

PRESS HANDBOOK

Facts - Figures - Features

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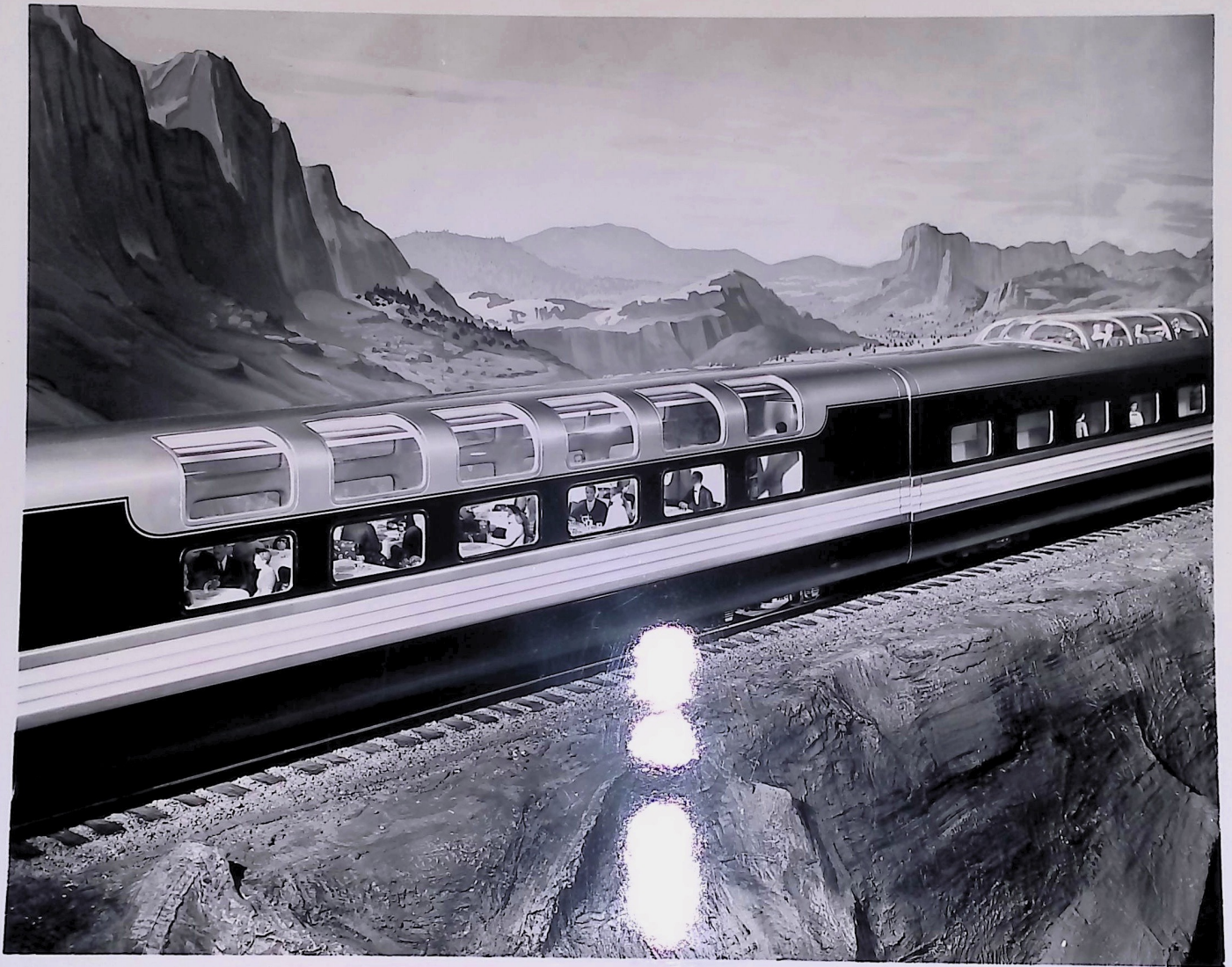
General Motors

TRAIN OF TOMORROW

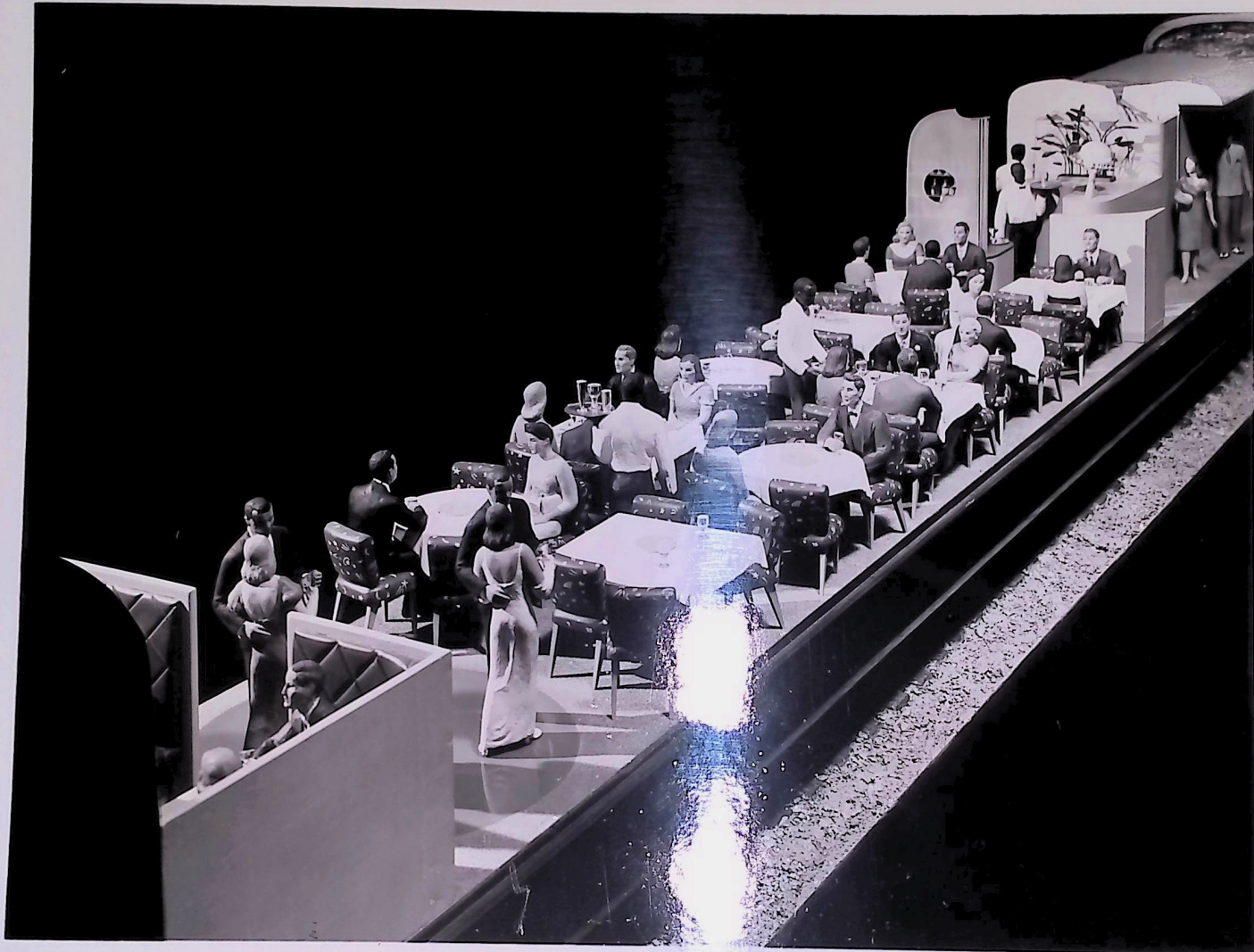


1949

**Department of Public Relations
General Motors Corporation
Detroit 2 - - - Michigan**



Exterior view of model of the Astra Diner, designed by General Motors Styling Section, showing thermo-pane glass roof over table seating section. Astra Dome of the Astra Sleeper car shows on the model to the right.



View of model of the Astra Diner with roof and sides removed disclosing small dance space at left end of car and arrangement of islands and partitions at right end of car to keep waiters and waiting passengers separated. Cocktail waiting alcove at extreme left of car.





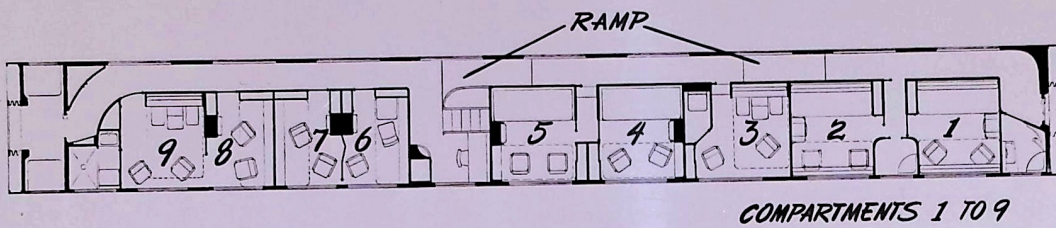
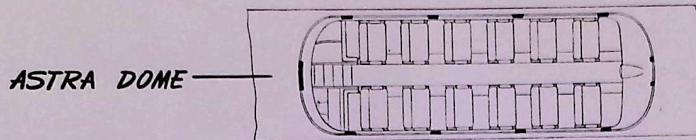
View of the interior of the Astra Lounge car model, designed by General Motors Styling Section, with car sides and roof removed. The picture shows the upper level cocktail lounge in the foreground, the lower level cocktail bar in the depressed room at lower left and the Astra Dome, upper left.



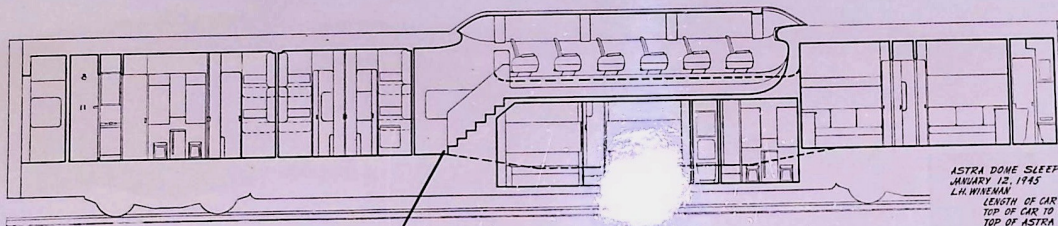
Various levels in the Astra Lounge car, designed by General Motors Styling Section, are shown in this picture of scale model with sides and roof removed. The Observation Room is shown at the right, with its floor eighteen inches higher than that of the conventional car. Passengers mount to the Astra Dome by a stairway leading out of the Observation Room. Beneath the Astra Dome is the lower level cocktail bar and at the extreme left end of the car on the conventional floor level is the upper level cocktail lounge.



Various levels in the Astra Lounge car, designed by General Motors Styling Section, are shown in this picture of scale model with sides and roof removed. The Observation Room is shown at the right, with its floor eighteen inches higher than that of the conventional car. Passengers mount to the Astra Dome by a stairway leading out of the Observation Room. Beneath the Astra Dome is the lower level cocktail bar and at the extreme left end of the car on the conventional floor level is the upper level cocktail lounge.



ASTRA DOME-SLEEPING CAR



ASTRA DOME SLEEPING CAR
 JANUARY 12, 1945
 L.H. WILKINSON
 LENGTH OF CAR OVER BUFFERS 84'-6"
 TOP OF CAR TO RAILS 13'-6"
 TOP OF ASTRA DOME TO RAILS 15'
 DIS. BETWEEN TRUCK CENTER 54'-6"
 4 WHEEL TRUCKS
 CAPACITY SLEEPING ROOMS 20 PASS.
 CAPACITY ASTRA DOME 24 PASS.

Drawings of the Astra Sleeper car, designed by General Motors Styling Section, showing how room for the Astra Dome is found within the limits of overhead clearance by depressing three rooms beneath the dome.



Interior of one of the master suites on the Astra Liner, designed by General Motors Styling Section. This suite includes a single bedroom, at right, a room with double bed in center and shower and toilet room at left. The clay modelled figures in the center room are playing cards on a table that unfolds from the bottom of the double bed, which at night swings out across the room. Note also that in the single bedroom both berths fold into the wall, making ample room in the daytime for two comfortable chairs and creating a living room effect.



PRIVATE DINING ROOM ON GM TRAIN OF TOMORROW - IN APPEARANCE AND UTILITY, THE GENERAL MOTORS TRAIN OF TOMORROW DINING CAR HAS ABUNDANT INNOVATIONS, ONE OF WHICH IS THE PRIVATE DINING ROOM, SHOWN ABOVE.

TABLE SERVICE IS ON THREE LEVELS. IN THE ASTRA DOME ONE MAY DINE UNDER THE STARS IN A ROOF GARDEN-LIKE ATMOSPHERE. THERE ARE OTHER TABLES AT CONVENTIONAL LEVEL, WHILE THE PRIVATE DINING AREA IS IN A SUNKEN SECTION BENEATH THE ASTRA DOME. THIS IS THE FIRST RAILWAY DINING CAR TO BE EQUIPPED WITH AN ALL-ELECTRIC KITCHEN AND PANTRY.

THE TRAIN OF TOMORROW, NOW ON NATIONWIDE EXHIBIT TOUR OF PRINCIPAL CITIES, IS COMPOSED OF THE DINER, SLEEPING CAR, OBSERVATION LOUNGE AND COACH. IT IS COMPLETELY AIR CONDITIONED BY FRIGIDAIRE AND IS POWERED BY A 2000 HORSEPOWER DIESEL LOCOMOTIVE, MANUFACTURED BY THE ELECTRO-MOTIVE DIVISION OF GENERAL MOTORS.



