What Happened to Speed?

Scheduled Speeds and Travel Times of North American Passenger Trains, 1965-2015

TRB Paper Number 16-2844

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November 12, 2015 version

Word count: 5,731 (not counting references), plus 5 pages of tables
Equivalent of 6,981 words

95th Annual Meeting of the Transportation Research Board,
Washington, D.C., January 2016

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By John G. Allen and Herbert S. Levinson

Abstract: Most larger North American railroads provided intercity passenger service until the 1970s, when the industry experienced a difficult restructuring period. During that decade, US and Canadian federal governments took responsibility for intercity passenger trains. Meanwhile, railroads (especially in the US Northeast and Midwest) were downgrading their lines and deferring maintenance. Although railroads returned to financial health in the 1980s and 1990s largely because of deregulation, track capacity was substantially reduced compared to the 1960s, and most lines were optimized for freight rather than passenger service.

To assess the effects of these changes on scheduled travel times and speeds, intercity passenger timetables for specific routes were examined for selected years between 1965 and 2015. Although certain long-distance routes were scheduled for noticeably slower speeds in 2015 than in 1965, other scheduled speeds decreased only marginally. On long-distance routes and in corridors outside the northeastern US, track capacity reductions and/or freight train interference seem to have placed downward pressure on scheduled speeds.   Scheduled speeds tended to decrease only modestly or have increased on lines that have seen substantial investment. Massive federal investment in the Northeast Corridor since the 1970s has resulted in considerably faster schedules.

INTRODUCTION

Passenger train speed has been an important consideration in railroad technology and operations since the mid-19th century. Steam locomotives were progressively improved to carry longer trains at higher speeds, and diesel locomotives continued this trend (*1*). The streamliners of the 1930s, 1940s and 1950s vied for passengers in terms of speed, comfort, and amenities. One account of a ride on the *New England States*, the New York Central's premier Chicago, Ill. – Boston, Mass. train, in 1953 when the diesel locomotive was displacing steam, recalled that "there was always the sense of relentless speed …" (*2*, p. 104).

Along with comfort, cost and reliability, speed is an important attribute for the general public when choosing travel modes for intercity trips. But in North America after World War II, competition from airliners and automobiles (using government-funded infrastructure) resulted in sharp declines in intercity passenger train ridership, even on the so-called "crack" trains—the fastest, most comfortable limited trains that railroads operated in major intercity travel markets (*3*). The elimination and/or downgrading of these trains has resulted in the perception (which this research questions) that intercity passenger trains were significantly faster in the mid-20th century than in the early 21st century.

Today, air travel is commonly associated with speed (although not necessarily with comfort or reliability). In some markets, particularly for distances up to 400 mi, ground-side access and time required for security clearance at airports give passenger trains a potential overall travel time advantage.

This paper examines scheduled passenger train times (and their inverse component, average speeds) for various years between 1965, at the close of the great postwar era of streamlined trains, and 2015, when the effects of busy rail freight service were making themselves felt on North American railroads. (Scheduled travel times and speeds were used because they provide a readily-available data set, although it is acknowledged that actually-achieved timings may, for various runs, be considerably slower than those scheduled.)

Three principal types of markets – long-distance service, daytime corridor service on routes owned primarily by freight railroads, and the Boston – New York – Washington, D.C. Northeast Corridor (NEC) – were explored, along with patterns and implications of each service type.

RAILROAD INDUSTRY CONTEXT

As passenger trains became a small part of the total intercity traffic mix outside the NEC (the only major intercity rail line owned by passenger railroads rather than freight railroads), great changes overtook the North American railroad industry. At the mid-20th century, dozens of larger railroads operated both freight and passenger service. Railroads serving several cities, especially New York, Chicago, Philadelphia, Pa., and Boston, also operated commuter trains.

Mergers and acquisitions have resulted in six very large freight railroads in the US and Canada. North America's freight railroads experienced significant resurgence by the 1990s following deregulation (*6*) in the US (1980, Staggers Act) and in Canada (1967, National Transportation Act).

Relieving freight railroads of passenger service deficits was also helpful. Between the 1960s and the 1980s, state, provincial, and regional governments took responsibility for funding commuter trains. Federal governments in both countries took further action to relieve railroads of financially-expensive passenger service obligations:

- The Rail Passenger Service Act of 1970 created the National Railroad Passenger Corporation (Amtrak), effective May 1, 1971 (*5-6*).
- The Northeast Rail Service Act of 1981 relieved Conrail of responsibility for operating commuter rail service, directing regional transit authorities to take full financial and operating responsibility for these trains effective January 1, 1983 (*7*).
- The Canadian government created Via Rail Canada (Via) as a federal Crown corporation in 1978 (*8*).

Amtrak and Via are subject to budgetary allocations from the US and Canadian federal governments. Although Amtrak is legally allowed to operate anywhere on the general railroad system of the United States, track capacity and quality are sometimes crucial constraints. Only in the Northeast Corridor does Amtrak operate its own lines on an extensive basis (although the commuter railroad Metro-North controls a 55-mi segment between New Rochelle, N.Y. and New Haven, Conn.). Amtrak also owns a 12-mi segment in New York State linking its Albany-Rensselaer station with the ex-Boston & Albany main line, and a longer 98-mi segment between Porter, Ind. and Kalamazoo, Mich., which is part of its Chicago – Detroit, Mich. route. Via owns no track of its own, and it relies entirely on trackage rights agreements with Canada's freight railways.

Today's freight railroads are in good physical shape, and often congested. But a long and painful retrenchment, when railroads were eager to shed what then appeared to be surplus track capacity, preceded this prosperity. Starting in the 1960s, but especially during the 1970s and 80s, railroads undertook the following measures to bring what was then excess capacity into closer balance with the reduced traffic flows of that time:

- Many surplus routes were abandoned altogether, concentrating more traffic on the surviving main lines (e.g., rationalization under Conrail during the late 1970s).
- Other routes were sold to regional railroads (thus, Burlington Northern sold its former Northern Pacific main line to Montana Rail Link).
- Some lines that were formerly double-track were largely converted to single track (e.g., Illinois Central, Chicago – New Orleans, La.), and certain multiple-track segments were reduced to double track (e.g., parts of the east-west main lines of the New York Central System and the Pennsylvania Railroad).
- Maintenance standards were reduced on many lines, resulting in widespread reductions in maximum authorized track speeds.

