

REPORT ON
STREAMLINE, LIGHT-WEIGHT,
HIGH-SPEED PASSENGER TRAINS

June 30, 1939

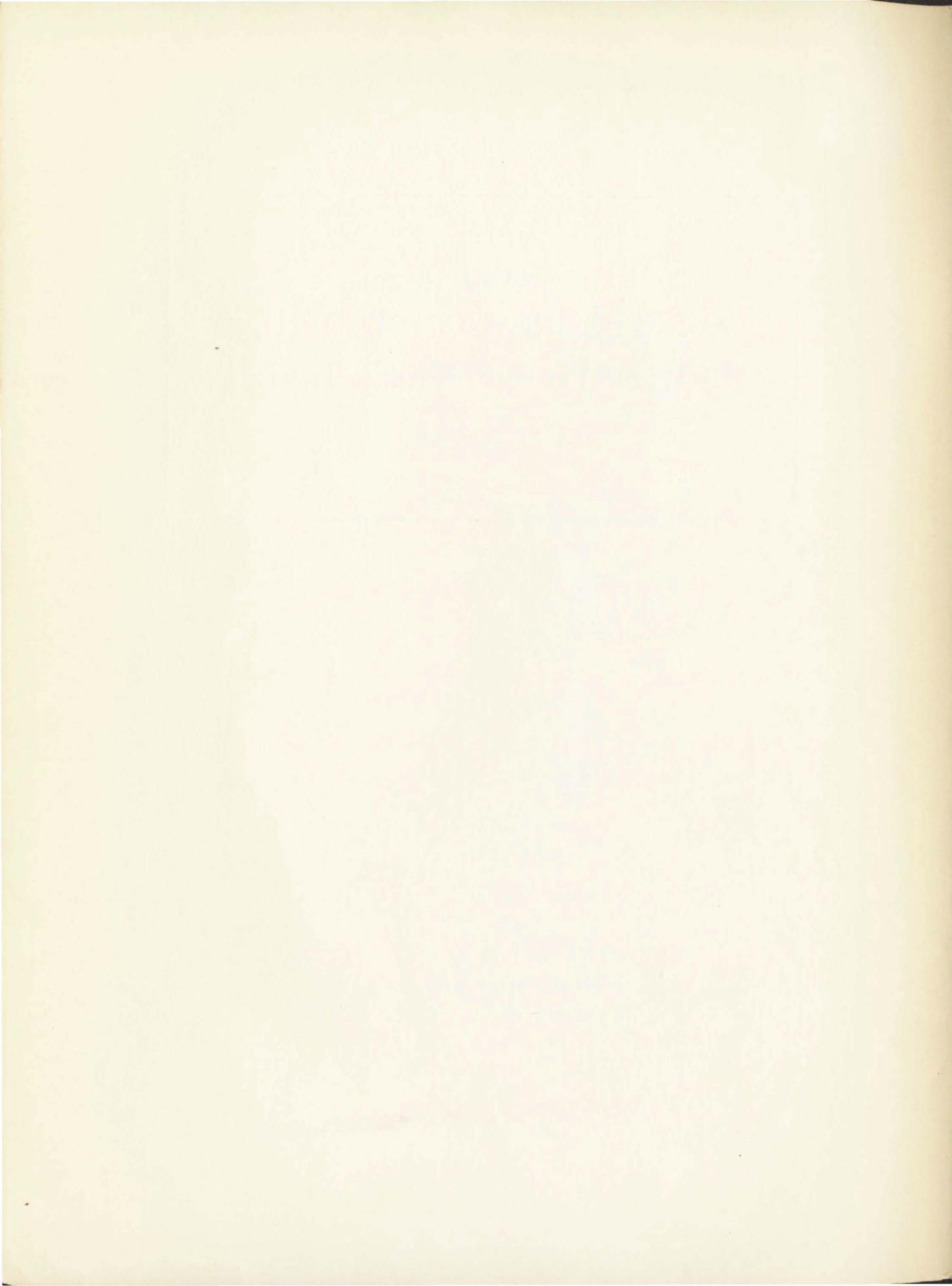
COVERDALE & COLPITTS
CONSULTING ENGINEERS
120 WALL STREET, NEW YORK

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REPORT ON STREAMLINE, LIGHT-WEIGHT, HIGH-SPEED PASSENGER TRAINS

As of June 30, 1939

BY COVERDALE & COLPITTS

INTRODUCTION

ON January 15, 1935, we made a report on the performance of the first Zephyr type, streamline, stainless steel, light-weight, high-speed, 3-car passenger train, built by the Edward G. Budd Manufacturing Company for the Chicago, Burlington & Quincy Railroad Company, and placed in service on that company's line between Kansas City, Mo., and Omaha and Lincoln, Neb., on November 11, 1934.

In that report we drew attention to the marked decline in railroad passenger traffic in recent years and discussed the prospects for regaining a measure of that traffic through the adoption of modern light-weight high-speed equipment. We described the main features of the first Zephyr train, its new and unusual appointments and the superior structural characteristics resulting from the use of high tensile stainless steel and the shot-welding process. Various pertinent subjects were discussed in this report and, amongst other data, it included an estimate of the increase in traffic of the Kansas City-Omaha-Lincoln line since

the inauguration of service by the Zephyr and a statement comparing the cost of operation of the Zephyr with that of the trains it replaced.

On October 1, 1935, we made a further report on the three high-speed trains which had been placed in service earlier in that year between Chicago and the Twin Cities—the Twin Zephyrs of the Burlington, the Hiawathas of the Chicago, Milwaukee, St. Paul and Pacific, and the "400" of the Chicago and North Western. The report outlined in general terms the factors which are responsible for the low stage of passenger traffic on the railroads of the country and voiced the view that the marked and growing popularity of the new high-speed trains gave promise of greatly increased patronage following their more general adoption. The report included a brief description of the main characteristics of each of the three fast trains in the Chicago-Twin Cities service, with comparable statements of their respective revenues and expenses, and it indicated also in general terms the sources of the increased traffic.

As of June 30, 1938, we made a survey and report pertaining to the operations of all streamline, light-weight, high-speed passenger trains in the country. The purpose of the present report is to bring the figures of the 1938 report down to June 30, 1939.

In the past twenty years the travel habits of the people of the United States have expanded enormously. The remarkable growth in private automobile ownership has been almost wholly responsible for this greatly increased urge to travel. This new vehicle and, to a much lesser degree, the common carrier bus have now created an immense stream of highway passenger traffic which, in the course of its expansion, has absorbed about two-thirds of the movement that formerly was attached to the rails. It is in this new reservoir of highway travel, vast and continuing to expand, and susceptible in part of being restored to the railroads, that the hopes of railroad managements lie for regaining the patronage the roads once enjoyed.

It is necessary to point out that the situation in respect of the possibilities for retrieving passenger traffic is radically different from that pertaining to freight traffic. Only to a very limited extent can the railroads as a whole increase the freight traffic of the country. They now move a very large percentage of the total tonnage available for movement and the volume is dependent upon general business conditions and other factors entirely beyond the scope of railroad activity. It is true that one line, by more aggressive solicitation or improved service, may seize the freight traffic of another line, or another transportation agency, but it does so against strongly organized and constant resistance, and the total volume is not thereby increased.

On the other hand, the reservoir of highway passenger traffic waiting to be tapped is twenty times larger than that which now flows toward the railroads, and the diversion of a portion of the auto-

mobile travel, however small in relation to the total volume, is prospectively of great importance in augmenting railroad revenues. And, to whatever extent automobile travel is diverted to the railroads, it will have the desirable effect of reducing highway congestion and, instead of generating resistance, will meet with favor on every hand.

Railroad officials for many years have given intensive study to this subject of the most practicable means for recovering passenger traffic, and have been keenly alive to the fact that, to the extent this purpose could be accomplished through the medium of the equipment, a railway vehicle must be presented to the public that would possess qualities of safety, speed, comfort and economy not possible in highway vehicles.

It would appear that the solution of the problem has been found in the streamline train.

Perhaps no other important new development in transportation has proceeded with greater rapidity than has the streamline train—not even the automobile or the airplane. It was only a few years ago that the Diesel-electric locomotive was made available for high-speed trains and that the materials suitable for light-weight train construction, such as aluminum alloy and high tensile stainless steel, could be obtained at prices within reach for large structures. Since then a whole new philosophy of light-weight car design and construction technic, of decoration and comfort-affording facilities, has had to be formulated. Considering the consequences of accident at high speed, strength factors could not be sacrificed to light weight, so that designs along entirely new lines had to

be perfected to withstand the rigorous stresses to which the new trains are subjected.

The leaders in this new field of light-weight streamline train construction have been the Pullman-Standard Car Manufacturing Company and the Edward G. Budd Manufacturing Company, in designing and perfecting construction methods for the building of light-weight cars, the former by the employment of aluminum alloy as the weight-saving medium, and the latter through the use of high tensile stainless steel and its shot-welding process; the Electro-Motive Corporation, in devising and adapting a Diesel two-cycle engine practicable for high-speed train service; the Union Pacific, with the cooperation of the Chicago and North Western and the Southern Pacific, the Chicago, Burlington & Quincy, and more recently the Atchison, Topeka and Santa Fe and the Chicago, Rock Island and Pacific, in reaching conclusions respecting the economic factors involved in fast train construction and operation and in establishing extensive streamline train services on their respective lines.

The early inauguration of high-speed services by the Hiawathas of the Chicago, Milwaukee, St. Paul and Pacific, the Flying Yankee of the Boston and Maine-Maine Central, the Comet of the New York, New Haven and Hartford, the Royal Blue, Columbian, Abraham Lincoln and Ann Rutledge of the Baltimore and Ohio-Alton, the Green Diamond of the Illinois Central, the Mercury of the New York Central, the Rebels of the Gulf, Mobile and Northern, and by the Crusader of the Reading, has contributed

greatly toward popularizing travel in high-speed streamline trains.

The fine new semi-light-weight streamline trains, the Twentieth Century Limited, the Commodore Vanderbilt and the Southwestern Limited of the New York Central; and the Broadway Limited, the Liberty Limited, the General, and the Spirit of St. Louis of the Pennsylvania—all recent installations—have received wide public approbation.

New entries in the field are the Seaboard Air Line with the Silver Meteor, introduced in February, 1939, and with two additional trains to be placed in service in December; the Atlantic Coast Line and the Florida East Coast, with two trains each, also to be installed in December; and the Missouri Pacific, with two trains to be inaugurated on January 1, 1940.

Heavy contributors to the comfort and safety of travel in the newer types of trains have been the designers and makers of air-conditioning equipment, high-speed brakes, light-weight sound and heat insulation, safety glass, roller-bearing trucks, and numerous other modern installations.

Perhaps no instrumentality not directly engaged in the construction or operation of railroad trains has done more to promote and encourage the introduction of the new types of passenger equipment on American railroads than has the Railway Age.

That much progress has been made in the establishment of fast passenger train service throughout the country is seen in the fact that, since the inauguration of the first 3-car Zephyr on the Burlington on November 11, 1934, and the 3-car City of Salina on the Union Pacific on January 31, 1935, approximately 100

high-speed trains with modern luxurious appointments have been introduced on different roads, a large number of which are of streamlined, light-weight construction.

These trains, however, have replaced or extended but a small fraction of the high-class passenger train service of the country. We believe the marked public appeal of the new types of trains, as evidenced by the financial success which has accompanied their operations which this report displays, fully confirms the opinion expressed in our earlier reports with respect to them.

It is primarily the purpose of this report to present in brief form such facts respecting the financial results of recent operations of the new streamline light-weight, high-speed passenger trains as are available to us for the information of those interested in the restoration of railroad passenger traffic. The financial statements and the data surrounding them pertaining to the individual trains and the lines on which they operate will, it is hoped, be of assistance to railroad officials in reaching conclusions as to the merits of high-speed service on their own roads.

We wish here to acknowledge the courtesies shown us by the gentlemen who are the sources of the information given in this report:

MR. L. W. BALDWIN,
Chief Executive Officer: Missouri Pacific
Railroad Company

MR. J. L. BEVEN,
President: Illinois Central Railroad Com-
pany

MR. RALPH BUDD,
President: Chicago, Burlington & Quincy
Railroad Company

MR. M. W. CLEMENT,
President: The Pennsylvania Railroad
Company

MR. SAMUEL O. DUNN,
Editor: Railway Age

MR. E. M. DURHAM, JR.,
Chief Executive Officer: The Chicago,
Rock Island and Pacific Railway Com-
pany

MR. GEO. B. ELLIOTT,
President: Atlantic Coast Line Railroad
Company

MR. E. J. ENGEL,
President: The Atchison, Topeka and
Santa Fe Railway Company

MR. E. S. FRENCH,
President: Boston and Maine Railroad
and Maine Central Railroad Company

MR. W. M. JEFFERS,
President: Union Pacific Railroad Com-
pany

MESSRS. W. R. KENAN, JR., and S. M.
LOFTIN,
Receivers: Florida East Coast Railway

MR. A. D. McDONALD,
President: Southern Pacific Company

MR. HOWARD S. PALMER,
President: The New York, New Haven
and Hartford Railroad Company

MESSRS. L. R. POWELL, JR., and H. W.
ANDERSON,
Receivers: Seaboard Air Line Railway
Company

MR. H. A. SCANDRETT,
Trustee: Chicago, Milwaukee, St. Paul
and Pacific Railroad Company

MR. EDWARD W. SCHEER,
President: Reading Company

MR. CHARLES M. THOMSON,
Trustee: Chicago and North Western
Railway Company

MR. I. B. TIGRETT,
President: Gulf, Mobile and Northern
Railroad Company

MR. DANIEL WILLARD,
President: The Baltimore and Ohio Rail-
road Company and Alton Railroad
Company

MR. F. E. WILLIAMSON,
President: The New York Central Rail-
road Company

PREFATORY REMARKS

The arrangement of the different sections of the report is partly chronological and partly geographical. The development of the streamline train was initiated and has been carried farther in the West than in the East, and it, therefore, seemed proper to begin the report with discussions of the trains of western lines and proceed eastward to the trains of roads in New England.

The report is based wholly on records compiled by the accounting officers of the respective railroads. Attention should be drawn to the fact that the items in TRAIN EXPENSES in the statements are not entirely comparable, one railroad with another, although the effort has been made to make them as nearly so as practicable without involving a restatement of the accounts of the different roads. Because of this situation, and also because of the widely different operating conditions on different roads, it should be emphasized that comparisons of operating costs of the trains of one road with those of another are not to be taken as measures of relative efficiency. Nevertheless, it can be said that each statement, with the explanations attaching to it, presents a reasonably accurate record of the performance of the train or trains to which it refers.

We have not included in the statements of REVENUES and EXPENSES of

the trains, the items of INTEREST, DEPRECIATION, TAXES and INSURANCE for the reason that these are in the nature of fixed or overhead charges not directly attached to train operation. A further reason for not including the items of interest and depreciation is that interest rates on one road may differ from those on another, while depreciation rates are still a matter of controversy and no uniform rate would be generally acceptable. Neither have TERMINAL RENTALS been included, since they depend largely upon the local conditions of each route and are not informative in their application to prospective new situations. The figures of NET REVENUE appearing in the statements are, therefore, subject to deductions for these items. All of the excluded items are susceptible of easy computation in any particular case.

The trains discussed in this report all have distinctive names. Many of them are run in duplicate, and to indicate that fact clearly and briefly in references to them we have taken the liberty of pluralizing their names. The two El Capitan trains, for example, we speak of as El Capitans.

The report embraces operations for the years ended June 30, 1938 and 1939, or for lesser periods in the cases of trains installed within the year.

STREAMLINERS

UNION PACIFIC

GENERAL STATEMENT

The Union Pacific for long distance travel, in conjunction with the North Western and the Southern Pacific, and the Burlington for short distance services in its initial undertakings, were pioneers in the development of the streamline train and in introducing into them the modern conveniences and attractions which have completely transformed railroad travel.

Conscious of the growing necessity for faster and more comfortable railroad service on its long routes if it were to meet the competition of private automobiles, buses and airplanes and retain the position it had always held as a major passenger transportation agency between the East and the West, the Union Pacific began its investigations in 1932 with the purpose of effecting a substantial reduction in the time of transit between Chicago and the three Pacific Coast terminals—Los Angeles, San Francisco and Portland.

The conclusion was soon reached that to accomplish this purpose cars much lighter and with a lower center of gravity than the conventional types were necessary, and that a radically different type of motive power than the standard steam locomotive was also essential. The extensive studies and experiments of the Union Pacific, working in conjunction with the Pullman-Standard Car Manufacturing Company, the Electro-Motive Corporation, and others, were therefore

directed toward producing equipment capable of meeting the new demands.

In this undertaking the Union Pacific was well equipped by experience and knowledge of the mechanical and economic problems involved. The McKeen car, gasoline driven, was the invention of a Union Pacific official. First placed in service in 1905, many are still in operation on the road. The gas-electric car, a later development, also found wide use on the Union Pacific.

It was a natural progression from these earlier types of internal combustion motive power to the Diesel-electric locomotive, which had been the subject of a vast amount of research and experimentation coincident with the development of the art of building light-weight cars. The combination of the two, the Diesel-electric locomotive, with its long range, and light-weight streamline cars, constituting a train of low center of gravity, seemed the answer to the problem of greater speed in passenger train movement. These advances, coupled with air-conditioning, better riding qualities, and greater travel conveniences and comforts than had hitherto been known in conventional trains, found expression in the first streamline train built in the United States.

The announcement by the Union Pacific on May 24, 1933, of the introduction to the transportation world of America's first "streamliner" created a sensation and captured the public imag-

ination as perhaps nothing had done since the opening of the first transcontinental line in 1869. This train, built of aluminum alloy, as have been all subsequent light-weight trains built by the Union Pacific, was completed early in 1934. It was immediately presented to the public in a widely publicized and astonishingly successful coast-to-coast tour and was later exhibited at the Century of Progress exposition in Chicago. It was placed in regular service between Kansas City and Salina as the "City of Salina" on January 31, 1935, and is still operating on this route.

The Union Pacific was thus launched upon its extensive streamliner program. While its first streamliner was proceeding on its exhibition tour construction was begun of the second streamliner, the City of Portland, comprising six splendidly appointed cars, the first light-weight streamline train to carry sleepers. This train, completed in October, 1934, made a test run from Los Angeles to Chicago in 38 hours and 50 minutes, and to New York in 56 hours and 55 minutes. The run from Los Angeles to New York established a record which still stands. The train was placed in regular service on a 39 $\frac{3}{4}$ -hour schedule between Chicago and Portland on June 6, 1935.

There followed in quick succession the magnificent streamliners, the City of Los Angeles, the City of San Francisco, the City of Denver and the Forty Niner, all of which are described herein.

Another step in the program of the Union Pacific to retrieve passenger traffic paralleling that of other lines was taken on July 1, 1935, when the Challenger, a conventional type train, planned to operate on a 60-hour schedule between Chicago and Los Angeles, was introduced. It was exclusively a coach and tourist

sleeping car train and was the first train to provide stewardess-nurse service, low cost meals and many other innovations.

The first Challenger was an instant success, and almost immediately the operation was extended to Portland and San Francisco. So rapidly did the new one-class luxury service at the low coach and tourist car rates grow in popularity that in 1937 five Challenger trains with new light-weight streamline equipment were installed. Thus, the way was paved for the successful establishment of long distance sleeper coach trains on other roads.

Note: The Challengers are operated on much slower schedules than the streamliners and are hauled by steam locomotives. The record of their performance is not, therefore, included in this discussion.

The fleet of streamliners now comprises eight trains—City of Salina, City of Portland, City of Los Angeles (two), City of San Francisco, City of Denver (two), and the Forty Niner. That the program as a whole has been remarkably successful, the statements which follow will show.

The streamline trains which now operate on the Union Pacific constitute a large fleet and are all, with one exception, long distance trains, reaching Chicago over the rails of the North Western; Portland, Los Angeles and Denver over its own lines, and San Francisco over the lines of the Southern Pacific.

The exception is the City of Salina, a Union Pacific train, to which reference has already been made.

Before proceeding to discuss the operations of the long distance streamline trains in which the three railroads participate, it seems advisable first to comment on the performance of the City of Salina.

CITY OF SALINA

UNION PACIFIC

The City of Salina was the first streamline light-weight train to be built in the United States. After a country-wide tour of exhibition, including a showing at the Century of Progress in Chicago in the latter part of 1934, it was placed in regular operation on January 31, 1935, following by about three months the inauguration in service of the first Zephyr.

It is a 3-car train, built of aluminum alloy by Pullman. The front car houses in the forward end a 600 H.P. butane fuel-electric power unit, which was changed from a distillate-electric power unit on March 27, 1939. The train is fully articulated, weighs 124 tons, is 205 feet long, contains 108 coach seats and a buffet. The center of gravity of the forward car is 54 inches above the rail, and of the other two cars, 45 inches.

The train makes a daily round trip between Kansas City and Salina and between Kansas City and Topeka. The daily mileage of the train is 510 and its average speed about 56 miles per hour.

This train, a pioneer in light-weight streamline construction, retains the popularity it won when first introduced to the public.

PHYSICAL CHARACTERISTICS OF LINE

Kansas City-Salina, 187 Miles

About 36% of the line is double track.

RULING GRADES beyond the terminal are 0.6% in both directions.

MAXIMUM CURVES are generally 4°, rang-

ing in a few cases up to 6°. About 81% of the line is straight track.

WEIGHT OF RAIL—90 to 110-pound.

TIES are all treated.

BALLAST—Sherman Hill granite.

RESULTS OF OPERATION OF
CITY OF SALINA

The revenues and expenses of the City of Salina for the years ended June 30, 1938 and 1939, are given in the statement on the following page. They include the figures for substitute steam service and a relatively small amount of extra steam service.

The Net Revenue of the City of Salina for the year ended June 30, 1938, was 25.7 per cent of the Revenues, and for the following year 9.4 per cent.

GROWTH OF TRAFFIC

The revenues of the City of Salina (exclusive of dining car revenues) by six-months' periods were as follows:

Period	6 Months	Year
July 1 to Dec. 31, 1935	\$69,381	
Jan. 1 to June 30, 1936	73,540	\$142,921
July 1 to Dec. 31, 1936	71,175	
Jan. 1 to June 30, 1937	75,551	146,726
July 1 to Dec. 31, 1937	80,885	
Jan. 1 to June 30, 1938	74,624	155,509
July 1 to Dec. 31, 1938	72,103	
Jan. 1 to June 30, 1939	66,549	138,652

This train is operated on comparatively short runs (Kansas City-Salina, 187 miles, and Kansas City-Topeka, 68 miles) in a section served by competing railroads and traversed by excellent highways.