YESTERDAY AND TOMORROW -- When the General Motors Train of Tomorrow was exhibited at Baltimore the Baltimore and Ohio Railroad presented from its historical collection of early motive power by way of contrast the "Lafayette" locomotive of 1837 and two "Imlay" coaches of 1832. The "Lafayette," first locomotive on the B&O with horizontal boiler and six wheels, was built ~~from the~~ by William Norris and Company of Philadelphia in 1827 and made its initial run between Baltimore and Frederick that year. The picturesque yellow coaches with double-decks were designed and built by Richard Imlay, famous coach built of Philadelphia, and were first operated in trains pulled by grasshopper type locomotives between Baltimore and Ellicott's Mills, Md.

Sent in by R. M. Van Sant of the B&O. 7-10-47



Close-up of the Astra Dome in the Astra Lounge car, designed by General Motors Styling Section. Note also unusually high and wide windows in Observation Room at right end of car.

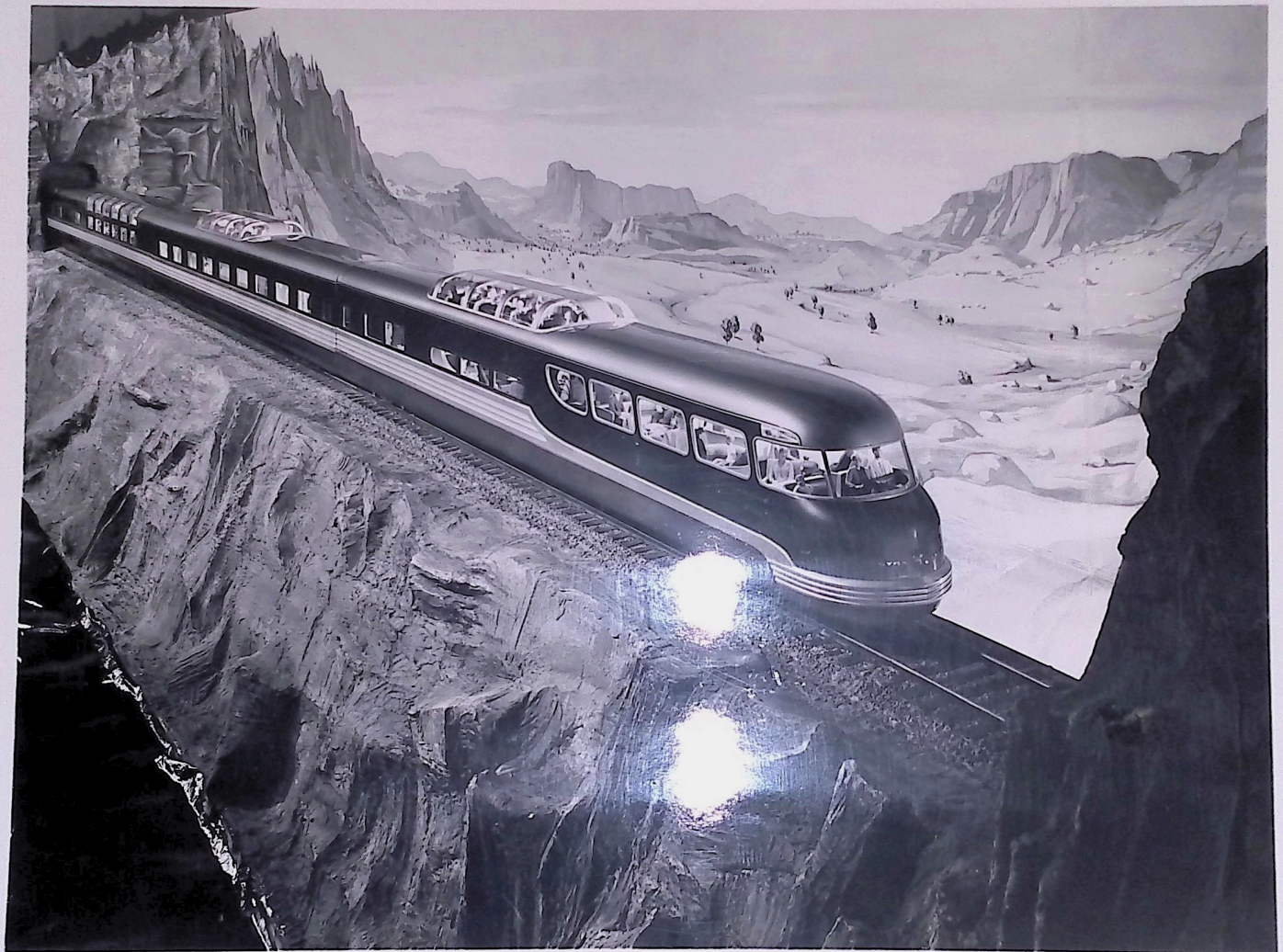


FOR RELEASE ON OR AFTER
9 A.M. - MAY 28

MULTI-LEVEL CHAIR CAR OF GM EXHIBIT TRAIN - STYLING, COMFORT AND GROUP PRIVACY ARE FEATURES OF THIS STRIKING CHAIR CAR OF THE GENERAL MOTORS TRAIN OF TOMORROW, NOW ON NATIONWIDE TOUR OF PRINCIPAL CITIES.

THE THREE LOWER CENTER SECTIONS ARE DESIGNED FOR OCCUPANCY BY GROUPS OF FRIENDS OR FAMILIES. ABOVE, PROTECTED BY SPECIAL GLARE AND HEAT RESISTANT SAFETY GLASS, PASSENGERS ENJOY A HIGH-UP VIEW OF THE PASSING COUNTRYSIDE.

THE TRAIN OF TOMORROW, CONSISTING OF DAY COACH, DINER, OBSERVATION LOUNGE AND SLEEPING CAR, IS AIR CONDITIONED BY FRIGIDAIRE AND IS POWERED BY A STANDARD 2000 HORSEPOWER DIESEL LOCOMOTIVE, MANUFACTURED BY THE ELECTRO-MOTIVE DIVISION OF GENERAL MOTORS.



Scale model (right to left) of the Astra Liner cars, the Astra Lounge, the Astra Sleeper and the Astra Diner, designed by General Motors Styling Section.





GM80716-9

DINING IN SPLENDOR ON GM TRAIN OF TOMORROW - IN APPEARANCE AND UTILITY, THE GENERAL MOTORS TRAIN OF TOMORROW DINING CAR HAS ABUNDANT INNOVATIONS. IT IS THE FIRST RAILWAY DINING CAR TO BE EQUIPPED WITH AN ALL-ELECTRIC KITCHEN AND PANTRY.

TABLE SERVICE IS ON THREE LEVELS. IN THE ASTRA DOME ONE MAY DINE UNDER THE STARS IN A ROOF GARDEN-LIKE ATMOSPHERE. SHOWN ABOVE IS THE MAIN SECTION CONVENTIONAL LEVEL. THE THIRD SECTION, A SUNKEN AREA BENEATH THE ASTRA DOME, INCLUDES A PRIVATE DINING ROOM ACCOMODATING EIGHT PERSONS.

FOOD IN THE ASTRA DOME IS SERVED BY MEANS OF A DUMB WAITER FROM THE KITCHEN.

THE TRAIN OF TOMORROW, NOW ON A NATIONWIDE TOUR OF PRINCIPAL CITIES, IS COMPOSED OF THE DINER, OBSERVATION LOUNGE, SLEEPING CAR AND COACH. IT IS POWERED BY A 2000 HORSEPOWER DIESEL LOCOMOTIVE, MANUFACTURED BY ELECTRO-MOTIVE DIVISION OF GENERAL MOTORS. THE ENTIRE TRAIN IS AIR CONDITIONED BY FRIGIDAIRE.

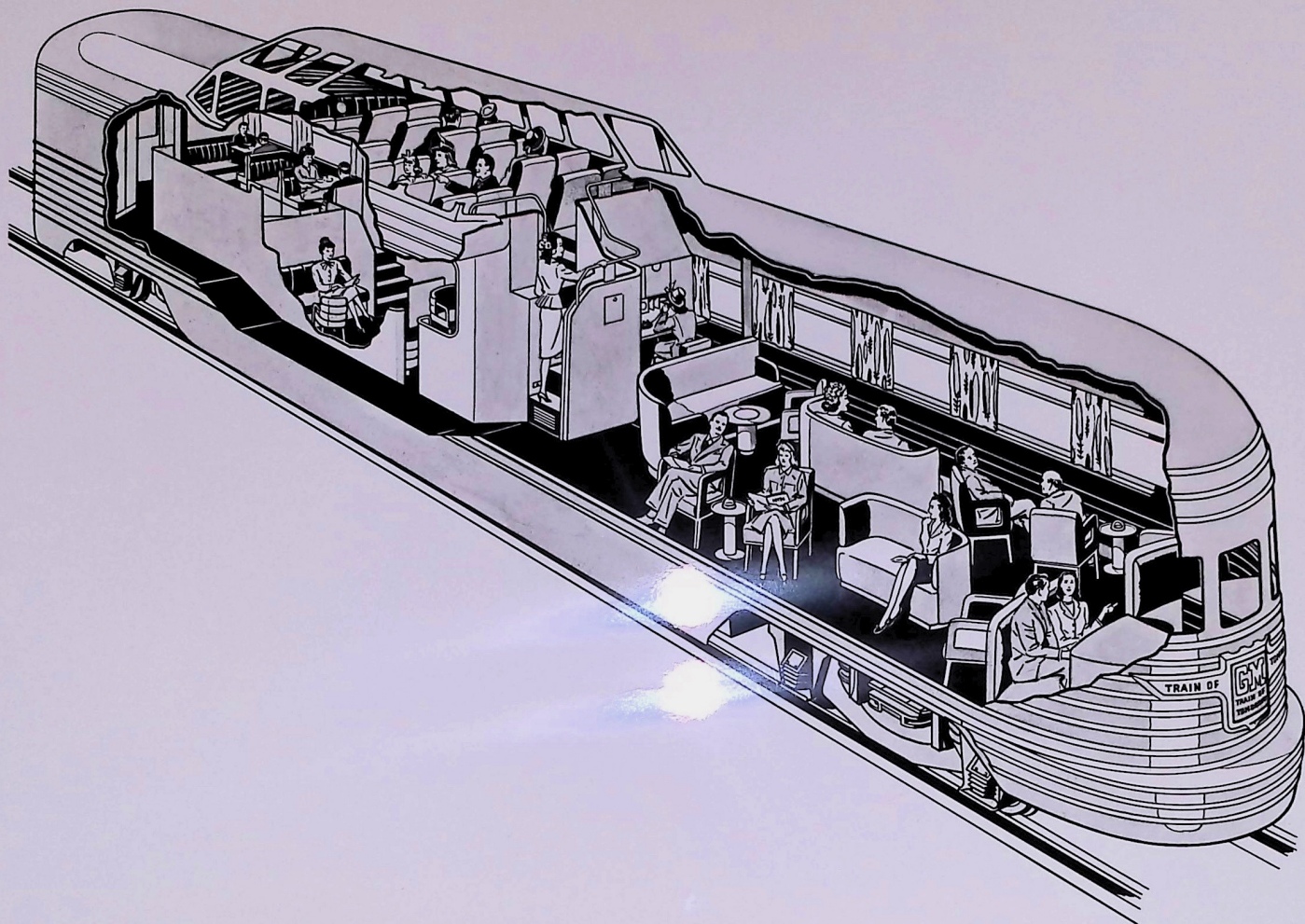


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THIS CUTAWAY DRAWING OF THE OBSERVATION LOUNGE CAR ON THE GENERAL MOTORS' TRAIN OF TOMORROW SHOWS ITS UNIQUE FOUR-LEVEL ARRANGEMENT, INCLUDING THE ASTRA DOME OBSERVATION ROOF. MUCH OF THE INTERIOR FURNISHINGS ARE MOVEABLE AND FLEXIBLE IN ARRANGEMENT. THE GLASS-ENCLOSED DOME PROVIDES SEATING AND UNUSUAL SCENIC ENJOYMENT FOR 24 PASSENGERS. THERE ARE 68 SEATS IN THE ENTIRE CAR.

FROM Electro-Motive Division
General Motors Corp.
La Grange, Ill.

RELEASE AT WILL

The Train of Tomorrow is powered by a "Locomotive of Tomorrow", a General Motors 2000 horsepower high-speed passenger locomotive. This locomotive embodies engineering advances comparable with those in the cars.

These advances grew out of the twenty-five continuous years of experience of Electro-Motive Division in the application of the internal combustion engine to standard gauge railroad train propulsion.

The improvements, according to C. R. Osborn, Vice President of General Motors and General Manager of Electro-Motive Division, have to do not only with the locomotive's ability to perform but also with the lengthening of its life and reduction of operating and maintenance costs.

"In addition," said Mr. Osborn, "We have accomplished design changes which make it possible to manufacture the locomotives more efficiently and economically. There is strong evidence of this in the fact that we are able to supply a greatly improved line of locomotives at considerably less percentage of price increase than you can find on any item of similar bulk and complication. While our labor rates have gone up 89% over the pre-war levels (1941), we have improved design and manufacturing methods to such an extent that the average price increase over 1941 on our entire line of locomotives has been only 14.3%."

Outlining the experience that lies back of the locomotive Mr. Osborn pointed out the following facts:

Electro-Motive had put 500 gasoline-electric rail cars on American railroads prior to 1933 when Mr. Charles F. Kettering completed develop-

ment of the General Motors two-cycle Diesel engine which made the modern Diesel locomotive possible. Some of these rail cars had as much as 900 horsepower. The first Diesel train, the Pioneer Zephyr, had 600 horsepower. The Diesel engine opened up a great new field for the application of Electro-Motive's experience because higher horsepower, longer life and lower operating costs were possible with it.

By 1940 Electro-Motive had all regular classes of motive-power service on standard gauge railroads covered by one or the other of its four standardized types of locomotives.

