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# Communicating a Complex Model and Forecasts to the Public – Summarizing the California Statewide Model for High-Speed Rail

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The California High Speed Rail Authority (CHSRA) is midst of a high-profile environmental review process that will result in a decision of a preferred High-Speed Rail (HSR) alignment from California's central valley to the Bay Area. An accurate portrayal of the potential ridership and revenue (and resulting travel impacts) from such a system is an integral part of both the environmental review and the viability of the project as a public-private investment. A new statewide model was developed and ridership forecasts for a variety of alternatives were presented in both the official environmental review documents as well as in technical project reports. While the existing documents were technically comprehensive, the CHSRA recognized the need for additional material about the model, model assumptions, and forecasts that could be easily understood by the public and decision-makers. The CHSRA commissioned the production of seven explanatory material of a summary nature on the following topics:

1. Executive / legislative summary on model, model inputs, and forecasts,
2. Ridership and revenue model overview,
3. Travel market segments and their elasticities
4. Travel times and cost assumptions for all travel options (modes),
5. Description of high-speed rail operating plan alternatives,
6. Systemwide ridership and revenue, and
7. Sources of high-speed rail ridership, diversions from other travel options (modes)

Each summary sheet is roughly two-pages long and utilizes bullets, charts, and graphics as opposed to detailed tables and lengthy paragraphs. Modeling terms such as "mode" were avoided and items such as "service headway" were converted to measurements that the public can grasp, "number of trains from X to Y per day". Due to page-length constraints, only two of the draft summary sheets are being included here. The finalized summary sheets will be available for public consumption by early spring 2008.

# Ridership and Revenue Model Overview

## Model Objectives

The California Statewide Model for High-Speed Rail (HST Model) was developed to forecast ridership and revenue for high-speed rail alternatives in California. It was initially developed and used for the Bay Area to Central Valley HST environmental and engineering studies, and is now being used for HST project-level activities as well as other regional and statewide studies throughout California.

The HST Model includes intercity travel by air, auto, conventional passenger rail, and HST options. The model functions by forecasting how intercity travel choices will be affected by changes to the transportation system and economic growth over time. Transportation system characteristics that are considered include:

- Rail station and airport locations and access (i.e. parking costs; travel times to and from station; ticketing, check-in and processing times, etc.)
- Rail and airline fares and operating plans (i.e. how often service is provided; stations/airports that are served; travel times; etc.).
- Highway system characteristics such as gasoline, tolls, parking costs, and roadway location, speed and capacity.

Demographic characteristics include:

- Number, location, and type of households reflecting things like income, vehicle ownership, and number of residents and workers in a household.
- Number, location, and type of jobs.

## Model Development

The HST Model addresses differences in decision-making patterns for intercity trips that occur within a single urban area (intraregional trips) versus trips that occur between urban areas (interregional trips). A series of statistical models were developed to accurately represent each decision-making stage for both types of intercity trips, and to forecast the ridership and revenue of a statewide HST system.

The statistical models were developed and verified from thousands of intercept surveys of in-state travelers conducted in 2005 and other sources:

- 1,234 surveys of airline passengers at the Sacramento, San Jose, San Francisco, and Fresno airports.
- 430 surveys of rail passengers from the Altamont Commuter Express (ACE), Capitol Corridor, Pacific Surfliner, San Joaquins, and Metrolink services.
- 1,530 surveys of interregional auto travelers from the HST study area.

- A California Statewide travel survey of 17,040 households, conducted in 2000-2001 in each of the 58 counties throughout the State.
- Over 36,000 household travel surveys covering urban area travel in the Bay Area, Sacramento region, and Los Angeles Basin.
- National surveys of intercity and commute travel conducted by the Department of Transportation and the Census Bureau.
- Air and rail passenger data compiled by the Federal Aviation Administration and rail operators.
- Highway traffic counts at 1,370 locations from Caltrans and regional agencies.

A peer review panel comprised of local, national, and international travel model and HST experts provided an objective and independent review of the modeling assumptions, methodologies, and results during each stage of model development. Demographic characteristics for future years are based on projections from the California Department of Finance, regional planning agencies, and a national economic forecasting firm (Woods and Poole).