The first two of these measures require regulatory approval; the others do not. Many lines that were historically able to accommodate trains of differing types and speeds with relative ease are now largely optimized for freight trains. In many cases, there is less track capacity. Additionally, Amtrak established agreements in 1971 with its host railroads guaranteeing the same travel times for the next 25 years. These agreements were far from consistently enforced between 1971 and 1996 (and were unenforceable with railroads that could not afford maintaining tracks to 1971 standards). Since 1996, if Amtrak wants faster speeds than the host railroads need, it must pay for the additional track upgrading and maintenance required (*9*).

The freight railroad resurgence had unintended consequences for intercity passenger trains, because passenger and freight trains have differing track occupancy characteristics based on acceleration, braking, speed, and train length (*10*). These differences affect what can be accomplished in a shared-track environment:

> The capacity of an existing rail corridor … depends on many factors, including the quantity of track (e.g., single or double track, siding/passing tracks); the quality of the track; and the signalling system. … [T]he greater the relative difference in speeds between the trains, the more capacity [is] required … This means that adding passenger train services … can take up substantial capacity … [Via Rail Canada] trains run up to 100 mph [in parts of the Québec City, Qué. – Windsor, Ont. Corridor], while freight trains run up to 60 mph on the best tracks (*11*).

Freight is not the only type of traffic for which demand is increasing on the railroads. Growth in passenger travel is also signficant. Between 2002 and 2012, total vehicle-miles traveled per capita in the United States decreased by an average of 0.5% per year. During the same period, passenger-miles traveled on Amtrak increased by an average of 3.5% annually (*12*).

RESEARCH APPROACH

This research analyzes changes in scheduled travel times and average speeds between 1965 and 2015.. To gain a better sense of the connection between passenger train schedules and broader changes in the railroad industry, heritage railroad, Amtrak and Via schedules were examined for 1965, 1970, 1975, 1985 and 2015. Each year represents a significant point for North American railroads:

- 1965 serves as the baseline, reflecting the operating and service benefits that resulted from post-World War II modernization with diesel locomotives and streamlined cars.
- By 1970, some of the difficulties of the railroad industry, particularly in the northeastern US, were resulting in slower travel times. The two-year-old Penn Central merger, bringing together the Pennsylvania Railroad and the New York Central, ended in bankruptcy in 1970. Amtrak began operations a year later, in 1971.
- In 1975, the railroad industry was near its low point. Much of the Northeastern rail system was in bankruptcy, and most of these troubled railroads would be incorporated into Conrail in 1976 (when Amtrak took control of most of the Northeast Corridor). Meanwhile, Amtrak was operating a streamlined fleet which was showing the effects of age and deferred maintenance. Various main lines, particularly on Northeastern railroads, were in poor condition.
- By 1985, railroads had shed much excess capacity, and were rebuilding their physical plants. Amtrak and Via were mainly operating modern or refurbished equipment, and investment in the NEC was resulting in faster speeds for some trains.

- Finally, 2015 saw little surplus capacity on most major rail freight main lines. Accordingly, Amtrak had made various schedule adjustments, and Via had added a third night to its Toronto – Vancouver transcontinental schedules to reflect actual operating conditions. At the same time, Amtrak and Via were accommodating record ridership with aging fleets, and Acela trains were providing the fastest travel times ever on the NEC.

Public timetables for 2015, the *Official Guide of the Railways* for 1965 and 1970 (*13-14*) and its successor passenger edition for 1975 and 1985 (*15-16*). were consulted to obtain mileages (needed to compute scheduled miles per hour) and the best scheduled running times for trains in three major categories:

1. Long-distance intercity passenger routes (e.g., Albany, N.Y. – Chicago; Chicago – Los Angeles, Calif.).

2. Corridor services operated mainly on freight railroads outside the Northeast Corridor. Some of these corridors are firmly established (e.g., Los Angeles – San Diego, Calif.; Montréal. Qué. – Toronto, Ont. in Canada), and others are emerging (e.g., Chicago – Milwaukee, Wis.) or have yet to emerge (Chicago – Indianapolis, Ind.).

3. Northeast Corridor services between Boston, New York, Philadelphia, and Washington.

The best-scheduled-times approach does not take into account the variations in running times found on some lines with multiple trains, or even between the same train in opposite directions. Some variations reflect different station stops being made. Other differences may be due to such factors as what times of day different levels of freight traffic may be expected, or how much cushion time is allotted for possible delays en route. This approach was chosen to show what railroads believed were the best possible performances given operating conditions, and to provide a consistent basis for analyzing a large number of passenger train schedules. Other methods would probably result in slightly different data, but it is doubtful that they would have yielded significantly different overall findings. Recovery time built into the schedule was counted the same as regular running time, on the assumption that recovery time reflected, to some degree, variability in operating conditions.

The resulting data in Tables 1-4 show timings and average speeds for various lines or segments. Because of the running time variations noted above, they should be treated as generally indicative of changing conditions over time, not as precise indicators. Wherever possible, only lines with continuous service throughout the study period were selected (although 1976 data were used for Albany – Chicago due to a hiatus in service in 1975, and an alternative route was used for Washington – Chicago in 1975 because there was no *Capitol Limited* service between 1971 and 1981).

Where trains were split up or combined en route, only the combined portion was considered (thus, Albany – Chicago was used rather than New York – Chicago). Service to Miami, Fla. was analyzed from Washington rather than New York to exclude the Northeast Corridor portion of that run, as the NEC is analyzed separately. Cross-border services between the US and Canada (e.g., Buffalo, N.Y. – Toronto) were excluded due to the difficulty of separating the time scheduled for train operation from that allotted for customs inspection at border points.