REVENUES AND EXPENSES

Item	KANSAS CITY-TOPEKA-SALINA			
	1 Train, 3 Passenger Train Cars, a part of one car containing the power plant. One round trip Kansas City-Salina, and one round trip Kansas City-Topeka, daily.			
	Operation begun January 31, 1935			
	Year ended June 30, 1938		Year ended June 30, 1939	
	Amount	Per Tr.-Mile	Amount	Per Tr.-Mile
REVENUES (Streamline and steam trains)	\$ 155,509	\$.827	\$ 138,652	\$.743
TRAIN EXPENSES				
Wages of crews	43,075	.229	35,646	.191
Fuel oil	9,692	.052	7,356	.040
Lubricants	5,252	.028	3,354	.018
Train supplies and expenses	6,407	.034	5,463	.029
Power plant maintenance	16,977*	.090	15,284*	.082
Train maintenance	4,786*	.025	4,191*	.022
Total	86,189	.458	71,294	.382
Steam train substitute service	22,371		47,895	
Steam train extra sections	1,870		818	
Total	24,241	.891	48,713	.886
TOTAL Train Expenses	110,430	.587	120,007	.643
Dining-Buffer net loss	-5,119	-.027	-5,569	-.030
TOTAL, Including D-B loss	115,549	.614	125,576	.673
NET REVENUE	39,960	.213	13,076	.070
Per cent of Revenues	25.7		9.4	
Route-miles	255		255	
Train-miles:				
Streamline trains	160,881		131,729	
Steam trains	27,197		54,981	
Total train-miles	188,078		186,710	
Passenger-miles	7,013,840		7,256,004	

* Overhaul repairs which, between January 1, 1936, and June 30, 1939 (3½ years), totaled \$89,433, or \$0.185 per train-mile, are not included.

JOINT THROUGH STREAMLINERS
OF THE
NORTH WESTERN-UNION PACIFIC
NORTH WESTERN—UNION PACIFIC—SOUTHERN PACIFIC

The joint through high-speed Streamliners of the North Western and Union Pacific, and of the North Western, Union Pacific and Southern Pacific, represent a very extensive passenger transportation operation, approximating two and one-quarter million train-miles and gross revenues of more than five million dollars per annum.

The area served by this large fleet of magnificent new trains extends from Chicago to Denver and from Chicago to the Pacific Coast ports of Portland, San Francisco and Los Angeles. The trains are unit operations, although traversing the lines of two and three companies, and the statements displaying their performance which follow are consolidations of the figures for the full length of the runs.

Unlike the other trains embraced in this report, these joint operations involve the use by each of the three railroads of the facilities of the others, as well as the services of the Pullman Company. This of necessity requires complete intercompany accounting for all items of expense attaching to the movement and maintenance of the trains, which is not the case when trains remain on the rails of one company. These charges and credits in some instances represent considerable amounts.

IT IS NECESSARY, THEREFORE, TO POINT OUT THAT THE STATEMENTS OF REVENUES AND EXPENSES OF THE STREAMLINERS WHICH FOLLOW ARE NOT TO BE CONSIDERED AS ON AN ENTIRELY COMPARABLE BASIS WITH THOSE OF OTHER TRAINS IN THIS REPORT.

STREAMLINERS

NORTH WESTERN—UNION PACIFIC

The North Western-Union Pacific fleet of streamliners consists of five trains: the City of Portland, the first City of Los Angeles (an extra-fare train), the City of Denver (two trains), and the second City of Los Angeles (also an extra-fare train). They comprise in all 55 cars, of which 23 are sleeping cars. The cars are of aluminum alloy construction and were built by Pullman. The trains are hauled by Diesel-electric locomotives, in units of 900 to 2,000 H.P., built by the Electro-Motive Corporation.

The City of Portland is fully articulated. The cars of the first City of Los Angeles are fully articulated with the exception of the baggage-dormitory car. Six cars in each of the two City of Denver trains are articulated in pairs. Ten cars in the second City of Los Angeles are articulated in pairs.

The center of gravity of the power cars in the City of Portland, the first City of Los Angeles and the City of Denver is 52 inches above the rail. That of the cars in the two first-mentioned trains is about 49 inches, and in the latter train about 52½ inches; that of the power cars of the second City of Los Angeles is 57 inches and of the cars 55 inches.

All of these trains and the City of San Francisco, but more particularly perhaps the City of Portland, can be said to have made streamline train history. As before stated, the City of Portland was the first streamline train to carry sleeping cars and the first to be operated in trans-continental service. It still holds the record for the run from Los Angeles to New York, made in October, 1934.

The second City of Los Angeles and the City of San Francisco (to be described later) are the longest streamline trains yet built and are powered with the largest Diesel-electric locomotives.

These long distance sleeping-car trains, more especially the newer City of Los Angeles, are the acme of travel luxury. They and the City of San Francisco and the trains of similar equipment of the Santa Fe and the Burlington are representative of the highest development of the art of streamline train construction, in beauty of line, in distinctive interior decorations and in the provision of features intended to add to the comfort of passengers. The statements of earnings which follow are indicative of their popularity.

CONSIST OF TRAINS

The makeup of the North Western-Union Pacific streamliners and the order of the cars in the trains are as follows:

The City of Portland is an 8-car train, composed of 2 power cars of 900 and 1,200 H.P., a mail-baggage car, a baggage-dormitory-kitchen car, a diner-lounge, 3 sleeping cars, a coach, and a coach-buffet car. The first City of Los Angeles is an 11-car train—2 power cars of 2,000 H.P. each, a baggage-dormitory, 2 coaches, a diner-kitchen, a diner, 5 sleepers, and an observation-lounge car.

The two 11-car City of Denver trains each comprise 2 power cars of 1,200 H.P. each, a baggage car, a baggage and mail car, a tavern car decorated in early frontier style, with bar, 2 coaches, a diner with cocktail lounge, 4 sleeping cars, and a sleeper-observation car. The second City of Los Angeles is a 14-car train—3 power cars of 1,800 H.P. each, a baggage-dormitory car, 2 coaches, a diner-kitchen, a diner, a dormitory-club car, 7 sleepers, and an observation-lounge car.

The City of Portland makes a round trip between Chicago and Portland every six days.

The two City of Los Angeles trains each make a round trip between Chicago and Los Angeles every six days.

16 STREAMLINE, LIGHT-WEIGHT, HIGH-SPEED PASSENGER TRAINS

The two City of Denver trains each make a one-way trip daily between Chicago and Denver.

WEIGHT, SEATING CAPACITY, ETC.

The weight, seating capacity, etc., of the North Western-Union Pacific streamliners, and the dates when placed in service, are given in the tables at the bottom of this page.

DAILY MILEAGE

The average daily mileage of these trains is as follows:

Name	Average Daily Mileage
City of Portland (1 train)	757*
City of Los Angeles (First) (1 train)	766*
City of Denver (2 trains)	2,096
City of Los Angeles (Second) (1 train)	766*
Total Daily Mileage	4,385

* Round trip mileage divided by 6.

The average speed of the City of Denver is 66 miles per hour and of each of the other three trains about 58 miles per hour.

PHYSICAL CHARACTERISTICS OF LINES

The five streamliners just described traverse North Western and Union Pacific lines. Two trains, the streamliner City of San Francisco and the Forty Niner, are operated over lines of the North Western, Union Pacific and Southern Pacific. These two trains will be discussed later in the report. Since the routes of the two latter trains partially overlap those of the former, it is advisable to describe here briefly the physical characteristics of the routes of the seven trains.

Run and Train	Date Placed in Service	Power Cars Exclusively Weight (Tons)	Trailing Cars Weight (Tons)	All Units	
				Weight (Tons)	Length (Feet)
(1) CITY OF PORTLAND Chicago-Portland 2 power cars and 8 trailing cars	6/6/35	185	283	468	649
(2) CITY OF LOS ANGELES (First) Chicago-Los Angeles 2 power cars and 11 trailing cars	9 trailers 5/15/36 10 trailers 4/15/38 11 trailers 8/18/38	222	443	665	871
(3 and 4) CITY OF DENVER Chicago-Denver 2 trains of 2 power cars and 11 trailing cars each Each train	6/18/36	215	514	729	948
(5) CITY OF LOS ANGELES (Second) Chicago-Los Angeles 3 power cars and 14 trailing cars	12/27/37	438	818	1,256	1,267

	Salable Seats			Other Seats			Total All Seats
	Coach	Pullman	Total	Dining	Lounge	Total	
(1)	86	66	152	40	17	57	209
(2)	88	102	190	92	41	133	323
(3 and 4) Each	100	103	203	40	56	96	299
(5)	104	141	245	104	71	175	420

STREAMLINE, LIGHT-WEIGHT, HIGH-SPEED PASSENGER TRAINS 17

*North Western. Chicago-Council Bluffs,
485 Miles*

All of the line is double track.

RULING GRADES are about 0.70% in both directions, except between Chicago and West Chicago, 30 miles, where they are much lighter.

MAXIMUM CURVES are 3° except in a few instances, mostly at terminals. About 84% of the line is straight track.

WEIGHT OF RAIL—110 and 112-pound.

TIES are all treated.

BALLAST—Between Chicago and Ogden, Iowa, 347 miles, crushed rock; balance, gravel.

*Union Pacific. Council Bluffs-Portland,
1,787 Miles*

About 56% of the line is double track.

RULING GRADES are as follows:

Section	Distance Miles	West-bound %	East-bound %
Council Bluffs-Summit	5	1.25	
Summit-Cheyenne	505	0.70	0.70
Cheyenne-Laramie	56	1.55	0.82
Laramie-Granger	281	0.82	0.82
Granger-Pocatello	214	0.75	1.50
Pocatello-Huntington	336	1.45	1.45
Huntington-Rieth	177	2.21	2.00
Rieth-Portland	213	0.50	0.60
Average Distance	1,787		

MAXIMUM CURVES are 3° east of Huntington with a few 6° curves, mainly in Idaho. West of Huntington curves range up to 10° with much lighter curves predominating. About 79% of the line is straight track.

WEIGHT OF RAIL—90 to 131 pounds, 100-pound predominating.

TIES are all treated.

BALLAST—Sherman Hill granite east of Granger and gravel west.

*Union Pacific. Council Bluffs-Los Angeles,
1,813 Miles*

About 63% of the line is double track.

RULING GRADES are as follows:

Section	Distance Miles	West-bound %	East-bound %
Council Bluffs-Summit	5	1.25	
Summit-Cheyenne	505	0.70	0.70
Cheyenne-Laramie	56	1.55	0.82
Laramie-Evanston	351	0.82	0.82
Evanston-Ogden	76	0.37	1.14
Ogden-Salt Lake City	36	0.50	0.50
Salt Lake City-Milford	207	0.80	0.80
Milford-Yermo	414	1.00	2.20
Yermo-Colton	99	1.60	2.20
Colton-Los Angeles	64	0.90	1.00
Average Distance	1,813		

MAXIMUM CURVES are 3° between Council Bluffs and Evanston, 917 miles; 3° between Ogden and the Utah-Nevada line, 321 miles, with occasional 4° curves; 7° between Evanston and Ogden, 76 miles, and up to 10° west of the Utah-Nevada line. Much lighter curves than the maximum predominate throughout the whole line. About 85% of the line is straight track.

WEIGHT OF RAIL—90 to 131 pounds, with 100-pound predominating east and 90-pound west of Salt Lake City.

TIES are all treated.

BALLAST—Sherman Hill granite east of Ogden and gravel and crushed rock elsewhere.

*Union Pacific. Council Bluffs-Denver,
563 Miles*

About 67% of the line is double track.

RULING GRADES are as follows:

Section	Distance Miles	West-bound %	East-bound %
Council Bluffs-Summit	5	1.25	
Summit-Julesburg	360	0.60	0.50
Julesburg-La Salle	151	0.30	0.30
La Salle-Denver	47	0.60	0.46
Average Distance	563		

18 STREAMLINE, LIGHT-WEIGHT, HIGH-SPEED PASSENGER TRAINS

MAXIMUM CURVES are 2° with lower rates predominating except at terminals. About 92% of the line is straight track.

WEIGHT OF RAIL—90 to 131 pounds, 100-pound predominating east and 90-pound west of Julesburg.

TIES are all treated.

BALLAST—Sherman Hill granite.

Southern Pacific. Ogden-Oakland, 781 Miles

About 75% of the line is double track.

RULING GRADES are as follows:

Section	Distance Miles	West-bound %	East-bound %
Ogden-Lucin	103	0.40	0.37
Lucin-Alazon	77	1.35	1.40
Alazon-Weso	180	0.43	0.40
Weso-Sparks	177	0.42	0.40
Sparks-Roseville	138	1.91	2.42
Roseville-Elvas	15	0.25	0.40
Elvas-Sacramento	3	0.38	0.30
Sacramento-Benicia Jct.	51	0.43	0.41
Benicia Jct.-Martinez	6	0.45	1.00
Martinez-Oakland Pier	31	0.26	0.22
Average Distance	781		

REVENUES AND EXPENSES

Item	Routes and Trains							
	CITY OF PORTLAND (1)				CITY OF LOS ANGELES (2)			
	Chicago-Portland				Chicago-Los Angeles			
	1 Train, 8 Passenger Train Cars. One round trip every 6 days.				1 Train, 11 Passenger Train Cars. One round trip every 6 days.			
	Operation begun June 6, 1935				Operation begun May 15, 1936			
	Year ended June 30, 1938		Year ended June 30, 1939		Year ended June 30, 1938		Year ended June 30, 1939	
Amount	Per Tr.-Mile	Amount	Per Tr.-Mile	Amount	Per Tr.-Mile	Amount	Per Tr.-Mile	
\$	\$	\$	\$	\$	\$	\$	\$	
REVENUES								
	371,901	1.364	389,108	1.427	551,059	2.337	678,786	2.460
TRAIN EXPENSES								
Wages of crews	110,122	.404	110,795	.406	96,360	.409	101,686	.369
Fuel	12,237	.045	13,554	.050	18,160	.077	26,980	.098
Lubricants, etc.	4,947	.018	6,708	.025	9,097	.038	11,464	.041
Train supplies and expenses	12,819	.047	15,099	.055	13,671	.058	19,180	.069
Power plant maintenance	69,221	.254	65,345	.240	107,666	.457	121,195	.439
Train maintenance	17,873	.065	25,621	.094	35,426	.150	52,872	.192
TOTAL	227,219	.833	237,122	.870	280,380	1.189	333,377	1.208
Steam train substitute service	—		550		—		—	
Steam train extra sections	—		—		—		—	
TOTAL	—		550	1.129	—		—	
TOTAL Train Expenses	227,219	.833	237,672	.872	280,380	1.189	333,377	1.208
Dining-Buffer net loss	-19,580	-.072	-21,355	-.078	-21,389	-.091	-30,724	-.111
TOTAL, Including D-B loss	246,799	.905	259,027	.950	301,769	1.280	364,101	1.319
NET REVENUE	125,102	.459	130,081	.477	249,290	1.057	314,685	1.141
Per cent of Revenues	33.6		33.4		45.2		46.4	
Route-miles	2,272		2,272		2,299		2,299	
Train-miles:	272,649		272,171		235,828		275,889	
Streamline trains	—		487		—		—	
Steam trains	272,649		272,658		235,828		275,889	
Total train-miles	272,649		272,658		235,828		275,889	
Passenger-miles	20,366,782		20,962,222		24,637,744		28,885,017	

(1) June 6, 1935, to Mar. 27, 1939: 6 Trailing cars
Mar. 28, 1939, to June 30, 1939: 8 Trailing cars

(2) May 15, 1936, to Dec. 26, 1937: 9 Trailing cars
Out of service—Dec. 27, 1937, to Feb. 20, 1938
Feb. 21, 1938, to Apr. 14, 1938: 9 Trailing cars
Apr. 15, 1938, to Aug. 17, 1938: 10 Trailing cars
Aug. 18, 1938, to June 30, 1939: 11 Trailing cars

STREAMLINE, LIGHT-WEIGHT, HIGH-SPEED PASSENGER TRAINS 19

MAXIMUM CURVES range up to 10°23' on mountainous subdivisions with lighter maximum curves ranging from 1°30' to 6° on other subdivisions. About 72% of the line is straight track.

WEIGHT OF RAIL—90 to 131 pounds, 110 to 112-pound predominating.

TIES are all treated.

BALLAST—Crushed rock predominating with balance gravel, slag and cinders.

RESULTS OF OPERATION OF NORTH WESTERN-UNION PACIFIC STREAMLINERS

Below is a statement of the revenues and expenses of the North Western-Union Pacific streamliners for the years ended June 30, 1938 and 1939. In the case of the second City of Los Angeles the first period covers 6 months 5 days from the beginning of operation.

Note: The railroad companies' proportion of sleeping car revenues on these trains is necessarily an estimate. It is a relatively small amount and is included in the item of Revenues.

REVENUES AND EXPENSES

Routes and Trains											
CITY OF DENVER (3)				CITY OF LOS ANGELES (4) (Second)				TOTAL FIVE TRAINS			
Chicago-Denver				Chicago-Los Angeles							
2 Trains, Each 11 Passenger Train Cars. One round trip daily.				1 Train, 14 Passenger Train Cars. One round trip every 6 days.							
Operation begun June 18, 1936				Operation begun December 27, 1937							
Year ended June 30, 1938		Year ended June 30, 1939		6 months 5 days ended June 30, 1938		Year ended June 30, 1939					
Amount	Per Tr.-Mile	Amount	Per Tr.-Mile	Amount	Per Tr.-Mile	Amount	Per Tr.-Mile	Amount	Per Tr.-Mile	Amount	Per Tr.-Mile
\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
1,710,030	2.220	1,661,426	2.171	507,605	3.499	899,109	3.259	3,140,595	2.206	3,628,429	2.283
238,531	.309	252,001	.329	60,205	.415	105,300	.382	505,218	.355	569,782	.359
72,908	.095	81,499	.107	26,281	.181	46,904	.170	129,586	.091	168,937	.106
28,939	.038	29,294	.038	9,440	.065	19,690	.071	52,423	.037	67,156	.042
54,610	.071	52,638	.069	14,734	.102	27,237	.099	95,834	.067	114,154	.072
277,407	.360	262,716	.343	92,797	.640	199,381	.722	547,091	.384	648,637	.408
190,483	.247	156,960	.205	36,902	.254	66,135	.240	280,684	.197	301,588	.190
862,878	1.120	835,108	1.091	240,359	1.657	464,647	1.684	1,610,836	1.131	1,870,254	1.177
—	—	510	—	—	—	1,634	—	—	—	2,694	—
2,944	—	—	—	—	—	—	—	2,944	—	—	—
2,944	1.051	510	.911	—	—	1,634	1.066	2,944	1.051	2,694	1.044
865,822	1.124	835,618	1.092	240,359	1.657	466,281	1.690	1,613,780	1.133	1,872,948	1.178
-39,213	-.051	-40,731	-.053	-16,079	-.111	-39,650	-.144	-96,261	-.068	-132,460	-.084
905,035	1.175	876,349	1.145	256,438	1.768	505,931	1.834	1,710,041	1.201	2,005,408	1.262
804,995	1.045	785,077	1.026	251,167	1.731	393,178	1.425	1,430,554	1.005	1,623,021	1.021
47.1	—	47.3	—	49.5	—	43.7	—	45.6	—	44.7	—
1,048	—	1,048	—	2,299	—	2,299	—	7,918	—	7,918	—
767,480	—	764,598	—	145,073	—	274,356	—	1,421,030	—	1,587,014	—
2,800	—	560	—	—	—	1,533	—	2,800	—	2,580	—
770,280	—	765,158	—	145,073	—	275,889	—	1,423,830	—	1,589,594	—
71,693,669	—	68,924,102	—	20,300,707	—	36,545,395	—	136,998,902	—	155,316,736	—

(3) June 18, 1936, to May 10, 1939: 10 Trailing cars
May 11, 1939, to June 30, 1939: 11 Trailing cars

(4) Dec. 27, 1937, to June 30, 1939: 14 Trailing cars

As will be seen from the foregoing statement, the Net Revenues in 1938 range from 33.6 per cent of the Revenues in the case of the City of Portland to 49.5 per cent in the case of the second City of Los Angeles, an average for all trains of 45.6 per cent.

For the year 1939 these percentages were 33.4 for the City of Portland and 47.3 for the City of Denver, an average for all trains of 44.7.

GROWTH OF TRAFFIC ON NORTH WESTERN-UNION PACIFIC STREAMLINERS

Following is a statement of the revenues of the North Western-Union Pacific streamliners (exclusive of dining car revenue) by six-months' periods (with one minor exception) from July 1, 1936, to June 30, 1939:

Period	6 Months	Year
<i>City of Portland</i>		
July 1 to Dec. 31, 1936	\$198,630	
Jan. 1 to June 30, 1937	142,464	\$341,094
July 1 to Dec. 31, 1937	189,055	
Jan. 1 to June 30, 1938	182,846	371,901
July 1 to Dec. 31, 1938	194,832	
Jan. 1 to June 30, 1939	194,276	389,108
<i>City of Los Angeles (First)</i>		
July 1 to Dec. 31, 1936	358,504	
Jan. 1 to June 30, 1937	347,283	705,787
July 1 to Dec. 31, 1937	337,618	
Jan. 1 to June 30, 1938	213,441	551,059
Out of service—Dec. 27, 1937, to Feb. 20, 1938		
July 1 to Dec. 31, 1938	351,463	
Jan. 1 to June 30, 1939	327,323	678,786
<i>City of Denver (Two trains)</i>		
July 1 to Dec. 31, 1936	967,309	
Jan. 1 to June 30, 1937	754,037	1,721,346
July 1 to Dec. 31, 1937	954,099	
Jan. 1 to June 30, 1938	755,931	1,710,030
July 1 to Dec. 31, 1938	907,657	
Jan. 1 to June 30, 1939	753,769	1,661,426
<i>City of Los Angeles (Second)</i>		
Dec. 27, 1937, to June 30, 1938	507,605	
July 1 to Dec. 31, 1938	445,904	
Jan. 1 to June 30, 1939	453,205	899,109

It will be seen that the revenues of these trains for corresponding periods have remained substantially uniform. This is due to the fact that the trains have been extraordinarily popular and have been booked substantially to capacity throughout the whole period of their operation. The larger second City of Los Angeles, installed December 27, 1937, replacing the first City of Los Angeles for a period of about two months, after which both trains were operated, has also been heavily patronized.

The revenues (exclusive of dining car revenue) of the North Western-Union Pacific Chicago-Los Angeles streamline extra-fare trains have been roughly proportional to the number of cars in this service, which tends to confirm the statement that capacity has been a major factor in limiting the traffic on these trains.

These trains have been remarkably successful, as the foregoing statements show, both in their public appeal and as business undertakings.

The splendid fleet of Streamliners will shortly be augmented by the addition of two new 14-car trains for service between Chicago and the Pacific Coast. One train will replace the present 11-car City of Los Angeles (First), and the other the 8-car Forty Niner.

These trains will be largely duplicates of the present City of Los Angeles (Second) and the City of San Francisco. The 3-car 6,000 H.P. Diesel-electric power units of each train will be built by the Electro-Motive Corporation, and the 14 trailing cars by Pullman.

STREAMLINERS

NORTH WESTERN—UNION PACIFIC—SOUTHERN PACIFIC

In addition to the streamliners operated jointly by the North Western and the Union Pacific two important extra-fare trains, the City of San Francisco and the Forty Niner, are operated over a route embracing lines of the North Western, Union Pacific and Southern Pacific, each train making a round trip every six days between Chicago and San Francisco.

The City of San Francisco is a 14-car train built by Pullman, hauled by a Diesel-electric locomotive of three units of 1,800 H.P. each, built by the Electro-Motive Corporation. It is an aluminum alloy train, splendidly appointed and handsomely decorated, and is largely similar in type and consist to the second City of Los Angeles. Eight cars are articulated in pairs. The train consists of a baggage-dormitory car, a coach, a diner-kitchen, a diner, a dormitory-club car, 8 sleeping cars, and an observation-lounge car.