Electro-Motive's plant for the exclusive manufacture of Diesel locomotives was opened at La Grange, Ill., in 1935. Prospect of volume was such that a standardized line of locomotives and mass production were in effect from the start. By 1938 the volume had grown to such proportions that Electro-Motive began the evolution of a specialized technique in the mass production of locomotives which has no counterpart elsewhere in the locomotive industry. This special technique is a combination of the sub-assembly system with some features of the assembly line system. The refinement of the technique has been rapidly accelerated since the end of the war as it has become possible to design and procure special single purpose machinery. This machinery is found nowhere else in the locomotive industry.

The original manufacturing set-up of 205,000 square feet of floor space with 300 employes has grown to 2,500,000 square feet and more than 10,000 employes. Electro-Motive is the only Diesel locomotive manufacturer that makes all its own important components.

The plant today turns out four completed locomotive units per working day, or an average of over eighty per month. This production rate will be considerably increased as materials become available. Productive capacity now

is ahead of material availability.

General Motors locomotives are operating on sixty-three railroads and in eighteen heavy industries. As of April 30, 1947, there were 1,374 freight units, 599 high speed passenger units and 1,003 switcher units in service. Among the passenger units alone, 180 have covered more than 1,000,000 miles; 23 more than 2,000,000 miles and 4 more than three million miles! The oldest locomotive in these groups is only thirteen years of age.

The freight locomotives have hauled more than 300 billion gross ton miles of freight since 1940 and operate today on assignments calling for over 100 billion gross ton miles per year.

General Motors locomotives, since 1934, have handled over one and a half billion passenger train car miles, chiefly on the most difficult schedules and today operate on schedules calling for over half a billion passenger train car miles per year.

One hundred and twenty-seven of the nation's famous name passenger trains use General Motors locomotives. A number of others soon will be so powered.

Both design and manufacturing work will continue at an accelerated rate, said Mr. Osborn, under the pressure of demand from the railroads. He pointed out that Electro-Motive now has on its books orders for 1,500,600 horsepower from forty-eight railroads. And, finally, to give the engineers the proper modern facilities for work on future "locomotives of tomorrow" the new Locomotive Development Center will be opened this summer. This is a large separate building equipped with facilities for design and experimental manufacture, separate from the original manufacturing space. There is no other institution like it in the locomotive industry.

Electro-Motive Division
General Motors Corporation
La Grange, Illinois

RELEASE ANY TIME ON OR AFTER 3 P.M. JULY 23.

THE ASTRA DINER

Two new types of dining cars have been suggested by the General Motors Styling Section.

One, which has the same contours as the present steel roofed cars, is distinguished by upper wall and rounded roof construction of the same Thermo-pane glass used in the Astra Dome. The glass portion of the roof extends over the section of the diner occupied by tables. Plastic shades may be adjusted underneath the glass roof sections in case sun glare becomes objectionable. This gives the diner the characteristics of a fashionable out of doors cafe, or of a roof garden.

Two end tables may be removed and folded into slots in side walls. This leaves an intimate space in which five or six couples may dance after dinner.

Linen storage space and partitions are so arranged at the kitchen end of the diner that waiting passengers may see the table seating situation without crowding into the aisle and getting in the way of waiters passing to and from the kitchen. A small service bar is located at one side of the entrance to the table space. A cocktail lounge waiting alcove seating ten persons is provided at the end of the diner opposite the kitchen. The partition separating this space from the table space is low enough to permit occupants to see the table seating situation without getting into the aisle.

The other diner, which is the type that will be included in the Astra Liner to be built, departs completely from conventional dining car design.

This startling new car will have an Astra Dome that will serve as part of the dining space. Tables will be located in both ends of the car and in the dome, while the kitchen will be located in the depressed central portion of

the car underneath the dome. A service pantry will be adjacent to the kitchen toward one end of the car and on the regular car floor level.

In addition to its appeal as a highly unusual place in which to enjoy food this car will have a number of practical operating advantages. It will seat at least ten more persons than the present diner and all diners will have more "elbow room". Serving will be expedited by the service pantry arrangement. Whereas dining car waiters now go back into the kitchen for food, they will have their orders filled from the service pantry over a counter in the Astra Diner. This counter is located in a passageway that runs along a car wall, giving easy access to the dining rooms in both ends of the car. The waiters serving the Astra Dome will dispatch used dishes and receive food via a dumb waiter from the kitchen immediately below.

A meal in the Astra Dome section of this diner probably will be one of those never to be forgotten experiences. To the charm of eating in air conditioned comfort out under the stars will be added the thrill of doing so at a hundred miles an hour.

Electro-Motive Division
General Motors Corporation
La Grange, Ill.

RELEASE ANY TIME ON OR AFTER 3 P.M. JULY 23

THE ASTRA LOUNGE

The designers have attempted to make the Astra Lounge car one of the most interesting vehicles in the world. Their thought has been to give passengers such a variety of delightful little surprises that they would never have a dull moment, even though on the train for two or three days.

The Astra Lounge has five levels: the regular car floor level, a center ramp, a lower cocktail lounge, a rear observation lounge and the Astra Dome. This permits a fascinating array of attractive sights within the car itself, to say nothing of the enjoyment of moving into several totally different atmospheres by merely stepping around a gracefully curved corner or going up or down a few steps. The car has seventy-five comfortable places to sit, at least forty of which are movable.

As in the Astra Sleeper the dome is in the roof approximately in the center of the car. It is equipped with twenty-four seats, as in the sleeping car. The seating may be varied. It has been suggested that in the lounge car it would be possible on transcontinental trains to equip the dome with fewer seats of chaise-lounge style for sun bathing or a quiet nap.

The space beneath the dome is used as the lower level cocktail bar. This space is given an intimate air by the short bar across one end, equipped with high seats; by high narrow windows, by the low ceiling and built-in nooks.

A more formal cocktail lounge is located on the regular car floor level at the forward end of the car. This room is entered either from a door at the forward end of the car or by three steps that lead up out of the lower cocktail lounge. Lavish use of color and amusing cartoons feature the decoration in both of these rooms.

The Astra Lounge

2)

The observation lounge at the rear end of the car has a floor eighteen inches higher than the regular car floor level. Windows are unusually wide and deep. The rear cockpit has only two small pillars to obstruct rear view and the sloping, rounded rear windows permit exceptional upward view. Most of the furniture in this room is movable, permitting passengers to form their own groups as in a private living room. The stairway to the Astra Dome leads out of the observation lounge.

Electro-Motive Division
General Motors Corporation
La Grange, Ill.

RELEASE ANY TIME ON OR AFTER 3 P.M. JULY 23

THE ASTRA COACH

The Astra Dome in the Astra Coach is a duplicate of the dome suggested for the Astra Sleeper. The space beneath the dome becomes available for a wide variety of uses that would give an all-coach train of this type high passenger appeal.

The extra space gained by the addition of the dome may be used, of course, to increase seating capacity. This arrangement might be followed for suburban or other short run trains. However, use of the space under the dome for special facilities for added comfort and enjoyment of the passengers is suggested for those runs taking several hours or overnight.

For instance it is suggested that some of the cars on overnight runs may be equipped with additional wash room facilities.

In the women's and children's car the under-dome space is divided between an unusually large woman's lounge and a nicely isolated children's playroom. Heavily padded quilted sides for the playroom and playthings devoid of sharp corners are suggested.

The woman's lounge is replete with thoughtful provisions for the comfort of mothers traveling with children, especially babies. Mothers may bring along their own formulas, identify them with gummed labels upon which they have written their own names and store large bottle or cans in a Frigidaire recessed into a wall. Beside this Frigidaire is an electric bottle warmer and an especially high faucet that will make bottle washing something of a pleasure. Gone would be the long trek back to the dining room to warm milk with baby under arm, or left with a chance seat mate.

A diaper changing table unfolds from a wall. A high-chair, securely fastened to the floor, sits in a corner of the lounge. Mothers may be free to perform their own toilet by strapping babies in the high-chair.

The dressing ledges, mirrors and chairs rival those in the finest powder rooms in the smartest of hotels.

Space beneath lavatories would be enclosed to cover what sometimes becomes unsightly, refuse catching plumbing. The fronts of these enclosures would be hinged at the bottom. Slots at the top would receive soiled towels. The towels would fall into a large disposal rack on the inside of the hinged panel, which the porter would empty at proper intervals.

Another suggested use of the under-dome space is to divide it into "Family Coach Sections". These would be private rooms, equipped with five reclining seats. A family party could have such a room by payment of a slight extra charge. Odd spaces left over between Family Coach Sections could be utilized as automat snack bars or card rooms.

Roll-away coat and hat racks that disappear into a nook have been designed. One new type of coach seat suggested would have a shelf underneath the seat in which a suitcase could be kept.

As in the luxury train a wide variety of color combinations is suggested for the coach.

Electro-Motive Division
General Motors Corporation
La Grange, Ill.

RELEASE ANY TIME ON OR AFTER 3 P.M. JULY 23

THE ASTRA SLEEPER

New arrangements of berths and other facilities providing approximately fifty per cent more free floor space during daytime occupancy, plus the Astra Dome, are among features suggested in the General Motors Styling Section's designs for the new Astra Sleeper.

A reserved seat in the Astra Dome of each sleeping car on the Astra Liner goes with each space in a room on the lower deck. In the scale model of the sleeper prepared by the GM designers the Astra Dome has twenty-four seats. This feature adds the charm and luxury ordinarily associated with a deck chair on an ocean liner, with the greater attraction that the scenery from a train is much more interesting. Use of laminated glass, such as has been proven under gunfire in windshields of thousands of airplanes during the war, for the gracefully curved roof of the Astra Dome, gives passengers 360 degree vision from a high vantage point. Eye level is above ordinary car roof height. The passengers have an unobstructed view ahead. Heat absorbent Thermo-pane glass is used. The laminated feature provides safety and long life, and the Thermo-pane feature prevents fogging in cold weather as well as helping to maintain a comfortable temperature in the Astra Dome in all weather.

Room for the Astra Dome is found within the limits of overhead clearance by the placing of three bedrooms beneath it on a lower level than the rest of the car floor. The usual side aisle, leading to the rooms, is depressed in the section underneath the Astra Dome to provide six feet, six inches head clearance. The three rooms beneath the Astra Dome are reached from this depressed portion of the aisle by two steps downward.

While there are notable innovations in all of the bedrooms in the new type of sleeper, three outstanding new types of rooms are modeled.

One new type is a pair of adjoining rooms opening off a lateral passage-

way from the through passage. Each of these rooms has one lower and two upper berths. In the normal day set-up, the lower berth, located on the wall opposite the window, is made up as a comfortable lounge with loose cushions that can be arranged to suit the occupant. The two upper berths, one above the lounge and the other parallel and attached to the outer wall, are folded into the walls during the day. Two comfortable movable chairs are located in the large, always free space between the lounge and the window. The two rooms are served by the same toilet, located between them at the end of their common lateral private hallway to the public passage after the manner of similar accommodations on fine boats and in some of America's better resort hotels. This is one of the moves by which the designers provided the unusual amount of free floor space in this type of room. Five passengers may be comfortably seated in such a room so that all have a good view out of the window, which is five feet wide. (All sleeping car windows in the Astra Liner are five feet wide except in the single bedrooms where they are four feet wide.)

Each of these rooms has a combination lavatory and dressing table. The dressing table is converted into a lavatory by merely lifting the gleaming metal hinged top.

Concealed in the lounge-berth is a luggage compartment. A five-foot section of the lounge seat lifts up, raising with it, to a convenient height, the luggage drawer. This drawer is wide and deep enough to accommodate two rather large suitcases.

The night time arrangement is unique in that both upper berths can be down, but passengers still may be seated in the chairs at the window or on the lounge. Individual reading lamps beamed from the bottom of the upper berth nearest the window, make it possible for some occupants to sit up "downstairs" without

disturbing those who have retired.

Since these two rooms open off a private hallway they can be made into an unusually roomy suite by merely leaving the inner hallway doors open and closing the hallway door to the public passage.

These rooms are decorated by wide scenic panels around the walls approximately coinciding with the window levels. This treatment, which adds to a feeling of spaciousness, is made possible by a new material, called "V-board". Pictures, lithographed or otherwise put on paper, are given plastic treatment, which results in a flexible sheet about a thirty-second of an inch thick. This sheet can be bent or creased at will, making it possible to put it on a surface like wallpaper. It can be cemented to any material likely to be used for car walls. The plastic covering makes the murals as safe from damage from ordinary wear and tear, including washing, as the best of painted walls.

Recesses are sunk just above head level of all berths in the room cars. These recesses accommodate a water carafe, books, purses or any other articles the passenger may want handy while in bed. Indirect tubular lighting fixtures inside these recesses provide unusually efficient illumination for reading in bed.

The rooms located under the Astra Dome are of another new luxury type. Each has two lower berths, one of them a conversion lounge, once again located along the wall opposite the window. The other berth folds into one of the end walls (as in a roomette car) by day, and opens out under the window and alongside the outer wall at night. The space next to the window by day is occupied by two comfortable chairs. The backs of these chairs fold down to fit beneath this outer lower berth at night.

An innovation in privacy is incorporated in these rooms. Toilet and lavatory fold out of a sanitary column in the center of one wall, rather than in

the outer wall as at present. When the toilet is in use a folding screen, concealed in the column, may be pulled out and around to afford privacy.

All bedrooms in this car have a full length wardrobe, designed to accommodate dinner dresses and long overcoats without crumpling of the hem.

Mirror panels at window level around the walls add to the feeling of spaciousness.

For those who desire extra roomy space on a train, there is an unusual room arrangement in the end of the Astra Sleeper car. This can be used either as a three-room suite-- shower and toilet room, double bedroom and single bedroom all in one; or as a suite consisting of the bathroom and double bedroom, with the single bedroom shut off for separate occupancy. By opening a collapsible wall between the two bedrooms, a living room almost as large as a small hotel bedroom is attained.

Arranged for daytime occupancy, the double bed folds into the wall opposite the window. A small table and two seats unfold from the bottom of the bed, to provide game or writing facilities, or serve as a coffee table. Two comfortable lounge chairs are placed by the window. Other folding chairs may be brought in by the porter if required.