Some substitute routings were made over the 50-year period; these are noted in the tables where significant. The most important such change has been on the *Capitol Limited*, which ran on the Baltimore & Ohio between Pittsburgh, Pa. and Chicago, but now runs from Pittsburgh to Cleveland on the former Pennsylvania Railroad and then on the ex-New York Central to Chicago. Where through service was discontinued over parts of a route, only the segment with continuous service has been analyzed. Thus, only the Winnipeg, Man. – Edmonton, Alta. – Vancouver, B.C. segment of Canadian National's transcontinental route was analyzed, as it alone has had through service continuously since 1965.

The fastest scheduled running times were used, regardless of travel direction, for the most comparable trains that could be found in terms of their overall market function to today's Amtrak and Via services. For some routes, comparisons with 2015 service were made for both faster and slower trains of the pre-Amtrak era:

- For the Albany, N.Y. – Chicago route, the New York Central System's *Twentieth Century Limited* (historically the railroad's fastest train) and the less rapid but still reasonably fast *Pacemaker* were compared with Amtrak's *Lake Shore Limited*.
- Between Chicago and New Orleans, the Illinois Central's fast *Panama Limited* on the one hand, and a combination of the slower *Louisiane* (1965) and *City of New Orleans* (1970; the pre-Amtrak day train) on the other hand were compared with Amtrak's *City of New Orleans* (the overnight train).
- Between the Twin Cities of Minneapolis – St. Paul, Minn. and Spokane, Wash., the Great Northern's faster *Empire Builder* and the same road's slower *Western Star* were compared with Amtrak's *Empire Builder*. When separate station stops were made in both Minneapolis and St. Paul, Minn., Minneapolis, as the more westerly of the two, was used.
- In the NEC, the heritage railroads' fastest trains (*Merchants Limited* and *The Congressional*) were compared with Amtrak Metroliner and Acela service, with regular intercity trains being compared with today's Northeast Regional service.

The mileages shown for many lines have changed marginally. In certain cases, measuring errors might have been subsequently corrected; in others, differences may reflect mileages being rounded up or down. Some mileage changes occurred because station locations have been changed (e.g., Albany Union Station versus Albany-Rensselaer, N.Y.). In other instances, routings have been changed on certain segments (e.g., Los Angeles to San Bernardino, Calif. on Amtrak's *Southwest Chief*).

FINDINGS

Running times, mileages, and average speeds were gathered for various runs in 1965, 1970, 1975, 1985 and 2015. The results are now analyzed for each type of route.

Long-Distance Routes

Many speeds for long-distance trains have declined over the decades, but the outcome is somewhat nuanced. Table 1 shows outcomes where particularly fast and somewhat slower long-distance trains operated in 1965 and, usually, 1970 as well. The successors to the great "crack" trains such as the New York Central's *20th Century Limited* and Illinois Central's *Panama Limited* were notably slower in 2015 than in 1965 (the right-hand columns of Tables 1-4 show average speeds in 2015 as a percentage of 1965 speeds). Nevertheless, the Amtrak trains of 2015 had scheduled speeds that differed little from the 1965 trains that were more comparable in station stops and overall market functions. Thus, between Albany and Chicago, Amtrak's *Lake Shore Limited* was only 70.5% as fast in 2015 as the famous *Twentieth Century Limited* was in 1965. Yet Amtrak's train was actually 7.4% faster in 2015 than New York Central's secondary train, the *Pacemaker*, was in 1965. Similar patterns may be seen on the Illinois Central between Chicago and New Orleans, La. and on the Great Northern between the Twin Cities of Minneapolis – St. Paul, Minn. and Spokane, Wash.

Table 2 shows the situation for other long-distance trains. There was relatively little change in average speed in 2015 from that in 1965 for some trains. Most of these were scheduled to run less than 10% slower in 2015 than five decades earlier. One, the *Cardinal* between Washington, D.C. and Cincinnati, Ohio, had a marginally faster schedule in 2015 than its 1965 counterpart.

Two routes examined had substantially slower schedules in 2015 than in 1965. On the Southern Pacific between Los Angeles and Oakland, Calif., the 2015 average speed was 85.9% of that in 1965. The greatest scheduled speed reduction for the same period was in Canada. On the Canadian National route between Winnipeg, Man. and Vancouver, B.C., the 2015 schedule was only 80.9% as fast as that in 1965. Space does not permit a discussion of all long-distance routes analyzed, but this noteworthy difference merits a brief historical analysis.

Traditionally, Canadian railways did not have capacity shortages. Instead, overbuilding in the late 19th and early 20th centuries and subsequent bankruptcies led to the federal government taking over those railways and merging them into Canadian National (CN) between 1918 and 1920 (*17*). But the financially-successful privatization of CN starting in 1995 suggested an increasing convergence with US railroads in the utilization of Canadian railways. By the early 21st century, Canadian railways were experiencing capacity shortages like their US counterparts, and this has affected the times that Via is able to achieve on CN's transcontinental route. The overall Toronto – Vancouver run now involves three nights on board rather than the earlier two-night schedule. As another indicator of rising freight traffic levels, in 1999 CN and its rival Canadian Pacific instituted directional running on their parallel lines on opposite sides of the Fraser River Canyon between Kamloops and Hope, B.C. (*18*).

Non-Northeastern Corridors

The data for corridor services outside the NEC show a mixed picture (Table 3). On Amtrak, there is a clear bifurcation between those corridors that have received substantial investment (Chicago – Detroit, Los Angeles – San Diego) and others, particularly the largely-neglected Chicago – Indianapolis route (*19*).