The center of gravity of the power cars is 57 inches above the rail, and of the cars 55 inches.

The Forty Niner is an 8-car sleeping car train, hauled by a streamline steam locomotive. The first 6 cars are rebuilt and refurbished conventional cars, consisting of a baggage-dormitory-kitchen car, a diner-lounge and 4 sleeping cars. They are followed by 2 cars of light-weight construction, articulated, built by Pullman. They are both sleeping cars, the rear car containing also a buffet-lounge.

WEIGHT, SEATING CAPACITY, ETC.

The weight, seating capacity, etc., of the North Western-Union Pacific-Southern Pacific Chicago-San Francisco extra-fare trains, the City of San Francisco and the Forty Niner, and the dates when placed in service, are given in the following statements:

Train and Run		Date Placed in Service	Power Cars or Locomotives Exclusively Weight (Tons)	Trailing Cars Weight (Tons)	All Units	
					Weight (Tons)	Length (Feet)
(1)	CITY OF SAN FRANCISCO Chicago-San Francisco 3 power cars and 14 trailing cars	1/2/38	441	832	1,273	1,292
(2)	FORTY NINER Chicago-San Francisco Steam locomotive and 8 trailing cars	7/8/37	N.W. 226 U.P. 284 U.P. 346 S.P. 330	661	887 945 1,007 991	644 650 660 664

	Salable Seats			Other Seats			All Seats
	Coach	Pullman	Total	Dining	Lounge	Total	
(1)	54	168	222	104	66	170	392
(2)		117	117	42	34	76	193

22 STREAMLINE, LIGHT-WEIGHT, HIGH-SPEED PASSENGER TRAINS

DAILY MILEAGE

The average daily mileage of each of these trains is 753 (round trip mileage divided by 6).

The average speed of the City of San Francisco is 57 miles per hour, and of the Forty Niner 46.

PHYSICAL CHARACTERISTICS OF LINE

This route partially overlaps those of the North Western-Union Pacific streamliners and its physical characteristics are briefly described in that section of the report.

RESULTS OF OPERATION OF CITY OF SAN FRANCISCO AND FORTY NINER

Following is a statement of the revenues and expenses of these trains for the respective periods of their operation to June 30, 1938, and for the year ended June 30, 1939:

Note: The railroad companies' proportion of sleeping car revenues on these trains is necessarily an estimate. It is a relatively small amount and is included in the item of Revenues.

The percentages of Net Revenue to Revenues of the two trains for the two periods were nearly equal, as the statement below shows. The average was 57.6 per cent.

GROWTH OF TRAFFIC ON CITY OF SAN FRANCISCO AND FORTY NINER

The City of San Francisco described in this report replaced another streamline train of the same name which was placed in service on June 14, 1936. The first City of San Francisco consisted of 2 power cars and 9 trailing cars fully articulated; the present train, as noted on

REVENUES AND EXPENSES

Item	CHICAGO-SAN FRANCISCO								TOTAL TWO TRAINS			
	CITY OF SAN FRANCISCO (1)				FORTY NINER (2)							
	1 Train 14 Passenger-Train Cars. One round trip every 6 days.				1 Train 8 Passenger-Train Cars. One round trip every 6 days.							
	Operation begun Jan. 2, 1938				Operation begun July 8, 1937							
	6 months ended June 30, 1938		Year ended June 30, 1939		11 months 24 days ended June 30, 1938		Year ended June 30, 1939		Period ended June 30, 1938		Year ended June 30, 1939	
	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.
REVENUES	\$ 564,468	4.155	\$ 1,129,800	4.173	\$ 501,802	1.888	\$ 525,958	1.943	\$ 1,066,270	2.655	\$ 1,655,758	3.058
TRAIN EXPENSES												
Wages of crews	59,209	.436	115,558	.427	90,347	.340	89,456	.330	149,556	.373	205,014	.379
Fuel	24,116	.178	49,100	.181	41,396	.156	42,371	.157	65,512	.163	91,471	.169
Lubricants, etc.	7,433	.055	13,731	.051	4,750	.018	4,298	.016	12,183	.030	18,029	.033
Train supplies and expenses	14,281	.105	30,731	.114	15,044	.056	15,466	.057	29,325	.073	46,197	.085
Power plant maintenance	85,119	.626	171,921	.635	45,141	.170	56,628	.209	130,260	.324	228,549	.422
Train maintenance	21,750	.160	58,853	.217	815	.003	1,050	.004	22,565	.056	59,903	.111
TOTAL Train Expenses	211,908	1.560	439,894	1.625	197,493	.743	209,269	.773	409,401	1.019	649,163	1.199
Dining-Buffer net loss	-13,153	-.097	-32,670	-.121	-26,363	-.099	-26,940	-.100	-39,516	-.099	-59,610	-.110
TOTAL, Including D-B loss	225,061	1.657	472,564	1.746	223,856	.842	236,209	.873	448,917	1.118	708,773	1.309
NET REVENUE	339,407	2.498	657,236	2.427	277,946	1.046	289,749	1.070	617,353	1.537	946,985	1.749
Per cent of Revenues	60.1		58.2		55.4		55.1		57.9		57.2	
Route-miles	2,259		2,259		2,259		2,259		4,518		4,518	
Train-miles	135,848		270,752		265,720		270,720		401,568		541,472	
Passenger-miles	20,292,379		41,058,291		17,229,582		18,340,826		37,521,961		59,399,117	

(1) June 14, 1936 to Jan. 1, 1938: 9 Trailing cars
Jan. 2, 1938 to June 30, 1939: 14 Trailing cars

(2) July 8, 1937, to June 30, 1939: 8 Trailing cars

a preceding page, consists of 3 power cars and 14 trailing cars, 8 of which are articulated in pairs. The train provides unsurpassed travel luxuries and is booked to capacity, frequently with a long waiting list.

The Forty Niner, a well appointed and comfortable all-Pullman train, is scheduled about 10 hours faster than the regular daily train service and about 9 hours slower than the City of San Francisco. The train is unusually popular.

The following statement showing the revenues of the City of San Francisco and the Forty Niner (exclusive of dining car revenues) by six-months' periods (with minor exceptions) from July 1, 1936, to June 30, 1939, includes the period of operation of the first City of San Francisco as well as that of the second train which replaced it:

Period	6 Months	Year
<i>City of San Francisco</i>		
July 1 to Dec. 31, 1936	\$360,723	
Jan. 1 to June 30, 1937	346,568	\$707,291
July 1 to Dec. 31, 1937	337,421	
Jan. 2 to June 30, 1938	564,468	901,889
July 1 to Dec. 31, 1938	554,720	
Jan. 1 to June 30, 1939	575,080	1,129,800
<i>Forty Niner</i>		
July 8 to Dec. 31, 1937	243,923	
Jan. 1 to June 30, 1938	257,879	501,802
July 1 to Dec. 31, 1938	246,419	
Jan. 1 to June 30, 1939	279,539	525,958

The revenues of the City of San Francisco and the Forty Niner, shown in the foregoing statement, like those of the City of Portland, the City of Los Angeles and the City of Denver, set forth previously, have been somewhat proportional to the number of cars in the respective services in different periods, which is a confirmation of the statement that the trains are patronized substantially to the full extent of their capacity.

These two trains, like the long distance streamliners previously discussed, have demonstrated in a striking manner the popularity of modern travel conveniences and comforts and high-speed schedules. The financial success which has attended their operation is clearly displayed in the foregoing statements.

As stated on page 20, the present City of Los Angeles (First) and the Forty Niner will shortly be replaced by new 14-car trains.

STREAMLINERS SOUTHERN PACIFIC

In addition to the streamliners operated by the Southern Pacific in conjunction with the Union Pacific and the North Western, the Southern Pacific operates two important pairs of streamline trains, the Sunbeams and the Daylights.

SUNBEAMS SOUTHERN PACIFIC

The two streamline 8-car trains, the Sunbeams, were placed in service between Houston and Dallas on September 19, 1937. The cars were built by Pullman and are drawn by oil-burning steam locomotives, also streamlined, built by the American Locomotive Company. The strength members of the car bodies are of Corten steel assembled by welding. The side sheathing is of stainless steel and the roof covering of Corten. The cars are so designed with respect to couplers, face plates and floor levels that they may be used with conventional equipment. Four cars are articulated in pairs. The center of gravity of the cars is 55 inches above the rail. The order of the cars in the train is—a baggage car, a coach exclusively for colored passengers, 2 articulated units of 2 coaches each, a parlor car, and a diner-observation car.

The weight of the locomotive is 281 tons, cars 394 tons, total 675 tons. The length of the train is 671 feet.

The seating capacity of each train is as follows:

Salable Seats	
Coach for colored passengers	48
4 Coaches articulated in pairs	200
Parlor car	<u>32</u>
Total Salable Seats	280
Non-Salable Seats	
Parlor car—card section	8
Diner-lounge	
Dining section	32
Lounge	<u>14</u>
Total Non-Salable Seats	<u>54</u>
Grand Total	334

Each train makes a daily one-way non-stop trip between Houston and Dallas under the name Sunbeam, for which the results of operation are shown later in this report. Since June 5, 1938, this equipment has made an additional daily one-way trip between Houston and Dallas under the name Hustler, on a slower schedule, making intermediate stops. Prior to that date, the Hustler was composed of conventional equipment and no detailed records were kept of its earnings and expenses.

Running as the Sunbeams, the two trains leave the terminals, traveling in opposite directions, at the close of the business day and cover the 264 miles without stops in 265 minutes, or at an average speed of 60 miles per hour. This fast schedule is maintained notwithstanding the necessity for complying with numerous speed restrictions through cities.

Passengers have been profuse in their praise of the conveniences, interior decorations, the excellent dining car service and the quiet, homelike atmosphere prevailing on the trains. The large rest rooms and their appointments, particularly in the coaches, have been the subject of much favorable comment.

PHYSICAL CHARACTERISTICS OF LINE

Houston-Dallas, 264 Miles

About 3% of the line is double track.

RULING GRADES are 1% in each direction.

STREAMLINE, LIGHT-WEIGHT, HIGH-SPEED PASSENGER TRAINS 25

MAXIMUM CURVES range up to 4°, with 2° curves prevailing. About 96% of the line is straight track.

WEIGHT OF RAIL—36.8% 90-pound; 22.5% 110-pound; and 40.7% 112-pound.

TIES—90% creosoted; remainder are cy-press and zinc treated.

BALLAST—47.7% crushed rock; 33.2% coarse gravel; and 19.1% light gravel.

RESULTS OF OPERATION OF SUNBEAMS

Following is a statement of the revenues and expenses of the Sunbeams for the period of their operation from September 19, 1937, to June 30, 1938, and for the year ended June 30, 1939:

The Net Revenue of the Sunbeams from the beginning of operation to June 30, 1938, was 16.5 per cent of Revenues, and for the year ended June 30, 1939, 29.1 per cent.

GROWTH OF TRAFFIC ON SUNBEAMS

The following shows the revenues of the Sunbeams (exclusive of dining car revenues) by six-months' periods from the beginning of operation to June 30, 1939:

Period	6 Months	Year
Sept. 19 to Dec. 31, 1937	\$58,828*	
Jan. 1 to June 30, 1938	93,877	\$152,705**
July 1 to Dec. 31, 1938	102,098	
Jan. 1 to June 30, 1939	109,939	212,037

* 3 months 12 days.
** 9 months 12 days.

REVENUES AND EXPENSES

Item	HOUSTON-DALLAS			
	2 Trains, Each Steam Locomotive and 8 Passenger Train Cars. Each one-way trip daily.			
	Operation begun September 19, 1937			
	9 Months 12 Days ended June 30, 1938		Year ended June 30, 1939	
Amount	Per Train-Mile	Amount	Per Train-Mile	
\$	\$	\$	\$	
REVENUES	152,705	1.015	212,037	1.100
TRAIN EXPENSES				
Wages of crews	43,726	.291	51,053	.265
Fuel	17,844	.119	20,059	.104
Lubricants, etc.	3,213	.021	4,070	.021
Enginehouse expenses	7,525	.050	8,156	.043
Train supplies and expenses	23,098	.154	17,876	.093
Power plant maintenance	7,128	.047	16,629	.086
Train maintenance	17,061	.113	20,380	.106
TOTAL Train Expenses	119,595	.795	138,223	.718
Dining-Buffer net loss	-7,974	-.053	-12,213	-.064
TOTAL, Including D-B Loss	127,569	.848	150,436	.782
NET REVENUE	25,136	.167	61,601	.318
Per cent of Revenues	16.5		29.1	
Route-miles	264		264	
Train-miles	150,480		192,720	
Passenger-miles	5,853,000 (est.)		8,728,442	

DAYLIGHTS

SOUTHERN PACIFIC

The Daylights were placed in service on March 21, 1937, between Los Angeles and San Francisco, 471 miles, replacing conventional trains of the same name. Each of the two trains consists of a specially designed steam locomotive built by the Lima Locomotive Works, to serve both on mountain grades and at high speeds on level grades, and 14 light-weight, attractively styled and splendidly appointed streamline cars built by Pullman, principally of Corten steel. Six cars in each train are articulated in pairs. The weight of each train is—locomotive, 417 tons; cars, 712 tons; total, 1,129 tons; the length—locomotive, 110 feet; cars, 1,029 feet; total, 1,139 feet. The center of gravity of the cars is about 55 inches above top of rail.

Each train consists of a baggage-coach, 8 coaches, a parlor car, a parlor-observation car, a coffee shop car, a tavern car, and a diner. The salable seats total 497, of which 440 are coach and 57 parlor car seats. Other seats include 56 in the coffee shop, 56 in the tavern car, 40 in the diner, and 18 in lounges, a total of 170. The total of all seats is 667.

The trains each make a one-way trip daily, covering the 471 miles in 9 hours

and 45 minutes, or at an average speed of 48.3 miles per hour. The entire trip is made in daylight along the scenic California coast route.

PHYSICAL CHARACTERISTICS OF LINE

Los Angeles-San Francisco, 471 Miles

About 19% of the line is double track.

RULING GRADES are 2.2% in the mountain section between Santa Margarita and Pismo, 27 miles, and 1% on the balance of the line.

MAXIMUM CURVES are 6°, with a few sharper curves on mountainous sections and at terminals. 72% of the line is straight track.

WEIGHT OF RAIL—110 to 131 pounds, with 110-112-pound predominating.

TIES are all treated.

BALLAST—Crushed rock.

RESULTS OF OPERATION OF DAYLIGHTS

The statement on the following page shows the revenues and expenses of the Daylights for the years ended June 30, 1938 and 1939. The statement does not include the revenues and expenses of extra sections.

The Revenues of the Daylights are not only extraordinarily large, but the proportion of the Net Revenue to the Revenues is also high.

REVENUES AND EXPENSES

Item	LOS ANGELES-SAN FRANCISCO			
	2 Trains, Each Steam Locomotive and 14 Passenger Train Cars. Each one-way trip daily.			
	Operation begun March 21, 1937			
	Year ended June 30, 1938		Year ended June 30, 1939	
	Amount	Per Train-Mile	Amount	Per Train-Mile
REVENUES	\$ 1,580,871	\$ 4.631	\$ 1,816,268	\$ 5.283
TRAIN EXPENSES				
Wages of crews	140,158	.411	146,325	.426
Fuel	86,748	.254	83,058	.242
Lubricants, etc.	4,879	.014	4,824	.014
Enginehouse expenses	16,980	.050	15,633	.045
Train supplies and expenses	99,857	.293	94,025	.274
Power plant maintenance	35,292	.103	42,892	.125
Train maintenance	94,429	.277	111,555	.325
TOTAL Train Expenses	478,343	1.402	498,312	1.451
Dining-Buffer-News Service net loss or gain	-6,335	-.018	6,672	.021
TOTAL, Including D-B-N S loss or gain	484,678	1.420	491,640	1.430
NET REVENUE	1,096,193	3.211	1,324,628	3.853
Per cent of Revenues	69.3		72.9	
Route-miles	471		471	
Train-miles	341,337		343,720	
Passenger-miles	80,000,000 (est.)		127,121,322	

GROWTH OF TRAFFIC OF DAYLIGHTS

Following is a statement showing the revenues of the Daylights (exclusive of dining, buffet, and news service revenues) by six-months' periods to June 30, 1939:

Period	6 Months	Year
July 1 to Dec. 31, 1937	\$850,913	
Jan. 1 to June 30, 1938	729,958	\$1,580,871
July 1 to Dec. 31, 1938	907,164	
Jan. 1 to June 30, 1939	909,104	1,816,268

The record of earnings of the Daylights since March 21, 1937, when conventional trains were replaced by the present splendid streamline light-weight equipment especially designed for the service and the schedules were shortened from 11 hours to 9 hours and 45 minutes, is outstanding. During the summer vacation season more particularly the earnings have been very large, at times reaching a figure in excess of \$6.00 per train-mile.

Two new 14-car trains are in process of construction by Pullman and will shortly be placed in service to supplement the highly popular Daylights, the demands for accommodations on which have been such as to require the frequent running of extra sections throughout the year and every day in the summer months.

The new trains will be practically duplicates of the present trains. An innovation will be an articulated 3-car dining unit consisting of a dining car, a kitchen car and a coffee-shop car; another is a luggage compartment in each car with outside doors.

Like the present Daylights, the new trains will be hauled by steam locomotives.

ZEPHYRS

CHICAGO, BURLINGTON & QUINCY

GENERAL STATEMENT

The Burlington, along with the Union Pacific, was a pioneer in the development of the streamline train, the former in its earlier undertakings in the establishment of short distance services, working in conjunction with the Edward G. Budd Manufacturing Company and using stainless steel as the weight-saving medium; the latter for transcontinental runs in cooperation with the Pullman-Standard Car Manufacturing Company, using aluminum alloy. In finding solutions of the motive power problems of both roads the Electro-Motive Corporation has played a major part.

The Burlington, like the Union Pacific and a number of other roads, early realized the necessity for providing more attractive equipment, better service, and greater speed in its passenger train operations if it were to stem the tide of fast receding railroad passenger traffic. Its extensive studies of the subject led to the conclusion that to accomplish this object trains of a type entirely different from those in general use must be offered the traveling public. With a knowledge of the fact that the bulk of railroad passenger business is short distance travel, the Burlington's first efforts were devoted to the

production of a train possessing qualities of speed, comfort and convenience, and beauty of design and decoration that would assure the diversion of a measure of the local traffic from the highway stream.

The wide experience of the company in the operation of gas- and oil-electric trains pointed to the Diesel-electric engine as the most desirable motive power to meet the new and more exacting requirements. In cooperation with the Budd Company a stainless steel car was produced in the first train built that has constantly stood the test of service under the most extreme conditions of high-speed operation.

So successful have been the short distance services thus far established that the company's more recent activities have been directed to the long distance field, and with equally or even more satisfactory results.

With these beginnings, in which the principles and philosophy underlying stainless steel, light-weight, high-speed, streamline train construction were laid down, the company has rapidly extended its high-speed services to the point where it now possesses one of the largest fleets of streamline trains in the country.

The first Zephyr train, as soon as completed, made a nation-wide exhibition tour and attracted extraordinary interest in every direction. On May 26, 1934, it made a non-stop run from Denver to Chicago in 13 hours and 5 minutes, at an average speed of 77.6 miles per hour, breaking all previous records, entering the grounds of the Century of Progress exposition at the completion of the trip, where it remained on display for a short time prior to its placement in service. It was assigned to the line between Kansas City, Mo., and Omaha and Lincoln, Neb., on November 11, 1934, thus gaining the distinction of being the first streamline Diesel-electric train to be placed in regular service in the United States.

Initially the train consisted of three cars, the forward car containing the power plant. On June 24, 1935, a 40-seat coach was added, which was removed from the train on June 28, 1938, and replaced by a dinette-coach with 24 coach seats and 16 dinette seats. This train was the subject of our report of January 15, 1935.

The original Twin Zephyrs began operation between Chicago and the Twin Cities for single daily service on April 21, 1935. Favorable public reaction led to the establishment of double daily service on June 2, 1935. Each of these trains comprised 3 cars, the forward car in each case containing the power plant. Following various reassignments of trains and

cars, further public demand resulted in the introduction, on December 18, 1936, of the fifth and sixth Zephyrs—the larger Twin Zephyrs. These trains originally consisted of 7 cars each, one of which is the power plant car. In September 1937, a dinette-coach was added to each train containing 40 coach seats and 16 dinette seats.

The fourth Zephyr train to be built was placed in operation between St. Louis, Mo., and Burlington, Ia., on October 28, 1935, and is now operating between St. Louis and Kansas City. It consists of 4 cars, with the power plant in the forward car. Shortly before it was placed in regular service this train, during a trial run, attained a speed of 122 miles per hour for a short distance.

The seventh and eighth Zephyr trains were assigned to service between Chicago and Denver on November 8, 1936. Two of the original 3-car Zephyr trains had been operated on this route between May 31, 1936, and November 8, 1936. The larger Denver Zephyrs originally comprised 12 cars each, of which 2 cars in each train were power cars. On May 27, 1938, a dinette-coach, and on June 3, 1939, a sleeper, were added to each train. One of these trains, on October 23, 1936, captured the record from the first Zephyr in making a non-stop run of 1,017 miles from Chicago to Denver in 12 hours and 12 minutes, at the average speed of 83.4 miles per hour.

One of the original 3-car Twin Zephyrs was placed in service between Fort Worth, Dallas and Houston on October 1, 1936. On July 8, 1938, a 40-seat coach was added to this train. The other original 3-car Twin Zephyr was placed in service between St. Louis and Kansas City on December 20, 1936.

The latest acquisition, the General Pershing, was placed in service between St. Louis and Kansas City on April 30, 1939, but the results of its operation for May and June are not available for this report.

BRIEF DESCRIPTION OF BURLINGTON ZEPHYRS

The smaller Zephyr trains, and all cars in the larger trains, including the sleeping cars in the Denver Zephyrs, are of stainless steel and were built by the Edward G. Budd Manufacturing Company. All of the trains are propelled by Diesel-electric locomotives. The power plants in the smaller trains and the power cars and power plants in the larger trains were built by the Electro-Motive Corporation. Those of the smaller 4-car trains are 600 H.P., except the General Pershing, which is 1,000 H.P., of the Twin Cities trains 1,800 H.P. (2 power plants of 900 H.P. each) and of the Denver trains 3,000 H.P. (2 power plants of 900 H.P. each and 1 of 1,200 H.P.). All trains are fully articulated with the exception of the Denver trains, which are partially articulated, and the General Pershing, which is non-articulated throughout.

The center of gravity of the power cars in the case of the smaller trains is 52½ inches above the rail, and of the Twin Cities and Denver power cars about

57 inches. That of the cars in the smaller trains is about 48 inches above the rail, and in the larger trains about 52 inches.

The fundamental structural features of the newer Zephyr trains follow the description of the original Zephyr given in our report of January 15, 1935. Great thought and care have been devoted to the questions of structural strength and of beauty of exterior design and interior decoration. All known travel conveniences and comforts were embodied in these trains at the time they were built, but each new train surpasses the earlier ones in luxuriousness of appointments, in riding qualities and in passenger appeal.

