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MASS TRANSIT: AMF MONORAIL

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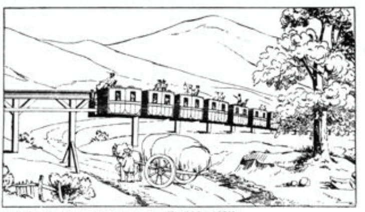
MASS TRANSIT PART 2: AMF MONORAIL

A monorail system by American Machine & Foundry Company for overhead suspended transportation, as designed by the Walter Dorwin Teague office, comprises the subject for this, our second in a series on design for mass transit. Versatility, safety, and low cost are the ingredients.


1. Palmer conveyance system (English, 1820).

Acceleration of information and enthusiasm dealing with mass transportation has reached a level which is difficult to keep up with. One danger of this overwhelming interest will be that no one system will achieve sufficient breathing room to be given an adequate trial. At the moment a Japanese monorail 7.8 miles long, linking Tokyo's International Airport with its own downtown, is nearing completion. This 54 million dollar installation will help serve the many passengers expected during the Olympics. Built to handle 100,000 passengers a day at 48 mph average speed, this system will be typical of many new installations which serve a specific function rather than the problems of over-all mass transportation. The American Machine & Foundry system will share the problems of any transportation system which is added to existing systems. And in this country, we are dealing with not only existing systems but unbelievable numbers of about-to-be-built proposals. For instance, both the St. Louis Car Company, who are builders of the AMF cars, and the Budd Company are engaged in studies of the regeneration of existing two-rail systems. Specifically, the Budd Company is studying a potential 125 mph train on the already available standard track right-of-way between Boston and Washington. Such improvements as the possible Boston-to-Washington reconstruction would serve only a part of our mass transit needs. As evidence, George Russell, executive vice president of *ness Review* called "The Automobile in Industry and General Motors, in an artice in the *Michigan Busi-* its Prospects," says: "In urban areas of one million people, 88% of the trips made in a day are to and from locations other than downtown." Of course, the GM solution would be cars and buses; however, it would be in such relatively short-haul passage that a system of the AMF type would be most feasible.

AMF system

The cars, a joint effort of Walter Dorwin Teague Associates and AMF design development engineers for the New York World's Fair, are a step forward, but hardly a fair test for the actual problems of getting people to and from places of business and pleasure. The existing train, consisting of coupled cars 90 feet long, rides 40 feet above the ground on two parallel 4000-foot loops and is moved by "bogies" developed by the General Electric Company. The system is not a new one, since both its forerunners and the present system are the product of long term development by SAFEGE (Societé Anonyme Françoise de Gestion et d'Enterprises). This giant French combine has as its various ingredients Renault, Michelin Rubber, French banks, construction com-

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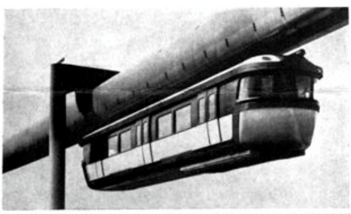
Milton Immermann, a partner of Walter Dorwin Teague Associates, has been in charge of the design of the American Machine & Foundry monorail, both for the World's Fair and in terms of its application to mass transportation use. The monorail system is shown on pages 2-7, the second in our series on mass transit systems. Immermann is a past director of the ASID and, now, as chairman of its design protection committee, he has been influential in the development of current legislation in this area.

Immermann


2. Demonstration monorail at Chateauneuf-sur-Loire. A SAFEGE train, consisting of a single car, rides on an overhead, enclosed, cantilevered track.

panies and metal fabricators. Lucien F. Chadenson, chairman and president of SAFEGE-Transport, developed his boxed-beam principle, and subsequently built a mile long test track at Chateauneuf-sur-Loire. During the past two years, a SAFEGE car has been

World's Fair train travel at only 9 miles an hour, and, although this is not a test of the system, the Fair installation does demonstrate the following: that it can exist in airspace over congested areas; that its narrow support beams do not greatly interfere with traffic or structures below (which may mean a good deal when considering the expense of purchase and taxation on right-of-way); that it can manage turns in a short space (it can potentially round ¼ mile radius curves at 70 mph); that the system is relatively noiseless, and not subject to appreciable sway (anti-sway devices, whether needed or not, have been installed in this prototype system); that the trains are capable of exceptional deceleration, which is a must ingredient of any system operating over short runs; and that a considerable price saving can be achieved in the choice of 1.5 million per mile monorail cost over 7.5 million per mile subway cost.