In earlier decades, with speeds of up to 100 mph, trains on the Milwaukee Road between Chicago and Milwaukee had higher average speeds on this 85-mi route than pre-Metroliner service on the 91-mi route between New York and Philadelphia on the NEC. Average speeds fell somewhat starting in the 1970s as track maintenance standards were reduced. Nevertheless, timings have since improved thanks to track improvements, despite the addition of a new stop at Milwaukee Airport Rail Station in 2005. In 2015, track upgrades were under way on parts of the Chicago – St. Louis line, and future schedules should reflect these improvements. The Los Angeles – San Diego corridor showed the benefits of investment, where 2015 schedules were 6.1% faster than their 1965 timings.

The greatest improvement was in Canada, where the Montréal – Toronto services have been substantially accelerated since the 1960s (*20*). The 1965 performance, indifferent by later standards, reflects the “pool train” arrangement between CN and CP to jointly serve Canada’s most important intercity corridor. Shortly thereafter, CN cancelled the agreement, and initiated substantially faster service. The quest for speed in the corridor culminated with the 1981 introduction of Via’s Light, Rapid, Comfortable (LRC) cars. These cars, originally designed for speeds of up to 125 mph, were built with “banking systems … to counter centrifugal forces on curves … But the systems were fully deactivated … because of repeated problems of locking in cold weather” (*21,* p. 48).

This, along with growing freight traffic, help explain why the best 1985 timings were slightly faster than those for 2015 (although even the latter were slightly faster than those achieved by Amtrak Acela trains between New York and Boston). Via’s existing top speeds of 90 to 100 mph are very good for the freight-optimized lines in Ontario and Québec. With rail freight prospering, there is little prospect of higher speeds being achieved.

Northeast Corridor

The Boston – New York – Philadelphia – Washington Northeast Corridor shows most clearly that large and ongoing investment has produced significant improvements in running times (Table 4). With the minor exception of the Turbo Train, only conventional equipment was used between Boston and New York until the introduction of Acela Express service in 2000 once all-electric operation had been established east of New Haven, Conn. earlier that year (*22*). The best extra-fast conventional equipment timings were only 5.9% faster than the best regular timings in 1965. This compares with a 19.0% speed differential in 2015 with Acela equipment, which reaches 150 mph on segments in Massachusetts and Rhode Island. Tilt-body technology enables fast Acela timings, particularly on the Shore Line Route’s many curves between Westerly, R.I. and New Haven, Conn. (For a brief period in the late 1960s and early 1970s, Penn Central and Amtrak experimented with tilt-body Turboliners on the Boston – New York run, achieving running times substantially comparable to those of today’s Acela trains. These timings are not analyzed here, however, because they do not provide a consistent time series.)

Before Amtrak, trains from Boston terminating in New York went to Grand Central Terminal (GCT) rather than Penn Station, which was served from Boston only by trains continuing onward to Philadelphia and Washington. The GCT route was shorter than that to Penn Station, but Amtrak chose to consolidate its New York NEC operations at Penn Station. Today, almost all Amtrak NEC trains to and from Boston also serve Washington, which cannot be reached from GCT.

Another factor in Boston – New York service is the segment between New Haven and New Rochelle controlled by commuter railroad Metro-North. This portion is now part of North America's busiest commuter rail line and is optimized for overall passenger throughput. The present operating plan may not maximize speed, but it provides frequent service for a large ridership.

The New York – Washington part of the NEC has fewer curves and has long enjoyed faster schedules than the Boston – New York portion. Until Metroliner equipment entered service in 1969, the fastest expresses between New York and Washington used the same equipment as other intercity trains. Amtrak replaced the Metroliner electric multiple-unit cars with locomotive-hauled coaches by 1982, but these trains, like the Metroliners, continued to run on accelerated schedules, and were replaced by Acela trainsets in 2000.

In 1965, PRR's fastest New York – Washington timing was 3 hours 35 mins. Extra-fast trains with conventional equipment between New York and Washington saved only 10 minutes compared with regular passenger trains, but this began to change with the implementation of Metroliner service in 1969 and of Acela service in 2000, which compared to 1965, saved 36 minutes in 1970 and 51 minutes in 2015.

The Acelas' tilt-body feature saves less time on the faster New York – Washington line than it does between Boston and New York, but other gains may be achieved by raising overall speed. Amtrak plans to do just this between New Brunswick and Trenton, N.J. by raising maximum Acela speeds to 160 mph in the coming years. The maximum speed for Acela trains between New York and Washington is presently no greater than 135 mph, and that only on limited segments (*23*).

RUNNING TIME AND RELIABILITY

It should be emphasized that the tables show scheduled running times, rather than those actually achieved in service. Particularly since the early 1970s, there have been substantial discrepancies on some routes between passenger train schedules and day-to-day timekeeping, with the result that the published schedules tend to overstate the average speeds actually achieved, at least at the margin (although cushion time in some long-distance schedules occasionally results in slightly early arrivals). Some unreliability is inherent in railroad operations, because

> [t]he actual track occupancy of a … train is a function of the number and type of cars … weight of the train, characteristics and mechanical condition of the locomotive configuration, track condition, [and] interference of other trains in the system (*24*, p. 18).

One factor affecting reliability is that major freight railroads operate freights on an improvised basis, as extras, rather than as regularly-scheduled services. Although this allows dispatchers to direct (and modify) operations as circumstances arise, "[t]he diminishing effectiveness of improvised operation manifests [itself] as decreasing predictability. … When the condition becomes extreme, it can manifest [itself] as crew shortages, often caused by hours of service tie-ups" (*25*, p. 35). This has had significant consequences for operating reliability when passenger trains use major freight routes dispatched by freight railroads.

Scheduled connections at Chicago for transcontinental travel appear to be affected by reliability considerations. Before Amtrak, transcontinental limiteds from the West Coast were scheduled to reach Chicago in the early afternoon, which generally permitted late afternoon connections to major trains for New York, Boston, Philadelphia and Washington. By the mid-1970s, schedules, particularly for Eastern trains, had lengthened, but the same general time frame remained in effect for connections. In 2015, Amtrak trains from the West Coast were scheduled for afternoon arrivals at Chicago, but the major Eastern trains left later: the *Capitol Limited* left for Washington at 6:40 PM, and the *Lake Shore Limited* left for New York and Boston at 9:30 PM.