The single bedroom, which is typical of other single bedrooms in the car, is distinguished by the large increase in free floor space by day over that now available in this type of room. This is accomplished by the simple expedient of making the lower berth fold into a side wall as does the upper berth. This leaves ample room for the two comfortable movable chairs to be placed by the window. At night the back of one of these chairs folds down and it goes beneath the lower berth, while the other chair remains by the window for use in dressing or undressing.

All of the single bedrooms have a four-foot window instead of the two-foot window now in such rooms. This is made possible by the placing of the sanitary

column on a side wall instead of on the outside wall as at present.

Passengers mount to the Astra Dome by a stairway that leads upward from a lateral hallway placed between rooms about one-third of the distance from one end of the car. The stairway is deliberately made narrow enough that passengers will naturally grasp handrails for ascending or descending. Steps are illuminated like steps in modern theaters.

The small space at the end of the hallway leading to the Astra Dome stairway, between the stairway and the outer car wall, is occupied by a chair and desk which serve as the porter's or conductor's headquarters. This solves the vexing problem of providing the conductor a permanent place in which to do his necessary "paper work".

Lavish use of color and other modern decorative devices is apparent throughout the car, the general effect being as pleasant as that of America's newest hotels and apartments.

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NOTE -- In the following pages,
description is given according to
location and according to function.
This gives rise to some duplication,
but it was felt the Handbook would
be more helpful if this style were
used. In this way, each section can
be complete in itself.

Moreover, opening pages of
certain sections are briefs of the
entire sections, as an aid to speedy
reading of the high points.

It is hoped that the Handbook
will simplify note-taking.

An effort has been made to
hold to straightforward newspaper style
so that chosen portions may be torn
out and pasted up if the material is
deemed satisfactory.

STATEMENT
on the
GENERAL MOTORS TRAIN OF TOMORROW
by
C. E. Wilson, President, General Motors

The General Motors Train of Tomorrow, which is being exhibited to the public in many cities across the country, is an experimental project to try out ideas for improvement of railroad travel in future years.

Suggestion for the central idea of the Train, the Astra Dome, originated with General Motors in 1944 and has been worked out, together with numerous other innovations, through the cooperation of Electro-Motive Division engineers and General Motors Styling Section.

To check the possible usefulness of these ideas, Electro-Motive showed a model of the Train to 350 officials of more than 50 Class I railroads during the summer of 1945. Many of these officials urged that an experimental train embodying these ideas be built, operated and exhibited to determine how many of the ideas might be practical for inclusion in trains of future years. Being interested in all forms of advanced transportation, General Motors, therefore, decided to undertake the project.

ORIGIN AND PURPOSE

Coincident with this development a number of railroads contracted for dome cars, each of the car building companies securing orders. The car builders were given letters of permission to use the General Motors designs without fee.

General Motors has no intention of going into the railroad passenger car business. We are interested in the entire field of transportation and, of course, have a special interest in railroads as our Electro-Motive Division is the leading Diesel locomotive builder. We are also interested as suppliers of other railroading equipment; air conditioning through the Frigidaire Division, anti-friction journal box bearings through the Hyatt Bearings Division, and Diesel generating equipment through the Detroit Diesel Division and the Delco Products Division.

The Train of Tomorrow represents the resources and "know how" of many individuals and industries and once more the interdependence of various sections of American industry is demonstrated. The Train of Tomorrow becomes a research project for the improvement of American transportation in which a motive-power manufacturer, the railroad car builders and the great railway systems of America have pooled their accumulated skills.

ORIGIN AND PURPOSE

We believe that this forward looking presentation in rail transportation may prove to be as helpful as were some of the efforts we made in the past to assist in modernizing transport on highways and waterways.

The Futurama of the General Motors exhibit at the New York World's Fair, viewed by 24,000,000 visitors who were drawn by its representation of what the years ahead can offer in the way of improved highway transportation, was another General Motors project inspired by the same sort of thinking. The first post-war undertaking of General Motors along the same line is the Train of Tomorrow.

The country already has had a glimpse of the Astra Dome idea in the experimental Vista Dome car of the Burlington Lines. This coach was built by Burlington, with General Motors engineers and styling experts cooperating in its design and construction.

Since General Motors is not in the railroad passenger car business, several of the established builders were invited to submit proposals on construction of the Train of Tomorrow cars. The proposal of the Pullman-Standard Car Manufacturing Company was accepted and that company was commissioned to complete detailed engineering and construct the four cars, working with General Motors Styling staff and Electro-Motive engineers.

FROM IDEA TO REALITY

A History of The General Motors

TRAIN OF TOMORROW

In character with the name of its most distinctive feature, the Astra Dome, the story of the General Motors Train of Tomorrow begins 10,000 feet above sea level.

In the summer of 1944, C. R. Osborn, vice-president of General Motors and head of the Electro-Motive Division, which designs and manufactures General Motors Diesel locomotives, set out to observe performance of such motive power in the movement of war freight between Chicago and the Pacific Coast over the Burlington, the Denver and Rio Grande Western, the Western Pacific, and the Santa Fe railroads. He elected to ride freight trains over the entire route.

Idea Originates in Locomotive Cab

On a late July morning with Mr. Osborn sitting in the fireman's seat in the cab of one of the Denver and Rio

Grande Western's General Motors locomotives, the magnificent panorama of the Colorado Rockies rolled before his appreciative gaze. Never before had he had such an unimpeded view of this particularly thrilling section of the country.

"A lot of people would pay \$500 for this fireman's seat from Chicago to San Francisco if they knew what they could see from it," he remarked.

This, of course, is a thought that railroad men have had many times and the group in the cab discussed it as the train pushed on up the grade.

"Why wouldn't it be possible to build some sort of glass covered room in the roof of a car so passengers could get this kind of view?" proposed Mr. Osborn. Someone pointed out that there must be sufficient room within bridge, tunnel and station limits because cupolas of cabooses, which rise considerably higher than a standard passenger car roof lines, go through.

All day long the idea kept recurring to Mr. Osborn. It persisted to such an extent that later that night in a Salt Lake City hotel he made some quick sketches on hotel stationery before going to bed.

Questions Put to Electro-Motive Engineers

On his return to LaGrange, Illinois, he put the matter up

HISTORY OF GM TRAIN OF TOMORROW

to the cab structure engineers of Electro-Motive Division. Men in this section of the engineering department had been designing the cab structure of General Motors locomotives for years. They were fully competent to pass upon the engineering practicability of the dome idea.

The principal questions to be settled were:

1. With the use of steel ribs and the heavy, bullet-proof glass developed during the war, could a dome be built that would provide the necessary passenger safety?
2. Would it be low enough to clear most tunnels, bridges and station roofs in the United States?
2. Could the regular floor of the car be depressed sufficiently to provide head-room beneath the dome, as well as in the dome, and still meet clearance requirements of the railroads?
4. If the regular floor line were thus altered, could the buff and drag of moving cars be transmitted through a re-designed underframe instead of through the conventional heavy center sill?

In due course the Electro-Motive engineers reported that the answer to these questions was, "Yes".

In Interest of All Railroads

Consideration was given to the propriety of the Electro-Motive Division, whose sole business is the design and manufacture of locomotives for all classes of standard railway service, suggesting radical changes in passenger car design. The answer lay in the history of Electro-Motive's own business. Many improvements in General Motors locomotives had grown out of criticisms and definite suggestions offered by the railroads and passenger and freight car manufacturers. Obviously the success of Electro-Motive was dependent upon public use of the railroads and any idea that might contribute to making railroad travel more attractive should be passed along to the proper officials on the railroads. It will be recalled, also, that there was considerable Governmental encouragement for postwar planning in all industries in 1944 which heightened the natural desire of manufacturers to have their houses in peacetime order shortly after V-Day.

GM Styling Section's Contribution

Meanwhile another idea had been taking form. For many years General Motors Styling Section at Detroit has been responsible for the appearance of the products of General Motors. Some of the artists, sculptors, and modellers in this section, trained in the technique of heightening attractiveness of automobiles, busses, Frigidaires, and many other products

HISTORY OF GM TRAIN OF TOMORROW

had also had some experience in the styling of railroad equipment. However, railroad work had not been their chief occupation. It was just possible that if some of these versatile men were available they might contribute many fresh ideas for making railroad travel more attractive to the public. It might be that their limited experience on railroad equipment would be an asset.

So the project was put up to Harley Earl, vice president of General Motors in charge of the Styling Section. Throughout the war the Section had been working upon Government assignments including camouflage and silhouetting of tanks, trucks and other equipment. These assignments had slowed up due to the fact that the war was in its final stages. Such manpower as was available without detracting from the war effort was assigned to the train project by Mr. Earl.

1500 Sketches Made

For two months the designers studied existing railroad passenger equipment. They rode trains of every description across the country. Some of them took their wives and children. They came back with a long list of things which

HISTORY OF GM TRAIN OF TOMORROW

they, just as passengers, would like to see improved. The group, nine men in all, then started putting their ideas on paper, with the understanding that they were not to be inhibited by more than a few obvious engineering requirements, such as permissible length and height of cars, and allowance for heating, lighting, air conditioning and air brake equipment. The results - some 1,500 sketches in crayon, pencil and water color - were beautiful, some of them fantastic. Most of the improvements were based upon possibilities opened up by inclusion of the dome and the extra space created by the room beneath it.

The entire mass of drawings was screened through the Electro-Motive car designing engineers. One hundred of the 1,500 sketches survived. The engineers approved them as practicable both as to construction and economical operation. Mr. Osborn had presented merely an idea. Mr. Earl and his men had developed it into a practical and beautiful actuality.

Train Model Constructed

The Styling Section model builders took over and put the ideas into three dimensions in a beautiful model of a train, made of wood, metal and plastics. Each car was 10 feet long. The cars sat upon a waist-high track in a background simulating a western mountain scene. The cars were populated with

HISTORY OF GM TRAIN OF TOMORROW

approximately 175 clay figures of men, women, and children seated, walking or standing in the natural attitudes of passengers on a moving train. Tiny glasses and bottles tooled from Lucite bars enlivened the scene in the cocktail lounges. Plastic plates, cups and glasses, and three-quarter inch long knives and forks carved from aluminum sheets lent reality to the tables in the dining car. Little replicas of popular magazines lay carelessly on tables, chairs, and berths. An intricate lighting system was installed to make all interior details visible.

Model Exhibited to Railroad and GM Officials

This exhibit was brought to Chicago, where, to test the soundness and appeal of the dome and other ideas in the train, a small group of railroad and General Motors executives were invited to view it. In the event the reaction of these officials was negative, further development would be stopped and the project dropped. However, the reaction was enthusiastic. The transportation officials present urged that the designs be shown immediately to as wide a segment of railroad management as possible.

So, presidents of American railroads were invited to visit the exhibit with such members of their staffs as they cared to include. More than 350 of the highest ranking officials of fifty-five Class I American railroads viewed the designs.

HISTORY OF GM TRAIN OF TOMORROW

The same invitation was extended to presidents of American railroad car building companies and they, with members of their staffs, carefully studied the designs and offered a number of helpful suggestions.

In each presentation it was made clear that General Motors had no intention of going into the car building business. To quote the presentation exactly:

"This study is presented to the railroads of America as a supplement to their own forward thinking and as a contribution by Electro-Motive Division to the industry with which it is so completely involved."

Burlington Builds Dome Car

From the start of the presentations there was enthusiastic interest in the designs. Within a few weeks after he had seen the designs Mr. Ralph Budd, president of the Burlington Lines, had ordered a modern coach, then undergoing repairs at the Aurora, Illinois shops of the Burlington, rebuilt to incorporate a dome. The depressed floor under the dome was omitted because materials and time were not available and because the principal idea was to test public reaction to the ride in the dome. This experimental car was called the Vista Dome. It was placed in service on regular Burlington trains and run over the entire system under all kinds of conditions.

HISTORY OF GM TRAIN OF TOMORROW

During this testing period passengers who rode in the dome were invited to record their reactions. More than 10,000 opinions in writing were gathered. These left no doubt that the general public would like the "ride under the skies."

Railroads Urge GM To Build Train

Meanwhile there had been expressions from railroad executives that someone ought to build a train in which not only the Astra Dome idea but many of the other improvements in the model could be tried out. In view of the generally enthusiastic acceptance, General Motors gave consideration to the idea of building such a train. However, before any decision, railroads from coast to coast were canvassed as to their opinion and whether they would desire to exhibit such a train on their own lines.

The response to this survey was such that General Motors finally decided, late in the summer of 1945, that it would undertake the building and try-out of the train as a development project for the railroads.

Railroad car building companies were asked to bid on construction of the Astra Dome cars for the "Train of Tomorrow." A contract was let to the Pullman-Standard Car Manufacturing Company. Under direction of the Electro-Motive Division and the General Motors Styling Section, Pullman carried on to completion the Train of Tomorrow's sleeping, dining, lounge and chair cars.

STATISTICS AND HIGHLIGHTS
of
General Motors TRAIN OF TOMORROW
(Brief Descriptions)

Units - Diesel locomotive (designed and manufactured by Electro-Motive Division of General Motors), sleeping car, chair car, dining car and lounge car.

Length of Train - 411' (including locomotive).

Car Heights - Rail to Astra Dome roof, 15' 6".

Weight empty - 920,000 pounds.

Weight loaded - 977,000 pounds.

Exterior finish - Steel and glass; blue and silver.

Interior - Metals, wood, plastics and fabrics -- 37 colors.

Passenger capacity - 216.