## Model Application

The HST Model has two key enhancements over traditional travel demand models that make it well-suited for HST ridership and revenue forecasting:

- It predicts changes in a traveler's willingness to travel to a particular destination based on HST implementation or improvements to the air, auto or conventional rail system.

- It directly considers the reliability of travel times for each travel option, and differences in key travel time components such as boarding and exiting vehicles, security screening, and typical pre-board waits.

The HST Model is applied as a disaggregate model and subsequently has the capability to output very detailed information about travel behavior. The appropriate use of the HST Model is for planning-level forecasts such as comparison of different interregional or statewide investment scenarios at aggregate, market levels (i.e. from the Bay Area to the Sacramento region). Further study, refinement, and sensitivity testing of the demographic and transportation characteristics in the HST Model are being pursued by different agencies; these enhancements may make the HST Model suitable for very localized applications.

# Sources of HST Ridership

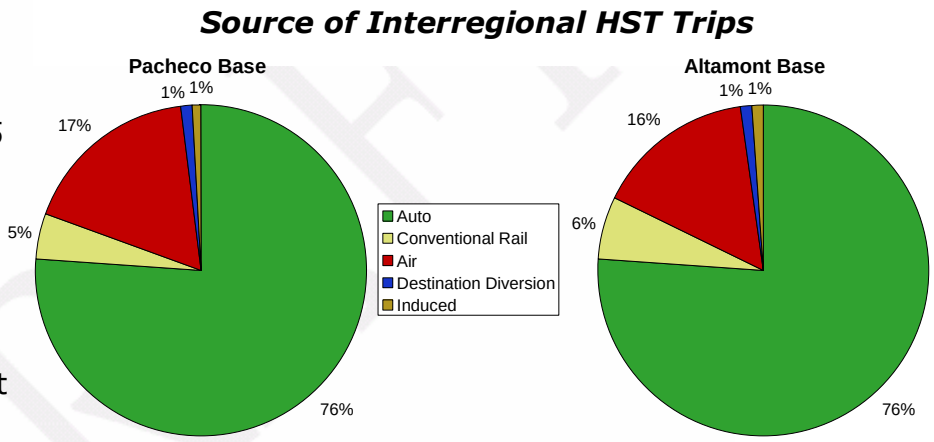
HST will gain ridership and revenue from one of three sources:

- **Modal Diversion** accounts for trips that would have been taken in a market using a different travel option (automobile, conventional rail or air), but now use HST. For example, a traveler from Palmdale who may have traveled by air for a business trip to San Jose will instead use HST for the same business trip to San Jose.

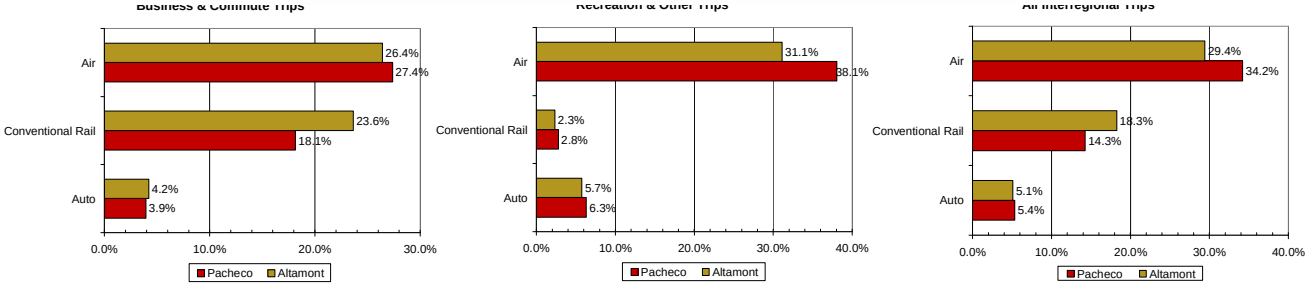
- **Destination Diversion** accounts for travelers that switch their destination due to the presence of HST. For example, a traveler from Merced who may have traveled by auto to Fresno on a shopping trip will now instead use HST to travel to Sacramento for the same shopping trip.