CONSIST OF TRAINS

The Kansas City-Lincoln train, the Pioneer Zephyr, consists of 4 cars—a power plant-mail compartment-baggage car, a baggage-boiler room car, a dinette-coach, and a coach-parlor-observation car.

The Fort Worth - Dallas - Houston Zephyrs, the Sam Houston and the Texas Rocket, and the St. Louis-Kansas City Zephyrs, the Mark Twain and the General Pershing, are 4-car trains. The Sam Houston and the Texas Rocket consist of a power plant-baggage-express car, with space for colored passengers, a dinette-coach, a coach and a coach-parlor-observation car. The Mark Twain is somewhat similar in car arrangement to the Kansas City-Lincoln Zephyr. The new General Pershing consists of a power-baggage car, 2 coaches, and a diner-parlor-lounge car.

The two Twin Zephyrs are each composed of a power car and 7 passenger

train cars, the latter comprising a bar-cocktail lounge-baggage car, in which is an auxiliary engine, 2 coaches, a dinette-coach, a diner, a parlor car, and a parlor-observation car.

The two Denver Zephyrs are each composed of 2 power cars and 12 passenger train cars, the latter comprising a baggage-mail car, in which is an auxiliary

engine, a baggage-cocktail lounge-bar car, a dinette-coach, 2 coaches, a diner, 5 sleeping cars, and a lounge-parlor-buffet-car.

WEIGHT, SEATING CAPACITY, ETC.

The weight, seating capacity, etc., of the Burlington Zephyrs, and the dates when placed in their present service, are given in the following tables:

Train and Run		Date Placed in Service	Power Cars Exclusively Weight (Tons)	Trailing Cars Weight (Tons)	All Units	
					Weight (Tons)	Length (Feet)
(1)	PIONEER ZEPHYR Kansas City-Omaha-Lincoln 4-car train	11/11/34			151	261
(2 and 3)	SAM HOUSTON TEXAS ROCKET Fort Worth-Dallas-Houston 2 4-car trains	10/1/36			136	247
		11/3/38			144	261
(4 and 5)	MARK TWAIN GENERAL PERSHING St. Louis-Kansas City 2 4-car trains	10/28/35			145	280
		4/30/39			270	337
(6 and 7)	TWIN ZEPHYRS Chicago-Twin Cities 2 trains of 1 power car and 7 trailing cars each Each train	12/18/36				
			112	267	380	531
(8 and 9)	DENVER ZEPHYRS Chicago-Denver 2 trains of 2 power cars and 12 trailing cars each Each train	11/8/36				
			216	566	782	1,059

	Salable Seats					Other Seats				Total All Seats
	Coach	Sleepers	Cocktail Annex	Parlor	Total	Dining	Cocktail Lounge	Parlor, Lounge and Card Playing	Total	
(1)	64			12	76	16			16	92
(2 and 3)	88			22	110	16			16	126
	108			22	130	16			16	146
(4 and 5)	60			16	76	16			16	92
	122			22	144	24			24	168
(6 and 7) Each train	160		16	46*	222	48	18	10	76	298
(8 and 9) Each train	150	114	16	10	290	56	18	30	104	394

* 43 Parlor. 3 Drawing room.

DAILY MILEAGE OF ZEPHYR TRAINS

The daily mileage of Zephyr trains on the Burlington has now reached imposing proportions.

The lines to which the nine Zephyrs are assigned and the average daily mileage of each are given in the table below:

Name	Run	Average Daily Mileage
Pioneer Zephyr	Kansas City-Omaha-Lincoln	500
Sam Houston	Fort Worth-Dallas-Houston	1,132
Texas Rocket	St. Louis-Kansas City	1,116
Mark Twain	Chicago-Twin Cities (2 trains)	1,764
General Pershing	Chicago-Twin Cities (2 trains)	1,764
Twin Zephyrs	Chicago-Denver (2 trains)	2,073
Denver Zephyrs	Chicago-Denver (2 trains)	2,073
Total Daily Mileage		6,585

Since the beginning of Burlington Zephyr service, the accumulated mileage of the trains to June 30, 1939, totals over seven million, with the high average availability over the whole period of 95.4 per cent.

The maximum speeds of the Burlington Zephyrs are limited by rules to the following:

	Miles Per Hour
On tangent track and 1 degree curves	90-100
On 2 degree curves	85
On 3 degree curves	65

The average scheduled speed of the Twin Cities and Denver Zephyrs is about 65 miles per hour.

PHYSICAL CHARACTERISTICS OF LINES

For a proper understanding of the conditions under which the trains operate a

brief description of the physical characteristics of the lines is given below:

Kansas City-Omaha-Lincoln, 250 Miles

About 44% of the line is double track.

RULING GRADES—There are no adverse grades except between Omaha and Lincoln, where the ruling grades are 1.25% in each direction.

MAXIMUM CURVES are 1° except in terminals and near ends of double track at Weston, Iatan and Armour. About 81% of the line is straight track.

WEIGHT OF RAIL—90 to 112 pounds, 90-pound predominating.

TIES are treated throughout.

BALLAST—Cinders, slag and chatts, cinders predominating.

Fort Worth-Dallas-Houston, 283 Miles

The line is practically all single track.

RULING GRADES range from 0.70% to 1.00%.

MAXIMUM CURVES are generally 1° between Fort Worth and Dallas, 34 miles, 2° between Dallas and Teague, 97 miles, and 3° between Teague and Houston, 152 miles. About 88% of the line is straight track.

WEIGHT OF RAIL—85 and 90-pound, the latter predominating.

TIES are all treated.

BALLAST—Crushed rock, gravel, burnt gumbo and shell, the latter predominating.

St. Louis-Kansas City, 279 Miles

About 12% of the line is double track.

RULING GRADES are as follows:

Section	Distance Miles	Westbound %	Eastbound %
St. Louis-West Alton (C.B. & Q.)	20	0.5	0.5
West Alton-Old Monroe (C.B. & Q.)	32	None	None
Old Monroe-Mexico (C.B. & Q.)	65	0.5	0.5
Mexico-Slater (Alton)	67	1.0	0.8
Slater-Kansas City (Alton)	95	1.1	1.0

MAXIMUM CURVES except at terminals are 1° on the C. B. & Q. between St. Louis and Mexico, 117 miles, and 2° on the Alton between Mexico and Kansas City, 162 miles. About 78% of the line is straight track.

WEIGHT OF RAIL—85 to 112 pounds, 100-pound predominating, including the Alton.

TIES are 100% treated on the C. B. & Q. and largely untreated on the Alton.

BALLAST—Stone, crushed slag and chatts, stone and crushed slag predominating.

St. Louis-Burlington, 221 Miles

About 13% of the line is double track.

RULING GRADES range from 0.30% to 0.50%.

MAXIMUM CURVES are 2° except at terminals. About 77% of the line is straight track.

WEIGHT OF RAIL—85 to 112 pounds, 90-pound predominating.

TIES are treated throughout.

BALLAST—Principally chatts, gravel and slag; chatts predominating.

Chicago-Twin Cities, 441 Miles

About 75% of the line is double track.

RULING GRADES over the greater portion of the route are 0.30% in both directions. Between Aurora and Savanna, 107 miles, the ruling grades are 0.80% westbound and 0.88% eastbound. On the Great Northern between St. Paul and Minneapolis, 10 miles, which is used by the Burlington, the ruling grades are 1.65% westbound and 0.70% eastbound.

MAXIMUM CURVES—1° curves prevail except at terminals. About 76% of the line is straight track.

WEIGHT OF RAIL—90 to 131 pounds, 100-pound largely predominating.

TIES are all treated.

BALLAST—Principally washed and crushed gravel and chatts.

Chicago-Denver, 1,036 Miles

About 46% of the line is double track.

RULING GRADES are as follows:

Section	Distance Miles	Westbound %	Eastbound %
Chicago-Aurora	38	0.5	0.3
Aurora-Galesburg	124	0.87	0.4
Galesburg-Burlington	43	None	0.4
Burlington-Creston	188	0.66	0.66
Creston-Pacific Junction	82	0.66	0.66
Pacific Jct.-Lincoln via Plattsmouth	81	1.25	1.25
Pacific Jct.-Lincoln via Council Bluffs	76	1.25	1.25
Lincoln-Hastings	96	0.60	0.45
Hastings-McCook	132	0.5	0.5
McCook-Denver	254	0.7	0.7
Average Distance	1,036		

MAXIMUM CURVES—1° curves prevail except at terminals. About 81% of the line is straight track.

WEIGHT OF RAIL—90 to 131 pounds, 100-pound largely predominating.

TIES are all treated.

BALLAST—Principally chatts, gravel and slag. Gravel predominates east, and slag west of the Missouri River.

34 STREAMLINE, LIGHT-WEIGHT, HIGH-SPEED PASSENGER TRAINS

RESULTS OF OPERATION OF ZEPHYRS

Following is a statement of the revenues and expenses of the Zephyrs for the year ended June 30, 1938 and 1939.

The statement below shows that the total Net Revenue for the eight trains for the year ended June 30, 1938, was 65.9 per cent of the Revenues, and for

REVENUES AND EXPENSES

Item	Routes and Trains											
	KANSAS CITY-OMAHA-LINCOLN				FORT WORTH-DALLAS-HOUSTON				ST. LOUIS-KANSAS CITY			
	1 Train, 4 Passenger Train Cars. One round trip daily.				2 Trains (2), 4 Passenger Train Cars Each. Each one round trip daily.				1 Train (3), 4 Passenger Train Cars. One round trip daily.			
	Operation Begun November 11, 1934				Operation Begun October 1, 1936				Operation Begun December 20, 1936			
	Year Ended June 30, 1938		(1) Year Ended June 30, 1939		Year Ended June 30, 1938		(2) Year Ended June 30, 1939		Year Ended June 30, 1938		(3) Year Ended June 30, 1939	
	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.
REVENUES	\$ 221,072	\$ 1.221	\$ 106,123	\$ 1.214	\$ 199,628	\$.982	\$ 314,019	\$.928	\$ 167,917	\$.823	\$ 238,715	\$.733
TRAIN EXPENSES												
Wages of crews	46,535	.257	22,873	.262	50,431	.248	85,632	.253	50,117	.245	77,995	.239
Fuel	4,054	.022	1,679	.019	3,965	.020	6,842	.020	4,428	.022	7,946	.025
Lubricants, etc.	579	.003	280	.003	1,180	.006	1,704	.005	796	.004	1,400	.004
Train supplies and expenses	5,973	.033	2,457	.028	9,659	.048	14,758	.044	8,958	.044	13,317	.041
Power plant maintenance	13,756	.076	5,561	.064	25,216	.124	41,369	.122	15,042	.074	26,792	.082
Train maintenance	23,259	.129	10,335	.118	26,578	.131	31,772	.094	15,657	.077	26,064	.080
TOTAL Train Expenses	94,156	.520	43,185	.494	117,029	.577	182,077	.538	94,998	.466	153,514	.471
Dining-Buffer net loss	-4,362	-.024	-3,086	-.035	-6,792	-.033	-12,828	-.038	-10,284	-.050	-12,311	-.038
TOTAL, Including D-B loss	98,518	.544	46,271	.529	123,821	.610	194,905	.576	105,282	.516	165,825	.509
NET REVENUE	122,554	.677	59,852	.685	75,807	.372	119,114	.352	62,635	.307	72,890	.224
Per cent of Revenues	55.4		56.4		38.0		37.9		37.3		30.5	
Route-miles	250		250		283		283		279		279	
Train-miles	181,000		87,435		203,352		338,461		204,049		325,672	
Passenger-miles	8,234,506		3,769,279		9,709,959		15,973,562		7,746,492		10,361,825	

Note: Power plant and train maintenance figures include both running and general repairs.

(1) On other runs from October 23, 1938, to May 2, 1939, during which time it was replaced by steam train.

(2) Second train added November 3, 1938. Statement for period includes operation of second train from November 3, 1938, to June 30, 1939.

(3) Two trains were operated on this run from September 25, 1938, to April 29, 1939. The General Pershing replaced one of these trains on April 30, 1939, but figures of its operation are not available and are not included in this statement.

STREAMLINE, LIGHT-WEIGHT, HIGH-SPEED PASSENGER TRAINS 35

the year ended June 30, 1939, 65.0 per cent. From this standpoint the most profitable trains during both years were the two large Chicago-Denver trains, averaging 73.5 per cent.

GROWTH OF TRAFFIC ON ZEPHYRS
The statement on the following page shows the revenues (exclusive of dining car revenues) of the Zephyrs by six-months' periods from January 1, 1935, to June 30, 1939.

REVENUES AND EXPENSES

Routes and Trains														TOTAL EIGHT TRAINS	TOTAL EIGHT TRAINS
ST. LOUIS-BURLINGTON				CHICAGO-TWIN CITIES				CHICAGO-DENVER							
1 Train, 4 Passenger Train Cars. One round trip daily.				2 Trains, each 7 Passenger Train Cars. Each one round trip daily.				2 Trains, 12 Passenger Train Cars. Each one-way trip daily.							
Operation Begun October 28, 1935				(6) Operation Begun December 18, 1936				(7) Operation Begun November 8, 1936							
(4) Year Ended June 30, 1938		(5) 2 Months 20 Days Ended Sept. 20, 1938		Year Ended June 30, 1938		Year Ended June 30, 1939		Year Ended June 30, 1938		Year Ended June 30, 1939		Year Ended June 30, 1938		Year Ended June 30, 1939	
Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.
\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
107,752	.949	35,737	1.002	1,211,806	1.889	1,186,571	1.990	2,101,117	2.764	2,077,444	2.964	4,009,292	1.906	3,958,609	1.899
28,186	.248	8,896	.249	167,873	.262	161,251	.270	204,681	.269	196,353	.280	547,823	.260	553,000	.265
2,738	.024	920	.026	30,699	.048	30,203	.051	58,950	.077	57,462	.082	104,834	.050	105,052	.050
443	.004	164	.005	6,769	.011	6,290	.011	13,228	.017	12,229	.017	22,995	.011	22,067	.011
4,260	.037	1,505	.042	33,878	.053	31,606	.053	38,577	.051	35,843	.051	101,305	.048	99,486	.048
8,918	.078	3,503	.098	77,979	.122	87,710	.147	129,766	.171	136,300	.195	270,677	.129	301,235	.145
11,190	.099	3,053	.086	62,389	.097	55,745	.093	62,660	.083	62,747	.090	201,733	.096	189,716	.091
55,735	-.490	18,041	-.506	379,587	-.593	372,805	-.625	507,862	-.668	500,934	-.715	1,249,367	-.594	1,270,556	-.610
-4,272	-.038	-2,226	-.062	-43,811	-.068	-36,656	-.062	-49,711	-.065	-46,355	-.066	-119,232	-.057	-113,462	-.054
60,007	.528	20,267	.568	423,398	.661	409,461	.687	557,573	.733	547,289	.781	1,368,599	.651	1,384,018	.664
7,745	.421	15,470	.434	788,408	1.228	777,110	1.303	1,543,544	2.031	1,530,155	2.183	2,640,693	1.255	2,574,591	1.235
44.3		43.3		65.1		65.5		73.5		73.6		65.9		65.0	
221		221		441		441		1,036		1,036		2,510		2,510	
113,606		35,668		641,608		596,239		760,175		700,760		2,103,790		2,084,235	
3,476,317		1,223,665		6,476,743		6,195,011		9,373,473		9,340,068		187,301,490		187,219,010	

(4) Train on other runs, June 17, 1937, to September 8, 1937, December 8, 1937, to December 15, 1937, December 27, 1937, to December 31, 1937, and April 3, 1938, to April 8, 1938.

(5) Train removed from St. Louis-Burlington run and placed on other runs on September 20, 1938.

(6) Operation begun with 3-car trains April 21, 1935.

(7) Operation begun with 3-car trains May 31, 1936.

36 STREAMLINE, LIGHT-WEIGHT, HIGH-SPEED PASSENGER TRAINS

Period	6 Months	Year	Period	6 Months	Year
<i>Kansas City-Omaha-Lincoln</i>			<i>St. Louis-Burlington</i>		
Jan. 1 to June 30, 1935 (Operation begun 11/11/34)	\$110,271		Jan. 1 to June 30, 1936 (On other runs, 5/17/36 to 12/31/36)	\$58,110	
July 1 to Dec. 31, 1935	102,271		July 1 to Dec. 31, 1936 (On other runs, 5/17/36 to 12/31/36)	—	
Jan. 1 to June 30, 1936 (On other runs, 4/27/35 to 11/7/36)	69,596	\$171,867	Jan. 1 to June 30, 1937 (On other runs, 6/17/37 to 9/8/37)	67,435	\$67,435
July 1 to Dec. 31, 1936 (On other runs, 4/27/35 to 11/7/36)	29,609		July 1 to Dec. 31, 1937 (On other runs, 6/17 to 9/8/37, 12/8 to 12/15 and 12/27 to 12/31/37)	42,071	
Jan. 1 to June 30, 1937	107,741	137,350	Jan. 1 to June 30, 1938 (On other runs, 4/3 to 4/8/38)	65,681	107,752
July 1 to Dec. 31, 1937	111,267		July 1 to Dec. 31, 1938 (On other runs, 9/21/38 to 6/30/39)	35,737	
Jan. 1 to June 30, 1938	109,805	221,072	Jan. 1 to June 30, 1939 (On other runs, 9/21/38 to 6/30/39)	—	35,737
July 1 to Dec. 31, 1938 (On other runs, 10/23/38 to 5/2/39)	71,584				
Jan. 1 to June 30, 1939 (On other runs, 10/23/38 to 5/2/39)	34,539	106,123			
<i>Fort Worth-Dallas-Houston</i>			<i>Chicago-Twin Cities</i>		
Jan. 1 to June 30, 1937	95,072		July 1 to Dec. 31, 1935	316,012	
July 1 to Dec. 31, 1937	109,496	199,628	Jan. 1 to June 30, 1936	303,327	619,339
Jan. 1 to June 30, 1938	90,132		July 1 to Dec. 31, 1936	423,972	
July 1 to Dec. 31, 1938 (1 train 7/1/38 to 11/2/38 2 trains 11/3/38 to 12/31/38)	131,336		Jan. 1 to June 30, 1937	524,258	948,230
Jan. 1 to June 30, 1939	182,683	314,019	July 1 to Dec. 31, 1937	648,356	
			Jan. 1 to June 30, 1938	563,450	1,211,806
<i>St. Louis-Kansas City</i>			<i>Chicago-Denver</i>		
Jan. 1 to June 30, 1937	76,747		July 1 to Dec. 31, 1938	665,946	
July 1 to Dec. 31, 1937	88,090		Jan. 1 to June 30, 1939	520,625	1,186,571
Jan. 1 to June 30, 1938	79,827	167,917			
July 1 to Dec. 31, 1938 (1 train 7/1/38 to 9/24/38 2 trains 9/25/38 to 12/31/38)	116,078				
Jan. 1 to June 30, 1939 (2 trains 1/1/39 to 4/29/39 1 train 4/30/39 to 6/30/39)	122,637	238,715			

* Includes railroad proportion of Pullman revenue.

The Zephyrs in the Chicago-Twin Cities service have in four years grown from twin three-car trains, each making a one-way trip daily, to twin seven trailing car trains, each making a round trip daily. This expansion of the service by successive steps is evidence of the growth in demand for accommodations on the trains.

While the available data do not give complete answers to the question of the extent of traffic growth due to the introduction of the Zephyrs, they prove conclusively that the new trains have induced a large number of persons to travel by rail who would not otherwise have

done so. In the opinion of the officials also the benefits derived in added freight traffic have been quite important.

The record of the Burlington in the operation of its Zephyr trains has been one of continuous and rapid growth, both in the number and size of trains and in the replacement of smaller trains with larger ones.

The foregoing statements clearly display the extent to which these developments have won the approval of the traveling public. The financial success attained in the operation of the Zephyrs is outstanding.

HIAWATHAS

CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC

GENERAL STATEMENT AND BRIEF
DESCRIPTION OF NEW HIAWATHAS

In our report of October 1, 1935, we described and commented upon the great popularity of the original Hiawathas of the Milwaukee operating between Chicago and the Twin Cities. In our report of June 30, 1938, mention was made of the fact that the original equipment was replaced with cars of similar structural design. Since then a second replacement of entirely new equipment, including new locomotives, has been made. In addition, Morning Hiawathas have been installed, also consisting of new equipment throughout. All of the cars in both the Morning and Afternoon Hiawathas were built in the company's shops.

The new cars are similar to the older cars in their main structural features.

They are built of high tensile steel, the members welded together, permitting of light-weight construction. The center of gravity is about 50 inches above the rail.

The cars are not articulated.

Many new features have been embodied in the cars to improve their riding qualities and generally to promote travel comfort.

The average daily mileage of each train is 422.

The following statement gives the consist, length, weight and seating capacity of each unit of the Morning and Afternoon Hiawathas. The Afternoon Hiawathas are hauled by oil-burning Atlantic type, and the Morning Hiawathas by coal-burning Hudson type, steam locomotives, built by the American Locomotive Company. The locomotives are fully streamlined.

Consist	Length Over all (Feet)	Weight (Tons)	Seating Capacity				
			Main Rooms	Lounges	Drawing Room	Other	Total
AFTERNOON HIAWATHAS—BOTH DIRECTIONS							
1 Steam Locomotive, Atlantic 4-4-2	89	274					
1 Tap-Buffer and Express Car	82	51				44	44
4 Coaches	327	192	224	56			280
1 Diner	82	54				48	48
2 Parlor Cars—Drawing Room	163	96	48	20	10		78
1 Parlor Car—Beaver Tail	82	47	28	17			45
Total—9 Cars	825	714	300	93	10	92	495
MORNING HIAWATHA—WESTBOUND							
1 Steam Locomotive, Hudson 4-6-4	104	395					
3 Express Cars	226	133					
1 Railway Post Office	63	45					
1 Tap-Buffer and Express Car	82	51				44	44
3 Coaches	245	144	168	42			210
1 Diner	82	54				48	48
1 Parlor Car—Drawing Room	82	48	24	10	5		39
1 Parlor Car—Beaver Tail	82	47	28	17			45
Total—11 Cars	966	917	220	69	5	92	386

Notes: The eastbound Morning Hiawatha is identical with the westbound train except that it carries only one express car.

Extra cars are frequently added. A maximum of 14 cars can be handled in each direction on the schedules. A Hudson type coal-burning locomotive is used on the Afternoon Hiawathas with more than 9 cars.

STREAMLINE, LIGHT-WEIGHT, HIGH-SPEED PASSENGER TRAINS 39

PHYSICAL CHARACTERISTICS OF LINE

Chicago-Twin Cities, 422 Miles

The line is double track throughout.

RULING GRADES between Chicago and Portage, 178 miles, are about 0.50% in both directions; between Portage and La Crosse, 104 miles, 0.66%; between La Crosse and St. Paul, 128 miles, 0.30%.

MAXIMUM CURVES are 1° between Chicago and Milwaukee, 85 miles, and 2° on balance of line. About 80% of line is straight track.

WEIGHT OF RAIL—100 to 131 pounds, 112-pound largely predominating.

TIES are all treated.

BALLAST—Gravel.

RESULTS OF OPERATION OF HIAWATHAS

The statement below gives the revenues and expenses of the regular Afternoon and Morning Hiawathas (i. e., exclusive of extra sections) for the years ended June 30, 1938 and 1939 for the former, and for 5 months and 11 days to June 30, 1939, for the latter.