STATISTICS - GM Train of Tomorrow

SPECIAL TRAIN FEATURES

- Astra Domes** - Each of the four cars features an Astra Dome two feet above the car roof level. A six foot, two inch depressed center aisle provides headroom. The Astra Domes are 30 feet long and 10 feet wide. There are reclining seats for 24 passengers in the Astra Domes of the sleeping car, chair car and lounge car, and tables and seats for 18 in the dining car Astra Dome.
- Air Conditioning** - Entire Train, including Astra Domes, air conditioned by Frigidaire.
- Lighting** - Wide use of fluorescent lighting and fixtures of unusual design (also some incandescent auxiliary lighting). Individual directed seat lights for reading.
- Telephones** - Inter-car phone service. Also "Train-to-anywhere" radiophone service in transit, plus plug-in phone while in stations.
- Glass** - Specially developed railroad Thermopane glass, assuring maximum safety and protection from sun glare and heat.
- Amplifying System** - Loudspeakers located in all cars and in each Astra Dome. These are connected with radio-recorder-

STATISTICS - GM Train of Tomorrow

address system for reproduction of radio programs, wire recordings or direct voice transmittal.

Seats

All chair car seats are reclining design, adjustable to nine positions. Lounge car chairs and chairs in the sleeping car rooms are movable, permitting desired groupings. Some of the dining car chairs are hinged like theatre seats, permitting easy access to tables without disturbance to other diners. The chair car seats are of the new "Sleepy Hollow" design, based on research of human measurements by the famed anthropologist, Dr. E. A. Hooton of Harvard University.

Smoking

- Permitted in all sections of the Train. All Astra Dome and chair car seats have built-in ash trays.

Luggage Handling and Storage - Special compartments are provided in the chair car for luggage. These compartments have outside doors through which porter passes baggage with no blockage of aisles and vestibules. Generous storage space is provided for luggage in all rooms of the sleeping car.

Independent Power System - Each car of the Train of Tomorrow is equipped with its own power supply (by means of

STATISTICS - GM Train of Tomorrow

a Diesel engine) which provides for air conditioning, ventilating and lighting, without dependence on power from the locomotive. This assures consistent temperature and lighting under all conditions.

- Trucks** - Easier riding is provided by means of outside swing hanger suspension, a development of Electro-Motive, which reduces sideway to a minimum. This was designed for locomotives and now is being applied to passenger cars. Coil springs and special shock absorbers contribute further to riding comfort.
- Detectors** - Each car is equipped with a detector system with warning lights, in case of overheating of journal boxes.
- Brakes** - All-electric design and wheel slide control.

STATISTICS - GM Train of Tomorrow

LOCOMOTIVE

Type - Standard 2000 horsepower (two 12-cylinder, two-cycle, v-type Diesel engines) General Motors Diesel locomotive, designed and manufactured by Electro-Motive Division of General Motors, LaGrange, Illinois.

Length - 71'

Weight loaded - 318,000 pounds

Truck wheelbase - 14', 1"

CHAIR CAR ("Stardust")

Length - 85'

Weight empty - 147,000 pounds

Weight loaded - 159,000 pounds

Seating capacity - 72 seats (including Astra Dome)

DINING CAR AND KITCHEN ("Skyview")

Length - 85'

Weight empty - 160,000 pounds

Weight loaded - 184,000 pounds

Seating capacity - 52 (including 18 in Astra Dome and 10 in private dining room).

Refrigerating space - 111 cubic feet (equal to 15 standard home refrigerators).

Ice-making capacity - 225 pounds of ice cubes every 24 hours.

Extra power unit - 40 kw., driven by four-cylinder GM Diesel

STATISTICS - GM Train of Tomorrow

engine with installation engineered by
Frigidaire.

All-electric kitchen - First all-electric railroad kitchen.

Equipment includes three ranges, fry
kettles, broilers, plate and cup
warmers, hot food table, coffee urn,
juice extractor, dish washer and
garbage disposal unit.

SLEEPING CAR ("Dream Cloud")

Length - 85'
Weight empty - 150,000 pounds
Weight loaded - 158,000 pounds
Passenger capacity - 24 sitting, 20 sleeping (exclusive of
24 Astra Dome seats).
Accommodations - Two drawing rooms, each with three berths;
three compartments, each with two lower
berths; eight duplex roomettes for single
occupancy. All berths installed lengthwise
of the Train.

Observation - LOUNGE CAR ("Moon Glow")

Length - 85'
Weight empty - 141,000 pounds
Weight loaded - 158,000 pounds

STATISTICS - GM Train of Tomorrow

Seating capacity - 68

Sections - Rear main lounge, cocktail lounge, lower bar and Astra Dome.

Windows - Oversize windows, up to 5', 2" in width.

COMPLETE DESCRIPTIONS OF
TRAIN OF TOMORROW UNITS

THE DIESEL LOCOMOTIVE

A 100-mile-an-hour General Motors Diesel passenger locomotive is the motive power of the Train of Tomorrow. The locomotive is the standard post-war model, designed and manufactured by Electro-Motive Division of General Motors, LaGrange, Illinois.

The power, developed by two 1000 horsepower, two-cycle, 12 cylinder v-type General Motors Diesel engines, is transmitted to driving wheels by an electric transmission, also designed and manufactured by Electro-Motive. The transmission consists of a direct current generator driven directly by each engine, a traction motor for each driving axle and control apparatus. The traction motors are located in the trucks and are geared directly to the axles. Altogether, there are two Diesel engines, two direct current generators and four traction motors in the 2000-horsepower locomotive.

Better Vision

The smokeless, steamless locomotive contributes importantly to unmarred passenger vision through the Astra Domes and the broad expanses of over-sized windows featured throughout the Train of Tomorrow.

More Comfort

The locomotive insures the ultimate in smooth riding for passengers. Starts and stops are hardly perceptible because the entire train is "tight-lock" coupled. This means that the usual six to eight inches of slack between passenger cars, which accounts for the bunching and jerking when cars start one at a time, has been eliminated. The Train of Tomorrow's Diesel locomotive has such high initial tractive power that it can start the entire train at once. The end car starts moving at the same moment as the locomotive, and there is no "piling-up" when stops are made.

Speed with Safety

Two major design features contribute to the locomotive's stability at high speeds, both on the straightaway and on curves. First, the center of gravity of the GM locomotive is low. Second, the Electro-Motive Division has developed what is known as "outside swing hanger suspension". This has been a feature of GM locomotives for a number of years. This system of distributing the weight of the car body to the truck springs reduces sidesway to a minimum. Powerful shock absorbers give further stability. The locomotive has short, flexible wheel bases (14 feet and one inch per

truck), which permits the trucks to follow curves with maximum ease and safety.

Cab Efficiency Features

Every possible feature contributing to the alertness, comfort, and convenience of the engineer and fireman is provided in the locomotive cab. Comfortable, upholstered swivel arm chairs in the nose of the locomotive lessen fatigue. The short nose and wide front and side windows afford the Train crew a completely unobstructed view of the right-of-way and approaches. Cab windows are equipped with powerful defrosters and windshield wipers. Controls are similar in function to those of the steam locomotive, thereby assuring that veterans of steam operation may competently operate Diesels after only one or two trips with an instructor. These controls are located so that they may be operated with minimum exertion and with the most natural movements of arms and hands. The cabs are soundproofed to such a degree that the engineer and fireman may talk in tones hardly louder than that used in normal conversation.

The locomotive is equipped with gauges, lights and bells that register operating information necessary to safety and efficiency.

CHAIR CAR ("Star Dust")

Comfort, lighting, color and utility of space are predominant features of the Train of Tomorrow chair car.

The chairs are the widely known "Sleepy Hollow" design made from studies of human measurements by Dr. Earnest A. Hooton, noted anthropologist of Haryard University. Each seat may be adjusted to nine positions and each has an adjustable footrest.

The car has a seating capacity of 72. There are 24 seats in the Astra Dome; 28 in the forward and rear main sections, and space for 20 in the depressed lower level beneath the Astra Dome.

Chair Car - Lower Level Section

The sunken lower section has three semi-private compartments, two of which seat seven persons and the other six. These are ideally arranged for occupancy by groups of friends or families.

The two larger spaces are equipped with seats and sofas of brown Ardmore upholstery. The smaller center compartment has two sofas covered in super needle point blue. Peach carpeting is used in all three spaces. The ceilings are light blue and the wall space, except near the windows, is light grey peach. Walls adjacent to the windows are covered with stain-resistant Varlar material in a

plaid pattern of grey, orange, rust and light peach. A Flutex glass panel above the sofas continues the partitioning of the compartments to the height of the rail bordering the passageway. The passageway separates the area from the remainder of the car. As an accentuating decorative note, the top of the railing is yellow.

Chair Car - Forward and Rear Main Sections

The forward section of the chair car has 16 chairs, arranged in pairs on each side of the aisle. The rear section has 12 chairs. The chairs are reversible so that four persons may face each other, if desired.

The ceiling of these sections is yellow, with wall sections of grey and yellow. A special wear-resistant Es Es material, to withstand rubbing from luggage and general scuffing, is used on the lower wall sections. Grey and yellow draperies of a Chinese lattice design, and a diamond pattern of grey and green seat upholstery are used.

Direct light is used down the center of the car, with individual beamed lights directed at each chair for reading. Each seat is equipped with a built-in ash receiver. The stairway partition houses a locker for section tables, water cooler, intra-train telephone, porter's seat, loud speaker, chimes and a coat locker for persons using the Astra Dome.

Chair Car - Astra Dome

Walls and metal structure of the chair car Astra Dome are light tan. The bolster roll on the front dash is upholstered in snuffed London glaze leather of grey green. The carpeting is jade green and the chair coverings Rainier rose. To insure unobstructed vision and because of the roof height, chairs in the Astra Domes have a shorter back than those elsewhere in the Train.

Chair Car - Dressing Rooms

There are two commodious, attractively decorated dressing rooms at the rear of the chair car and two smaller lavatories at the front.

WOMEN'S DRESSING ROOM - Three wall sections of the women's dressing room are mirrored. The upper walls are peach grey and the ceiling and dressing table shelf yellow. Stainless steel wainscoting is used on the lower wall sections. The room is equipped with two wash basins, a dental lavatory, dressing table shelf and chair, covered in a blue-grey nylon fabric. A toilet room connects. Cabinet space is recessed above the window. The floor covering is red Es Es material.

MEN'S DRESSING ROOM - The toilet room, wash basins and dental lavatory are the same as in the women's dressing room. The ceiling and two walls are a light grey-blue, with stainless steel wainscoting. The other

two walls are covered with large-patterned Gay '90s V-board. Electrical outlets for toilet appliances are featured in both dressing rooms.

Chair Car - Luggage Compartments

An important convenience feature of the chair car is the two large luggage compartments, located on either side of the rear exit. Shelves are arranged so that luggage may be stored in accordance with destination arrivals. It is unloaded quickly by the porter through an outside hatch, eliminating blocking of aisles and doors. The compartments are of sufficient size to accommodate normal hand baggage of the car's capacity.

Chair Car - Alternate Uses of Space

Designers point out that the lower level section of the chair car might well be adapted for special appointments other than for seats. Suggestions, any one of which could be arranged without basic change in the car's structure, have included a spacious women's lounge with equipment for caring for small children, including bottle heating facilities and refrigerated storage for infants' formulas; a playroom for children on long distance trains; a game and recreation room or a snack bar.

DINING CAR AND KITCHEN

("Skyview")

In appearance and utility, the Train of Tomorrow dining car has abundant innovations. This is the first railway dining car to be equipped with an all-electric kitchen and pantry.

There is table service on three levels. In the Astra Dome one may dine under the stars in a roof garden-like atmosphere. There are other tables at conventional level. The third section, a sunken area underneath the Astra Dome, includes a private dining room.

Wide vision windows add enjoyment to dining. A service pantry is arranged so that service from the kitchen to the two lower levels is efficient. One section of the kitchen is directly beneath the Astra Dome so that waiters may serve food by means of a dumb waiter.

Capacity of the dining car is 52.

Dining Car - Main Section

The main dining car section, seating 24 persons, is at the rear of the car with the stairway to the Astra Dome opening off it. One side of the car is made up of tables for two, and the other side of tables for four. The smaller tables are triangular and have upholstered built-in wall seats. The same type of seats are used on the wall side for the larger tables, with two movable chairs opposite. Design of tables and seats permits easy access to all seats without disturbing others at the tables. A built-in service island for menus, silverware and water pitchers is located between each two tables.

The section has peach carpeting, with ceiling and walls of parchment color. Walls and partitions at the end of the car and the Astra Dome stairway (near the steward's headquarters) are paneled in natural color oak flexwood, protected by transparent lacquer. Upholstery of the built-in seats and chairs is super needle point chartreuse. Draperies are designed in pistachio, dark blue and chartreuse on parchment background. Two panels on the rear wall are edge-lit lucite. The accenting background color of these and of the entrance door matches the dark blue color in the draperies. There is direct overhead lighting from circular ceiling fixtures, which may be dispensed with when a softer lighting effect is desired. This effect is possible by means of indirect lighting concealed in satin-finished stainless steel troughs just above the window line.

DINING CAR AND KITCHEN

The steward's compartment is equipped with refrigerator, an intra-train telephone, cigar and cigarette compartment, cash drawer, and beverage storage lockers.

Dining Car - Astra Dome

Capacity of the Astra Dome dining room is 18. The aisle is off-center, providing tables for couples on one side and for groups of four on the other.

The stairway carpeting is Lido sand. The walls, overhead structure and serving cabinets are light grey-blue. Seats are covered in brown leather, and the backs of the chairs in a brown sandalwood fabric. All chairs are secured, with bench backs, but at the larger tables the seats on the aisle tip up, as do theatre chairs, permitting diners to reach the inside seats with ease. There is a built-in lamp at each table as well as overhead lighting.

The forward space is given over to service from the dumb waiter. The furnishings include a china locker, refrigerator, coffee-maker, toaster, silverware racks, bottle receptacles, ice well, sink covers and storage space. Efficient designing permits all of this in an area ten by eight feet.

Dining Car - Private Dining Room

In the space beneath the Astra Dome is a private dining room, seating 10 in two groups of five, and also the pantry from which the private dining room and the main dining room are served.

