Intercity Passenger Trains Are Not Commuter Trains
--Implications for Public Policy

Gregory L. Thompson and David Schonbrunn
19 April 2017

Introduction

Three state-supported agencies provide intercity passenger rail service in corridors connecting metropolitan regions in California. Other California agencies operate intra-metropolitan passenger train services known as commuter trains. Some commuter trains operate on the same tracks as state-supported intercity passenger rail trains. Under the recent devolution of power from the state to JPAs, these intercity services are managed by commuter rail agencies. This intermingling results in confusion as to the respective market functions of these two distinct types of service. None of the state-supported intercity rail corridor agencies has adopted service design standards to distinguish intercity trains from commuter services.

This paper addresses whether the state-supported intercity passenger rail services do (or should) serve different markets than commuter trains. It first examines definitions found in the literature for intercity passenger rail service and commuter service. It then explores examples of those service patterns still found today. Finally, it investigates the three state-sponsored intercity services and compares them to a commuter service. These three sections lead to recommendations on how the two types of service should evolve in California, to enhance their usefulness to the traveling public.

Definitions of Commuter and Intercity Rail Service

The authorizing Amtrak legislation distinguishes between commuter and intercity passenger service: ". . . commuter rail passenger transportation means short-haul rail passenger transportation in metropolitan and suburban areas usually having reduced fare, multiple-ride, and commuter tickets and morning and evening peak period operations. Intercity rail passenger transportation means rail passenger transportation, except commuter rail passenger transportation."[1] This failure to affirmatively define what intercity services are has led to decades of confusion.

There are other definitions for shorter-distance trains services that distinguish between commuter and intercity services. Wikipedia defines commuter rail as, ". . . a passenger rail transport service that primarily operates between a city centre, and the middle to outer suburbs beyond 15 km (10 miles) and commuter towns or other locations that draw large numbers of commuters—people who travel on a daily basis."[2] It defines a commuter train ". . . as a passenger train that is ridden primarily by passengers who travel regularly from one place to another."[3]

In contrast, Wikipedia defines intercity rail services "as express passenger train services that cover longer distances than commuter or regional trains. There is no precise definition of inter-city rail; its meaning may vary from country to country. Most broadly, it can include any rail services that are neither short-distance commuter rail trains within one city area, nor slow regional rail trains calling at all stations and covering local journeys only. Most typically, an inter-city train is an express train with limited stops and comfortable carriages to serve long-distance travel. Ideally, the average speed of inter-city rail service would be faster than 100 km/h (62 mph) in order to be competitive with car, bus and other methods of transport."[4]

The term "average speed" used in the preceding definitions requires further explication. Travelers are most concerned about the time it takes to get from their beginning station to their terminating station. This is expressed as the average speed traveled between the two stations. It includes the time the train is stopped at intermediate stations ("dwell time"). Often when discussing high-speed rail, authors will refer to the highest speed reached by a train over the length of its run.

There is a significant difference in most if not all rail passenger corridors between the speed of the fastest segment of track and the average speed experienced by passengers. The segment of the Pacific Surfliner corridor between Los Angeles and San Diego, for example, has several segments of 90 mph track, and some observers refer to the corridor as a 90 mph corridor because of this higher speed track. However, the average speed of the corridor is only 44 mph. This slow average speed is a key determinant influencing passenger choice of a travel mode.

The Northeast Corridor: Clearly Distinct Intercity and Commuter Services

There is only one intercity passenger corridor in the United States that meets Wikipedia's definition of an intercity passenger rail corridor: the Northeast Corridor. Two to four well-maintained tracks stretch 454 miles between Boston, New York, Philadelphia, Baltimore, and Washington, D.C. The existing infrastructure and the passenger rail services using it are descendants of services and infrastructure that private railroads developed in the early 20th century in response to a large travel market. That is, the intercity corridor service and short-distance commuter services we see in the Northeast Corridor today are the descendants of services shaped by profit-seeking, rather than by political considerations.

What developed closely follows the Wikipedia definition of commuter and corridor service. Because both northern and southern California are taking on population and employment densities similar to those of the Northeast Corridor, it is instructive to examine the service patterns in the Northeast Corridor that come down to us from market-based beginnings well over a century ago. The Northeast Corridor offers California the best demand-based model in the United States for passenger train service development.

Amtrak offers two service categories within the NE Corridor, each of which can be characterized as intercity corridor service that meets, or nearly meets, Wikipedia's definition of intercity passenger corridor service. Amtrak markets one as the Acela Express. As shown in Table 1, nine daily Acela Express trains cover the 454 miles between Boston and Washington, D.C. at an average speed of 65 mph. The Value Fare[5] is $0.50 per mile. Acela average speeds, frequencies, and Value Fares are considerably higher on the southern half of the corridor between New York and Washington DC: 78 mph, 15 daily frequencies, and $0.80 per mile. The overall load factor for all Acela trains is 68%.[6]

Table 1. Summary Northeast Corridor Intercity Rail Characteristics

Corridor Segment	Distance (miles)	Southbound Weekday Trains	Average Speed (mph)	Value Fare, One-Way (dollars per mile)
Boston - Washington DC				
Acela Express	454	9	67	$0.50
Northeast Regional	454	7	57	$0.32
Boston - New York				
Acela Express	229	10	64	$0.58
Northeast Regional	229	9	54	$0.34
New York - Washington DC				
Acela Express	225	16	78	$0.82
Northeast Regional	225	22	66	$0.41