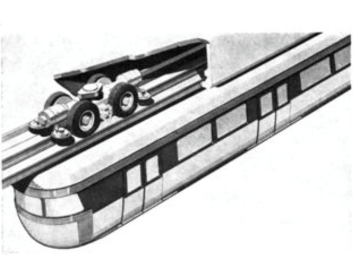
operating on this track at speeds up to 90 mph while running almost daily. The advantages of a box beam are simply that it keeps out the weather, giving uninterrupted transportation service, leading also to safety conditions which are reinforced by both a fail-safe method of switching and a fail-safe supporting system.

AMF has been granted a franchise to construct prototypes and working trains in the United States for SAFEGE. The World's Fair train is an example of the cooperation of this alliance. As it exists at the Fair, it is automatically controlled, governing train arrivals, departures, door opening and closing. In keeping with the ground rules for speed, the

Passenger cars

Each individual car, as constructed for the Fair, measured 45 feet over-all as coupled, 9'6" in height, and 8'3" in width. Capacity of a single car rests at 40, with the orientation back to back along a central axis. In the event of future installations for higher speeds, seating would probably be oriented at right angles to the direction of travel. The coupled cars travel with an attendant for each train, who has over-ride controls to be used in case of emergency or by maintenance personnel.

The general appearance of the car is reminiscent of the old trolley car. (This reminiscence is even greater if you turn the picture upside down). The similarity stops at the surface, however. The design and construction of the present cars are to a certain extent the product of very short-run production, requiring much lay-up by hand and a spectacular 362-day design and construction program, since the Teague office did not start the project before April, 1963. According to Milton Immermann, director of the WDTA design team for the World's Fair Monorail project which included partner Robert H. Ensign and associate Danforth Cardozo, the reinforced plastic would be used more extensively in a full-production model. As it is, the front and back windows are tinted acrylic, the front of the car is reinforced plastics, window surrounds are vacuum-formed ABS



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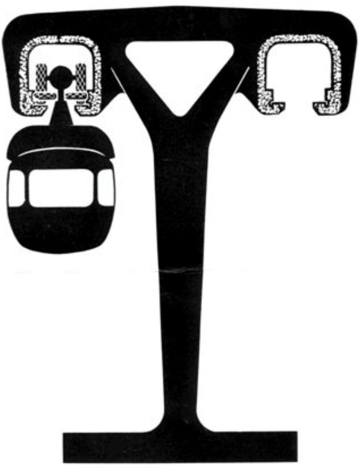
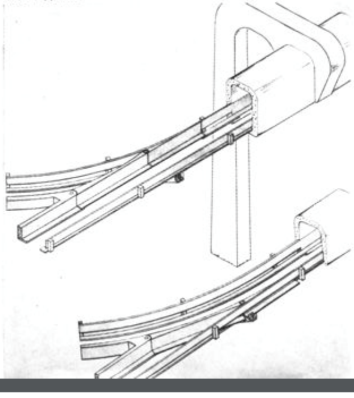


4, 5, 6 (opposite)



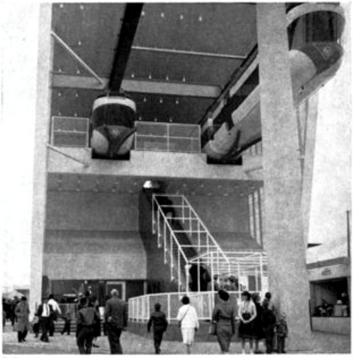
3. A perspective cut-a-way rendering of the SAFEGE monorail vehicle with its four-wheeled "bogie" exposed. Four additional horizontally oriented smaller wheels act to guide the truck along the track web. Two of these smaller wheels, diagonally opposed, are fixed in place, while the other two are spring loaded to compensate for variations in the track web. All eight "bogie" tires are rubber cushioned.
4. Simplified elevation diagram illustrates a dual track and pier. Each of the two tracks suspend the car by "primary link, pin connected to the car fitting at its lower end and a ball swivel anchors to the track at its upper end. The ball swivel pin is captive in a steel casting, which is guided in the track frame and supported by four air springs."
5. AMF/SAFEGE fail-safe track switch. Upper picture depicts straight-away position, lower picture, turned-out position. Switch unlocks, rotates, and relocks in the same manner as standard high-speed railway switches.
6. Inside car view looking forward in the AMF installation at the New York World's Fair. Notice that the seats are back to back, slightly tilted and ribbed for comfort. Car walls also angle in toward the floor. We noticed on a test ride of the vehicle that visibility was excellent from any vantage point, and that passengers were not particularly aware of overhead suspension. Entrance and egress seemed appropriately efficient when dealing with a full load of passengers.

6

plastics, the bogies' shroud is again reinforced plastics and, finally, the seats are constructed of reinforced plastics with vinyl upholstery. The side body paneling of the present model is of steel sheet, but in the full production model this could very well be reinforced plastic. Strength in the event of accident does not depend on the thin-skinned outer shell, but on a steel skeleton, one of whose beams can be seen in illustration 6 at the end of the interior. Standard procedures and materials were used throughout to assure speed of construction. Any further systems would be redesigned to fit specific problems.