Also perhaps indicative of reliability considerations, in 2015 the eastbound *Lake Shore Limited* from Chicago was scheduled to reach New York at 6:23 PM, after the height of the PM peak. Busy commuter rail operations make platform space scarce at New York Penn Station, so this schedule helps avoid conflicts that an earlier-scheduled *Lake Shore Limited* might cause if late running put it into New York during the 5 PM hour.

IMPLICATIONS

The data indicate changes in scheduled intercity passenger train travel times and speeds over the decades. Relevant factors include deteriorating track conditions (particularly during the 1970s), freight congestion (especially since the 1990s), and the number of station stops. Holding all else equal, speeds have been improved by track rehabilitation, track capacity enhancement, rerouting freight trains elsewhere, and signaling upgrades. Where infrastructure has been systematically improved, passenger trains tended to be scheduled for faster running in 2015 than in 1965. Conversely, on lines without significant investment in speed and/or capacity improvements, speeds generally decreased by varying amounts.

The freight railroad industry was more productive in 2015 than in 1965. Although this situation has many causes (particularly deregulation and changes in operating practices), another factor was that financially-stressed railroads removed substantial amounts of track capacity during the 1970s and 1980s. Some of the increased efficiency of today's freight railroads has come at the expense of reliability, affecting passengers and shippers alike.

> The precision on-time railroading required by the passenger train had a halo effect that carried over to … fast freights. … As the tight discipline of passenger operations waned into sloppiness, so did all the precision and discipline, and the freight operation got sloppy as well. This was just as the motor carrier was poised to [provide service] straight from one loading dock to another with precisely the service the customer required (*2*, p. 100).

Further investigation of on-time performance would be a useful follow-up to this research. Various factors affect schedule adherence, including freight train congestion, passenger loadings, weather, and mechanical reliability of equipment. Intercity passenger train reliability and causes for delays might be a productive topic for future research, much as similar research has been done for freight (*26*-*27*) and commuter rail (*28*).

Without major upgrading of lines or the construction of new high speed rail (HSR) routes allowing for speeds above 160 mph, the future prospects for passenger train speeds are mixed. Fundamental conditions point toward continued prosperity in the rail freight industry, suggesting that freight traffic congestion will continue on most rail lines used by passenger trains outside the NEC.

Conversely, other developments may benefit passenger trains. Public investment in corridors such as Chicago – Detroit, Chicago – St. Louis, Portland, Ore. – Seattle, Wash., and Montréal – Toronto has enabled or should enable passenger train operators to run more trains and/or faster schedules.

Passenger train reliability on host railroads remains an issue. Amtrak has expressed its frustration with the effects of rail freight congestion on the on-time performance of its own trains, and is reportedly exploring administrative remedies with the Surface Transportation Board (*29*). Broadly, to the extent that rail freight continues to prosper, railroads should have the resources they need for track maintenance—a welcome contrast to the situation in the 1970s.

Policymakers considering how intercity passenger trains might best serve North America's traveling public must find ways to accommodate passengers on a largely freight-owned and freight-optimized rail system (outside the NEC). Several points emerge for consideration:

- It is usually easier to implement and/or upgrade service on lines with little freight, or on busy freight lines where tracks have been added, than on busy freight lines with capacity constraints.
- On lines owned by freight railroads with substantial freight traffic, it is not realistic to seek passenger train speeds significantly above 90 mph. At higher passenger speeds, rail freight capacity would diminish because the speed differential requires keeping freights out of the way to a degree that would affect freight train throughput.
- Even small differences in speed can affect the train's attractiveness, particularly in intercity corridors where driving or flying are convenient options.
- On several routes, scheduled running times have not slowed as much as might have been thought, given reductions in track capacity.
- Increased freight congestion appears to affect passenger train operations more in terms of travel time variability than of scheduled running time.

CONCLUSIONS AND DIRECTIONS

Contrary to what may be thought with the demise of the crack passenger trains of the earlier 20th century, scheduled North American intercity passenger train speeds at the beginning of the 21st century were not greatly different from those scheduled in the 1960s for secondary trains. Salient conclusions and possible directions follow.

- Scheduled North American intercity rail passenger speeds between 1965 and 2015 have been closely related to track capacity, ownership and control, and particularly investment in improved track capacity and conditions for higher speeds. Speeds are governed by track geometry, station frequency and dwell times.

- Intercity passenger trains are commonly delayed by freight train interference on host railroads, which may see dozens of freights and as few as two Amtrak trains daily on several important lines. This situation results from capacity shortages in a formerly-troubled industry that downsized shortly before enjoying a resurgence.
- As with commuter trains operating on freight railroads, passenger railroads might have to make speed and capacity to run more trains and to make existing ones faster and more reliable. Purchasing entire routes (including dispatching rights), or making incentive payments to host railroads for dispatching priority are other possible mitigation strategies.
- In busy terminal districts with freight congestion, improvements primarily oriented toward freight may also improve passenger-train reliability, as with the Chicago Region Environmental and Transportation Efficiency (CREATE) Program (*30*).
- Most long-distance passenger trains are only moderately slower than they were in the 1960s, but the length of these runs magnifies the effect of small changes in average speed.
- Major reinvestment has brought about significant travel time improvements in the Northeast Corridor, and to a lesser degree on a few other corridors that have also had significant investment. Corridors that have not yet benefited from major reinvestment, however, have generally experienced slower scheduled running times.
- To serve both freight and passenger trains efficiently, different lines may have to focus on each type of traffic. Thus, between New Jersey and Washington, D.C., Amtrak's NEC is optimized for passengers, and the nearby Conrail-CSX route is freight-optimized. Similarly, in the Hudson Valley and between Harrisburg, Pa. and New Jersey, passenger-oriented and freight-only lines perform very different functions. Such differentiation, however, may not be possible in some corridors.
- Implementation of Positive Train Control, required by December 2018 on all US lines with passenger or hazardous-material freight service, may result in so-called underspeeding by locomotive engineers who may "operate two or three mph below the nominal enforced speed to avoid the risk of penalty brake applications" (*31*, p. 1). This may reduce average speeds marginally, and in some instances may even induce Amtrak and commuter railroads to lengthen schedules slightly.
- There are several possible future options for intercity rail passenger service: doing nothing, making incremental improvements, upgrading to higher-speed rail (HrSR) status (i.e., raising maximum track speeds to 110 or 125 mph), and building new high-speed rail (HSR) lines, commonly involving maximum speeds in the 150-200 mph range. As overall population and travel demand increase, expanding highway and airport capacity could be difficult. Therefore, interest in faster rail passenger service is likely to grow.
- Upgrading existing lines between major city pairs can provide higher-speed rail service, at speeds up to 110 mph, and even 125 mph if grade crossings are eliminated. Improvements between Chicago and St. Louis were underway in the mid-2010s, and Chicago – Detroit trains already traveled at up to 110 mph on parts of the line between Porter, Ind. and Kalamazoo, Mich. Similar improvements might be undertaken elsewhere, such as Chicago – Milwaukee.