Amtrak brands the second category as Northeast Regional Service, whose trains stop somewhat more frequently and therefore are somewhat slower and less expensive to ride than Acela Express trains. Ten daily Northeast Regional trains run each way over the 454 miles between Boston and Washington, DC at an average speed of 57 mph, charging a Value Fare of $0.32 per mile. The fare is about double what consumers are willing to pay for the longest corridor services in California. Northeast Regional Trains operate even faster between New York and Washington DC. Fourteen daily NE Regional trains cover the 225 miles in each direction at an average speed of 66 mph, charging an average Value Fare of $0.42 per mile. The average load factor for all Northeast Regional Trains is 48%.[7]

Various state and local agencies operate commuter trains over most of the length of the corridor. Table 2 illustrates how commuter trains and the two categories of Amtrak's intercity passenger corridor services fit together on four stretches of the corridor. Two stretches are north of New York on the slower part of the corridor, while two are south of New York.

Table 2. Comparisons Between Amtrak and Commuter Operations on Four Segments of the NE Corridor

NE Corridor Segment	Distance (miles)	Weekday southbound departures	Average Speed (mph)	Fare per mile
Old Saybrook CT to New Haven Union Station CT	32.8			
Acela Express (no Acela Expresses stop at Old Saybrook)		0	NA	NA
NE Regional Corridor Trains		6	58	$0.49
Shore Line East (CT DOT) commuter trains		17	47	$0.12
New Haven Union Station CT to New York [8]	72.3			
Acela Express		9	47	$1.07
NE Regional Corridor Trains		11	43	$0.58
Metro North (New York MTA) commuter trains[9]		40	38	$0.17
NY Penn Station to Trenton NJ	58.1			
Acela Express (only 2 trains stop at Trenton)		2	75	$1.33
NE Regional Corridor Trains[10]		31	64	$0.84
New Jersey Transit commuter trains[11]		53	39	$0.21
Trenton to Philadelphia 30th Street	30.9			
Acela Express (only 2 stop at Trenton)		2	73	$1.78
NE Regional Corridor Trains		28	64	$1.06
SEPTA commuter trains[12]		28	38	$0.15

Note: The fares shown for NE Regional and Acela Express are Value Fares; commuter fares are for one-way rides using a monthly pass.

On all four stretches of the corridor both categories of intercity corridor trains operate at higher speeds than commuter trains and charge much higher fares, as well. The speed differential is greater south of New York than it is north of New York, and perhaps because of that, the fare differential is higher south of New York, as well. In these Northeast Corridor cases, commuter fares are $0.12 to $0.21 per mile when using a monthly pass. These Northeast Corridor commuter fares are somewhat higher than those in California. The several commuter services summarized in Table 3 for California are in the range of $0.10 to $0.13 per mile for monthly pass holders.

Table 2 shows the relatively slow speeds of both Acela Expresses and Northeast Regional train service between New Haven and New York compared to their overall average speeds for all of the corridor as shown in Table 1. Speeds on this stretch are almost as slow as those in California. Because Amtrak owns and operates most of the corridor, it is curious that these slow speeds occur on one of only two parts of the corridor where Amtrak is a tenant--with no control over scheduling and dispatching. Hearsay suggests that this lack of control over dispatching is responsible for its inferior performance there. If further research demonstrates that this is true, institutional structure will need to be considered an important variable in California rail corridor development affecting the effectiveness of policy and service initiatives to lure choice passengers on board.

Another important point is that most freight traffic has been diverted to freight main lines that parallel the NE Corridor. The small amount of freight traffic that still remains on the Corridor receives a lower dispatch priority than corridor and commuter passenger trains. Improvement of California's corridor and commuter services will require more separation of freight and passenger service.

How California Intercity Corridor and Commuter Train Services Fit the Definitions

California's population and employment growth is yielding travel demand and congestion of similar magnitudes to those found in the Northeast, but California's railroad heritage is far different. Private railroad infrastructure grew in California to accommodate the freight and passenger traffic of a much smaller population, albeit a rapidly-growing one. Passenger and freight services were relatively infrequent, and the state's main intercity rail routes mostly were low-capacity, single-track lines. Over time, growing freight traffic replaced declining passenger traffic on many routes. Private rail companies invested in those routes to operate longer and heavier freight trains, with no provision for passenger trains, except to a certain extent on the routes between San Francisco and San Jose and Oakland and Sacramento.

Designers of California's more recent expansion of state-supported passenger services attempted to shoehorn those services into an intercity rail infrastructure suited to the state's much smaller cities of a century ago. Spending hundreds of millions of dollars to add more capacity in the forms of passing sidings and crossovers could not change that fundamental compromise. The significant consequences of that compromise are detailed in comparisons between the California services and the demand-based services that evolved in the Northeast Corridor. Achieving California services as effective as those in the Northeast would require substantial additional rail investment, to increase speeds. While the price tag would be high, it would only be a small fraction of the cost of the state's current High Speed Rail project.