Any city contemplating the installation of an AMF monorail could design the system around some rather exciting aspects. The cars can climb at 10% grade. The system is attachable to existing bridges without a great deal of new superstructure and the trains could be run either above ground or on ground level or in a tunnel. Serious consideration is being given to the AMF monorail by several U.S. cities. *The Wall Street Journal* reports that the company expects one firm order before the close of the year. Among the cities interested are Newark, Los Angeles, Washington, Kansas City, Chicago, Sacramento, Long Beach, Las Vegas, Palm Springs, and Atlantic City. It will not be decided, until someone takes a crack at it, whether monorail travel does or does not do the job that its several backers claim.

7, 8, 9, 10. Four views of the AMF monorail at the World's Fair. Overhead station is serviced by an escalator. The "T" shaped piers are dotted along the 4000 foot ride in the Fair's amusement area.



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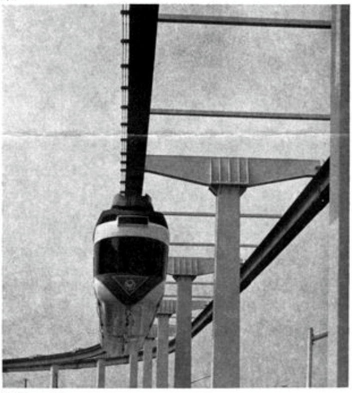

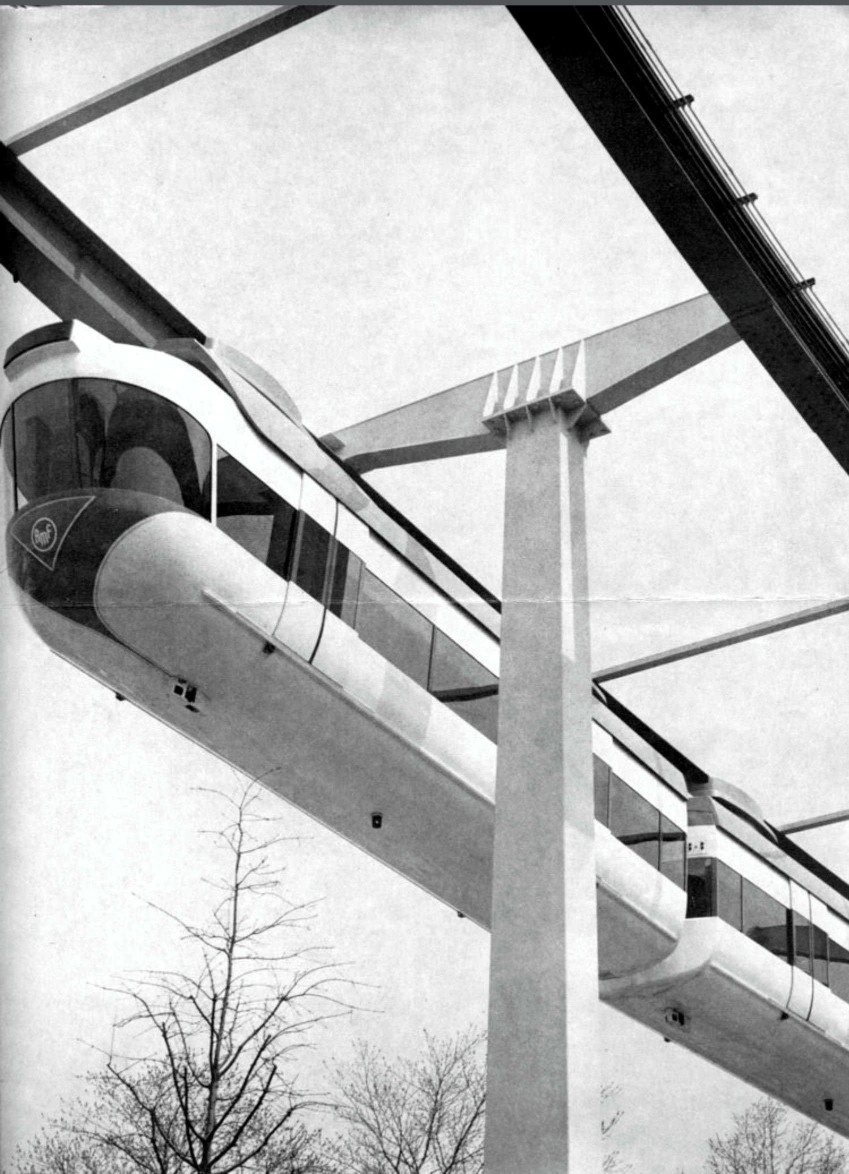9, 10 opposite