The Net Revenue of the Afternoon Hiawathas for the year ended June 30, 1938, as shown in the statement below, was 75.7 per cent of the Revenues, and for the following year 75.3 per cent; and for the Morning Hiawathas, 64.1 per cent of the Revenues.

REVENUES AND EXPENSES

Item	CHICAGO-TWIN CITIES					
	Afternoon Hiawathas				Morning Hiawathas	
	2 Trains, Steam Locomotive and 9 Passenger Train Cars. Each a one-way trip daily.				2 Trains, Steam Loco. and 9-11 Passenger Train Cars. Each a one-way trip daily.	
	Operation begun May 29, 1935				Operation begun January 21, 1939	
	Year ended June 30, 1938		Year ended June 30, 1939		5 Months 11 Days ended June 30, 1939	
	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.
REVENUES	\$ 1,337,898	\$ 4.343	\$ 1,310,036	\$ 4.253	\$ 404,823	\$ 2.979
TRAIN EXPENSES						
Wages of crews	100,630	.326	103,769	.337	49,181	.362
Locomotive fuel (oil and coal)	54,213	.176	45,539	.148	29,150	.215
Water for locomotives	2,043	.007	2,154	.007	1,249	.009
Lubricants for locomotives	3,038	.010	3,160	.010	1,525	.011
Other supplies for locomotives	731	.002	605	.002	119	.001
Train supplies and expenses	30,482	.099	34,717	.113	12,862	.095
Locomotive repairs	82,972*	.269	68,718*	.223	19,814*	.146
Passenger car repairs	50,702*	.165	51,115*	.166	15,663*	.115
Enginehouse expenses	12,120	.039	11,048	.036	4,384	.032
TOTAL Train Expenses	336,931	1.093	320,825	1.042	133,947	.986
Dining-Buffer net gain or loss	11,557	.037	-3,342	-.011	-11,406	-.084
TOTAL, Incl. D-B gain or loss	325,374	1.056	324,167	1.053	145,353	1.070
NET REVENUE	1,012,524	3.287	985,869	3.200	259,470	1.909
Per cent of Revenues	75.7		75.3		64.1	
Route-miles	422		422		422	
Train-miles	308,060		308,060		135,884	
Passenger-miles	64,089,349		61,972,661		12,051,656	

* The figures in the table are the actual cost of locomotive and passenger car repairs incurred in each period. The repair costs attaching to each period, based upon anticipated average expense per mile over the expected life of the equipment, are estimated as follows:

Locomotive repairs	\$71,689	\$69,218	\$23,456
Passenger car repairs	83,575	88,638	40,562

GROWTH OF TRAFFIC ON HIAWATHAS

The original Hiawathas were placed in service on May 29, 1935, as 7-car trains. They were soon extended to 8 cars and later to 9 cars. At times of exceptionally heavy traffic as many as 14 cars are hauled.

A statement of the revenues of these trains (exclusive of extra sections and dining car revenue) by six-months' periods follows:

Period	6 Months	Year
<i>Afternoon Hiawathas</i>		
July 1 to Dec. 31, 1935	\$534,396	
Jan. 1 to June 30, 1936	540,404	\$1,074,800
July 1 to Dec. 31, 1936	631,057	
Jan. 1 to June 30, 1937	643,078	1,274,135
July 1 to Dec. 31, 1937	684,940	
Jan. 1 to June 30, 1938	652,958	1,337,898
July 1 to Dec. 31, 1938	697,289	
Jan. 1 to June 30, 1939	612,747	1,310,036
<i>Morning Hiawathas</i>		
Jan. 21 to June 30, 1939	\$404,823	

The remarkable success of the Hiawathas and their growing popularity are demonstrated clearly by the figures in the two foregoing statements.

The Morning Hiawathas replaced and shortened the schedules of former trains.

A decline will be noted in the traffic of the Afternoon Hiawathas since the installation of Morning Hiawathas, but the sum of the two represents a substantial increase. At the same time the traffic on all Chicago-Twin Cities' trains of the Milwaukee has grown considerably.

THE "400"'S

CHICAGO AND NORTH WESTERN

GENERAL STATEMENT AND BRIEF DESCRIPTION OF "400"'S

The two "400"'s of the North Western were placed in operation on January 2, 1935. The cars, of which there are now 7 in each train, are of conventional type. They are not new but were reconditioned, redecorated and refurnished for their present service and are described in our October 1, 1935, report. The trains are hauled by oil-burning steam locomotives reconditioned to meet the demands of high speed. While the "400"'s are not light-weight trains, their schedules equal those of the Burlington Twin Zephyrs and the Milwaukee Hiawathas. The appointments are excellent and the trains are popular with the traveling public.

The average daily mileage of each train is 419.

The consist of each of the "400"'s, and other data concerning them, are given in the table below. An additional coach was added to each train on July 1, 1938.

PHYSICAL CHARACTERISTICS OF LINE

Chicago-Twin Cities, 419 Miles

About 75% of the line is double track.

RULING GRADES between Chicago and Eau Claire, 322 miles, and between Wilson and North Line, 27 miles, range from 0.50% to 0.75%. Except for 6 miles of 1.30% ruling grades, those of the balance of the line vary from 0.50% to 1.17%.

MAXIMUM CURVES are 3° except in a few instances. About 88% of the line is straight track.

WEIGHT OF RAIL—100 to 112 pounds, 100-pound largely predominating.

TIES are all treated.

BALLAST—Between Chicago and Milwaukee, 85 miles, crushed rock; balance of line, gravel.

7-Car Train	Length Over All (Feet)	Weight (Tons)	Seating Capacity	
			Main Rooms, Lounges, etc.	Total
1 Locomotive	89	296		
1 Baggage and Passenger	77	77	Main Room 42, Men's Lounge 20	62
1 Coach	69	75	Main Room 56, Lounges 9	65
1 Lounge-Coach	82	77	Main Room 38, Lounges 12	50
1 Diner	84	88		36
1 Lounge Car	78	76	Lounge 27, Parlor 13	40
1 Parlor Car	78	71	Lounge 13, Parlor 31	44
1 Parlor Car	84	87	Parlor 23, Solarium 8, Drawing Room 5	36
Total	641	847		333

REVENUES AND EXPENSES

Item	CHICAGO-TWIN CITIES			
	2 Trains, Steam Locomotive and 7 Passenger Train Cars (Increased by addition of 1 coach on July 1, 1938) Each a one-way trip daily			
	Operation begun January 2, 1935			
	Year ended June 30, 1938		Year ended June 30, 1939	
	Amount	Per Train-Mile	Amount	Per Train-Mile
REVENUES*	\$ 667,474	\$ 2.058	\$ 715,056	\$ 2.209
TRAIN EXPENSES				
Wages of crews	99,917	.308	102,897	.318
Fuel (oil)	87,323	.269	87,426	.270
Lubricants, water, etc.	6,365	.020	5,632	.018
Train supplies and expenses	23,040	.071	27,934	.086
Locomotive repairs	63,091	.194	77,715	.240
Passenger car repairs	51,414	.159	56,935	.176
TOTAL Train Expenses	331,150	1.021	358,539	1.108
Dining-Buffer net loss	-19,367	-.060	-18,806	-.058
TOTAL, Including D-B loss	350,517	1.081	377,345	1.166
NET REVENUE	316,957	.977	337,711	1.043
Per cent of Revenues	47.5		47.2	
Route-miles		419		419
Train-miles		324,376		323,679
Passenger-miles		36,986,278		39,344,540

Note: Revenues and Expenses include extra sections when operated.

* Revenues exclude dining and buffet receipts.

RESULTS OF OPERATION OF "400"s

Above is a statement of the revenues and expenses of the "400"s for the years ended June 30, 1938 and 1939.

As shown in the foregoing statement the Net Revenue for the years ended June 30, 1938 and 1939 was 47.5 per cent and 47.2 per cent, respectively, of the Revenues.

GROWTH OF TRAFFIC ON "400"s

The revenues of the "400"s (exclusive of dining car revenue), by six-months' periods from July 1, 1935, to June 30, 1939, are given as follows:

Period	6 Months	Year
July 1 to Dec. 31, 1935	\$274,401	
Jan. 1 to June 30, 1936	277,934	\$552,335
July 1 to Dec. 31, 1936	388,294	
Jan. 1 to June 30, 1937	345,048	733,342
July 1 to Dec. 31, 1937	373,864	
Jan. 1 to June 30, 1938	293,610	667,474
July 1 to Dec. 31, 1938	378,792	
Jan. 1 to June 30, 1939	336,264	715,056

It will be noted that traffic on the "400"s did not increase during the year ended June 30, 1938. This is accounted for in part by the fact that the Minnesota "400", operated during a portion of that year and then withdrawn, diverted a certain amount of patronage from the "400"s. With the removal of that train the traffic on the "400"s has returned substantially to its former amount.

The trains, as the statements indicate, have been a successful operation from the beginning.

On September 24, 1939, the "400"s described in the foregoing were withdrawn and replaced by new splendidly appointed light-weight streamlined 10-car trains, drawn by Diesel-electric locomotives in two units of 2,000 H.P. each. The cars are of Corten steel built by Pullman, the locomotives by the Electro-Motive Corporation.

STREAMLINE TRAINS

ATCHISON, TOPEKA AND SANTA FE

GENERAL STATEMENT

The Atchison, Topeka and Santa Fe now possesses and operates a larger fleet of streamline light-weight trains than any other railroad. Its experience in this field is, therefore, of especial interest.

On May 12, 1936, the Santa Fe introduced its Super Chief, the first 39 $\frac{3}{4}$ -hour extra-fare train between Chicago and Los Angeles, followed quickly by the Union Pacific's City of Los Angeles. The Super Chief, when first installed, was unique only in its Diesel-electric locomotive and its great speed. Otherwise, it consisted of ordinary high-type, heavy conventional Pullman equipment.

When first placed in service there was a definite question in the minds of many Santa Fe officials as to the need and probable success of the new train. At that time the Santa Fe Chief, an extra-fare train, was running light. It was felt by many that the day of extra-fare luxury travel had largely passed, and that the patronage of the once-a-week Super Chief would be mainly drawn from the Chief itself.

Experience quickly demonstrated the fallacy of this view. The original Super

Chief proved instantly and strikingly successful, being booked to capacity on practically every east and westbound trip as long as it remained in service. It was significant too that from the day the fast Super Chief was inaugurated there was an immediate and heavy increase in the patronage of the slower Chief. In fact for a number of months the Chief itself has been carrying more passengers than in any previous corresponding period in its 12-year life.

On May 17, 1937, the Santa Fe's first new stainless steel streamline Super Chief completed a record run from Los Angeles to Chicago in 36 hours and 49 minutes. On the following day it was placed in regular service. Its capacity was somewhat greater than that of the original conventional train, but it too continued to be booked to capacity, regardless of season, and normally with a long waiting list.

Prior to 1938 this new Super Chief was the only streamline train in operation on the Santa Fe. A major program for extensive streamline train operation, however, had been under careful consideration and development for many months. It came to full fruition early in 1938. On February 20, 1938, a second

streamline Super Chief was placed in service, thus doubling the de luxe service; and on February 22nd two new light-weight high-speed coach trains, El Capitans, were introduced, running twice weekly between Chicago and Los Angeles on the same fast $39\frac{3}{4}$ -hour schedule.

On March 23, 1938, another streamliner, the San Diegan, was put in service between San Diego and Los Angeles, making two round trips daily on a $2\frac{1}{2}$ -hour schedule.

The new 7-car streamliners, the Chicagoan and Kansas Cityan, were installed on April 17, 1938, each train making one trip daily, in reverse directions, between Chicago, Kansas City and Wichita, Kan.

On July 1, 1938, two 5-car streamliners, the Golden Gates, went into service between Bakersfield and San Francisco, Cal., each train making one round trip daily.

During the period of construction of these new trains and their Diesel-electric locomotives, the six trains required for the daily Chief were completely re-equipped with new light-weight equipment of the same high type of workmanship and completeness of appointments as had been provided for the Super Chief.

Thus, in a period of a few months in the early part of 1938 the number of Santa Fe streamline trains had grown from one to fifteen.

The experience with the Super Chief has been outlined. The first once-a-week conventional train was sold out to capacity from the beginning. Its operation undoubtedly increased the patronage on the daily Chief, then also conventional in form. When the first Super Chief was replaced by a stainless steel streamliner of greater capacity, it too continued to be sold out. The same condition continued to obtain when the second Super Chief was built and its operation placed on a twice-a-week basis. Even at the present time, under conditions highly unfavorable to luxury spending, the Super Chiefs are filled nearly to capacity, while the now streamlined Chief, steam-drawn, continues to hold its patronage.

It is significant that there are now in weekly operation eleven extra-fare first-class trains each way between Chicago and Los Angeles, and that these trains in the aggregate are today carrying many more extra-fare first-class passengers than in any other corresponding period in the history of western travel.

Perhaps the Santa Fe's most interesting experiment in transcontinental streamline service was in the introduction of El Capitans. These are 5-car stainless steel streamline trains, drawn by Diesel-electric locomotives, and operated twice a week in each direction between Chicago and Los Angeles on the same days and on the same $39\frac{3}{4}$ -hour schedule as the Super Chiefs. The latter carry only extra-fare first-class passengers. El Capitans, however, cater en-

tirely to coach travel, at the lowest existing coach fares plus a small extra fare. So far as our knowledge goes, El Capitans are the only transcontinental all-coach streamliners in the world.

Prior to the introduction of El Capitans, splendid economy service in coaches was already being given on such trains as the 60-hour Challengers (North Western-Union Pacific-Southern Pacific), the 60-hour Santa Fe Scout and others. The North Western-Union Pacific high-speed streamliners City of Los Angeles also carried coach equipment, charging a small extra fare. The question to be solved by the Santa Fe officials was whether sufficient transcontinental coach business existed or could be created to justify new trains entirely devoted to such travel and at the Super Chief's speed and with an extra fare. It was their feeling that there was potential business for such trains and that the economy traveler would welcome the service afforded by fast, luxurious and highly comfortable coach streamliners, in which he would have the run of the train, and on which all would pay the same fare; and that the saving in time and the low basic fares would overbalance the slight extra charge.

El Capitans were designed to permit of extremely economical operation. Having no definite measure of the degree of acceptance the train would receive from the public, a rate of mileage revenue only slightly in excess of a generous figure for operating costs was set up as a preliminary acceptable rate.

The operation of El Capitans has been surprisingly successful. Introduced on February 22, 1938, patronage increased rapidly from the beginning. Week after week the train was completely sold out. By June capacity operation in both directions had been attained, with mileage revenues approaching three times the preliminary estimate.

The introduction of the San Diegan on March 23, 1938, made good a promise for such service of long standing. It is a relatively local operation between two major points where a highly competitive situation exists as between rail and highway travel. No definite estimate of prospective revenue was made under the circumstances, but it can be said that this train, averaging nearly 4,000 passengers per week, has been extremely successful both from an actual revenue standpoint and because of its success in recapturing automobile and other highway travel.

The two Golden Gates, placed in service on July 1, 1938, between Bakersfield and San Francisco, also represented the fulfillment of a promise made several years ago. In this case also no definite estimate of probable revenues could be made. The results, however, parallel those of the San Diegan. Here again, in excess of 4,000 passengers have been carried weekly, and the results currently exceed expectations by wide margins.

The streamliners Chicagoan and Kansas Cityan, operating daily between Chi-

cago, Kansas City and Kansas points west to Wichita, are proving another successful operation. Traffic has increased steadily since the inauguration of the trains and is now well above the preliminary estimates.

In summation it may be said that the experience of the Santa Fe has paralleled that of the Burlington and the Union Pacific. These two roads first and the Santa Fe later had each reached the conclusion that the high speeds, comfort and luxuriousness possible in modern streamline trains have extraordinary public appeal, and that the new trains are not only an effective means of recapturing traffic previously lost to the highways and airways, but of developing much new traffic that otherwise would not move at all.

We have dwelt at some length on the Santa Fe's experience in the operation of streamline trains, particularly the fast coach trains, because of the fact that, as a whole, the developments have been more recent, more rapid and more extensive on this line than on any other and, as will be seen from the statements which follow, the program has been a highly successful one from the beginning.

BRIEF DESCRIPTION OF SANTA FE STREAMLINE TRAINS

Note: The six Santa Fe Chiefs are largely streamline light-weight trains, but carry conventional type non-passenger cars, and are operated on much slower schedules than the Super Chiefs and El Capitans and are hauled by steam locomotives. The performance record of these trains is not, therefore, included in this discussion.

The Santa Fe's fleet of streamline light-weight high-speed trains consists of the Super Chiefs, El Capitans, the San Diegan, the Chicagoan and Kansas Cityan and the Golden Gates. They comprise a total of 61 cars, of which 54 (including 5 sleeping cars) were built of stainless steel by Budd, and 7 sleeping cars of Corten steel, sheathed with stainless steel, by Pullman. All of the trains are hauled by Diesel-electric locomotives in units of 1,800 H.P., built by the Electro-Motive Corporation.

The cars in all trains are non-articulated.

The center of gravity of the cars averages about 55 inches above the rail, and that of the locomotives about 57 inches.

These trains, like the larger Burlington Zephyrs, the Rock Island Rockets, the North Western-Union Pacific-Southern Pacific Streamliners, the Reading Crusader and others, represent the highest and most recent developments in railroad passenger car construction. Each of the Santa Fe streamline trains has been designed to provide the maximum degree of comfort in travel consistent with the type of service required of it. While the structural characteristics are alike in all, each possesses distinctive interior decorative features that have won pronounced public admiration.

CONSIST OF TRAINS

The first Super Chief is exclusively a sleeping car train, composed of 2 power

cars and 9 light-weight passenger train cars, 8 of which are of stainless steel built by Budd and 1 by Pullman. The order of the train is—a club-baggage car, 3 sleeping cars, a club-lounge, a diner, and 3 sleeping cars, the rear car containing an observation end. The second Super Chief is similar in makeup to the first Super Chief and consists of 9 light-weight cars, 3 of which are of stainless steel built by Budd, and 6 by Pullman.

The locomotives of the Super Chiefs are Diesel-electric, in two units of 1,800 H.P. each, built by the Electro-Motive Corporation.

The two El Capitan trains are exclusively coach trains, each composed of a Diesel-electric locomotive and 5 light-weight stainless steel passenger train cars—a baggage-dormitory-coach, a coach, a lunch-diner a coach for women and children, and a coach-observation car. The cars were built by Budd and the locomotive (1,800 H.P.) by the Electro-Motive Corporation.

The Super Chiefs and El Capitans make a round trip weekly between Chicago and Los Angeles, leaving Chicago on Tuesdays and Saturdays, and Los Angeles on Tuesdays and Fridays.

The San Diegan is composed of a Diesel-electric locomotive and 7 light-weight stainless steel passenger train cars—a baggage and mail car, 4 coaches, a tavern-lunch counter car, and a parlor-

observation car. The cars were built by Budd, and the locomotive (1,800 H.P.) by the Electro-Motive Corporation. The San Diegan makes two round trips daily between Los Angeles and San Diego.

The Chicagoan and Kansas Cityan are companion trains, each consisting of a Diesel-electric locomotive and 7 light-weight stainless steel passenger train cars—a baggage and mail car, 3 coaches, a club-coach car, a diner, and a parlor-observation car. The cars were built by Budd, and the locomotives (1,800 H.P.) by the Electro-Motive Corporation and St. Louis Car Company.

The Chicagoan and Kansas Cityan each make a one-way trip daily between Chicago and Wichita.

The two Golden Gates are each composed of a Diesel-electric locomotive and 6 light-weight stainless steel passenger train cars—a baggage-coach car, 2 coaches, a coach-club-bar car, a lunch-diner car, and a parlor-observation car. The cars were built by Budd, and the locomotives (1,800 H.P.) by the Electro-Motive Corporation.

The Golden Gates each make a round trip daily between Bakersfield and San Francisco.

WEIGHT, SEATING CAPACITY, ETC.

The weight, seating capacity, etc., of the Santa Fe streamline light-weight trains, and the dates when placed in

48 STREAMLINE, LIGHT-WEIGHT, HIGH-SPEED PASSENGER TRAINS

service, are given in the following tables: the San Diegan 50, of the Chicagoan and Kansas Cityan 58, and of the Golden and El Capitans is 56 miles per hour, of Gates 54.

Run and Train	Date Placed in Service	Power Cars Exclusively Weight (Tons)	Trailing Cars Weight (Tons)	All Units	
				Weight (Tons)	Length (Feet)
(1 and 2) SUPER CHIEFS Chicago-Los Angeles 2 trains of 2 power cars and 9 trailing cars each One train One train	5/18/37	287	509	796	891
	2/20/38	287	515	802	891
(3 and 4) EL CAPITANS Chicago-Los Angeles 2 trains of 1 power car and 5 trailing cars each Each train	2/22/38	147	263	410	474
(5) SAN DIEGAN Los Angeles-San Diego 1 train of 1 power car and 7 trailing cars	3/23/38	145	355	500	628
(6 and 7) CHICAGOAN AND KANSAS CITYAN Chicago-Wichita 2 trains of 1 power car and 7 trailing cars each Each train	4/17/38	145	363	508	628
(8 and 9) GOLDEN GATES Bakersfield-San Francisco 2 trains of 1 power car and 6 trailing cars each Each train	7/1/38	145	311	456	554

	Salable Seats				Other Seats			Total All Seats
	Coach	Sleeper	Parlor	Total	Dining	Lounge	Total	
(1 and 2)		122		122	36	77	113	235
(3 and 4)	188			188	38		38	226
(5)	204		34	238	13	24	37	275
(6 and 7)	182		34	216	48	29	77	293
(8 and 9)	226			226	39	30	69	295

DAILY MILEAGE

The average daily mileage of these trains is as follows:

Name	Average Daily Mileage
Super Chiefs (2 trains)	1,274*
El Capitans (2 trains)	1,274*
San Diegan (1 train)	512
Chicagoan and Kansas Cityan (2 trains)	1,358
Golden Gates (2 trains)	1,252
Total Daily Mileage	5,670

* Round trip mileage divided by 7.

PHYSICAL CHARACTERISTICS OF LINES

The physical characteristics of the lines on which the Santa Fe streamline light-weight trains operate are briefly described below:

Chicago-Los Angeles, 2,228 Miles

The line between Chicago and Los Angeles, over which the Super Chiefs and El Capitans operate, traverses prairie, semi-mountainous and mountainous

country. The ruling grades and maximum curves vary accordingly, covering the whole range up to 3.5 per cent and 11 degrees, respectively.

About 65% of the line is double track.

RULING GRADES are as follows:

Section	Distance Miles	West-bound %	East-bound %
Chicago-Fort Madison	233	1.5	1.5
Fort Madison-Kansas City	218	0.8	0.9
Kansas City-Newton (via Ottawa Jct.)	186	0.6	0.9
Kansas City-Newton (via Topeka)	201	1.1	1.0
Newton-La Junta	356	0.6	0.6
La Junta-Isleta	359	3.5	3.3
Isleta-Gallup	147	1.0	0.6
Gallup-Winslow	128	0.6	0.3
Winslow-Needles	293	1.4	1.8
Needles-Barstow	167	1.5	1.0
Barstow-San Bernardino	82	1.6	2.2
San Bernardino-Los Angeles	59	1.5	2.2
Average Distance (via Ottawa Jct.)	2,228		

MAXIMUM CURVES between Chicago and La Junta, 992 miles, range from 4° to 6°. In the mountain sections west of La Junta, they are 11°. On the balance of the line, they vary from 4° to 6°. Throughout the whole line, the predominating curvature is much lighter than the maximum, being generally 1° to 1½° on the low grade sections and 1½° to 4° in the mountain territory. About 82% of the line is straight track.

