may be infeasible under a combination of private and public ownership. Putting all elements into the public domain may be a prerequisite.

References

1. Railway Gazette, July 24, 1942, p. 71.
2. Railway Gazette, Aug. 14, 1942, p. 149.
3. Railway Gazette, Jan. 23, 1931, p. 123.
4. Railway Gazette, Oct. 9, 1931, p. 451.
5. Railway Gazette, April 15, 1932, p. 593.
6. Railway Gazette, Oct. 9, 1931, p. 451.
7. Railway Gazette, Aug. 12, 1932, p. 188.
8. Headlights. Electric Railroaders' Association, New York, Jan. 1968, p. 2.
9. Railway Age, Oct. 22, 1932, p. 582.
10. Transit Journal, Vol. 77, July 1933, p. 234.
11. Transit Journal, Vol. 77, June 1933, p. 199.
12. Headlights, Jan. 1968, p. 2.
13. Railway Age, Feb. 23, 1935, p. 306.
14. New York Post, July 20, 1967.
15. New York Times, July 21, 1967.
16. Newsday, Dec. 4, 1967.
17. Cleveland Press, April 14, 1968.
18. Miami News, Feb. 20, 1968.
19. Times-Picayune, Jan. 22, 1969.
20. Kansas City Times, Dec. 22, 1967.
21. Rocky Mountain News, March 7, 1969.
22. Railway Age, Nov. 6, 1967.
23. Wall Street Journal, Oct. 2, 1967, p. 14.
24. St. Paul Dispatch, Dec. 6, 1967.
25. Headlights, Jan. 1967, pp. 3-4.
26. Hartford Courant, July 11, 1970.
27. Hartford-Bloomfield Rail-Bus Feasibility Study. Oct. 1968.
28. Hartford Times, Sept. 25, 1970.
29. Hartford Times, July 10, 1970.
30. Hartford Times, Dec. 22, 1970.
31. Hartford Times, Oct. 20, 1970.
32. Hartford Times, May 10, 1971.
33. Hartford Courant, May 16, 1971.
34. Hartford Times, July 24, 1970.
35. R. S. Prosser. How Safe Were the Motor Trains? Traffic Quarterly, Oct. 1973.
36. R. S. Prosser. American Railcars: A Study in Safety. Rail International, Feb., 1974.