- Developing high speed rail on new alignments between major city pairs such as Los Angeles and San Francisco, as California is doing, and possibly in Texas and elsewhere would substantially reduce travel times. These improvements, however, would require considerable investment.
- If transportation agencies pursue higher-speed or high-speed rail, it might be desirable to seek synergies with commuter railroads in metropolitan areas, as Caltrain and the California High-Speed Rail Authority plan to do between San Francisco and San Jose, and as Amtrak and commuter railroads now do in the Northeast Corridor.

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TABLE 1 Average Timings, Distances and Speeds, for Principal and Secondary Long Distance Passenger Trains and Successor Services, Selected Years

Route, Services	*1965*	*1970*	*1975*	*1985*	*2015*	*2015 mph as percent of 1965 mph*
Albany, N.Y. (*A*) – Chicago, Ill. (NYC *20th Century Ltd*.; Amtrak *LSL*)	11: 03, 819 mi, 74.1 mph	15: 00, 818 mi, 54.5 mph (*C*)	16: 01, 819 mi, 51.1 mph (*D*)	14: 44, 818 mi, 55.5 mph	15: 40, 818 mi, 52.3 mph	70.5%
Albany, N.Y. (*A*) – Chicago, Ill. (NYC *Pacemaker*; Amtrak *LSL*)	16: 50, 819 mi, 48.2mph	15: 00, 818mi, 54.5 mph (*C*)	16: 01, 819 mi, 51.1 mph (*D*)	14: 44, 818 mi, 55.5 mph	15: 40, 818 mi, 52.3 mph	107.4%
Chicago (*E*) – New Orleans, La. (Illinois Central *Panama Ltd*.; Amtrak *CNO*)	15: 30, 921 mi 59.4 mph (*F*)	16: 50, 921 mi, 54.7. mph (*F*)	16: 30, 923 mi 55.9 mph	18: 00, 925 mi, 51.4 mph	19: 15, 934 mi, 48.5 mph	81.6%
Chicago (*E*) – New Orleans, La. (Illinois Central *Louisiane /CNO*; Amtrak *CNO*)	19: 25, 921 mi 47.4 mph (*F*)	17: 05, 921 mi, 53.9 mph (*G*)	16: 30, 923 mi 55.9 mph	18: 00, 925 mi, 51.4 mph	19: 15, 934 mi, 48.5 mph	102.3%
Twin Cities – Spokane, Wash. (GN E*mpire Builder*; Amtrak *Empire Builder*)	26: 45, 1,442 mi, 53.9 mph	29: 10, 1,442 mi, 49.4 mph	29: 15, 1,470 mi, 51.1 mph	27: 40, 1,460 mi, 52.8 mph	29: 30, 1,461 mi, 49.5 mph	91.9%
Twin Cities – Spokane, Wash. (GN *Western Star*; Amtrak *Empire Builder*) (*H*)	30: 10,1,442 mi, 47.8. mph	29: 10, 1,424mi, 44.4 mph	29: 15, 1,470 mi, 51.1 mph	27. 40, 1,460 mi, 52.8 mph	29: 30, 1,461 mi, 49.5 mph	103.6%

NOTE: 1 mi = 1.609 km. Sources: Public timetables and references (*11-14* and *21*). Timings shown as hours: minutes. CNO – City of New Orleans. LSL – Lake Shore Limited. NYC – New York Central. A – Trains moved from Albany Union Station to Albany-Rensselaer in 1968. C – Numbered but unnamed New York – Chicago train. D – Information for 1976; Amtrak operated a New York – Albany – Chicago train between July 1971 and January 1972, restoring service in October 1975. E – Moved to Chicago Union Station from Central Station in 1972. Other routing changes occurred in subsequent years. F – *Louisiane*. G – *City of New Orleans*. H – The Western Star used a slightly different routing than the Empire Builder in 1970.

TABLE 2 Average Timings, Distances and Speeds, Other Long Distance Passenger Trains, Selected Years