WEIGHT OF RAIL—90 to 131 pounds, 110-pound largely predominating.

TIES are all treated.

BALLAST—About 40% gravel, 37% crushed rock, 17% volcanic cinders, the remainder slag and screenings.

Los Angeles-San Diego, 128 Miles

The line is single track.

RULING GRADES are 2.2% in both directions.

MAXIMUM CURVES are 10°20', with 1° to 4° predominating except in heavy grade sections. About 78% of the line is straight track.

WEIGHT OF RAIL—Practically all 90-pound.

TIES are all treated.

BALLAST—About 74% of the line is ballasted with gravel, 19% with crushed rock and the remainder with cinders and screenings.

Newton-Wichita, 27 Miles

The line is single track.

RULING GRADES are about 0.8% in both directions.

MAXIMUM CURVES are 3°13', with 1½° and 2° predominating. About 88% of the line is straight track.

WEIGHT OF RAIL—90 to 112 pounds, 90-pound largely predominating.

TIES are all treated.

BALLAST—All crushed rock.

Bakersfield-Oakland, 313 Miles

About 2% of the line is double track.

RULING GRADES are 1.2% against west-bound and 1.5% against eastbound traffic.

MAXIMUM CURVES are 6°, with 1° to 3° predominating except on heavy grade sections. About 90% of the line is straight track.

WEIGHT OF RAIL—90-pound.

TIES are all treated.

BALLAST—All crushed rock.

50 STREAMLINE, LIGHT-WEIGHT, HIGH-SPEED PASSENGER TRAINS

RESULTS OF OPERATION OF SANTA FE STREAMLINE TRAINS 30, 1938, and for the year ended June 30, 1939:

Following is a statement of the revenues and expenses of the Super Chiefs for the years ended June 30, 1938 and 1939, and for the other Santa Fe streamline trains for the respective periods of their operation in the year ended June

Note: The railroad company's proportion of sleeping car revenues on the Super Chiefs is necessarily an estimate. It is relatively a small amount and is included in the item of Revenues.

From this statement it will be seen that the Net Revenue of seven trains for

REVENUES AND EXPENSES

Item	Routes and Trains											
	SUPER CHIEFS Chicago-Los Angeles				EL CAPITANS Chicago-Los Angeles				SAN DIEGAN Los Angeles-San Diego			
	1 Train, 7/1/37-2/19/38		2 Trains		2 Trains, 5 Pass. Train Cars each. (1) Each one round trip weekly.				1 Train			
	2 Trains, 2/20/38- 6/30/38								6 Pass. Tr. Cars		7 Pass. Tr. Cars (2)	
	9 Pass. Trains Cars each. Each one round trip weekly.								Two round trips daily.			
	Operation begun 5/12/36				Operation begun 2/22/38				Operation begun 3/23/38			
	Year ended 6/30/38		Year ended 6/30/39		4 mos. 7 days ended 6/30/38		Year ended 6/30/39		3 mos. 9 days ended 6/30/38		Year ended 6/30/39	
Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	
REVENUES	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	
	794,358	2,514	1,114,630	2,404	279,655	1,701	907,423	1,957	70,003	1,447	329,192	1,785
TRAIN EXPENSES												
* Wages of crews	(4) 95,210	.301	132,170	.285	44,980	.274	127,543	.275	13,315	.276	57,402	.311
Fuel	(4) 31,275	.099	46,305	.100	9,378	.057	26,577	.057	4,127	.086	22,699	.123
Lubricants, etc.	(4) 8,882	.028	19,340	.042	2,556	.015	9,390	.020	388	.008	4,147	.022
Train supplies and expenses	33,362	.106	48,344	.104	13,044	.079	34,456	.074	5,813	.120	22,095	.120
Helper locomotive expense	(5) 3,947	.012	7,640	.017	1,526	.009	6,045	.013	78	.001	859	.004
Enginehouse expense	(4) 6,970	.022	7,411	.016	1,972	.012	4,812	.011	604	.012	3,448	.019
Power plant maintenance	(4) 46,852	.148	62,628	.135	12,094	.074	46,161	.100	4,426	.091	36,812	.200
Train maintenance	26,214	.083	32,986	.071	19,388	.118	51,262	.111	7,386	.153	28,413	.154
TOTAL Train Expenses	252,712	.799	356,824	.770	104,938	.638	306,246	.661	36,137	.747	175,875	.953
Dining-Buffer net loss	-10,944	-.035	-12,184	-.026	-6,332	-.039	-26,063	-.056	-2,855	-.059	-11,739	-.064
TOTAL, Incl. D-B loss	263,656	.834	369,008	.796	111,270	.677	332,309	.717	38,992	.806	187,614	1.017
NET REVENUE	530,702	1.680	745,622	1.608	168,385	1.024	575,114	1.240	31,011	.641	141,578	.768
Per cent of Revenues	66.8		66.9		60.2		63.4		44.3		43.0	
Route-miles	2,229		2,228		2,229		2,228		126		128	
Train-miles	316,028		463,601		164,378		463,601		48,384		184,400	
Passenger-miles	26,424,162		36,148,511		15,739,789		51,083,841		5,494,068		23,810,959	

(1) EL CAPITANS operate during summer months with 2 Diesel-electric units, 1 additional diner and 2 to 3 additional coaches in each train.

(2) SAN DIEGAN, CHICAGOAN and KANSAS CITYAN operate with additional coaches as required.

(3) Increased from 5 to 6 cars each September 1, 1938.

(4) Includes Diesel-electric expense and corresponding expense of steam relief locomotives.

(5) Wages, fuel, lubricants and supplies, enginehouse expense, and maintenance of steam helper locomotives.

the respective periods of operation in the year ended June 30, 1938, was 62.5 per cent of the Revenues, and of nine trains for the year ended June 30, 1939, 58.0 per cent. From this standpoint, as well as from the standpoint of Net Revenue, the most profitable trains have been the Super Chiefs and El Capitans.

GROWTH OF TRAFFIC ON SANTA FE STREAMLINE TRAINS

The first Super Chief was placed in service on May 12, 1936. From that date to May 18, 1937, it consisted of a Diesel-electric locomotive and conventional high-type heavy Pullman cars. On the latter date the cars were replaced by

REVENUES AND EXPENSES

Routes and Trains											
CHICAGOAN AND KANSAS CITYAN Chicago-Wichita				GOLDEN GATES Bakersfield-San Francisco							
2 Trains, 7 Pass. Train Cars each. (2) Each one-way trip daily.				2 Trains, 6 Pass. Train Cars each. (3) Each one round trip daily.				TOTAL SEVEN TRAINS		TOTAL NINE TRAINS	
Operation begun 4/17/38				Operation begun 7/1/38							
2 mos. 14 days ended 6/30/38		Year ended 6/30/39				Year ended 6/30/39		Various Periods ended 6/30/38		Year ended 6/30/39	
Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.
\$	\$	\$	\$			\$	\$	\$	\$	\$	\$
162,912	1.600	859,517	1.734			649,142	1.396	1,306,928	2.072	3,859,904	1.863
24,636	.242	132,062	.266			131,542	.283	178,141	.282	580,719	.280
6,980	.068	34,348	.069			26,729	.057	51,760	.082	156,658	.076
2,032	.020	11,710	.024			8,707	.019	13,858	.022	53,294	.026
11,005	.108	45,613	.092			37,389	.080	63,224	.100	187,897	.091
1,006	.010	8				47		5,551	.009	14,599	.007
		4,391	.009			6,954	.015	10,552	.017	27,016	.013
11,506	.113	46,400	.094			26,726	.057	74,878	.119	243,362	.117
16,811	.165	72,080	.145			51,361	.111	69,799	.111	243,386	.117
						58,645	.126				
73,976	.726	346,612	.699			348,100	.748	467,763	.742	1,533,657	.740
-2,091	-.021	-16,244	-.033			-22,718	-.049	-22,222	-.035	-88,948	-.043
76,067	.747	362,856	.732			370,818	.797	489,985	.777	1,622,605	.783
86,845	.853	496,661	1.002			278,324	.599	816,943	1.295	2,237,299	1.080
53.3		57.8				42.9		62.5		58.0	
679		679				313		5,263		5,576	
101,850		495,670				465,010		630,640		2,072,282	
7,558,149		39,359,659				48,392,319		55,216,168		198,795,289	

Bus Service San Francisco-Oakland

stainless steel streamline equipment of greater capacity, and on February 20, 1938, a second Super Chief with a Diesel-electric locomotive and light-weight streamline cars was placed in this service. The two Super Chiefs each make a weekly round trip between Chicago and Los Angeles.

The revenues by six-month's periods

of all trains are given in the following statement:

The remarkable increase in the revenues of the Super Chiefs which the foregoing statement discloses is a measure of their popularity, especially when considered in the light of the fact that the Chiefs have continued to retain their patronage.

Period	SUPER CHIEFS	EL CAPITANS	SAN DIEGAN	CHICAGOAN AND KANSAS CITYAN	GOLDEN GATES
	2 Trains	2 Trains	1 Train	2 Trains	2 Trains
July 1 to Dec. 31, 1936	\$199,246				
Jan. 1 to June 30, 1937	238,581				
Year	437,827				
July 1 to Dec. 31, 1937	306,286	Operation Begun	Operation Begun	Operation Begun	Operation Begun
Jan. 1 to June 30, 1938	488,072	2/22/38	3/23/38	4/17/38	7/1/38
Year	794,358				
July 1 to Dec. 31, 1938	545,517	\$455,561	\$167,258	\$446,190	\$306,725
Jan. 1 to June 30, 1939	569,113	451,862	161,934	413,327	342,417
Year	1,114,630	907,423	329,192	859,517	649,142

Notes: In the case of the Super Chiefs the Revenues include an estimate of the railway company's proportion of Pullman earnings.

In the case of all trains the Revenues exclude dining car earnings.

The average monthly earnings of El Capitans, San Diegan, Chicagoan and Kansas Cityan for the first months of their operation have been greatly exceeded by those of the subsequent period which is indicative of the popularity of these new splendidly appointed trains

and high-speed service.

The whole Santa Fe streamline train program has been attended with remarkable success, both in the manner in which the trains have been received by the public and in the financial results of their operation.

ROCKETS

CHICAGO, ROCK ISLAND AND PACIFIC

GENERAL STATEMENT

As in the case of other western roads, the adoption of streamline train service on the Rock Island was the result of a very careful study of ways and means for stemming the decline in passenger traffic on its lines and for recovering to whatever extent might be possible the large amount which had been diverted to other agencies of transportation—the automobile, the bus and the airplane. These studies, directed to specific routes, coupled with a knowledge of the satisfactory experience of other roads, led to the conclusion that the streamline fast train, with its great popular appeal, its high availability in service and economy of operation, was capable of reversing the downward trend. Immediately upon reaching this conclusion, six trains, which were named Rockets, were purchased.

The present routes of the Rockets are:

CHICAGO-PEORIA (161 miles), where the travel is normally heavy and where by the use of one Rocket, making two round trips daily, satisfactory schedules are furnished.

CHICAGO-DES MOINES (358 miles), where one daily round trip serves, besides the terminal cities, the important centers of Moline, Rock Island, Davenport and a number of other large intermediate points.

KANSAS CITY-ST. PAUL-MINNEAPOLIS (489 miles), where two trains, each making a one-way trip daily, serve a number of important centers.

KANSAS CITY-DALLAS (677 miles), where two trains, each making a daily one-

way trip, serve two large terminal cities and a number of other important centers, such as Topeka, Wichita, Enid, El Reno, Oklahoma City and Fort Worth.

The Rockets, as at present operated, were placed in service on the Chicago-Peoria, Chicago-Des Moines and Kansas City-St. Paul-Minneapolis routes during the latter part of September 1937, and on the Kansas City-Oklahoma City route on February 13, 1938. The latter run was discontinued on November 14, 1938, and service established between Kansas City and Dallas, via Oklahoma City, on the following day.

As the statements which follow show, the trains have been given a highly favorable reception by the traveling public.

BRIEF DESCRIPTION OF ROCK ISLAND ROCKETS

The fleet of Rock Island Rockets comprises four 4-car trains and two 3-car trains, a total of 22 cars, all of which were built by Budd. The trains are hauled by Diesel-electric streamline locomotives of 1,200 H.P. each, built by the Electro-Motive Corporation.

Three cars in each of the 4-car trains and two cars in each of the 3-car trains are articulated.

The center of gravity of the cars averages about 58 inches above the rail, and that of the locomotives about 57 inches.

The Rock Island Rockets are representative of the high type of workmanship, beauty of line, excellence of interior decoration, completeness of appointments

and travel comforts and smooth riding qualities that characterize the newer high-speed streamline trains.

CONSIST OF ROCKETS

The Rockets are all day trains—four of 4 cars and two of 3 cars.

The two 4-car trains operating between Chicago and Peoria, and between Chicago and Des Moines each consist of a combination baggage-dinette car, a 60-seat coach, a 76-seat coach, and a 37-seat parlor car with bar.

The two 3-car trains of the Kansas City-St. Paul-Minneapolis route each contain a dinette-coach with baggage

compartment, a 76-seat coach, and a combination lounge-coach having 28 coach seats and 24 parlor seats, with bar.

The two 4-car trains in the Kansas City-Dallas service are each made up of a combination baggage-mail car, a dinette-coach (with baggage space), a 76-seat coach, and a combination lounge-coach with 28 coach seats and 24 parlor seats, with bar in the lounge end.

WEIGHT, SEATING CAPACITY, ETC.

The weight, seating capacity, etc., of the Rock Island Rockets, and the dates when placed in service, are given in the following tables:

Run and Train		Date Placed in Service	Power Cars Exclusively Weight (Tons)	Trailing Cars Weight (Tons)	All Units	
					Weight (Tons)	Length (Feet)
(1)	CHICAGO-PEORIA 1 train of 1 power car and 4 trailing cars	9/19/37	110	176	286	357
(2)	CHICAGO-DES MOINES 1 train of 1 power car and 4 trailing cars	9/26/37	110	176	286	357
(3 and 4)	KANSAS CITY-ST. PAUL-MINNEAPOLIS 2 trains each of 1 power car and 3 trailing cars Each train	9/29/37	110	140	250	293
	KANSAS CITY-OKLAHOMA CITY 1 train of 1 power car and 3 trailing cars	2/13/38 Discontinued 11/14/38	110	140	250	293
(5 and 6)	KANSAS CITY-DALLAS 2 trains each of 1 power car and 4 trailing cars Each train	11/15/38	110	180	290	361

	Salable Seats			Other Seats Dinette	Total All Seats Each Train
	Coach	Parlor	Total		
(1 and 2) Each train	136	37*	173	32	205
(3, 4, 5 and 6) Each train	112	24	136	24	160

* Includes 5 seats in drawing room.

DAILY MILEAGE

The current average daily mileage of the Rockets is as follows:

Run	Average Daily Mileage
Chicago-Peoria (1 train)	644
Chicago-Des Moines (1 train)	716
Kansas City-St. Paul-Minneapolis (2 trains)	978
Kansas City-Dallas (2 trains)	1,354
Total Daily Mileage	3,692

Through the inauguration of Rocket service the Rock Island has effected a net reduction in train mileage of other trains of 2,410 per day.

The average speed of the Rockets ranges from 53 miles per hour in the case of the Kansas City-St. Paul-Minneapolis trains to 60 in the case of the Chicago-Peoria and Chicago-Des Moines trains.

PHYSICAL CHARACTERISTICS OF LINES

Before proceeding to display the statements of revenues and expenses of the Rockets, brief descriptions of the physical characteristics of the lines on which they operate will be given, as follows:

Chicago-Peoria, 161 Miles

About 70% of the line is double track.

RULING GRADES are approximately 0.50% in both directions.

MAXIMUM CURVES of 1° predominate except at terminals. About 80% of the line is straight track.

WEIGHT OF RAIL—90, 100 and 112-pound. TIES are all treated.

BALLAST—Crushed rock and gravel, the latter predominating.

Chicago-Des Moines, 358 Miles

About 70% of the line is double track.

RULING GRADES are 1.00% westbound and 0.77% eastbound.

MAXIMUM CURVES of 1° predominate except at terminals. About 82% of the line is straight track.

WEIGHT OF RAIL—100, 110 and 112-pound.

TIES are all treated.

BALLAST—Crushed rock and gravel, the latter predominating.

Kansas City-St. Paul-Minneapolis, 489 Miles

About 17% of the line is double track.

RULING GRADES are 1.00% in each direction.

MAXIMUM CURVES of 2° predominate except at terminals. About 80% of the line is straight track.

WEIGHT OF RAIL—85 to 112-pound.

TIES are all treated.

BALLAST—Gravel, shale, burnt gumbo and chatts.

Kansas City-Dallas, 677 Miles

About 25% of the line is double track.

RULING GRADES are 0.80% westbound and 0.70% eastbound between Kansas City and Oklahoma City, and 1% in both directions between El Reno and Dallas.

MAXIMUM CURVES of 2° predominate except at terminals. About 86% of the line is straight track.

WEIGHT OF RAIL—90 to 112-pound.

TIES are all treated.

BALLAST—Crushed rock, gravel, burnt gumbo and chatts.

56 STREAMLINE, LIGHT-WEIGHT, HIGH-SPEED PASSENGER TRAINS

RESULTS OF OPERATION OF ROCKETS

Following is a statement of the revenues and expenses of the Rockets for the respective periods of their operation to June 30, 1938; for the year ended June

30, 1939, in the cases of the Chicago-Peoria, Chicago-Des Moines, and Kansas City-St. Paul-Minneapolis Rockets; for the period from July 1, to Nov. 14, 1938, (when the train was discontinued) in the case of the Kansas City-Okla-

REVENUES AND EXPENSES

Item	Routes and Trains											
	CHICAGO-PEORIA				CHICAGO-DES MOINES				KANSAS CITY-ST. PAUL-MINNEAPOLIS			
	1 Train, 4 Pass. Train Cars. Two round trips daily.				1 Train, 4 Pass. Train Cars. One round trip daily.				2 Trains, 3 Pass. Train Cars each. Each a one-way trip daily.			
	Operation begun 9/19/37				Operation begun 9/26/37				Operation begun 9/29/37			
	9 mos. 12 days ended 6/30/38		Year ended 6/30/39		9 mos. 5 days ended 6/30/38		Year ended 6/30/39		9 mos. 2 days ended 6/30/38		Year ended 6/30/39	
	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.
REVENUES	\$ 314,688	\$ 1.714	\$ 382,795	\$ 1.630	\$ 353,956	\$ 1.785	\$ 491,820	\$ 1.882	\$ 310,530	\$ 1.155	\$ 463,586	\$ 1.298
TRAIN EXPENSES												
Wages of crew	47,041	.256	60,503	.257	49,661	.251	66,594	.255	66,815	.248	89,373	.250
Fuel oil	9,154	.050	10,528	.045	9,696	.049	11,629	.044	12,901	.048	15,734	.045
Lubricants, etc.	4,255	.023	5,498	.023	5,284	.027	4,691	.018	5,935	.022	8,298	.023
Train supplies and expenses	9,831	.054	10,947	.047	9,995	.050	7,576	.029	12,532	.047	15,393	.043
Power plant maintenance	13,143	.072	27,202	.116	15,727	.079	25,819	.099	16,205	.060	27,654	.077
Train maintenance	10,390	.056	17,594	.075	8,765	.044	16,338	.063	12,848	.048	23,256	.065
TOTAL Train Expenses	93,814	.511	132,272	.563	99,128	.500	132,647	.508	127,236	.473	179,708	.503
Dining-Buffer net gain or loss	139	.001	-1,684	-.007	3,996	.020	2,748	.011	1,869	.007	-3,613	-.010
TOTAL, Incl. D-B gain or loss	93,675	.510	133,956	.570	95,132	.480	129,899	.497	125,367	.466	183,321	.513
NET REVENUE	221,013	1.204	248,839	1.060	258,824	1.305	361,921	1.385	185,163	.689	280,265	.785
Per cent of Revenues	70.2		65.0		73.1		73.6		59.6		60.5	
Route-miles	161		161		358		358		489		489	
Train-miles	183,540		235,060		198,346		261,340		268,950		356,970	
Passenger-miles (est.)	15,734,000		19,024,563		17,698,000		24,687,830		15,527,000		22,121,515	

Note: This statement does not include the Fort Worth-Dallas-Houston train, the operations of which were shown in last year's report, and which was formerly operated by the Burlington-Rock Island Railroad Co., because this train was actually leased to that Company on a rental basis up to the time it was placed in Rock Island service between Kansas City and Dallas.

The power plant and train maintenance figures include running and general repairs and are not subject to material increase for future general overhauling.

homa City Rocket; and for the period from Nov. 15, 1938, to June 30, 1939, for the Kansas City-Dallas Rockets.

the beginning of operations to June 30, 1938, was 66.3 per cent of the Revenues, and for the year ended June 30, 1939, 62.9 per cent. From this standpoint the most profitable train is the Chicago-Des Moines train.

It will be seen from this statement that the Net Revenue of all trains from

REVENUES AND EXPENSES

Routes and Trains											
KANSAS CITY-OKLAHOMA CITY				KANSAS CITY-DALLAS VIA OKLAHOMA CITY				TOTAL ALL TRAINS			
1 Train, 3 Pass. Train Cars. One round trip daily.				2 Trains, 4 Pass. Train Cars* each. Each a one-way trip daily.							
Operation begun 2/13/38 Operation discontinued 11/14/38				Operation begun 11/15/38				Various periods ended 6/30/38		Various periods ended 6/30/39	
4 mos. 16 days ended 6/30/38		4 mos. 14 days ended 11/14/38				7 mos. 16 days ended 6/30/39					
Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.
\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
94,626	.850	96,117	.858			290,421	.941	1,073,800	1.409	1,724,739	1.354
27,098	.243	26,861	.240			75,396	.244	190,615	.250	318,727	.250
4,576	.041	4,265	.038			12,598	.041	36,327	.048	54,754	.043
2,042	.018	2,032	.018			6,177	.020	17,516	.023	26,696	.021
5,057	.046	4,481	.040			10,703	.035	37,415	.049	49,100	.039
5,944	.054	7,183	.064			17,625	.057	51,019	.067	105,483	.083
2,796	.025	3,476	.031			13,739	.044	34,799	.046	74,403	.058
47,513	.427	48,298	.431			136,238	.441	367,691	.483	629,163	.494
-1,018	-.009	-1,475	-.013			-6,393	-.021	4,986	.006	-10,417	-.008
48,531	.436	49,773	.444			142,631	.462	362,705	.476	639,580	.502
46,095	.414	46,344	.414			147,790	.479	711,095	.933	1,085,159	.852
48.7		48.2				50.9		66.3		62.9	
408 111,320 4,731,000		408 112,066 5,028,087				677 308,712 14,070,777		1,416 762,156 53,690,000		1,416-1,685 1,274,148 84,932,772	

* Includes baggage-mail car added 5/15/39.