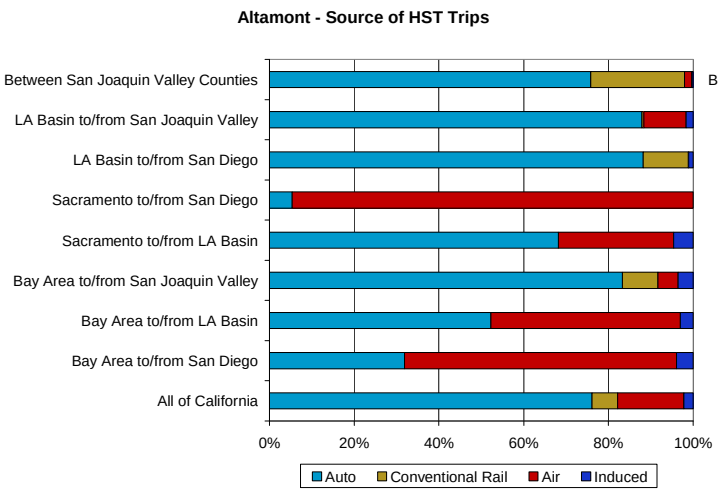
- **Induced** accounts for travelers who make entirely new trips due to the travel time and cost benefits provided by HST. For example, a traveler from Bakersfield may make additional weekend recreational trips to San Diego.

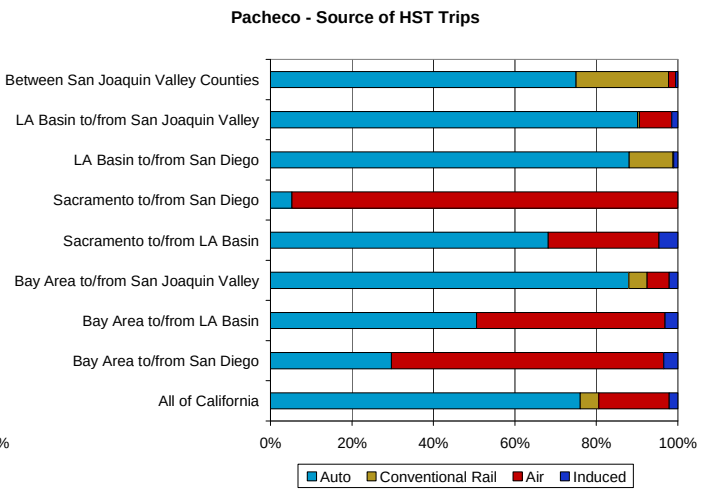
The majority of interregional HST trips (about 76 percent) are diverted from automobile, 16 percent from air, and 5 percent from conventional rail. Induced travel and destination diversion each account for about 1 percent of HST trips. These values are nearly identical for both Altamont and Pacheco alignments.




This diversion will result in a reduction in interregional travel using these other modes. About 5 percent of what would have been total interregional auto trips in California will be made by HST in 2030. Pacheco diverts more air travel (34 percent) than Altamont (29 percent), while Altamont diverts more conventional rail travel (18 percent than Pacheco (14 percent).






Individual travel markets show wide variation in the source of HST trips (shown above) and diversion rates (shown below):

- **Air** is the dominant source of HST trips in medium to long distance markets between Northern and Southern California. About 42 percent of the Bay Area to LA Basin air market is projected to divert to HST, with lower diversion rates in most other markets.

- **Auto** is a dominant source of HST trips in short to medium distance markets, particularly those involving the San Joaquin Valley. Auto is also a large source in many longer distance markets, although less so between Northern California and San Diego. The largest auto diversion rates generally involve trips between the LA Basin and either Sacramento or the Bay Area.

- **Conventional rail** is a modest source of HST trips for some short to medium distance markets, with highest diversion rates in the San Joaquin Valley.

The source and diversion rates are similar for the Altamont and Pacheco alignments, particularly for auto. Overall HST diverts a relatively small percentage of the travel markets involving the San Joaquin Valley. Altamont diverts a higher percentage of the conventional rail and air markets involving the San Joaquin Valley.

***Percent Diversion to HST for Representative Travel Markets***