Route, Services	*1965*	*1970*	*1975*	*1985*	*2015*	*2015mph as percent of 1965 mph*
Washington, D.C. – Chicago (Baltimore & Ohio; Amtrak *Capitol Limited*)	15: 59, 768 mi, 48.1 mph	16: 10; 768 mi, 47.5 mph	16: 10, 866 mi, 53.6 mph (*A*)	18: 13, 766 mi, 42.0 mph (*B*)	16: 30, 780 mi, 47.3 mph (*C*)	98.4%
Washington – Cincinnati, Ohio (C&O *George Washington*; Amtrak *Cardinal*)	14: 45, 599 mi, 40.6 mph	14: 40, 599 mi, 40.8 mph	14: 05, 599 mi, 42.5 mph (*D*)	13: 55, 608 mi, 43.7 mph	14: 08, 603 mi, 42.7 mi	105.1%
Washington – Miami, Fla. (RF&P,-SCL; Amtrak *Silver Meteor*)	21: 00, 1,164 mi 55.4 mph	20: 30, 1,164 mi, 56.8 mph	21: 00, 1,164 mi, 55.4 mph	21: 42, 1,157 mi, 53.3 mph	23: 01, 1,164 mi, 50.6 mph	91.3%
Chicago – Los Angeles, Calif. (ATSF *Super Chief*; Amtrak *Southwest Chief*)	39: 30, 2,222 mi, 56.3 mph (*E*)	40: 30, 2,222 mi, 54.9 mph (*E*)	40: 05, 2,222 mi, 55.5 mph	41: 00, 2,242 mi, 54.7 mph (*F*)	43: 00, 2,265 mi, 52.7 mph (*G*)	93.6%
Los Angeles – Oakland, Calif. (SP *Coast Daylight*; Amtrak *Coast Starlight*) (*H*)	9: 45, 470 mi, 48.2 mph	9: 45, 470 mi, 48.2 mph	10: 05, 467 mi, 46.3 mph	9: 37, 467 mi, 48.6 mph	11: 12, 464 mi, 41.4 mph	85.9%
Chicago – Oakland (*I*) (CB&Q-D&RGW-WP; Amtrak *California Zephyr*) (*J*)	50: 00, 2,525 mi 50.5 mph (*K*)	50: 05, 2,525 mi, 50.4 mph	48: 02, 2,407 mi, 50.1 mph (*K*)	49: 50, 2,427 mi, 48.7 mph	45: 15, 2,205 mi, 48.9 mph (*L*)	92.5%
Winnipeg, Man. – Vancouver, B.C. (CN *Super Continental* (*M*); Via *Canadian*)	37: 00, 1,559 mi, 42.1 mph	34: 40, 1,559 mi, 45.0 mph	39: 30, 1,559 mi, 39.5 mph	40: 30, 1,559 mi, 38.5 mph	46: 00, 1,568 mi, 34.1 mph (*N*)	80.9%

NOTE: 1 mi = 1.609 km. Sources: Public timetables and references (*11-14* and *21*). Timings shown as hours: minutes. ATSF – Atchison, Topeka & Santa Fe. B&O – Baltimore & Ohio. C&O – Chesapeake & Ohio. CB&Q - Chicago, Burlington & Quincy. CMStP&P – Chicago, Milwaukee, St. Paul & Pacific. CN – Canadian National. D&RGW – Denver & Rio Grande Western. NYC – New York Central. PRR – Pennsylvania Railroad. RF&P – Richmond, Fredericksburg & Potomac. SCL – Seaboard Coast Line. SP – Southern Pacific. WP – Western Pacific. A – This faster average speed is not directly comparable with the *Capitol Limited*; this was the Washington section of the *Broadway Limited*, operating via Harrisburg, Pa. on an all-PRR route. B – Ex-B&O Washington – Pittsburgh, ex-PRR Pittsburgh – Chicago. C – Ex-B&O Washington – Pittsburgh, ex-PRR Pittsburgh – Cleveland, ex-NYC Cleveland – Chicago. D – Amtrak *James Whitcomb Riley*. E – Comparison with *Super Chief/El Capitan*, which ran in two sections during busier travel periods. F – Southwest Chief rerouted via Lawrence and Topeka, Kan. in October 1979. G – Southwest Chief shifted from Pasadena to Fullerton, Calif., in Nov. 1993 and from ex-ATSF to ex-CB&Q between Chicago and Galesburg, Ill. in August 1996. H – Pre-Amtrak schedule terminated at Southern Pacific's San Francisco station; Amtrak's Oakland routing to/from Seattle became effective May 1, 1971. Oakland station moved from West Oakland to downtown in (year). I – Amtrak's California Zephyr has used the CB&Q-D&RGW-SP route since July 16, 1983; before then, Amtrak used a CB&Q-UP-SP route via Denver, Cheyenne and Ogden. J – Information shown for the City of San Francisco (CMStP&P-UP-SP), as the California Zephyr was no longer operating west of Salt Lake City. J – Information for Amtrak's City of San Francisco, which followed CB&Q to Denver, then UP to Ogden, then SP to Oakland. L – Oakland replaced by Emeryville as the terminal for trains to/from Chicago since August 1994. W – The Western Star used a slightly different routing than the Empire Builder in 1970. M – Via eliminated the *Super Continental* in 1981 and restored it in 1985; became the *Canadian* in 1990 when Via discontinued passenger train service on the Canadian Pacific route and used the equipment on the Canadian National route. N – Canadian Pacific and Canadian National have had joint single-directional operation on each other's lines in British Columbia's Fraser River Canyon since December 1999 (*20*); Via's *Canadian* follows this joint routing.

TABLE 3 Average Timings (hours:minutes), Distances (mi) and Speeds (mph), Corridors Other Than Northeast Corridor, Selected Years