GROWTH OF TRAFFIC ON ROCKETS

The first Rocket to be inaugurated on the Rock Island was the Chicago-Peoria train, which was placed in service on September 19, 1937.

The statement which follows shows the monthly revenues (exclusive of dining car revenues) of each train or pair of trains:

It will be seen from this statement that since October 1937, the traffic on the Chicago-Peoria, Chicago-Des Moines and Kansas City-St. Paul-Minneapolis trains has remained remarkably stationary for corresponding periods. The reassignment of the other trains makes a similar comparison impossible.

It is the opinion of the officials that a substantial portion of the travel on the Rockets is newly induced traffic.

The Rock Island streamline train program as a whole, as the foregoing statements clearly indicate, has been highly successful.

The Rock Island will shortly place in service two new light-weight, streamline Budd-built stainless steel trains of the most modern design, to be known as the Rocky Mountain Rockets, to operate between Chicago and Denver-Colorado Springs.

Rocket Routes	Date Placed in Service	(Dollar Figures in Thousands)										Total
		1937				1938						
		Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	
Chicago-Peoria	9/19/37	\$ 9,	\$ 34,	\$ 36,	\$ 41,	\$ 39,	\$ 35,	\$ 32,	\$ 31,	\$ 30,	\$ 27,	\$ 314,
Chicago-Des Moines	9/26/37	4,	36,	38,	47,	44,	37,	35,	38,	35,	40,	354,
Kansas City-St. Paul-Minneapolis 2 Trains	9/29/37	1,	27,	29,	41,	40,	34,	34,	34,	31,	38,	309,
Kansas City-Oklahoma City	2/13/38						13,	20,	22,	19,	21,	95,
Kansas City-Dallas 2 Trains	11/15/38											
Total		14,	87,	113,	129,	123,	119,	121,	125,	115,	126,	1,072,

Rocket Routes	(Dollar Figures in Thousands)												Total
	1938						1939						
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	
Chicago-Peoria	\$ 33,	\$ 34,	\$ 32,	\$ 32,	\$ 33,	\$ 38,	\$ 36,	\$ 32,	\$ 30,	\$ 28,	\$ 27,	\$ 28,	\$ 383,
Chicago-Des Moines	43,	45,	43,	39,	38,	45,	47,	37,	36,	38,	37,	44,	492,
Kansas City-St. Paul-Minneapolis 2 Trains	42,	47,	41,	33,	35,	44,	43,	36,	36,	34,	33,	41,	465,
Kansas City-Oklahoma City	22,	24,	21,	20,	9,	Discontinued 11/14/38						96,	
Kansas City-Dallas 2 Trains	Installed 11/15/38				19,	41,	39,	33,	34,	35,	41,	48,	290,
Total	140,	150,	137,	124,	134,	168,	165,	138,	136,	135,	138,	161,	1,726,

EAGLES

MISSOURI PACIFIC

On January 1, 1940, two new Diesel-electric streamline 6-car trains, to be known as "The Eagle," will replace two existing steam trains in daylight service on the Missouri Pacific between St. Louis and Kansas City. The locomotives, of 2,000 H.P., are under construction by the Electro-Motive Corporation. Each train will be composed of a mail-baggage car, a storage-express car, two de luxe

coaches, a diner-bar car and a parlor-observation car. The cars, which will be of aluminum, with cast steel end sills, are under construction by the American Car and Foundry Company.

The train will be handsomely decorated and will be equipped with all the modern travel conveniences and comforts characteristic of the new streamline trains.

GREEN DIAMOND

ILLINOIS CENTRAL

GENERAL STATEMENT AND BRIEF
DESCRIPTION OF GREEN DIAMOND

The Green Diamond was placed in service on the Illinois Central between Chicago and St. Louis, 294 miles, on May 17, 1936, supplanting two steam trains. It consists of 5 fully articulated light-weight streamline cars, with dimensions generally corresponding to standard steam train practice. The forward car is a 1,200 H.P. Diesel-electric locomotive, followed by a mail-baggage car, a 56-seat coach, a coach-diner with 44 coach seats and 16 diner seats, and a diner-lounge car with 22 parlor car and 8 diner seats. The seating capacity is—100 coach, 22 parlor and 24 diner seats, a total for the train of 146. Its weight is 248 tons and its length 329 feet. The train was built by Pullman. The principal structural material is Corten steel assembled by riveting. Aluminum is used for interior finish and decorative features. The power plant was built by the Electro-Motive Corporation.

The center of gravity of the power car is 61 inches, and of the trailing cars 57 inches, above top of rail.

The Green Diamond makes a round trip daily and traverses the distance between Chicago and St. Louis, 294 miles, in 4 hours and 55 minutes, or at an average speed of 60 miles per hour.

The train possesses many unusual and attractive features. The effective air conditioning, smooth riding qualities at high speed, absence of shock in starting and stopping and its fast schedule are most favorably commented on by passengers.

PHYSICAL CHARACTERISTICS OF LINE

The physical characteristics of the line on which the Green Diamond operates are as follows:

Chicago-St. Louis, 294 Miles

About 32% of the line is double track.

RULING GRADES are 0.76% in both directions, except between Gilman and Clinton, 68 miles, where the southbound ruling grade is 1%.

MAXIMUM CURVES are 6°, with a few sharper curves at terminals. About 94% of the line is straight track.

WEIGHT OF RAIL—15% 112-pound; 24% 110-pound; and 61% 90-pound.

TIES are all treated.

BALLAST—50% chatts; 17% broken stone; 13% slag; 12% cinder; 6% gravel; and 2% screenings.

REVENUES AND EXPENSES

Item	CHICAGO-ST. LOUIS			
	1 Train, 4 Passenger Train Cars. One round trip daily.			
	Operation begun May 17, 1936			
	Year ended June 30, 1938		Year ended June 30, 1939	
	Amount	Per Train-Mile	Amount	Per Train-Mile
REVENUES	\$ 277,974	\$ 1.486	\$ 278,710	\$ 1.393
TRAIN EXPENSES				
Wages of crews	51,053	.273	55,696	.278
Fuel	8,957	.048	10,609	.053
Lubricants, etc.	2,583	.014	2,396	.012
Train supplies and expenses	14,864	.079	12,433	.062
Power plant maintenance	32,548	.174	36,929	.184
Train maintenance	37,621	.201	24,451	.122
TOTAL Train Expenses	147,626	.789	142,514	.712
Dining car net loss	-20,137	-.108	-16,416	-.082
TOTAL, Including dining car loss	167,763	.897	158,930	.794
NET REVENUE	110,211	.589	119,780	.598
Per cent of Revenues	39.6		43.0	
Route-miles	294		294	
Train-miles	187,109		200,661	
Passenger-miles	11,683,493		11,751,210	

RESULTS OF OPERATION OF THE GREEN DIAMOND

Above is a statement of the revenues and expenses of the Green Diamond for the years ended June 30, 1938 and 1939:

The percentage of Net Revenue to total Revenues for the first year was 39.6, and for the second 43.0.

GROWTH OF TRAFFIC ON GREEN DIAMOND

The revenues of the Green Diamond (exclusive of dining car revenues) by six-months' periods are shown in the following statement:

Period	6 Months (est.)	Year
July 1 to Dec. 31, 1936	\$164,000	
Jan. 1 to June 30, 1937	149,032	\$313,032
July 1 to Dec. 31, 1937	155,346	
Jan. 1 to June 30, 1938	122,628	277,974
July 1 to Dec. 31, 1938	144,194	
Jan. 1 to June 30, 1939	134,516	278,710

REBELS

GULF, MOBILE AND NORTHERN

GENERAL STATEMENT AND BRIEF
DESCRIPTION OF REBELS

The two original Rebels are streamline Diesel-electric 3-car trains, designed and built by the American Car and Foundry Company. They were placed in service on the Gulf, Mobile and Northern between New Orleans, La., and Jackson, Tenn., in July 1935, replacing conventional steam trains. They are run on night schedules of approximately 14 hours for the 488 miles between terminals, making 47 stops. The average speed is about 35 miles per hour.

The principal material of construction in the trains is Corten steel. The cars are not articulated. Each train consists of a power car with compartments for mail and baggage, a buffet-passenger coach, and an observation-sleeping car. An additional coach is provided for use interchangeably in the two trains.

The motive power is a 660 H.P., 4-cycle McIntosh & Seymour Alco type Diesel engine, with cylinders of 12½-inch bore and 13-inch stroke, directly connected to a Westinghouse generator.

The center of gravity of the power car is 49 inches, and of the coaches and sleeping cars 51 inches, above top of rail.

The buffet-passenger coach seats 38 in the white compartment and 24 in the colored compartment. The buffet is equipped to serve meals throughout the train and is operated by the Interstate News Company at a small loss to the railway company.

The observation-sleeping car contains 6 sections and 1 stateroom, together with spacious dressing rooms for men and women. The lounge-observation compartment seats 18 persons. The sleeping cars are operated by the railway company.

The extra car is a coach of 71 seats, 47 in the white compartment and 24 in the colored compartment. It is attached to the Rebels for the run between Jackson, Miss., and New Orleans, a distance of 186 miles, where the population is relatively dense.

The total weight of the 4-car train is 234 tons, and its length 302 feet. The total weight of the 3-car train is 187 tons, its length 226 feet.

In January 1938, a third Rebel was placed in service between Mobile, Ala., and Union, Miss., 181 miles. This train consists of a power car (of the same type as those of the New Orleans-Jackson, Tenn., Rebels) and a combination coach-sleeping car which it delivers to and receives from the New Orleans-Jackson, Tenn., Rebels. These combination cars contain 40 coach seats and 6 sleeping car sections, are 81 feet in length and weigh 53 tons. Thus, the New Orleans-Jackson, Tenn., Rebels are 4-car trains between New Orleans and Jackson, Miss., 186 miles; 3-car trains between Jackson, Miss., and Union, Miss., 74 miles; and 4-car trains between Union, Miss., and Jackson, Tenn., 228 miles.

The Rebel trains were designed to meet the particular needs of Gulf, Mobile and Northern passenger travel. They were an evolution rather than an innovation, as the company has operated motor trains since 1924, and gas-electric trains since 1930. The inauguration of the Diesel-electric trains marked the complete replacement of steam motive power in passenger train service with self-propelled internal combustion equipment.

Until the inauguration of the Silver Meteor of the Seaboard Air Line on February 2, 1939, the Rebels were the only streamline trains operated in the South. They are air-conditioned, ride smoothly and possess many features designed to add to the comfort and convenience of passengers. A hostess is in attendance on all trains. Because of their attractiveness and the completeness of their appointments, the enthusiasm with which

they were first received has been fully sustained throughout the whole period of their operation.

PHYSICAL CHARACTERISTICS OF LINE

New Orleans, La.-Jackson, Tenn., 488 Miles

About 16 miles of the line is double track, the balance single track.

RULING GRADES are 1%.

MAXIMUM CURVES are 4°. Lower rates predominate, except at terminals. About 84% of the line is straight track.

WEIGHT OF RAIL—2% 80-pound; 47% 85-pound; and 51% 90-pound.

TIES—85% of the ties in the main track are treated.

BALLAST—The entire line is ballasted: 39% gravel, 57% slag and 4% cinders.

RESULTS OF OPERATION OF THE REBELS

Following is a statement of the revenues and expenses of the New Orleans-Jackson, Tenn., Rebels for the years ended June 30, 1938 and 1939:

REVENUES AND EXPENSES

Item	NEW ORLEANS-JACKSON, TENN.			
	2 Trains, 4 cars New Orleans-Jackson, Miss. 3 cars Jackson, Miss.-Union. 3 cars to 1/16/38, 4 thereafter, Union-Jackson, Tenn. Each a one-way trip daily.			
	Operation begun July 29, 1935			
	Year ended June 30, 1938		Year ended June 30, 1939	
Amount	Per Train-Mile	Amount	Per Train-Mile	
REVENUES	\$ 238,292	\$.679	\$ 226,896	\$.638
TRAIN EXPENSES				
Wages of crews	79,027	.225	82,969	.233
Fuel oil	9,977	.028	10,743	.030
Lubricants, etc.	2,449	.007	1,490	.004
Train supplies and expenses	18,316	.052	17,432	.049
Power plant maintenance	19,525	.056	21,982	.062
Train maintenance	21,543	.061	23,363	.066
TOTAL Train Expenses	150,837	.429	157,979	.444
NET REVENUE	87,455	.250	68,917	.194
Per cent of Revenues	36.7		30.4	
Route-miles	488		488	
Train-miles	350,955		355,480	
Passenger-miles (est.)	7,800,000		7,600,000	

As the statement shows, the Net Revenue for the first year was 36.7 per cent of the Revenues, and for the second year 30.4 per cent.

GROWTH OF TRAFFIC ON THE REBELS

The revenues of the New Orleans-Jackson, Tenn., Rebels (exclusive of buffet revenues) by six-months' periods are given in the following statement:

Period	6 Months	Year
July 1 to Dec. 31, 1935	\$80,693	
Jan. 1 to June 30, 1936	75,847	\$156,540
July 1 to Dec. 31, 1936	121,772	
Jan. 1 to June 30, 1937	104,598	226,370
July 1 to Dec. 31, 1937	124,995	
Jan. 1 to June 30, 1938	113,297	238,292
July 1 to Dec. 31, 1938	120,904	
Jan. 1 to June 30, 1939	105,992	226,896

As this statement shows, the increase from the first year to the third was 52 per cent, and to the fourth year 47 per cent.

It is the opinion of the officials that approximately 40 per cent of the traffic of the Rebels is drawn from the highways, a view which is confirmed by the fact that the number of passengers declines about that amount when the Rebels are withdrawn from service for any reason and conventional steam trains substituted.

MERCURY

NEW YORK CENTRAL

GENERAL STATEMENT AND BRIEF DESCRIPTION OF MERCURY

The Mercury was placed in service on July 15, 1936, between Cleveland and Detroit, 164 miles. It was at first a 7-car train consisting of a baggage-coach, a coach, a coach-kitchen, a diner, a lounge car with bar, a parlor car and an observation-parlor car. In December 1936, 2 additional coaches were added to meet the growing demand for space on the train.

The cars which constitute the Mercury are semi-light-weight. They were originally built for suburban service and were completely rebuilt and redecorated for their present service, the work being done in the company's shops. The train is attractively streamlined throughout.

This train represents a complete departure from conventional design and decorative treatment in that the corridor-like appearance of the interiors of long passenger cars is largely overcome. The dining facilities are exceptionally commodious, permitting of serving 56 persons at one time.

The seating capacity is as follows: in coaches 194, in parlor cars 57, total 251;

in dining car 56, in lounges 95, total 151; a total for the train of 402.

The train is drawn by a high-speed streamline Pacific-type steam locomotive. A unique feature is the illumination at night of the driving wheels by hidden floodlights.

The center of gravity of the locomotive is 77 inches above top of rail, and of the cars, 60 to 63 inches.

The weight of the train is—locomotive 305 tons, cars 573 tons; total 878 tons. The length of the locomotive is 92 feet, cars 708 feet; total 800 feet.

The train makes a round trip daily, traversing the distance of 164 miles between Cleveland and Detroit in 2¾ hours, or at an average speed of 60 miles per hour.

RESULTS OF OPERATION OF MERCURY

The operating costs of individual trains are not prepared by the company and that information is not, therefore, available for the Mercury.

The earnings of the train for different periods are shown in the following statement:

Period	Revenue	Revenue per Train-Mile	Number of Passengers Handled	
			Westbound	Eastbound
July 15, 1936, to June 30, 1937	\$350,965	\$3.05	43,439	62,891
Year ended June 30, 1938	398,677	3.33	49,280	73,565
Year ended June 30, 1939	378,685	3.16	38,924	63,008

The popularity of the train because of its luxurious appointments, beauty of decoration, high speed and smooth riding qualities has been such as practically to double the volume of rail travel between Cleveland, Toledo and Detroit.

A second Mercury, the cars for which are under construction in the company's shops, will shortly be placed in operation, the two trains thus providing daily Mercury service between Chicago and Cleveland.

TWENTIETH CENTURY LIMITED
COMMODORE VANDERBILT
SOUTHWESTERN LIMITED
OF THE
NEW YORK CENTRAL
AND
BROADWAY LIMITED
LIBERTY LIMITED
GENERAL
SPIRIT OF ST. LOUIS
OF THE
PENNSYLVANIA

The equipment of the Twentieth Century Limited and the Broadway Limited was completely renewed on June 15, 1938, and that of the other trains, either wholly or partially, at different times since that date. In each instance the new cars are semi-streamlined and semi-light-weight.

The new cars, more especially those of the Twentieth Century Limited and the Broadway Limited, are splendidly appointed, handsomely decorated, and provided with all modern travel comforts and conveniences.

These trains, like all others on the same routes, are hauled by steam locomotives between the western termini and Harmon on the New York Central, and Harrisburg on the Pennsylvania. East of Harmon and Harrisburg the lines are electrified.

Since the traffic on these routes had largely been established before the new equipment was installed, and as neither road segregates the operating costs of individual trains, it is not thought that further available facts in connection with the trains will be of interest from the standpoint of this report.

ROYAL BLUE
COLUMBIAN
CAPITOL LIMITED
BALTIMORE AND OHIO

The Royal Blue was installed in service on the Baltimore and Ohio between Jersey City, N. J., and Washington, D. C., 224 miles, on July 2, 1935. It was re-equipped on September 26, 1937, for the third time. The equipment of the train now consists of a Diesel-electric locomotive and eight cars converted from conventional body construction into an attractive and pleasingly decorated streamline train with all modern conveniences. The work of reconstruction was done in the railroad company's shops.

The cars consist of a baggage-coach, 3 coaches, a lunch counter-coach, a dining car, a parlor car, and a cocktail lounge-observation car. The seating capacity is: coach, 240; parlor car, 32; total salable seats, 272; dining-lunch, 58; lounge, 42;

total non-salable seats, 100—a total of all seats of 372.

The Royal Blue makes one round trip daily between Jersey City and Washington, a total daily mileage of 448. Its average speed is about 56 miles per hour.

A similar Diesel-powered streamlined train, the Columbian, operates on an equivalent time schedule between Washington and Jersey City.

The streamlined Diesel-powered and splendidly appointed sleeping car train, the Capitol Limited, provides fast daily service between Washington and Chicago.

The revenues and expenses of these trains are not segregated in the Company's accounts and, therefore, are not available for this report.

ABRAHAM LINCOLN ANN RUTLEDGE

BALTIMORE AND OHIO—ALTON

The Abraham Lincoln and the Ann Rutledge are operated between Chicago and St. Louis, 282 miles, each train making a round trip daily, on about five-hour one-way schedules, at an average speed of 56 miles per hour.

The Abraham Lincoln was placed in service on June 24, 1935. It is an 8-car streamline train, built of aluminum alloy by the American Car and Foundry Company. It is handsome in appearance, well appointed, and with attractive interior decorations. It is hauled by an 1,800 H.P. Diesel-electric locomotive built by the Electro-Motive Corporation. The train consists of a baggage-coach car, 2 coaches, a diner-lunch car, a buffet-lounge, 2 parlor cars, and a parlor-observation car. The weight of the locomotive is 129 tons; cars, 361 tons; total 490 tons. The length of the locomotive is 66 feet, cars, 560 feet; total, 626 feet. The cars are non-articulated. The center of gravity is 46½ inches above the rail. The seating capacity is: coach, 164; parlor car, 76; total salable seats, 240; dining-lunch-buffet, 58; lounge, 35; total non-salable seats, 93—a total of all seats of 333.

The Ann Rutledge was installed under that name on the Alton for service between Chicago and St. Louis on July 26, 1937. From July 2, 1935, to July 25, 1937, the train had been operated as the Royal Blue by the Baltimore and Ohio

between Jersey City, N. J., and Washington, D. C. It is an 8-car Corten steel, beautifully styled and completely appointed, streamline train, built by the American Car and Foundry Company. It is hauled by a steam locomotive built in the railroad company's shops. The train is composed of a baggage-coach car, 2 coaches, a diner-lunch car, a buffet-lounge, 2 parlor cars, and a parlor-observation car. The weight of the locomotive is 266 tons; cars, 393 tons; total, 659 tons. The length of the locomotive is 97 feet; of the cars, 560 feet; total, 657 feet. The cars are non-articulated. The center of gravity of the cars is 46½ inches above the rail. The seating capacity is: coach, 172; parlor, 76; total salable seats, 248; dining-lunch-buffet, 58; lounge, 35; total non-salable seats, 93—a total of all seats of 341.

PHYSICAL CHARACTERISTICS OF LINE

Chicago-St. Louis, 282 Miles

About 98% of the line is double track.

RULING GRADES are 0.78% northbound, 0.70% southbound.

MAXIMUM CURVES are 2°, except at terminals. About 90% of the line is straight track.

WEIGHT OF RAIL—85 to 130 pounds, 90-pound predominating.

TIES—About 15% treated, balance untreated.

BALLAST—About 95% crushed stone or crushed slag, balance cinder.

RESULTS OF OPERATION OF ABRAHAM LINCOLN AND ANN RUTLEDGE

available for the period prior to December 1, 1937.

Complete information concerning the revenues and expenses of the Abraham Lincoln and the Ann Rutledge is not

Following is a statement of the revenues and expenses of the two trains for the seven months ended June 30, 1938, and for the year ended June 30, 1939:

REVENUES AND EXPENSES

Item	CHICAGO-ST. LOUIS										TOTAL TWO TRAINS			
	ABRAHAM LINCOLN				ANN RUTLEDGE				7 Months ended 6/30/38				Year ended 6/30/39	
	1 Train, Diesel-electric locomotive, 8 Passenger Train Cars. One round trip daily.				1 Train, Steam locomotive, 8 Passenger Train Cars. One round trip daily.									
	Operation begun 6/24/35				Operation begun 7/26/37									
	7 Months ended 6/30/38		Year ended 6/30/39		7 Months ended 6/30/38		Year ended 6/30/39		7 Months ended 6/30/38		Year ended 6/30/39			
	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.	Amount	Per Tr.-Mi.		
REVENUES	\$ 361,083	3.020	\$ 640,307	3.110	\$ 309,123	2.585	\$ 515,175	2.502	\$ 670,206	2.803	\$ 1,155,482	2.806		
TRAIN EXPENSES														
Wages of crews	34,250	.286	67,771	.329	31,571	.264	56,345	.273	65,821	.275	124,116	.301		
Fuel	9,767	.082	15,438	.075	14,107	.118	23,428	.114	23,874	.100	38,866	.094		
Lubricants, etc.	4,156	.035	5,725	.028	1,883	.016	4,385	.021	6,039	.025	10,110	.025		
Enginehouse expense	2,283	.019	3,217	.015	4,485	.037	5,806	.028	6,768	.028	9,023	.022		
Train supplies and expenses	19,206	.161	31,479	.153	17,672	.148	28,775	.140	36,878	.154	60,254	.146		
Steam locomotive maintenance	3,320	.027	5,154	.025	28,661	.240	41,591	.202	31,981	.134	46,745	.114		
Diesel locomotive maintenance	21,669	.181	42,615	.207			959	.005	21,669	.091	43,574	.105		
Train maintenance	17,562	.147	38,468	.187	17,648	.147	40,133	.195	35,210	.147	78,601	.191		
TOTAL Train Expenses	112,213	.938	209,867	1.019	116,027	.970	201,422	.978	228,240	.954	411,289	.998		
Dining-Buffer net loss	-11,942	-.100	-20,719	-.101	-11,333	-.095	-25,309	-.123	-23,275	-.098	-46,028	-.112		
TOTAL, Incl. D-B loss	124,155	1.038	230,586	1.120	127,360	1.065	226,731	1.101	251,515	1.052	457,317	1.110		
NET REVENUE	236,928	1.982	409,721	1.990	181,763	1.520	288,444	1.401	418,691	1.751	698,165	1.696		
Per cent of Revenues	65.6		64.0		58.8		56.0		62.5		60.4			
Route-miles	282		282		282		282		282		282			
Train-miles	119,568		205,860		119,568		205,860		239,136		411,720			
Passenger-miles	15,118,496		28,324,267		13,010,833		22,328,867		28,129,329		50,653,134			

The percentage of Net Revenue to total Revenues for the seven months ended June 30, 1938, in the case of the Abraham Lincoln was 65.6, of the Ann Rutledge 58.8, an average for the two trains of 62.5. For the year ended June

30, 1939, the corresponding percentages were 64.0, 56.0 and 60.4, respectively.