Table 3 summarizes service characteristics of the three state corridors as well as one commuter corridor. The three state-supported intercity passenger rail corridors are the Pacific Surfliner Corridor, the San Joaquin Corridor, and the Capitol Corridor. The commuter corridor is Caltrain. Comparing the characteristics of these services to the definitions suggests that they are neither commuter nor intercity market-oriented.

Pacific Surfliner

The Pacific Surfliner Corridor, governed by the LOSSAN JPA, extends from San Diego to Los Angeles, Santa Barbara, and San Luis Obispo. From the north end, the LOSSAN JPA leases track space from the Union Pacific Railroad to operate its trains from San Luis Obispo to Moorpark (about half way between Santa Barbara and Los Angeles). From Moorpark to Los Angeles, the LOSSAN JPA leases track space from the Southern California Regional Rail Authority. For the next 25 miles from Los Angeles to Fullerton, the LOSAN JPA uses the tracks of the private BNSF Railway. From Fullerton to Oceanside in northern San Diego County, the LOSSAN JPA again uses tracks owned by the Southern California

Regional Rail Authority. To get its trains from Oceanside to San Diego, the LOSSAN JPA must deal with yet another track owner, the North County Transit District.

Over most of this corridor freight traffic is light. There is heavy freight volume, however, between Los Angeles and Fullerton, about 25 miles. This stretch is part of the BNSF main line entering Los Angeles from the East. This short segment has been expanded from two to three main tracks with frequent cross overs to accommodate both freight and passenger service.

All but one of the state-supported passenger trains operate only in the heavily-populated territory east of Santa Barbara. Table 3 depicts the distribution of service east of Santa Barbara and also shows some (but not all) of the locally funded commuter trains there.

The most frequent state-supported service (12 daily round trips) runs 128 miles between San Diego and Los Angeles at an average speed of 44 mph. Five of these trains continue on to Santa Barbara, another 103 miles further west. They average 45 mph for the entire 231-mile run from San Diego to Santa Barbara. These speeds are below those defined by Wikipedia as constituting viable intercity corridor passenger service.

Table 3 also shows Value Fares, expressed as the fare per mile. State-supported fares reflect Amtrak practice in setting fares to obtain maximum revenue possible out of each market. That is, they reflect willingness to pay on the part of riders, so higher fares reflect higher demand. The fare for the 128-mile trip between San Diego and Los Angeles is $0.29 per mile, but the fare for the 231-mile trip between San Diego and Santa Barbara is only $0.18 per mile. This difference in fares suggests that

Table 3. California Rail Characteristics

Corridor	Distance (miles)	Weekday southbound departures	Stations (includes end point stations)	Avg. Speed (mph)	Fare per mile
Pacific Surfliner Corridor					
Santa Barbara -San Diego	231	5		45	$0.18
Santa Barbara - Los Angeles	103	5		46	$0.30
Los Angeles - San Diego	128	12	9 (plus 6)	44	$0.29
Los Angeles - Oceanside (Surfliner)[13]	87	12	7 (plus 1)	46	$0.32
Los Angeles - Oceanside (Metrolink)[14]	87	5	14	42	$0.13
Oceanside - San Diego (Surfliner)	41	14	3 (plus 5)	40	$0.37
Oceanside - San Diego (Coaster)	41	11	8	39	$0.10
San Joaquin Corridor					
Oakland Jack London - Bakersfield	315	5	14	51	$0.15
San Francisco - Los Angeles[15]	418	5	17	46	$0.14
Capitol Corridor					
Sacramento - Oakland Jack London	90	15	7	47	$0.32
Sacramento - San Jose	133	7	14	42	$0.30
Oakland Jack London - San Jose	43	7	7	33	$0.40
Caltrain Commuter Service[16]					
San Jose - San Francisco (local)[17]	47	14	22	30	$0.13
San Jose - San Francisco (limited stop)[18]	47	21	11 to 19	34	$0.13
San Jose - San Francisco (Baby Bullet)[19]	47	11	7	44	$0.13

average speeds of about 45 mph are just too slow for passengers travelling longer distances.

If Santa Barbara's smaller population than San Diego County explained the lower fare-per-mile between San Diego and Santa Barbara, we also would expect to see the lower fare-per-mile prevailing between Los Angeles and Santa Barbara. However, the Value fare for the 103-mile trip between Los Angeles and Santa Barbara is $0.30 per mile, almost exactly the fare-per-mile (and therefore demand) for a 128-mile trip from Los Angeles to San Diego. Population clearly is not a determinant here.

While the Pacific Surfliner trains are too slow to be attractive to the longer distance intercity travelers in the corridor, the trains also stop too infrequently to be attractive to many commuters, even though the JPA sells 10-ride tickets and monthly passes (which are less than half the per-mile cost of single tickets).

County and locally-based transit agencies in Southern California have formed two joint powers agencies to operate commuter trains on some of the tracks used by the Surfliners. Commuter trains run by the Southern California Regional Rail Authority under the moniker of Metrolink operate additional commuter trains over the corridor tracks from Moorpark (48 miles west of Los Angeles and 56 miles east of Santa Barbara) to Los Angeles and on to Oceanside. Additional commuter trains operated by the North County Transit District under the moniker of the Coaster run between Oceanside and San Diego. Table 3 shows characteristics of the Oceanside to Los Angeles leg of the Metrolink commuter service.