Route, Services	*1965*	*1970*	*1975*	*1985*	*2015*	*2015 mph as percent of 1965 mph*
New York – Buffalo, N.Y. (NYCS; Amtrak *Empire Service*) (*A*)	6: 50, 435 mi, 63.7 mph	7: 30, 437 mi, 58.2 mph	8: 25, 438 mi, 52.0 mph	8: 01, 439 mi, 54.8 mph	7: 57, 437 mi, 55.0 mph	84.1%
Chicago, Ill. – Detroit, Mich. (NYCS. Amtrak *Wolverine Service*)	5: 20, 283 mi, 53.1 mph	5: 35, 283 mi, 50.7 mph	5: 35, 279 mi, 50.0 mph	5: 30, 279 mi, 50.7 mph	5: 00, 281 mi 56.2 mph	105.9%
Chicago – Indianapolis, Ind. (NYCS; Amtrak *Hoosier State*)	3: 40, 194 mi, 52.8 mph (*B*)	3: 55, 193 mi, 49.3 mph (B)	4: 30, 199 mi, 44.2 mph (*C*)	4: 05, 195 mi, 47.8 mph (*D*)	5: 05, 196 mi, 38.6 mph (*D*)	73.0%
Chicago – St. Louis, Mo. (Gulf, Mobile & Ohio; Amtrak *Lincoln Service*)	5: 10 282 mi, 54.6 mph	5: 30, 282 mi, 51.3 mph	4: 59, 282 mph, 56.6 mph	5: 10, 282 mi, 56.6 mph	5: 30, 284 mi, 51.6 mph	94.6%
Chicago – Milwaukee, Wis. (CMStP&P; Amtrak *Hiawatha Service*)	1: 20, 85 mi, 63.8 mph	1: 25, 85 mi, 60.0 mph	1: 32, 85 mi, 55.4 mph	1: 32, 85 mi, 55.4 mph	1: 29, 85 mi, 57.3 mph	89.9%
Los Angeles – San Diego, Calif. (ATSF; Amtrak *Pacific Surfliner*)	2: 55, 128 mi, 43.7 mph	2: 55, 128 mi, 43.7 mph	2: 35, 128 mi, 49.4 mph	2: 45, 128 mi, 46.5 mph	2: 45, 128 mi, 46.5 mph	106.1%
Portland, Ore. – Seattle, Wash. (Great Northern; Amtrak *Cascades*)	4: 00, 186 mi, 46.5 mph	3: 45, 186 mi, 49.6 mph	3: 50, 185 mi, 48.3 mph	3: 50, 184 mi, 48.0 mph	3: 30, 187 mi, 53.4 mph	103.2%
Montréal, Qué. – Toronto, Ont. (CN; VIA *Corridor*)	6: 15, 335 mi, 53.6 mph	4: 59, 335 mi, 67.2 mph	4: 59, 335 mi, 67.2 mph	4: 45, 335 mi, 70.5 mph	4: 53, 335 mi, 68.6 mph	128.0%
Toronto – Windsor, Ont. (CN; VIA *Corridor*)	4: 05, 222 mi, 54.3 mph	4: 15, 222 mi, 52.2 mph	3: 50, 223 mi, 58.2 mph	4: 31, 231 mi, 51.1 mph	4: 05, 223 mi, 54.6 mi	100.5%

NOTE: 1 mi = 1.609 km. Sources: Public timetables and references (*11-14* and *21*). Timings shown as hours: minutes. ATSF – Atchison, Topeka & Santa Fe. CMStP&P – Chicago, Milwaukee, St. Paul & Pacific (Milwaukee Road). NYCS – New York Central System. A – Trains moved to New York Penn Station from Grand Central Terminal in April 1991. At the Buffalo end, trains vacated Buffalo Central Terminal for Exchange St. Station in October 1979. B – Former Cleveland, Cincinnati, Chicago & St. Louis Railroad (Big Four) route from Chicago Central Station to Indianapolis via Kankakee, Ill. and Lafayette, Ind. C – Chicago – Peru, Ind. – Muncie, Ind. – Indianapolis. D – Chicago Union Station – Dyer, Ind., Rensselaer, Ind. – Lafayette – Crawfordsville, Ind. – Indianapolis.

TABLE 4 Average Timings (hours:minutes), Distances (mi) and Speeds (mph), Northeast Corridor, Selected Years

Route, Services	*1965*	*1970*	*1975*	*1985*	*2015*	*2015 mph as percent of 1965 mph*
Boston – New York (regular trains) (NYNH&H; Amtrak *Northeast Regional*)	4: 30, 230 mi, 51.0 mph (*A*)	4: 30, 230 mi, 51.0 mph (*A*)	4: 40, 231 mi, 49.5 mph	4: 58, 231 mi, 46.5 mph	4: 10. 231 mi, 55.4 mph	108.7%
Boston – New York (fast trains) (NYNH&H; Amtrak *Acela Express*)	4: 15, 230 mi, 54.0 mph (*A*, *B*)	4: 15, 230 mi, 54.0 mph (*A*, *B*)	4: 30, 231 mi, 51.3 mi (*B*)	4: 31, 231 mi, 51.1 mph (*B*)	3: 30, 231 mi, 66.0 mph	122.2%
New York – Philadelphia (regular trains) (PRR; Amtrak *Northeast Regional*)	1: 35, 91 mi, 57.7 mph	1: 40, 91 mi, 54.8 mph	1: 45, 91 mi, 52.2 mph	1: 35, 91 mi, 56.2 mph	1: 25, 91 mi, 64.2 mph	111.3%
New York – Philadelphia (fast trains) (PRR; Metroliner; Amtrak *Acela Express*)	1: 35, 91 mi, 57.7 mph	1: 13, 91 mi, 75.1 mph	1: 11, 91 mi, 77.2 mph	1: 14, 91 mi, 72.2 mi	1: 15, 91 mi, 72.8 mph	126.1%
New York – Washington (regular trains) (PRR; Amtrak *Northeast Regional*)	3: 45, 227 mi, 60.4 mi	3: 50, 227 mi, 59.1 mph	3: 50, 227 mi, 59.1 mph	3: 45, 227 mi, 59.7 mph	3: 25, 226 mi, 66.1 mph	109.5%
New York – Washington (fast trains) (PRR; Metroliner; Amtrak *Acela Express*)	3: 35, 227 mi, 63.2 mi (*C*)	2: 59, 227 mi, 76.0 mph (*D*)	2: 59, 227 mi, 76.0 mph (*D*)	2: 55, 227 mi, 76.8 mph (*D*)	2: 46, 226 mi, 81.7 mph	129.2%

NOTE: 1 mi = 1.609 km. Sources: Public timetables and references (*11-14*, *16* and *24*). Timings shown as hours: minutes. NYNH&H – New York, New Haven & Hartford. PRR – Pennsylvania Railroad. A – Grand Central Terminal, New York through April 30, 1971; thereafter Penn Station, New York. B – Data for the *Merchants Limited*. C – Data for the *Congressional*. D – Data for Penn Central and Amtrak *Metroliner Service*.