DINING CAR AND KITCHEN

The dining room seats are built-in, with the exception of two movable chairs that may be fitted in against the wall to become a section of the built-in seats. The outer built-in seats are hinged like theatre chairs, permitting easy access to the inner seats.

Upholstery is a super needle point coral and the carpeting is turquoise. In the outer passageway, the carpet is turquoise with a peach inlay design on the ramps. Ceiling of the private dining room is ivory and the walls are covered with Varlar stain-resisting material in a red, green and blue floral pattern. The sunken compartment is reached by an illuminated glass step from the side passage.

Dining Car - Kitchen and Refrigeration

Cooking and refrigerating equipment on the Train of Tomorrow are of newest design and are arranged for maximum efficiency.

The kitchen is all-electric. There are three ranges, fry kettles, broilers, plate and cup warmers, hot food table, coffee urn, juice extractor, dish washer and garbage disposal unit, all operated by the Diesel-generated power originating within the car itself.

The car has unusual facilities for storage of large quantities of fresh and frozen foods. Eleven separate refrigerated fixtures provide 111 cubic feet of storage space, or more than would be provided by 15 standard size household refrigerators.

DINING CAR AND KITCHEN

A refrigerator at the right of the forward vestibule, where it opens into the kitchen, provides a large food storage space and also has capacity for freezing 225 pounds of ice cubes every 24 hours. Within the kitchen is an under-the-counter chef's refrigerator, a fish refrigerator and a frozen food storage cabinet.

There are two service refrigerators in the service pantry, as well as cabinets for the storage of ice cream and ice cubes. A refrigerated salad counter is also provided. There is a refrigerator in the Astra Dome and still another, with capacity for eight cases of bottled beverages, in the steward's compartment.

Four compact Frigidaire condensing units, concealed at different locations in the dining car, supply dependable refrigeration to the numerous units.

While electrical requirements for each of the Train of Tomorrow cars is supplied by a Frigidaire Diesel power unit, the extra needs of the dining car are provided for by an additional 40 kw auxiliary power unit, driven by a four-cylinder GM Diesel engine, with installation engineered by Frigidaire. This extra unit is installed in a soundproof compartment within the car and is operated only when additional power is required.

The kitchen crew entrance to the dining car is forward, off the main passage. Here is located the crew lavatory and a low door that serves as a supply hatch. Another such door opens directly into the kitchen from the other side of the car.

SLEEPING CAR

("Dream Cloud")

Design of the sleeping car of the Train of Tomorrow provides approximately 50 percent more free floor space in rooms during daytime occupancy than in ordinary sleeping cars. The car has sleeping accommodations for 20 persons. In addition to chairs and sofas in the individual compartments, drawing rooms and duplex roomettes, 24 seats are available for passengers in the Astra Dome.

The sleeping car is comprised of three compartments, each with two berths; two drawing rooms, each with three berths, and eight duplex roomettes, each designed for single occupancy.

All berths in the sleeping car are installed lengthwise of the Train.

Sleeping Car - Compartments

The three compartments, each with two lower berths, are on the lower level of the sleeping car, directly beneath the Astra Dome. They are reached by a step down from the main aisle to a short passageway.

During the day, one of the berths is converted into a comfortable sofa. The other berth folds into the wall, providing space for a folding upholstered lounge chair. The chair faces the four-foot, seven-inch window and at night is fitted beneath the pull-down berth. Each compartment is equipped with a three-quarter length door mirror and a smaller mirror over the wash basin. An aisle space between the berths at night permits access to the wash basin and toilet.

Ample baggage space for each compartment is provided beneath the sofa and the full length above the sofa. A shoe compartment is also provided.

COMPARTMENT A has peach carpeting, a ceiling of light warm blue-grey, and walls in two shades of grey. Draperies are of Shangri-la design of Malacia pink. The sofa is upholstered in super needle point turquoise, and the chair in super needle point rose.

COMPARTMENT B has a dove taupe carpet and walls and ceiling of grey cream and light blue. The draperies have

SLEEPING CAR

a red and black sky-writing pattern. The sofa and chair are upholstered in Rainier blue, with a sofa bolster roll of super needle point grey.

(Compartments A and B may be arranged en suite)

COMPARTMENT C has carpeting in Araby silver-grey and blue and grey draperies in a Gladstone floral pattern. The ceiling and side wall are light ivory and the end wall golden-cream. The sofa is upholstered in nylon taupe and the lounge chair in Bay Ridge gold.

As a visual aid to safety, as well as a decorative note, doorways to compartments and drawing rooms are varied in color -- light yellow, light green, medium blue-green and medium grey-blue.

Sleeping Car - Drawing Rooms

The two drawing rooms are located forward in the car, and will connect en suite if desired. Each has three berths, two upper and one lower. The rooms are so arranged that there is space for two upholstered lounge chairs, even when all berths are made-up. During the day, the lower berth converts into a sofa. There is a lavatory and toilet room opposite the entrance to each drawing room. Over this room and the entrance area is a larger baggage space, extending the full width of the room. Each room has a wardrobe closet. There are two Circuline lamps of fluorescent tubing overhead, and four reading lights at lower levels. The window is five feet, two inches long.

SLEEPING CAR

DRAWING ROOM D is carpeted in Araby silver-grey, the ceiling and portions of the walls are a medium tone of blue-green, with the remainder of the walls a light warm grey. The draperies are a Cape Cod floral pattern in shades of red and green on white background. The sofa and one chair are covered in super needle point green, and the other chair in super needle point of egg plant color. Wood sections of the chairs are of light bleached walnut.

DRAWING ROOM E has carpeting of Persian rose. The ceiling is light beige and the walls light beige and blue. The sofa is covered in super needle point Parma blue, and the two chairs in sandalwood color of the same fabric. The draperies are a Chinese lattice design in yellow and grey.

Sleeping Car - Duplex Roomettes

In the rear section of the sleeping car are eight rooms of the new duplex roomette design, each for single occupancy.

These roomettes are constructed so that the level of one is two steps above the aisle, while the adjoining one is level with the aisle. The steps are arranged in such a way as to eliminate hazard. In the raised-level roomettes, the berth fully made-up pulls down from the wall at one end. In the lower roomettes, the berth pulls out at floor level, pushing away, when not in use, drawer-fashion under the floor

SLEEPING CAR

of the adjoining roomette. Both berths can be easily and quickly manipulated without aid from the porter. Each roomette is equipped with wash basin, toilet and space for baggage storage.

Central passageway of the duplex roomette section is carpeted in Persian rose (as is the remainder of the sleeping car passage), except on the ramps, where the rose is inlaid with silver-grey. Wainscoting of the passage is leather of a London glaze grain finish of medium grey-green. The ceiling and upper wall sections are a light cream color. Portieres outside the sliding doors of each roomette are ashes-of-roses color.

Walls of the upper roomettes are in ivory, and the upholstery fabric in super needle point blue-green. Trim is in satin finish stainless steel. The carpets are Lido sand color.

The lower roomettes have ceilings and walls of light blue-green carpets of jade green upholstery in super needle point brown.

Sleeping Car - Astra Dome

The Astra Dome stairway wall, the partition and overhead structure are finished in light blue. The stairway and aisle carpeting is Araby dove taupe. The forward dash is covered with Imperial antique gold leather. The seats are upholstered in super needle point blue. Beside the stair of the Astra Dome, on the side opposite the aisle, is the porter's compartment, with loud speaker, chimes and berth.

OBSERVATION - LOUNGE CAR

("Moon Glow")

The lounge car has four different levels, with a total of 68 seats, more than half of which are movable, permitting flexibility of group formations as in clubs, homes and on shipboard.

The car is resplendent in color, lighting and appointments and every effort has been made to provide a variety of diverting and surprising travel innovations.

The Astra Dome, while equipped with 24 reclining seats, would be capable of easy variation for use on transcontinental trains. Tables, sofas and lounge-type chairs could be installed instead of the standard-type seats.

The rear cockpit of the lounge car has only two small columns, permitting a virtually unobstructed range of vision. Most of the furnishings in this section are movable.

Directly beneath the Astra Dome, in a sunken area, is the Top O' the Rail Bar with wall seats, chairs and tables forming an intimate and informal cocktail lounge.

The forward section is given over to a somewhat larger and more formal cocktail lounge. Spaciousness is achieved by opening part of the wall between this room and the passageway, at about eye level when seated.

Lounge Car - Rear Observation Section

Viewed from the center of the car, the rear observation lounge has an oval appearance, with rich dark color in the carpeting and wainscoting. The overhead tones are lighter, while furnishings are in turquoise and grey. Centered in the glass-enclosed, rounded cockpit at the rear, which supplants the outmoded observation platform, is a door. Triangular, window-high cabinets on either side provide storage space for a plug-in phone for use at station stops, and car supplies and equipment. The backs of the four fixed cockpit seats contain built-in magazine racks designed to serve the entire car. Most of the other chairs in this section are movable.

The carpet is Araby peach. The walls (to window height) are of red Velvean leather, with satin stainless steel moulding and trim. Draperies of a vari-colored Persian tree design on a light background conceal all of the wall space between the extra-wide windows, giving the illusion of complete glass encirclement. The upper walls are grey and the ceiling light ivory. Light is both direct and indirect. Lounge chairs are upholstered in turquoise and super needle point grey.

At the end of this rear lounge, recessed beside the Astra Dome stairway is a desk with radio telephone, clock, radio control and wire recorder apparatus. Located there also is a locked-away microphone connected with loudspeakers throughout the Train. These may be used to page passengers, to

OBSERVATION - LOUNGE CAR

announce station arrivals or for announcements of any nature. The radio serving each car is for pickup of regular radio programs or for the transmission of wire recorded musical programs.

Lounge Car - Lower Section

The lower section of the lounge car, located beneath the Astra Dome, houses "The Top O' the Rail", an intimate cocktail room and bar, accommodating 10 persons. The small bar, at the rear, serves all sections of the car. It has Weltex serriated wood paneling, with a dark top and a metal and picture glass back bar and trim. The interior wall finish is jade green with darker carpeting. Along the outer wall is an unusual tropical design of banana leaves in three tones of green. Chairs in the lower lounge are upholstered in honey-colored leather. Tables have a Formica top, hard and non-stainable, with attractive inlaid designs, each different. The wall covering, a Varlar material, is stain-proof.

Lounge Car - Forward Lounge

The forward lounge section is reached either by several steps up from the lower lounge or by the passageway to the front entrance of the car. As in the lower lounge, the partition between the room and the passage is cut away at about shoulder height. Built-in seats are upholstered in

OBSERVATION - LOUNGE CAR

chartreuse nylon with bolsters of rose nylon. The draperies emphasize the tropical motif. The inner walls are silver-grey and the carpeting is the same dark shade of green as in the lower lounge. Stainless steel trim is used on the sides and tops of the passageway openings. Lighting is from circular ceiling fixtures.

Lounge Car - Astra Dome

The stairway and aisle carpeting of the Astra Dome is Araby peach. The dashboard and arms and bolsters of the chairs are covered in turquoise leather and the seats of the chairs in fabric of the same color. The walls and upper dome structure are grey-tan.

Lounge Car - Lavatories

Special decorative treatment, in keeping with the luxurious atmosphere of other sections of the lounge car, is utilized in the lavatories. The women's room has two walls of yellow, grey and green V-board in an Adam and Eve pattern. The other two walls are light yellow and grey-green. The floor covering is an Es Es material of coral.

The men's lavatory has an Es Es floor of grey-blue, two walls of V-board with a simulated matte finish, and two walls painted light yellow and rust.

AIR CONDITIONING AND REFRIGERATION

From its background of 8,000,000 refrigeration and air conditioning products designed and manufactured in its quarter-century of experience, Frigidaire has contributed to the Train of Tomorrow the most advanced equipment of this kind ever produced, a unique integration of three components:

1. POWER PACKAGE - A compact, self-contained, Diesel-powered generator providing dependable current in ample quantities;
2. AIR CONDITIONING - Equipment which is substantially like installations now in wide use, but with basic improvements to meet increased needs resulting from the greatly enlarged expanse of transparent areas in dome-cars;
3. COMMERCIAL REFRIGERATION - Units of highest standards for food preservation and water and beverage cooling, of compact design, and utmost dependability, particularly important requisites for railroad cars.

Power Package

To understand the significance of this new unit, it is necessary to realize that modern railroad usage of electricity

AIR CONDITIONING AND REFRIGERATION

has vastly multiplied former requirements. On a single car, today, facilities may call for as much as 60 kilowatts of generating capacity -- enough to light 100 average American homes.

When air conditioning consisted of air blown by fans over cakes of ice in under-car bins -- that were re-filled by platform workmen at every station stop -- the demand for electricity in each car was adequately met by generating equipment operated by rotation of axles. This system had the virtue of simplicity, but was inefficient. Moreover, the locomotive was compelled to fight extra drag, with resultant slower travel and frequent dimming or flickering of lights.

The solution was developed as the Power Package. An independent Diesel engine, with its own generator, is mounted underneath each car of the Train of Tomorrow, making each car self-sustaining so far as electrical power is concerned. It permits any car to be uncoupled from the Train without interference with lighting, heating, cooling, ventilating, refrigeration, use of radio or electrical outlets for hand appliances such as razors, hair curlers, and so on. As a safeguard against breakdown of any unit, connections are furnished for tapping into the circuit of an adjoining car.

An outstanding feature of the power package is its mounting on rollers. The entire unit may be rolled out for

AIR CONDITIONING AND REFRIGERATION

inspection and maintenance, and may be replaced with a reconditioned unit in less than 60 minutes.

Key device is the "split-alternator" - simply described as two alternating current generators built on a common shaft and in a common frame - driven by a 3-cylinder, 1200-RPM engine. This ingenious arrangement enables a 15 kilowatt generator to furnish 220-volt, 60-cycle current for air conditioning and refrigeration equipment, while a 10 kilowatt generator furnishes 115-volt, 60-cycle current for lighting, ventilation, radio, electric shavers and other uses, plus reserve for an adjoining car if needed.