The table shows that 12 state-supported intercity corridor trains connect Oceanside with Los Angeles at an average speed of 46 miles per hour making 7+ stops and charging a fare of $0.32 per mile. Running on the same tracks between Los Angeles and Oceanside are an additional 5 transit-supported commuter trains. They stop more often (14 stops including end points), but because the commuter trains dwell only a few seconds at each stop and accelerate and decelerate faster than the more-cumbersome corridor trains, they are, at 42 mph average speed, almost as fast. Their fare is much lower, however---only $0.10 - $0.13 per mile with a monthly pass.

These service patterns do not fit the needs of either intercity passengers or commuters. Intercity service is too slow for its market, and commuter service is too infrequent for its market. The fact that the transit-oriented commuter agencies own most of the corridor and have little concern for the intercity market makes matters worse. One consequence of this ownership pattern is that the commuter agencies view the corridor trains as a cheap way to make up for the infrequent commuter service. They pressured the state-operated trains to make additional station stops and to accept commuter fares. The overall occupancy rate of San Diego corridor trains was about 39% in FY 2012, with an upward patronage trend.[20]

Complaints found on the web about Los Angeles to San Diego intercity passenger rail service are directed at its slow speed, its unreliability, and the practice of making the corridor trains stop at all of the commuter stops if a commuter train fails to make its run. This is particularly aggravating to corridor passengers, who pay three times as much as the one-way monthly pass cost of commuters.

Much could be done to attract ridership, including institutional reform, infrastructure improvements, lightweight, high-acceleration DMU trainsets, and a new service design. Placing the entire route between Moorpark and San Diego under the control of LOSSAN (perhaps with state oversight), with both Metrolink and the Coaster as tenants, would go a long way to improving the speed and reliability of the corridor trains. The 25-miles of route between Los Angeles and Fullerton require two dedicated passenger tracks alongside two BNSF freight tracks. The entire line from Santa Barbara to San Diego requires double-tracking.

Eliminating the long detour through Rose Canyon, near San Diego, by tunneling, would be a major improvement. There would be a station in the tunnel immediately beneath San Diego's largest and most vibrant employment center and one of its largest shopping districts in the region. The station also would serve the University of California San Diego's campus and related medical complexes, both a short hop away via light rail service. Finding a faster route through (or under) San Clemente would also

greatly speed up the service. Shedding many of the low-patronage intermediate stations better served by Coaster and Metrolink commuter trains would save even more time and return the Surfliner to the way Santa Fe Railway operated it in its heyday. Complementary high-speed corridor trains and slower-speed commuter trains would together provide an attractive service that many drivers on the adjacent congested freeway would find attractive.

San Joaquin Corridor

The presentation of the San Joaquin Corridor shown in Table 3 tells a somewhat different but not inconsistent story. The service is a tenant to two private railroads for its entire 315-mile distance from Oakland Jack London Square station to Bakersfield. Although no commuter trains share its tracks, the management of the ACE commuter service runs the service. There are five train departures from Oakland Jack London to Bakersfield, where passengers may transfer to dedicated buses to continue their trip to Los Angeles Union Station and other points in Southern California. At 51 mph the average speed between Jack London Square and Bakersfield is higher than that for other California corridor services, but it still is much slower than driving, which motivates charging a low fare of $0.15 per mile. One possible explanation is that 51 mph is just too slow for most longer-distance travelers, requiring an ultra-low fare to lure otherwise-reluctant passengers onto the train.

Another possibility is that because of its small population (roughly 350,000 within the city), Bakersfield has low patronage-generating potential. Most passengers on trains in Bakersfield are actually connecting by bus to points in Southern California.

Passengers traveling between downtown San Francisco and Los Angeles have dedicated bus connections at either end of the San Joaquin rail Corridor. Passengers begin their trip on a dedicated bus that takes them across the bay to Emeryville. They then have a 310-mile train ride to Bakersfield punctuated by 13 intermediate stops, after which they transfer to another bus for the remaining 100-mile ride to Los Angeles Union Station. Even though Los Angeles has high patronage potential, this travel pattern does not attract proportionate ridership.

The average overall speed from San Francisco to Los Angeles is 48 miles per hour, with an average Value Fare of only $0.14 per mile--even lower than it is to Bakersfield. Undoubtedly, the time and inconvenience of the bus-rail-bus trip is a factor in low demand between San Francisco and Los Angeles.

Competition may be another culprit responsible for the low fares. The San Joaquins suffer from competition by faster, transfer-free bus service between San Francisco and Oakland and Los Angeles Union Station. MegaBus offers about the same number of daily departures as does the San Joaquin Corridor, but the bus service departures are more evenly spaced around the clock, and MegaBus passengers get a through-ride without the need to transfer twice. MegaBus travel times range from 7 hours 30 minutes to 8 hours and 10 minutes compared to somewhat more than 9 hours for the San Joaquin bus/rail/bus service. MegaBus fares average about $23 for a reserved seat (including booking charge)[21] compared to San Joaquin Value fares of $59, also for reserved seats.