As the foregoing statement shows, the trains have been well patronized and the financial results of their operation have been highly satisfactory.

CRUSADER

READING COMPANY

GENERAL STATEMENT AND BRIEF DESCRIPTION OF CRUSADER

The Crusader is the first streamline light-weight train to be installed on the Reading System. It was placed in regular service on December 13, 1937, between Philadelphia and Jersey City. It consists of five cars hauled by streamline locomotives, of which two are assigned to it. The cars are of stainless steel built by Budd.

The arrangement of the cars in the train is such that it may be run in either direction. The center car is a diner-tavern, preceded and followed by two coaches with smoking lounges.

The weight of the train is—locomotive 248 tons, cars 272 tons: total 520 tons. Its length is 491 feet. It is non-articulated.

The coach compartments seat 224, the lounges 52, the diner-tavern 51: total 327.

The train makes two round trips daily (except Sundays) and is operated on schedules in the morning and evening to meet the needs of commuters to and from Philadelphia and New York.

The average mileage for the day's run is 361. The average speed is 55 miles per hour.

The train is splendidly appointed throughout, is strikingly handsome, and

possesses many unusual features in the form of day train comforts and conveniences. No extra fare is charged. A coach ticket entitles the passenger to any seat in the train.

PHYSICAL CHARACTERISTICS OF LINE

Philadelphia-Jersey City, 90 Miles

About 70% of the line is 4-track and 30% double track.

RULING GRADES are 1.20% eastbound and 0.73% westbound between Philadelphia and Bound Brook Junction, 58 miles, and 0.42% eastbound and 0.60% westbound on balance of line.

MAXIMUM CURVES are 2°. About 86% of the line is straight track.

WEIGHT OF RAIL—130-pound.

TIES are all treated.

BALLAST—Crushed rock.

RESULTS OF OPERATION OF CRUSADER

No separate statistics of operation of the individual express trains between Philadelphia and Jersey City are kept by the Reading Company and consequently the revenues and expenses of the Crusader are unavailable.

GROWTH OF TRAFFIC ON CRUSADER

The Crusader makes a round trip in the morning and another in the after-

noon, on weekdays only, between Philadelphia and New York. Its first east-bound trip, leaving Philadelphia at 7:40 A.M. and arriving at New York (Liberty Street) at 9:25 A.M., and its last west-bound trip, leaving New York at 5:30 P.M., and arriving at Philadelphia at 7:15 P.M., are the most popular.

The train is patronized to a large extent by through commuters between their homes in the suburbs of Philadelphia and the financial district of New York.

The increase in the number of passengers on the Crusader, as compared with the number carried on the conventional type trains previously operated, has been substantial. The traffic on all Reading Philadelphia-New York trains has also

increased since the establishment of the Crusader.

The officials of the company are of the opinion that trains of light-weight steel, with bright shining exteriors, constitute an excellent advertising medium, particularly in densely populated areas such as between Philadelphia and New York, and that the new technic of bright colors and varied designs used in the interior decoration of the cars appeals strongly to the traveling public. The unusual appointments of the dining car have also been a factor in popularizing the train.

The smooth riding qualities of the train, dependable on-time performance, and the fact that no extra fare is charged, further enhance its popularity with the patrons of the road.

SILVER METEOR

SEABOARD AIR LINE

GENERAL STATEMENT

The Seaboard Air Line was the first to inaugurate an eastern seaboard streamline train service. Prior to taking this step the company made extensive investigations of the experience of other roads which had installed modern streamline high-speed trains in respect of their ability to regain traffic lost to other agencies of transportation. The studies indicated that during the winter season (December 1st to May 30th) the traffic available would be more than ample to support a de luxe coach service between important eastern cities and the popular winter resorts of Florida. Some question remained as to the probable volume of traffic on the train during the summer months. It can now be said, however, that through the past winter season, and continuing into the summer months, the train has been substantially filled in both directions on each trip, while demands for accommodations are increasing.

Upon its inauguration, the Silver Meteor was placed in a fast one-night-out service, making a round trip between New York and Miami every third day, thence between New York and St. Petersburg every third day, with "sailing dates" from terminal cities in the North every

third day to either the east or west coast of Florida, and from South Florida points to the North every sixth day. Early in June, by dividing and reuniting the train at Wildwood, in mid-Florida, service to and from Miami and St. Petersburg was made available every third day instead of every sixth day.

BRIEF DESCRIPTION OF SILVER METEOR

The train consists of seven streamline, light-weight, stainless steel cars, built by the Edward G. Budd Manufacturing Company.

Between New York and Washington the train is hauled by Pennsylvania Railroad electric locomotives, and between Washington and the southern termini by Seaboard Diesel-electric locomotives of 2,000 H.P., built by the Electro-Motive Corporation.

The Silver Meteor makes 20 trips in each direction in a 30-day month, with an average total mileage of 810 per day over the Pennsylvania, the Richmond, Fredericksburg and Potomac, and the Seaboard. Of this total daily mileage, 689 are on the Seaboard.

The consist of the train, the seating capacity of each car, weight and length are given in the following table:

7-Car Train	Revenue Seats	Non-Revenue Seats	Weight (Tons)	Length Over All
Diesel-electric Locomotive			154	71' 4"
Baggage-Dormitory-Coach	22		54	84' 8"
Coach	60		51	84' 8"
Coach-Tavern-Lounge	30	30	54	84' 8"
Diner		48	62	84' 8"
Coach	60		51	84' 8"
Coach	60		51	84' 8"
Coach-Observation-Lounge	48	24	51	84' 10"
Total	280	102*	528	664' 2"

* Exclusive of 18 non-revenue seats in lounge compartments of coaches.

The train is air-conditioned throughout, pleasingly and distinctively decorated, and embodies the most modern features that provide comfort and safety in day coach travel, equivalent, except as to sleeping accommodations, to those provided in sleeping cars of late design. The center of gravity of the cars is about 54 inches above the rail. The train rides smoothly at the highest speeds attained.

The average scheduled speed of the train between New York and Miami is 52.3 miles per hour, including 27 stops. The elapsed time is 26½ hours.

PHYSICAL CHARACTERISTICS OF LINE

The line of the Seaboard between Richmond and Miami-St. Petersburg traverses the lower semi-flat regions of Florida and southern Georgia and the Appalachian foothills in North and South Carolina and Virginia. The ruling grades and maximum curves vary accordingly, ranging up to 1.3% grades and 6° curves.

RULING GRADES are as follows:

Section	Distance (Miles)	Ruling Grades Both Directions
Richmond-Hamlet	253	1.0%
Hamlet-Columbia	106	1.3
Columbia-Savannah	142	1.0
Savannah-Jacksonville	138	0.4
Jacksonville-Miami	405	0.8
Total	1,044	

MAXIMUM CURVES between Richmond and Savannah are 6°; between Savannah and Miami-St. Petersburg 5°. The predominant curves are 3½° and 2°, respectively. About 87% of the line is straight track.

WEIGHT OF RAIL—100-pound.

TIES—About one-third of the ties are treated and tie plated; the remainder are

principally cypress, used in the section south of Columbia and largely tie-plated.

BALLAST—A substantial part of the line is ballasted with crushed stone and gravel.

RESULTS OF OPERATION OF SILVER METEOR

Following is a statement of the results of operation of the Silver Meteor from the date of its inauguration, February 2, 1939, to June 30, 1939, which statement excludes car mileage earned on the Pennsylvania and Richmond, Fredericksburg and Potomac between New York and Richmond:

REVENUES AND EXPENSES

Item	RICHMOND-MIAMI AND ST. PETERSBURG	
	Amount	Per Train-Mile
	\$	\$
REVENUES	280,799	2.785
TRAIN EXPENSES		
Wages of crews	36,238	.359
Fuel	5,922	.059
Lubricants	1,427	.014
Train supplies and expenses	10,047	.100
Power plant maintenance	4,903*	.049
Train maintenance	9,955*	.099
Other expenses	11,420**	.113
TOTAL Train Expenses	79,912	.793
Dining-Buffer net loss	-758	-.007
TOTAL, Incl. D-B loss	80,670	.800
NET REVENUE	200,129	1.985
Per cent of Revenues	71.3	
Route-miles, between Richmond and St. Petersburg	Miami 1,051; St. Petersburg 911	
Train-miles	100,811	
Passenger-miles (est.)	20,126,000	

* Does not include estimated amounts of \$4,650 and \$8,445 accumulated for general overhaul of power plant and train, respectively, in excess of actual expenditures.

** Does not include advertising expense amounting to \$9,381.

Surveys made by officers of the company show that a substantial percentage of the traffic on the train has been diverted from the highways and other travel means.

The operation of the Silver Meteor has been so markedly successful, as the foregoing statement shows, that the Sea-

board has purchased two additional Budd-built trains to be placed in service on the same route in December.

These two additional Silver Meteors, of seven cars each, will be almost identical with the first Silver Meteor and will permit of the inauguration of daily coach-train service on the Seaboard between New York and Florida points.

CHAMPIONS
OF THE
ATLANTIC COAST LINE

AND

HENRY M. FLAGLER
OF THE
FLORIDA EAST COAST

The Atlantic Coast Line and the Florida East Coast have each purchased two Budd-built 7-car streamline coach-trains of distinctive design to be placed in service in December.

The two trains of the Atlantic Coast Line and one of the trains of the Florida

East Coast will be known as "The Champions" and will provide daily coach-train service between New York and Miami.

The second Florida East Coast train, to be named the "Henry M. Flagler," will be operated in daily round-trip service between Jacksonville and Miami.

THE COMET

NEW YORK, NEW HAVEN AND HARTFORD

GENERAL STATEMENT AND BRIEF
DESCRIPTION OF THE COMET

The 3-car Comet was placed in service between Boston (South Station) and Providence on June 5, 1935. The original schedules provided for five round trips daily, except Sundays, between these points, with one intermediate stop at Back Bay Station (Boston). Between September 29, 1935, and September 27, 1936, the runs were increased to six round trips, reverting to five on the latter date. On September 29, 1935, a stop at Pawtucket (a suburb of Providence) was added.

All of the above represented new service as no steam trains were replaced by the Comet. At the time the Comet was installed a one-day round trip rate of 2 cents per mile was inaugurated in this territory. Commutation tickets, however, which are available in this section, were not accepted on the Comet.

On September 26, 1937, the entire Boston-Providence service was revised, so that the Comet replaced three local steam trains, and it now makes five round trips on weekdays and four on Sundays. On four of these trips on weekdays and three on Sundays the train makes from 3 to 5 local stops, consuming from 48 to 55 minutes, while one train each way daily makes the run in 44 minutes with 2 stops. Commutation tickets are accepted on all of these trains.

During the first two years of operation the capacity of the train was not completely utilized, but since the addition of local stops and the acceptance of commutation tickets it has been necessary on occasion to substitute steam trains to relieve the growing over-capacity travel on the Comet.

The Comet is a 3-car articulated streamline unit, the car at either end

housing a 400 H.P. Diesel-electric power plant and containing an operating compartment. The cars are of aluminum alloy and were built by the Goodyear-Zeppelin Corporation. The power plants and electrical equipment were furnished by the Westinghouse Electric & Manufacturing Company. The center of gravity of the train is 50.3 inches above top of rail.

The total weight of the train is 127 tons, its length 207 feet. It seats 160 coach passengers and has no head end or dining accommodations.

The average speed is 60 miles per hour between terminals with two intermediate stops and somewhat less with additional stops. The daily mileage is 440 on weekdays and 352 on Sundays.

The train presents a handsome appearance, contains many unique features and its appointments and riding qualities have been most favorably commented upon.

PHYSICAL CHARACTERISTICS OF LINE

Providence-Boston, 44 Miles

A four-track line extends from Providence eastward for 5 miles and from Boston westward 10 miles. The balance is double track with a 5-mile section of third track.

RULING GRADES—0.6% westbound, 0.4% eastbound (4.7 miles).

MAXIMUM CURVES—2°, except in terminals. About 79% of the route is straight track.

WEIGHT OF RAIL—About 69% is 107-pound; 12% 112-pound; and 19% 130-pound.

TIES are all treated.

BALLAST—Stone with the exception of about 2 miles of gravel.

REVENUES AND EXPENSES

Item	BOSTON-PROVIDENCE			
	1 Train, 3 cars, 2 containing power units. 5 Round trips weekdays and 4 Sundays.			
	Operation begun June 5, 1935			
	Year ended June 30, 1938		Year ended June 30, 1939	
	Amount	Per Train-Mile	Amount	Per Train-Mile
REVENUES	\$ 149,997	\$ 1.101	\$ 104,960	\$ 1.223
TRAIN EXPENSES				
Wages of crews	32,315	.237	20,636	.240
Fuel oil	5,080	.037	2,808	.033
Lubricants	2,116	.016	1,437	.017
Train supplies and expenses	7,774	.057	4,603	.054
Power plant maintenance	19,846	.146	24,144	.281
Train maintenance	9,006	.066	20,434	.238
General overhauling	6,810*	.050		
TOTAL Train Expenses	82,947	.609	74,062	.863
NET REVENUE	67,050	.492	30,898	.360
Per cent of Revenues	44.7		29.4	
Route-miles	44		44	
Train-miles	136,202		85,806	
Passenger-miles (est.)	8,086,000		4,868,000	

* Train did not receive general repairs during the year and this item is therefore estimated.

Notes: The above figures are for the Comet only and do not include substitute steam operations, which represented 11.9 per cent of the service in the year ended June 30, 1938, and 45.2 per cent in the year ended June 30, 1939.

The Comet was out of service from July 2 to Nov. 3, 1938, for general repairs. The figures for the year ended June 30, 1939, include the cost of general overhauling which is required every three years.

RESULTS OF OPERATION OF COMET

Above is a statement of the revenues and expenses of the Comet for the years ended June 30, 1938 and 1939, respectively:

It will be seen from the statement that for the first year the Net Revenue was 44.7 per cent of the Revenues, and for the second, 29.4 per cent.

GROWTH OF TRAFFIC ON COMET

The revenues of the Comet (exclusive of those from excursions) by six-months' periods, were as follows:

Period	6 Months	Year
July 1 to Dec. 31, 1935	\$53,265	
Jan. 1 to June 30, 1936	48,461	\$101,726
July 1 to Dec. 31, 1936	49,871	
Jan. 1 to June 30, 1937	52,465	102,336
July 1 to Dec. 31, 1937	73,472	
Jan. 1 to June 30, 1938	76,525	149,997
July 1 to Dec. 31, 1938 (See note)	29,316	
Jan. 1 to June 30, 1939	75,644	104,960

During the first four periods the train

was out of service at different times for annual overhauling or other mechanical attention. The train was also out of service for its tri-annual general overhauling from July 2 to November 3, 1938. The variations in earnings were due principally to this fact.

It is estimated that during the first six months of operation about 60 per cent of the Comet's passengers represented new business. The increase in average monthly revenue in subsequent periods was due in part to added local stops and the acceptance of commutation tickets. As in the case of the Flying Yankee, it is probable that, but for the depressed business conditions, the earnings would have been larger.

In the opinion of the officials of the road the Comet has attracted a considerable number of passengers who would otherwise have traveled by highway.

FLYING YANKEE

BOSTON AND MAINE—MAINE CENTRAL

GENERAL STATEMENT AND BRIEF
DESCRIPTION OF FLYING YANKEE

The 3-car Flying Yankee was placed in service on the Boston and Maine and Maine Central railroads between Boston and Bangor on April 1, 1935. The new train did not replace an existing steam train; nevertheless, during the past three years its limited seating capacity has been a distinct handicap.

For the period from April 1, 1935, to June 1, 1936, the seating capacity of the train was adequate, except at times of holiday weekends. With the advent of reduced coach fares, however, its capacity was insufficient in the periods of peak travel, such as on holidays and during the summer months, and it was necessary to supplement it with steam sections on so many occasions that a companion Diesel-powered train of conventional equipment, the Mate, was placed in service paralleling the Flying Yankee schedules. It was found, however, that the net profits were not sufficient to justify the operation of both trains, and the companion train operation was discontinued on September 30, 1937. The Flying Yankee is run normally only on weekdays, and because of its inadequate seating capacity it was taken out of service on Mondays and Saturdays in the summer of 1938 and a larger steam train substituted. In the summer of 1939, the same unit, under the name The Mountaineer, was operated on a new run through the White Mountains, and the regular round trip between Boston and Portland was made by another train.

When the Flying Yankee was first introduced, the occasional substitution of a steam train was unpopular with passengers, so much so that it was necessary for a diplomatic passenger representative to be present to make explanations; and when the train was out of service for any considerable period as, for instance, during the annual shopping season, the business of the substituted trains declined more than that of other steam trains operating over the same route.

The Flying Yankee is a 3-car train, the forward car housing a 600 H.P. Diesel-electric power unit. The train was built by the Edward G. Budd Manufacturing Company, the power plant by the Electro-Motive Corporation. It is of stainless steel construction, streamlined, light-weight, and similar in its main features to the first Zephyr of the Burlington. The center of gravity of the train is about 52 inches above top of rail.

The total weight of the train is 123 tons, its length 199 feet. It contains 120 coach seats and 12 parlor seats in the observation end. The buffet on the train is rented to a concessionaire at a small percentage of the gross receipts.

The train operates at an average speed of about 62 miles per hour between Boston and Portland, and about 43 miles per hour between Portland and Bangor. The daily mileage is 734 for the days run.

The appointments and speed of the train have been favorably commented upon throughout New England. At the time it was built its appointments were

the most modern and attractive then evolved for trains of its type.

PHYSICAL CHARACTERISTICS OF LINES

The physical characteristics of the lines on which the Flying Yankee operates are as follows:

Boston and Maine. Boston-Portland, 114 Miles

The line is double track throughout practically the whole route of the Flying Yankee.

RULING GRADES are about 0.80%.

MAXIMUM CURVES are 2° except at terminals. About 80% of the line is straight track.

WEIGHT OF RAIL—About 70% of the rail is 100-pound; 5% 112-pound; and 25% 130-pound.

TIES are practically all treated.

BALLAST—The entire line is rock ballasted principally with trap rock.

Maine Central. Portland-Bangor, 139 Miles

About 41% of the line is double track.

RULING GRADES are about 0.90% east-bound and 0.85% westbound.

MAXIMUM CURVES are 6° with curves of 2° and under largely predominating. About 71% of the line is straight track.

WEIGHT OF RAIL varies from 100-pound to 112-pound, with a small proportion of 85-pound.

TIES—54% treated hard pine; 16% untreated hard pine; and 30% untreated cedar and other soft woods.

BALLAST—2% crushed rock; 13% washed gravel; 85% bank run gravel.

RESULTS OF OPERATION OF FLYING YANKEE

Following is a statement of the revenues and expenses of the Flying Yankee for the years ended June 30, 1938 and 1939:

Although inadequate for the service, as before stated, the percentage of Net Revenue to Revenues for the year ended June 30, 1938, was 65.9, and for the following year 59.2.

REVENUES AND EXPENSES

Item	BOSTON-PORTLAND-BANGOR			
	1 Train, 3 Cars, 1 containing power unit. Round trip Boston-Bangor and round trip Boston-Portland daily except Sunday.			
	Operation begun April 1, 1935			
	Year ended June 30, 1938		Year ended June 30, 1939	
	Amount	Per Train-Mile	Amount	Per Train-Mile
REVENUES	\$ 270,188	\$ 1.427	\$ 228,562	\$ 1.287
TRAIN EXPENSES				
Wages of crews*	45,769	.242	49,857	.280
Fuel oil	3,845	.020	2,923	.017
Lubricants, etc.	1,550	.008	1,132	.006
Train supplies and expenses	5,362	.028	5,043	.028
Power plant maintenance	14,115	.075	13,064	.074
Train maintenance	21,406	.113	21,254	.120
TOTAL Train Expenses	92,047	.486	93,273	.525
NET REVENUE	178,141	.941	135,289	.762
Per cent of Revenues	65.9		59.2	
Route-miles	367		367**	
Train-miles	189,310		177,542	
Passenger-miles (est.)	13,120,000		10,240,044	

* Baggage man added March 22, 1938.

** Route-miles 294 between June 23, 1939, and June 30, 1939.

GROWTH OF TRAFFIC ON FLYING YANKEE

The revenues of the Flying Yankee (exclusive of buffet revenues) by six-months' periods are shown in the following statement:

Period	6 Months	Year
July 1 to Dec. 31, 1935	\$132,066	
Jan. 1 to June 30, 1936	102,982*	\$235,048
July 1 to Dec. 31, 1936	145,367	
Jan. 1 to June 30, 1937	104,555**	249,922
July 1 to Dec. 31, 1937	153,501	
Jan. 1 to June 30, 1938	116,687***	270,188
July 1 to Dec. 31, 1938	114,686	
Jan. 1 to June 30, 1939	113,876****	228,562

* Out of service 7 weeks. Was shopped for annual inspection and shops marooned in flood.

** Out of service 7 weeks. Annual inspection and heavy repairs to car and power plant after 400,000 miles.

*** Out of service 3½ weeks for annual inspection and light repairs.

**** Out of service 4½ weeks for annual overhauling.

It is the belief of the officials that the train possesses a dramatic appeal that has been an important factor in attracting traffic. Questionnaires returned by passengers on the Flying Yankee during the early period of its operation indicate that about half of its patronage was either newly created or recaptured from the highways.

As the statements show, the Flying Yankee, though of small carrying capacity, has been a highly successful train from the beginning of its operation.

CONCLUSION

This report is not as complete as would be desirable for the reason that few actual data are available from which accurate determinations can be made of the sources of traffic on the new trains, the extent to which travel is diverted from other slower and less luxurious trains, recovered from the highways, or is newly created. In many cases we have stated the opinions of the officials of the respective lines on this subject and, although necessarily expressed in general terms, they may be taken as authoritative. It is clear from these opinions that a large proportion of the traffic on these trains has been newly created or retrieved from the highways.

The outstanding facts, however, which the statements in the report reveal in a striking manner, are the great popularity and the high degree of financial success attained in the operation of light-weight high-speed streamline trains.

In the past few years the long-distance coach trains in particular have demonstrated their ability to create new traffic and several new all-coach trains have been installed and others will shortly be placed in service.