Mounted on the side of the split-alternator housing, driven from the extended shaft by "V" belts, is a 38-volt, 1800-RPM direct current generator providing two to three kw as required. This same D. C. generator excites the fields of the split-alternator, a function necessary for the production of alternating current, and also charges the storage battery used for starting the engine, for controls and emergency lighting.

The Diesel engine that is the original power source for the foregoing is tilted on its crankshaft axis for better roadbed clearance, and to give accessibility to valve rockers, fuel injectors, oil filler tube, governor and other parts. The unit is fully enclosed beneath the car, protected from dirt and extreme temperatures,

AIR CONDITIONING AND REFRIGERATION

ventilated by clean air drawn from the interior of the car, rubber-mounted to deaden sound and dampen vibration, and equipped with a sealed-in cooling system that requires no servicing.

Here is a brief tabulation of the Power Package's advantages over axle-driven systems:

1. Reduction of load on locomotive, saving as much as 600 horsepower on a 12-car train, permitting longer trains and rapid acceleration for faster schedules;
2. Saves 3500 pounds or more in batteries per car;
3. Full and constant electrical capacity regardless of whether car is rolling or in storage;
4. Permits use of highly reliable and efficient A. C. motors with minimum maintenance;
5. Permits use of standard A. C. devices, particularly important in dining and lounge cars where most common appliances are used;
6. Permits use of cool, efficient fluorescent lighting in harmony with modern design of cars, without auxiliary converting or voltage regulating equipment;

AIR CONDITIONING AND REFRIGERATION

7. The 2-cycle Diesel engine, improved and tested under war conditions, provides highest reliability with minimum maintenance;
8. Maintenance facilities and personnel for Diesel locomotives can be used on these power units;
9. The same, non-hazardous, readily available, low cost fuel used in the Diesel locomotive is used in the unit, and exhaust fumes are non-toxic.
10. Simple removability of unit.

Air Conditioning

A 10-ton-cooling system is installed in each car, complete with conditioner, ducts, compressor and condenser units. It produces a cooling effect equal to the melting of 10 tons of ice per day, six-tenths of it applied to the lower portions of the cars and the remainder to the Astra Domes, which, while relatively small, require proportionately greater cooling power because of their exposure to the sun.

All units of the Frigidaire-designed and built system are engineered for matched operation and highest efficiency, but particularly important in this respect are the flooded-type condensers which boost efficiency enough to produce the extra cooling required for the Domes without use of additional

AIR CONDITIONING AND REFRIGERATION

electrical power.

The Conditioner cools or heats air and circulates it. Cooling is accomplished by evaporation of Freon, a GM-developed refrigerant, odorless and non-toxic, which absorbs heat from its surroundings as it changes from liquid to gas. The refrigerated coils reduce humidity by attracting moisture from the air to their cool surfaces. Heating is supplied by a steam coil within the unit over which air is driven.

Ducts ingeniously built into the varying structures of the cars convey the conditioned air to all parts of each car and deliver it, without drafts.

Compressor, Condenser Units. The compressor pumps heat-laden gas from the cooling unit and compresses it to concentrate its heat. The condenser dissipates the heat in converting the gas back to liquid form, and returns it to the evaporator cooling unit.

Controls are automatic, regulating temperature and humidity as desired, in all seasons, in all climates.

Refrigeration

Modern, spacious refrigerator fixtures throughout the Train of Tomorrow operate automatically to keep foods and beverages

AIR CONDITIONING AND REFRIGERATION

fresh, nutritious and appetizing.

The temperature range of these cold cabinets and fixtures varies with their purposes, ranging from 50 degrees F. for drinking water to zero F. for frozen foods.

Cool, fresh water is constantly circulated to faucets in the rooms of the sleeping car from a special tank-type cooler concealed in the rear vestibule and equipped with its own condensing unit. The chair car has an individual water cooler. Both are three-gallon-per-hour capacity.

Generous supplies of ice cubes and cold bottled beverages contribute to the popularity of the cocktail lounge in the observation car. The large cabinet built into the back bar is cooled by a condensing unit under the bar.

Dining Car Refrigeration

Kitchen, pantry and Astra Dome of the dining car offer the finest in modern food refrigeration on wheels. Eleven separate refrigerated fixtures provide 111 cubic feet of storage space for fresh and frozen foods - more than would be provided by 15 standard-size household refrigerators.

One fixture, at the right of the forward vestibule where it opens into the kitchen, affords a large food storage space, and capacity for freezing 225 pounds of ice cubes every 24 hours. In the kitchen is an under-counter chef's refrigerator, a fish refrigerator and a frozen food storage

AIR CONDITIONING AND REFRIGERATION

cabinet. There are two service refrigerators in the service pantry, as well as cabinets for storing ice cream and ice cubes. To assure fresh, crisp salads, there is a refrigerated salad counter. The Astra Dome has its own refrigerator, and another, large enough for eight cases of bottled beverages, is located in the steward's compartment.

Four compact Frigidaire condensing units, concealed in different locations in the car, supply dependable refrigeration to the numerous fixtures.

The dining car's extra demand for ample electrical power is guaranteed by an additional 40 kw auxiliary unit driven by a 4-cylinder Diesel engine, installed in a soundproof compartment in the car and operated when the power load of ranges, fryers, beaters and other appliances in the all-electric kitchen is heaviest.

TELEPHONE SERVICES

In addition to telephone installations that permit easy communications, through plug-in lines, while the Train of Tomorrow is immobile at a station, newly perfected radiophone equipment is aboard the Train.

Similar to shipboard installations, this "ship-to-shore" type equipment enables completion of calls by combination of radio and local or long-distance telephone lines. Thus, while rolling along at 100 miles per hour or less, passengers may call home, office or friends anywhere in America or in the world -- provided the train is within 25 miles of the 30 or more large cities having mobile telephone installations. (More cities are scheduled to gain such equipment shortly.)

Location, Operation

Conveniently situated in the lounge car, the mobile telephone instrument is the familiar cradle-type, but it has a push button in its handle. The button must be depressed while the passenger is speaking, released when he listens.

To make a call, the passenger lifts the instrument and listens, to make sure the radio channel is clear, then presses the push button for two or three seconds, and releases it. The operator cuts in with the name of her city

TELEPHONE SERVICES

and her identification: "Mobile service operator". The passenger gives the number of the telephone he wants to reach and also the number of the train phone. Usually the connection takes no longer than a standard call over regular lines.

Such calls may be made at any time the Train of Tomorrow is within the 25-mile range, and a single call could last as long as the Train remained within range. For instance, a passenger on a Chicago-New York trip in the vicinity of Cleveland could call San Francisco and talk for about an hour -- the time taken by the Train to pass through the 50-mile stretch west and east of Cleveland.

For long distance calls, the rate is the regular long distance person-to-person charge. An extra charge is made for local calls.

Incoming Calls

Subject only to the same limitation, as to being within range of one of the 30 equipped cities, passengers on the Train may receive calls.

The person wishing to reach the Train first asks for the long distance operator, then for the mobile telephone service operator who will put the call through. The caller should inform this operator of the approximate location of the train. As needed, intermediate telephone lines will be used to route the call to the city nearest the Train, then

TELEPHONE SERVICES

for the last link to the Train, the circuit utilizes FM (frequency modulation) radio which is static-free, even during electrical storms or under bridges and station structures. Passengers may be called to the phone from any part of the Train by loudspeaker announcement.

Technical Equipment

A 14-inch antenna is mounted on the roof of the lounge car for the short-wave operation of this system. The Train transmitter operates on 157.89 megacycles, the receiver on 152.63 megacycles.

Intra-Train Telephoning

While the Train of Tomorrow is also equipped with telephones in all cars and locomotive cab for car-to-car calls, this system will be reserved for use by members of the crew.

GLASS IN ASTRA DOMES AND WINDOWS

Surrounded on all sides and above by glass, the Train of Tomorrow passenger is assured of maximum safety and of protection from sun, heat and glare.

Since the Astra Domes and generous window spaces throughout are dominant features of the Train of Tomorrow, GM engineers realized in the early design stages of the Train, that a glass to meet all of the above-mentioned specifications must be used. With the assistance of technicians of the Libbey-Owens-Ford Glass Co., a special railroad Thermopane glass was developed.

What Thermopane Is

Such glass takes on significant meaning when the fundamental principle of Thermopane is understood. Regular Thermopane is an insulating unit consisting of two panes of glass separated by a dehydrated air space hermetically sealed in at the factory by a metal-to-glass bond. Based on the familiar storm sash principle of wintertime window insulation, such double-glass units increase the efficiency of air-conditioning in summer and heating in winter - both important factors in human comfort.

Heat Absorbed, Glare Reduced

The Thermopane glass units used in the Train of Tomorrow Astra Domes are made up as follows:

1. The outside sheet is heat-absorbing, glare-reducing polished plate glass and is tufflexed (heat-treated or tempered) to assure extra strength.
2. The inside glass, separated from the outside sheet by a quarter-inch dehydrated insulating air space, is made up of special laminated safety glass (two panes of glass with an inner layer of plastic similar to that used in automobile safety glass).

This multi-pane unit is fastened or sashed into the Astra Dome superstructure by special construction which insures maximum safety. The extra thick plastic of the inboard laminated glass extends beyond the edges of the glass about one inch and has imbedded in it a metal collar for additional strength. This Metl-flex extension, engineered by Libbey-Owens-Ford during the war, is then encased in rubber for a flexible cushion against torque stress. Then the over-all assembly is securely fastened to the car frame.

Glare is substantially reduced by the combination of the heat-absorbing plate glass of the outboard sheet, which is somewhat darker than regular plate glass, and by the special glare-reducing, extra-tough plastic of the laminated safety glass.

The outboard glass contains a special ingredient which absorbs a considerable percentage of the infra-red or heat-

carrying rays of the sun, re-radiating the heat of the sun to the outside of the car, thus assisting the insulating qualities of the glass in maintaining comfortable temperatures within the car.

Built-In Safety Features

The Thermopane glass in the Train of Tomorrow affords maximum safety in both its construction and installation.

By heat-tempering the outside sheet of glass, it becomes three to five times stronger than regular plate glass. This, coupled with the inner laminated safety plate glass, is given additional strength by the Metl-flex sashing which tends to "give" but not shear at the fastenings under impact. Under severe tests, the special railroad Thermopane units have resisted hurled objects even more effectively than steel plates used in the Train of Tomorrow roofs.

Thermopane utilized in windows of the main body of the cars is virtually the same as that used in the Astra Domes, but the units are mounted in a newly designed rubber gasket instead of the sash common to most train windows. By this method, it was possible to provide a greater area of glass, thereby affording passengers a considerably increased range of vision.

As installed in the Train of Tomorrow, the Thermopane units eliminate fogginess, condensation and drafts, enemies to vision and comfort in train travel.

ENGINES AND GENERATORS

Diesel engines built by the Detroit Diesel Engine Division of General Motors, and motors and generators built by the Delco Products Division, are basic components of the independent power sources engineered by Frigidaire.

Minor changes in the standard lubricating system of the Diesel engines were required to insure proper oiling of all moving parts when roadbed clearance dictated angular mounting of the engines beneath the cars.

The engines are water-cooled by a radiator mounted outside the engine enclosure, equipped with an electrically operated fan powered by a Delco motor. Mufflers are also mounted externally. Up to 500 cubic feet of air per minute, taken from the interior of the car at a temperature of 80 degrees F., is drawn through the generators and discharged into the engine compartments. This air improves engine operation by providing optimum environment and warm air for the engine intake. A small fan on the crankshaft ventilates the engine enclosure. These precautions for cooling and heating assure maximum performance in sub-zero winter or 130 degree summer heat.

Automatic overspeed, low oil pressure, and high temperature safety devices have been provided. Manual stopping and starting controls are installed in both engine compartment and interior of the car.

Hundred-gallon fuel tanks under the car floors feed the

ENGINES AND GENERATORS

Diesels and permit a transcontinental run without refueling.

A 4-cylinder Detroit Diesel and $37\frac{1}{2}$ kw Delco generator provide supplementary power for the all-electric kitchen in the dining car.

RIDING COMFORT AND SAFETY

Axles, truck frames, swing hangers, coil springs and shock absorbers are technical devices that seldom attract the attention of travelers. In the Train of Tomorrow, they include some revolutionary advances that warrant general interest, for they contribute vastly to both comfort and safety. Through virtual elimination of sideway, for instance, passengers are spared discomfort and hazards are reduced.

The Train of Tomorrow incorporates two distinctive comfort-safety improvements:

1. Outside swing hangers, a development of the Electro-Motive Division of General Motors;
2. Roller bearing journal boxes of advanced design produced by the Hyatt Bearings Division of GM, which include an arrangement permitting lateral movement of axles within limits established by thrust blocks mounted on synthetic rubber cushions.

Outside Swing Hangers

In the standard suspension of railroad cars, swing hangers

are mounted inside the truck frame, 56 inches apart at the lower ends. In the new design, they are mounted outside, 96 inches apart. The difference is similar to the difference in your sure-footedness when you stand with feet together and with feet wide apart.

Moreover, the hangers taper toward the top, causing an automatic "banking" on curves, proportioned to the speed of the train and the degree of the curve. The centrifugal force that formerly was upsetting to passengers is thus harnessed to increase stability.

Not only does this design cut sidesway, it materially increases the ability of the truck to dampen out shocks from imperfect track alignment, rough roadbed, sharp curves and similar conditions. But sidesway is the most important factor affected. In a test, an old-style car swayed 28 inches at roof level (14 inches to either extreme from the mid-point); the new car swayed less than six inches (3 inches to either extreme). The development is particularly important for cars with Astra Domes which give added weight at a higher level. These hangers have been used with signal success on General Motors Diesel locomotives for a decade.

They have also been installed by some railroads to overcome unusual problems. One road utilized the hangers to reduce sidesway in narrow tunnels where previously cars

RIDING COMFORT AND SAFETY

had actually scraped against tunnel walls and cars going in the opposite direction.