In FY 2012, the average San Joaquin train load factor was about 35%, and it has decreased since then. For the past three years, train patronage has been falling steadily, even after an additional train frequency was added in Fall 2016.[22] To be viable, a rail alternative requires considerably faster, direct train service linking Southern and Northern California. Wikipedia's 62 mph definition as the lower bound for competitive intercity passenger rail corridor service may be spot-on. What this corridor most needs is a passenger-only track, so that trains can travel at 110 mph between the well-spaced stations. That would eliminate scheduling conflicts with freight trains.

Tremendous synergies would result if the San Joaquin became an express service, paired with ACE local service, sharing a new passenger rail line across the Altamont Corridor. Discontinuing San Joaquin service to five or six of the existing low-patronage stations would result in much faster average

speeds and higher patronage. The ponderous double-deck trainsets should be replaced with lightweight, high-acceleration, high-speed DMU trainsets of European design. Replacement local service might also be provided much more economically by DMUs. Timed transfers between locals and expresses would facilitate longer-distance travel from lower-patronage stations (for those willing to pay for ticket upgrades). In the longer run, a new, direct route via Tejon Pass is needed from Bakersfield to the San Fernando Valley. Such an infrastructure investment would connect Southern and Northern California corridor rail services, dramatically increasing their patronage as well as patronage on the LOSSAN Corridor, to which it would connect in Los Angeles.

Capitol Corridor

Capitol Corridor train service runs from Sacramento to San Jose, 133 miles to the south, although one round trip begins and terminates at Auburn, about 35 miles northeast of Sacramento. Table 3 depicts service on that part of the corridor between Sacramento and San Jose.

The Capitol Corridor is a tenant of the Union Pacific Railroad over all but the last 3 miles of the distance between Sacramento and San Jose. (To access the San Jose Diridon Station from Santa Clara, Capitol Corridor trains use Caltrain's tracks, owned by the Peninsula Corridor Joint Powers Board.) Union Pacific operates a double track railroad between Sacramento and Oakland, a legacy of an earlier era when this route was an important intercity passenger corridor as well as heavy freight route. The route continues to accommodate heavy freight volumes. The part south of Oakland is single track and also accommodates heavy freight volumes.

An inspection of Table 3 shows that the Capitol Corridor has more commuter train-like attributes than the other two state corridors. It is considerably shorter than the other two state-supported intercity passenger corridors. It also offers commuter fare media as defined in Amtrak law's commuter definition, including monthly passes and 10-ride tickets good for 45 days from date of purchase. The northern two thirds of the corridor between Sacramento and Oakland Jack London Square provides 47 mph average speeds, comparable to those of the two other state corridors.

However, the remaining segment to San Jose offers the considerably slower average speed of 33 mph, slower than many commuter services and a far cry from the recommended average speed for intercity corridor services of over 62 mph.

Passenger boardings for the corridor peaked in FY 2012, declining about 20 percent when the Sacramento station platforms were moved to a location requiring passengers to walk a quarter of a mile from the station to the platforms. (Sacramento was the most heavily used station on the corridor.) Patronage began increasing again in FY2015 but still is about 15% less than the peak year. Revenues for FY2015 were about 3% higher than those of FY2012, either due to fare increases or due to a greater proportion of passengers riding longer distances (i.e., between Sacramento/Davis and the Bay Area). Unfortunately, the corridor agency does not publish passenger-mile data, making it impossible to tell.[23]

At around 29% of revenue seats occupied for FY2014-2015, the Capitol Corridor's load factor also is lower than that for the other two state-supported corridors.[24] To find out whether the slow average speed south of Oakland is the culprit,[25] we contacted the Capitol Corridor Joint Powers Agency for passenger loadings between pairs of stations. The agency graciously complied[26] with October 2016 data, a recent month representative of patronage. It had no major events at the Oakland Coliseum to skew results. We grouped adjacent stations into geographic zones for the corridor, as shown in Table 4. The original data depicted passengers traveling from every station to every other station for October 2016. We compressed the table into six zones and divided results by 31 days in the month to show average daily passenger flowing between every pair of station zones. The results are shown in Table 5.

Table 5 confirms that the south end of the line (South Bay and Santa Clara/San Jose) exhibits much lower passenger loadings than the north end. The Santa Clara/San Jose zone has more population, is more congested, and (with Silicon Valley) has a more vibrant, technology-based economy

Table 4. Station Groupings for Capitol Corridor Depiction of Travel Between Station Zones

Sierra Foothills	SAC/Davis	Straits	East Bay	South Bay	Santa Clara/San Jose
Auburn	Sacramento	Suisun-Fairfield	Richmond	Hayward	Santa Clara
Rocklin	Valley	Martinez	Berkeley	Fremont	Great America
Roseville	Davis		Emeryville		Santa Clara College
			Oakland Jack London		San Jose Diridon
			Oakland Coliseum		

Table 5. Average Daily Passengers Between Capitol Corridor Station Zones, October 2016

		And					
		Sierra Foothills	**SAC/Davis**	**Straits**	**East Bay**	**South Bay**	**S. Clara/ San Jose**
Between	**Sierra Foothills**	0	81	17	70	1	5
	SAC/Davis		164	543	1,937	97	329
	Straits			32	316	10	53
	East Bay				38	44	548
	South Bay					0	107
	Santa Clara/San Jose						14
	daily station boardings and alightings	174	3,314	1,002	2,991	258	1,069

than does the Sacramento region, for example, and yet its two stations account for less than one third of the daily passengers of the two stations in the SAC/Davis zone. By far the heaviest passenger travel is between the SAC/Davis and East Bay zones, on the faster northern part of the corridor. There is relatively little passenger interaction between the north and the south. Most travel on the southern third of the corridor is confined within that segment.

Some observers might argue that low patronage on the southern end of the line is due to one half as many trains operating on it compared to the northern part of the corridor. Empirical research suggest otherwise, however. Elasticity of demand with respect to service frequency is about 0.4, meaning that if the number of trains operating on the south end were increased by 100 percent, patronage would increase by only 40 percent. Such an increase would inject more patronage into the northern part of the line, but given the very slow speeds on the south, the added passengers would not compensate for the largely empty trains running on the south end of the line. Pressure to add additional frequencies south of Oakland would lower load factors even more, unless the trains are speeded up dramatically.

A far more successful way to increase ridership would be to take advantage of research pointing to elasticities with respect to speed, which are generally between 1 and 2 for intercity rail services.[27] A demand-oriented strategy for the Capitol Corridor would be to speed up the south part of the line. Shifting to another right-of-way between Martinez and Richmond would eliminate the slow-running section along San Pablo Bay--which will be under water eventually, due to sea level rise. The route also would benefit from lightweight, high-acceleration DMUs trainsets to replace the existing ponderous double-deck trains. The tendency to keep adding stations must be reversed. (See Conclusions.)

Caltrain Commuter Corridor

The nearly 150-year old double track corridor extends from San Francisco to San Jose, 45 miles, but since the 1980s, several trains daily have been extended farther south to Gilroy along a single-track route. Table 3 depicts the corridor between San Francisco and San Jose. We include this commuter rail system for comparison to the three state-supported corridors just described.

From 1870 into the 1980s this route was part of the Southern Pacific Company system. For much of that time, Southern Pacific operated heavy freight traffic and two types of passenger service over the route: long distance trains to Los Angeles and points further east, and commuter trains between San Francisco and San Jose. Most long-distance trains stopped only once or twice between San Francisco and San Jose, but commuter trains stopped at as many as 20 intermediate stations along the route. Several commuter trains did bypass many of the local stops, however. In later years, five express trains left San Jose in early morning hours during work days and bypassed many intermediate stops as they sped passengers to white collar jobs in San Francisco. Beginning in San Francisco at 5:14 PM, another five expresses returned city workers to their suburban homes, the classic picture of a commuter service.

In 1971 Southern Pacific rid itself of the last intercity passenger trains on this route, and the company wanted to eliminate what remained of the commute service, as well. Although patronage had declined steadily, too many passengers still used the commuter trains to allow their discontinuance. Beginning in 1980 Caltrans contracted with the Southern Pacific to continue with a subsidy to operate the commuter service, which Caltrans called Caltrain, and in 1985, Caltrans purchased the corridor from Southern Pacific and outfitted the service with new rolling stock.

In 1987 the three counties served by the corridor formed the Peninsula Corridor Joint Powers Board to run the service. The JPB receives a combination of operations and capital funding from the state as well as what is now the Federal Transit Administration, via the Metropolitan Transportation Commission. Institutionally, Caltrain is now a part of the Bay Area's urban transit structure rather than the state and federal intercity rail structure.

The lesson of interest is the way service has evolved since the JPB came into existence. The orientation of a classic commuter service, linking suburb to a dominant central city, is gone. San Francisco still has a powerfully important central business district. However, dense employment as well as retail activity--in some places dense--is now distributed along the length of the corridor. In addition, a large number of people who work in the southern part of the corridor now live in San Francisco. No longer is the primary demand from suburban home to San Francisco workplace on weekday mornings and return on weekday evenings. Demand now is in both directions and is heavy at all times of the day and on weekends.

Although the agency running the corridor is not a private enterprise, it appears to have been sensitive to the nature of the market and has expanded its service accordingly. It understands that there are complex travel demands at many times of the day. There are a large number of travelers who travel long distances, perhaps not habitually every day to work, but frequently to different destinations for work-related purposes (such as attending meetings). There also are people who travel relatively short distances. A complex train service has arisen in response.

Originally most trains stopped at all stations, and the thrust of service planning seems to have been to add frequencies in order to have regular departures at all stations all day long. However, the resulting service was far too slow and tedious for passengers whose demands were for longer distance travel. So, beginning in 2004 the JPA began adding limited stop express trains, called Baby Bullets. Baby Bullets differ from the expresses of the Southern Pacific era by operating all day long in both directions, seven days per week. Today, while 14 daily trains stop in each direction at most of the 22 stops along the line and average 30 mph, 11 Baby Bullets stop only at 7 stations and average 44 mph. They are heavily patronized. An additional 21 trains stop more frequently than the branded Baby Bullets but bypass many stops.