Roller Bearing Journal Boxes

The fight against friction is a ceaseless struggle in railroading. Hyatt Bearings Division has been a stout ally in this campaign. For 20 years Hyatt has been one of the largest suppliers of roller bearing journal boxes to U. S. railroads.

In the Train of Tomorrow, Hyatt journal boxes are standard on the trucks of the locomotive and all the cars - and the installation is Hyatt's newest design.

The new bearings require oiling only every 20,000 miles, and will operate satisfactorily at speeds far in excess of any common on existing railroads. Hot boxes are virtually unknown, due to the high precision manufacture of these components from special alloy steel and bronze.

Lateral Axle Movement Snubbed

Snubbers on automobiles are familiar to most people. They permit vertical movement when wheels strike bumps, but apply a braking action that cushions the shock.

RIDING COMFORT AND SAFETY

A similar influence is exerted on the sideward motion of the axles of trucks on cars of the Train of Tomorrow through a new development of Hyatt. The controlled lateral movement of the axles is cushioned on a synthetic rubber member which is interposed between the axle thrust block, which engages the end of the axle intermittently, and the front or outside cover of the journal box.

Passage through a track switch offers an excellent opportunity for this lateral-snubbing to show its advantages. The former, jerky thrusting from side to side is gentled down to a mild cradle-sway.

Hyatt journal boxes equipped with this snubbing action have proved their worth in hundreds of thousands of miles of service on General Motors Diesel locomotives, but are used for the first time on railroad passenger cars on the Train of Tomorrow.

Other Effects

The brake system of the Train of Tomorrow includes all electric features and wheel slide control devices that smooth stops.

Coil springs and four Delco direct-acting shock absorbers on each car multiply the comfort and safety factors built up in the new truck structures. An extra shock absorber installation on the final car prevents "whip-cracking" action.

RIDING COMFORT AND SAFETY

Aside from increased comfort and safety, the new equipment contributes economy of operation through greater wheel tread and flange life derived from reduced stresses.

ANSWERS TO MOST FREQUENTLY ASKED QUESTIONS

ABOUT THE

GENERAL MOTORS TRAIN OF TOMORROW

Q - HOW BIG IS THE TRAIN?

A - It is 411 feet long. It is made up of a GM Diesel locomotive 71 feet long, and sleeping, dining, lounge and chair car, each 85 feet in length.

Q - IS THE TRAIN ESPECIALLY LIGHT IN WEIGHT?

A - It is light enough for economy, heavy enough for comfort and safety. It weighs about 400 tons empty and about 30 tons more when loaded. This is somewhat heavier than most standard-designed modern trains, because of the Astra Domes.

Q - HOW MANY PASSENGERS CAN THE TRAIN CARRY?

A - The passenger capacity is 216. The design of the Train gives a distinct feeling of extra roominess.

Q - IS THE ASTRA DOME SAFE AND STRONG?

A - The dome framework is of high-strength steel, and the Thermopane windows are made of special tempered glass and plastics of great strength. In tests, these windows have withstood hurled objects as well or better than the steel plates of the Train roof.

ANSWERS TO MOST FREQUENTLY ASKED QUESTIONS

Q - IS THIS TRAIN PARTICULARLY FAST?

A - Since it is powered by a standard Electro-Motive Diesel locomotive, it is no faster than other trains so powered. It can exceed 100 miles per hour, but the Train's speed is governed by the condition of roadbeds and the observance of every possible safety precaution.

Q - WHAT ABOUT THOSE JERKY STARTS AND SUDDEN STOPS THAT WAKE YOU UP IN THE MIDDLE OF THE NIGHT, OR INTERFERE WITH EASY RIDING DURING THE DAY?

A - These are eliminated in the Train of Tomorrow, as in all GM Diesel-powered trains. Powered by the 2000 horsepower Diesel locomotive, the cars of the Train are "tight-lock" coupled and have no slack between cars. The entire Train starts and stops as a single unit, with none of the jarring and banging common to former trains.

Q - HAS ANYTHING BEEN DONE ABOUT SIDESWAY, ESPECIALLY ON CURVES?

A - This common fault has been almost completely overcome by a new type of weight suspension. Outside swing hanger suspension, a development of Electro-Motive, spreads the weight over a broader base,

ANSWERS TO MOST FREQUENTLY ASKED QUESTIONS

giving firmer footing (just as a human is more firmly footed when feet are spread apart). Moreover, the center of gravity is unusually low, further increasing traction and steadiness. Contributing further to smoothness of ride, the Train is equipped with special car journals, developed by Hyatt Bearings Division.

Q - HOW SOON MAY WE EXPECT TRAINS LIKE THIS IN REGULAR USE ON RAILROADS?

A - That will depend largely on public response to the present tour of the Train of Tomorrow and on the railroads' evaluation of the innovations being tested on the Train. Most of the railroads now have under construction greatly improved cars of every type, some of which already embody one or more features of the Train of Tomorrow.

Q - CAN OTHER COMPANIES BUILD TRAINS LIKE THIS?

A - Yes. Even before General Motors started constructing the Train, permission to use the new ideas in it was given to the entire railroading industry. Letters of permission were sent car building companies to make such use as they liked of the Train designs. The Burlington Lines, for example, tried out the Astra Dome idea with a specially built car. It is called the

ANSWERS TO MOST FREQUENTLY ASKED QUESTIONS

Vista Dome car. The Burlington has ordered a large number of Dome cars from one of the car-builders.

Q - WHY IS AN AUTOMOBILE COMPANY LIKE GENERAL MOTORS GOING INTO THE RAILROAD BUSINESS?

A - General Motors has no plans for "going into the railroad car business". The Electro-Motive Division of General Motors has been supplying internal combustion motive power to American railroads for 25 years and General Motors also has made a number of worthwhile contributions to the railroad industry through Hyatt, Frigidaire, Detroit Diesel, Delco Products and other Divisions of the corporation. General Motors, therefore, created the Train of Tomorrow, as a substantial contribution to the advancement of railroading, with whose progress it is so closely related. Actual building of the Train cars was done by the Pullman-Standard Car Manufacturing Company.

Q - THEN GENERAL MOTORS IS NOT GOING INTO RAILROAD PASSENGER CAR BUILDING?

A - No. The Train is very much like the General Motors Futurama at the New York World's Fair. There GM endeavored to dramatize new design ideas for highways and city planning - but broad application of these ideas

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was left to the experienced highway builders and city planners. Likewise, those in the railroad car business will build the cars of the future while General Motors builds locomotives.

Q - ISN'T THERE EXCESSIVE HEAT AND SUN GLARE IN THE ASTRA DOMES?

A - No. They are comfortable under all conditions. Heat and glare resistant Thermopane glass and plastics are used, and each of the Astra Domes is air conditioned.

Q - DOES THE ASTRA DOME CONSTRUCTION PERMIT CARRYING MORE PASSENGERS THAN AN ORDINARY COACH?

A - As it is presently designed, the chair car, or coach, carries 72 passengers, including the 24 chairs in the Astra Dome. This is a score more than the number accommodated in most of today's modern coaches. Dome cars materially increase the passenger capacity if the dome seats are sold.

Q - WILL THERE BE ENTERTAINMENT ON THE TRAIN OF TOMORROW?

A - Facilities are installed for the amplification in every section of the Train of radio programs, wire-recorded music and direct voice transmission. The extent and way in which this equipment may be used will be a matter of policy with the railroads operating such trains.

ANSWERS TO MOST FREQUENTLY ASKED QUESTIONS

Q - WHAT ABOUT TELEPHONE SERVICE ON THE TRAIN?

A - The newest type of in-transit phone service (familiarily known as a "ship-to-shore" phone) is a feature of the Train of Tomorrow. There is also a station-stop, plug-in phone service, which may be used by passengers during stops in cities. The Train is also equipped with an intra-train, car-to-car phone system, for use by members of the Train crew.

Q - WHO THOUGHT UP THE DOME TRAIN IDEA?

A - As you see it today, the Train represents the combined ideas and skills of designers, engineers, stylists, administrators, railroad people and others. The basic idea of the dome was conceived in the summer of 1944 by C. R. Osborn, vice president of General Motors and head of the Electro-Motive Division, when he was greatly impressed by the view he got while riding through the Rockies in the high-up, full-vision cab of a GM Diesel locomotive.

Q - DOES THE DESIGN REPRESENT A SOLUTION FOR ANY PARTICULARLY DIFFICULT ENGINEERING PROBLEMS?

A - Yes. There were several important questions to be answered by design and construction experts;

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1. With steel and bullet-proof glass developed during the war, could a dome be built that would provide safety and at the same time protect passengers from heat and glare from the sun?
2. Would the domes clear tunnels, bridges and station roofs?
3. If the regular car floor were to be lowered somewhat to allow for headroom in the double-deck construction, could sufficient clearance remain above the roadbed?
4. With such an alteration in the normal floor line, could the "crush-and-tug" forces of the Train in use (bearing in mind cars in front and rear) be handled by the underframe instead of by the customary center sill of conventional cars?

-- and, in due time, all of these questions were answered with "Yes".

Q - IS THIS A DREAM DESIGN OR IS IT PRACTICAL?

A - The public will provide the best answer for that - and has already provided many of the answers. Before construction was begun, a group of design experts of the General Motors Styling Section spent several months traveling on railroads all over the country. They observed what they liked and what they didn't like about

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passenger cars of all types. They asked countless questions of passengers and of train personnel, searching out desirable and objectionable features. The Train of Tomorrow incorporates scores of things these men learned. The present Train of Tomorrow nationwide tour is being conducted to find out how these new things work and how the public likes them.

Q - HAS ANYTHING BEEN DONE TO OVERCOME THE DISCOMFORT OF CARS BEING HOT AFTER STANDING IN THE SUN OR IN STATIONS?

A - This problem has been overcome. The solution is underneath each car, out of sight. It is a "power package" development of Frigidaire, equipped with a specially designed engine by the Detroit Diesel Division of General Motors. At all times, the cars are heated or cooled, wholly independent of power from the locomotive (which is the power source for trains of older design). This installation also assures maximum power for lights - with no flickering or lowering of lights on starts or stops.

ANSWERS TO MOST FREQUENTLY ASKED QUESTIONS

Q - WHAT IS NEW IN THE DINER KITCHEN?

A - It is the first railway diner to have an all-electric kitchen. Equipment includes electric ranges, broiler, dish-washer, garbage disposal, food mixer, hot table, fry kettle, glass washer, toaster and coffee urn. There are 11 refrigerators in the dining car. In addition to storing a quantity of food and beverages, these refrigerators have a capacity of 225 pounds of ice cubes every 24 hours.

Q - WHAT NEW MATERIALS HAVE BEEN USED IN THE INTERIOR?

A - One is Varlar wallpaper, which has a plastic coating that can easily be cleaned with soap and water. V-board, in both paper and fabric, is used on dressing room walls and elsewhere. It has a backing impregnated with plastic which makes a smooth outer surface, wear-resistant and easily cleaned. Es Es material, a synthetic rubber finished in attractive colors, is used for floor and wall coverings in dressing rooms and some of the vestibules. Nylon fabrics are used for coverings on some of the furniture and for draperies. It has a hard surface and it cleans easily.

GLOSSARY

- ASTRA DOME - The enclosure rising above roof level of the cars, glassed-in on all sides and top, affording all-direction vision and scenic enjoyment for 24 passengers (except in dining car, which accommodates 18).
- DIESEL, 2-CYCLE ENGINES - Internal combustion engines in which an injected charge of fuel is fired by the heat generated by high compression of air within the cylinder. Two-cycle Diesel engines require only two strokes of the piston (one up and one down) for each power impulse as contrasted with four-cycle operation requiring four strokes for each power impulse. The result is that two-cycle engines are more compact; provide greater power for their size. General Motors has played an important part in the development of the two-cycle Diesel engine and all of the General Motors locomotive and auxiliary Diesel engines used on the "Train of Tomorrow" are of this type.

- "DREAM CLOUD" - Name of the sleeping car with its rooms and roomettes for 20 sleeping passengers, 24 seated.
- ELECTRICAL POWER PACKAGE - A compact, self-contained two-cycle Diesel engine and generator for each car, providing reliable and independent sources of power for air conditioning, heating, lighting and refrigeration purposes.
- ES ES MATERIAL - A combination of synthetic resins with wearing qualities several times greater than any linoleum or similar products; suitable for floors or walls; in varied colors.
- FLUTEX GLASS - Ribbed glass, used for panels.
- FORMICA - A plastic of impregnated cellulose fiber.
- FREON - A GM-developed refrigerant, odorless, non-toxic and non-inflammable.
- JOURNAL BOX - Anti-friction mechanism at axles.
- LONDON GLAZE - Fine grain finish for leather prepared for flat wall covering.

- "MOON GLOW" - Name of Observation-Lounge Car, seating 68 passengers.
- OAK FLEXWOOD - Thin veneer of oak on sturdy cloth backing, flexible for application on curved surface.
- SUPER NEEDLE POINT - A type of fabric weave of fine design.
- "SKYVIEW" - Name of the dining car, seating 52 passengers.
- "STARDUST" - Name of the chair car, seating 72 passengers.
- THERMOPANE - Window panes consisting of two sheets of glass separated by dehydrated air space hermetically sealed to increase efficiency of air conditioning in summer and heating in winter On Train of Tomorrow, the outer glass is heat-absorbing and glare-reducing, heat-treated for extra strength, and the inner sheet is special laminated safety glass (a double sheet with a middle layer of plastic).

- TRUCKS - The under-car assembly of wheel-axle-springs-frame-journal box.
- VARLAR MATERIAL - A stainproof, plastic impregnated wall paper.
- VELVEAN LEATHER - Smooth-finished leather for various wall coverings.
- WELTEX SERRIATED WOOD - A plywood panel scraped with a knife blade with an irregular-toothed edge, to produce a rough surface.