Evaluation of California's Three State-Supported Corridors and the Caltrain Corridor Against the Wikipedia Criteria

State-supported corridor trains operating in California's three intercity corridors meet neither the commuter nor the intercity train definitions provided by Wikipedia. They are neither fish nor fowl. Their many stops slow the trains downs to the point where they are not attractive to many making intercity trips. Yet, the stops are too few to adequately serve a commuter function. The state-supported trains most closely resemble Wikipedia's definition for regional all-stops locals. These are trains running relatively long distances at low average speeds, stopping at numerous stations.

We deduce from comparing the fares that there is demand for two distinctly different types of passenger trains in these corridors. One type would stop only at the largest population and employment centers, between which it would offer several daily frequencies operating at average speeds in excess of 60 mph. The other type would be commuter trains, which would stop at many more places, offering average speeds of between 20 and 40 mph.

The one corridor in California where planners have been adequately sensitive to demand is the Caltrain commuter corridor. They clearly recognize this service distinction. Here there are three categories of service, distinguished by the number of stops that each category makes and the average speeds at which each category operates. The fastest category, the Baby Bullets, has an average speed almost 50% faster than the all-stops locals. The Baby Bullets have been a great step forward in service planning, as evidenced by its heavy patronage. If the top speed for the Baby Bullets was increased to 110 mph, the ridership would increase substantially. The Caltrain Corridor illustrates, that even for such a short corridor, there is a bifurcated demand that requires at least two very different types of train service.

Conclusions

While Northeast Corridor commuter fares are slightly higher than California commuter fares summarized in the table, fares charged for intercity corridor services in the Northeast Corridor are much higher than intercity fares in California. Service frequencies are similar in both regions and thus do not explain the fare differentials. What appears to explain them is the vastly faster intercity train service in the Northeast Corridor. There is a sizable segment of the public that demands to travel longer distances and is willing to pay much higher fares to achieve its travel desires. There undoubtedly are similar demands in the vast populated reaches of California, but because of the slow speeds of California's state-supported intercity corridor services, such demand generally avoids the trains.

For California to achieve a substantial increase in rail ridership, rail service needs a market-based model for rail service that is appropriate for dense urban corridors. Fortunately, there is one, and it is the Northeast Corridor from Boston to Washington, D.C. Examined in the context of this model, California's state-supported intercity corridor trains are not fulfilling their potential for attracting users from other modes. They are too slow, and are burdened by too many stops.

This is readily understandable, given the different historical legacy of California's intercity corridors, which includes their emergence from political compromises, rather than the discipline of market forces. California, however, now has the population and employment to generate travel demands similar to those in the Northeast. By applying the lessons of the Northeast Corridor, TRAC believes it is possible to deliver intercity service that competes well with congested highways.

Achieving that potential will require substantial additional infrastructure investment, including separate passenger rail rights-of-way and lightweight high-performance trainsets. It will also require the restructuring of service design and institutional reform. It may prove desirable to tender operations to private operators on these corridors, as that would be the most straightforward method of achieving a degree of independence from the inevitability of politics.

Politicians see new train stations as plums for their constituents, whose interests line up with the needs of commuters: they do not travel very far and want stations close to where they live. Case in point: while editing these very words, an announcement arrived calling on the Capitol Corridor to build a station in Hercules, signed by two congressmen, two mayors and a county supervisor. For an agency that relies on public funding, political pressure like that is impossible to ignore. Unfortunately, the political dynamic of catering to local wishes results in ever-slower rail travel, as stations are added. Additional stops would stimulate more short-distance riding, but slower speeds would reduce longer-distance ridership. The number of passengers could increase while the number of passenger-miles and revenue could decrease, as longer-distance passengers are driven away. Because their fares are what make these services economically feasible, the long-term viability of intercity rail is directly threatened by garden-variety politics. This is reason enough to be very concerned about the future of corridor services run by JPAs.

In short, the existing three corridor services in California are what you get when local politics overrides the demands of consumers, even when they have an extremely strong propensity to pay for fast service, as demonstrated by the dramatically higher intercity fares on the Northeast Corridor. Service allocations are the result of political processes and not market analyses. The public that wishes to travel longer distances is literally not represented--it is not concentrated into political districts where common interests prevail.

California greatly needs alternative modes of travel. Highways are jammed and climate change means that travel patterns must shift away from driving. It is clear that intercity passenger rail service in California needs to have certain attributes before it will attract the substantial ridership that is its potential.

First, passenger rail corridors need to be designed to facilitate two types of service: commuter and intercity corridor trains. Achieving such attributes will require additional infrastructure investment, which will carry a significant price tag, but be highly cost-effective in the long-run. The Northeast Corridor offers a good model. Catering to those going to work or engaging in personal business on a daily basis, commuter trains need to stop frequently, therefore operating more slowly. Their users expect low fares. Intercity corridor trains would stop only at the most important centers of population and employment and would operate at an average speed of at least 60 mph end to end. They would charge higher fares, which the longer-distance traveling public is willing to pay, as long as the trains are speedy.

Second, Intercity passenger corridors offering such service should be owned and operated by the state government, or by operators contracted by the state; commuter train agencies, whose orientation is local and regional, would be tenants. With careful attention to service design and institutional arrangements, California's rail services can be made far more useful to far more Californians.

[1] https://www.law.cornell.edu/uscode/text/49/24102
downloaded by GLT on 25 November 2016.
[2] https://en.wikipedia.org/wiki/Commuter_rail
downloaded by GLT on 25 November 2016.
[3] http://www.thefreedictionary.com/commuter+train
downloaded by GLT on 25 November 2016.
[4] https://en.wikipedia.org/wiki/Inter-city_rail
downloaded by GLT on 25 November 2016.
[5] Value fares correspond to coach seat fares on airlines. Value Fare tickets are fully refundable if canceled more than 48 hours prior to the scheduled departure from the origin but will incur a 20% refund fee if canceled less than 48 hours prior to scheduled departure. Value Fare tickets can be canceled with the ticket value stored as a credit in an eVoucher that can be used for future Amtrak travel.
[6] Reference MIT report for Acela load factors
[7] Reference MIT report for load factors
[8] Commuter trains operate to Grand Central Terminal; all others to Penn Station.
[9] Metro North is a division of the New York Metropolitan Transportation Authority and operates all commuter trains operating from Grand Central Terminal, including those to and from New Haven. Metro North also owns and dispatches NE Corridor track and power infrastructure from New Rochelle, NY (where Amtrak trains from the Penn Station and the south join the route to New Haven) to the Connecticut state line. From that point north to just beyond New Haven Union Station, Connecticut DOT owns, maintains, and dispatches the corridor. The distance from New Haven to New Rochelle, where Amtrak is a tenant on the corridor, is 55.7 miles.
[10] Included are NE Corridor Regional Expresses that operate only between New York and Philadelphia.
[11] The commuter operator is New Jersey Transit, which operates most transit services in the State of New Jersey. Commuter times in peak are in the low 70s minutes because of express trains; non-expresses are in the mid to high 90s. Time shown is the mean of a random pick of 9 schedules, including 2 expresses.
[12] SEPTA is the Southeastern Pennsylvania Transit Authority. The commuter fare is based on the single-ride ticket purchased off train ($9.00); 10-ride ticket is $8.00 per ride; single ride ticket purchased from conductor is $10.00.
[13] There are 9 stations where all trains stop; there are 6 additional stations where one or more of the trains stop.
[14] There are 7 stations where all trains stop; there is 1 additional station where one or more of the trains stop.
[15] Bus, SF Transbay Terminal to Emeryville (8.2 miles), train Emeryville to Bakersfield (310 miles), bus Bakersfield to Los Angeles Union Station (100 miles).
[16] Commuter fares are based on zones rather than types of service; San Jose to San Francisco is a Zone 4 fare. The fares are based on a monthly pass. The one-way fare is $9.75, or $0.21 per mile.
[17] Most Locals make 22 stops; a few make 23.
[18] Limiteds make from 11 to 19 stops.
[19] Baby Bullets make from 6 to 8 stops.
[20] LOSSAN Business Plan, 2016-17, p. 18 for passenger, passenger mile, and passenger mile per train mile trends, as well as for number of trains in service, and Wikipedia for train consists and number of revenue seats.

[21] Megabus reservation web page for the date of 23 January 2016. There were 5 departures from Los Angeles Union Station to San Francisco 4th and Townshend (Caltrain station) spread over a 24 hour period, with stops in San Jose and Oakland, with unreserved fares of $20. Most scheduled travel times between San Francisco and Los Angeles were 7 hours 30 minutes; the longest was 8 hours 10 minutes. Downloaded on 15 January 2017.

[22] San Joaquin JPA. 2016 Business Plan Update, Table 3.3 for passenger, passenger mile, and passenger mile per train mile trends, as well as for number of trains in service, and Wikipedia for train consists and number of revenue seats.

[23] Capitol Corridor JPA Business Plan Update, Appendix 1.

[24] From the CCJPA Business Plan Update for FY2016-17 to FY 2917-18, the Capitol Corridor's occupancy for FY 14-15 was 85.7 passenger-miles per train-mile. If all train consists are 4-cars, excluding seats in the lounge car, there are about 250 revenue seats, and the load factor is about 34%. If all train consists were 5-cars, with the lounge car exclusion, the load factor was about 25%. In practice, there is a mix of 4-car and 5-car consists serving the corridor, so the actual load factor was somewhere between 25% and 34%.

[25] Shedding anecdotal light on low passenger use on the southern end of the line, CBS San Francisco and Bay City News reported on southbound Capitol Corridor Train 527 striking an auto in Santa Clara at 10 am on Friday, 13 January 2017. The story reported that 45 passengers were on board the train. It is unclear whether the consist was 4 or 5 cars, but if the former, the load factor was about 18 percent and less if the latter. http://sanfrancisco.cbslocal.com/2017/01/13/capitol-corridor-train-motorist-killed-santa-clara-angew-lafayette/ downloaded by Greg Thompson on 19 January 2017.

[26] Capitol Corridor Joint Powers Agency, e-mail and data tables from Jim Allison, Planning Manager, and Tranika W. White, Senior Administrative Analyst, 1 February, 2017.

[27] R. Balcomb, et al. *The Demand for Public Transport: A Practical Guide*. Transport Research Laboratory, Report TRL 593, 2004.