APPENDIX 2-G

DESCRIPTION OF THE MODAL ALTERNATIVE AVIATION IMPROVEMENT OPTION METHODOLOGY

APPENDIX 2-G

DESCRIPTION OF THE MODAL ALTERNATIVE AVIATION IMPROVEMENT OPTION METHODOLOGY

Aviation Improvement Option Methodology

The level of improvement necessary to accommodate the representative travel demand entirely within the aviation mode of travel is represented in terms of additional airport terminal gates and runways which are key landside and airside capacity indicators, respectively. Additional terminal gates and runways will have associated landside and airside improvements such as, taxi ways, ground access, parking, passenger, and support facilities which will be estimated and accounted for in defining the cost and impact of the improvements identified. Significant improvements to the ground access/circulation systems as well as local and regional roadway networks would also be necessary to support the additional capacity at each airport location. As with passenger stations in the High-Speed Train Alternative, local roadway and regional roadway impacts associated with airport improvements will be addressed as part of the traffic and circulation impact analysis.

The introduction of larger aircraft (i.e., mid and long-range aircraft with passengers capabilities up to 500) to accommodate the representative intercity travel demand was not considered a viable alternative. The prevailing trend in the aviation industry and projections for future aircraft operations are toward a greater reliance on small and regional jet aircraft (up to 135 passengers) compared to large aircraft for the short-haul intercity travel market under evaluation for this study. For the California intercity air travel market, these smaller aircraft have the following advantages:

- increased frequency,
- shorter turn-around times,
- operate at lower altitudes,
- lower operating costs,
- access to more airports,
- lower airfares,
- operate from small terminals,
- better utilization of small airports,
- passenger acceptance of smaller (regional) jet aircraft, and
- higher gate utilization factors.

The shorter aircraft turn around time factor is integral to achieving the high-end gate capacities that (typically average 6 to 12 flights per day) have been assumed for this analysis. Despite the higher passenger capacities of the larger aircraft, the longer turn around times required for these aircraft reduce the overall capacity of a terminal gate.

As shown in Table 2-G-1, only two (Los Angeles International and San Francisco International Airports [LAX & SFO]) of the 18 commercial airports in the study area can adequately accommodate larger aircraft like the Boeing 747 without significant airside and/or land side improvements.. In addition, the 10 of the 18 airports that can currently accommodate medium aircraft (e.g., Boeing 757s and 767s, capable of carrying up to 250 passengers) will require landside (ground access, terminals, and gates) and airside (runways, taxiways, and navigational system) improvements to accommodate the projected

representative intercity demand. Overall, it is assumed that the improvements to the study area airports to accommodate either medium or large aircraft are infeasible and impractical because of the limited market served, high capital and operational costs of improvements, and significant environmental and land use constraints to accommodate improvements.

Table 2-G-1
Airport Capacity to Accommodate Larger Aircraft[1]

Airport	Types of Aircraft[2]	Improvements Required to Accommodate Larger Aircraft[3]
Oakland	Large	Landside
San Jose	Large	Airside & Landside
SF Airport	Large	None
Santa Rosa	Small	Airside & Landside
Bakersfield	Large	Landside
Fresno	Large	Landside
Merced	Small	Airside & Landside
Modesto	Small	Airside & Landside
Sacramento	Medium	Landside
Stockton	Large	Airside & Landside
Burbank	Small	Airside & Landside
LAX	Large	None
Visalia	Small	Airside & Landside
Long Beach	Medium	Airside
Orange County	Small	Airside & Landside
Ontario Airport	Large	Airside & Landside
Carlsbad	Small	Airside & Landside
San Diego[4]	Large	Airside & Landside

1 Based solely runway length. Other improvements required prior to implementations of larger aircraft service are noted in general (landside/airside) terms in the third column of this table.
2 Aircraft Categories:
Small = up to 135 passengers (e.g., Boeing 737 and regional jets)
Medium = up to 250 passengers (e.g., Boeing 757 and 767)
Large = up to 500 passengers (e.g., Boeing 747 and 777)
3 Improvement Categories: Landside=gates, terminals, roadways and access, Airside=runways and taxiways.
4 No current operations of larger aircraft at SDIA; however, British Airways operated both 747 and 777 aircraft at SDIA in the past.

The No Project Alternative defines the commercial aviation system represented by the 18 airports in the geographic area that currently serve the same intercity travel markets as the proposed high-speed train system. To identify hypothetical improvements to the aviation system associated with the Modal Alternative, the representative intercity travel demand is assigned to the five statewide regions where these airports are located: Bay Area, Central Valley, Southern San Joaquin Valley, Los Angeles, and San Diego. For this analysis, it is assumed that improvements will only occur at airports where there is currently (and assumed to be in the future) existing intercity commercial airline passenger service.

Regional demand and associated capacity improvements are estimated first for an individual airport and then summed for the entire region. The purpose of identifying specific airports is to provide a logical and reasonable basis for estimate hypothetical effects associated with these improvements. *A key principle of*

this analysis is that this process is not an aviation planning exercise and does not purport to recommend or suggest that these improvements could be implemented at a specific airport but rather, is merely a means to assess their hypothetical effects.

At each airport, new terminal gates are estimated based on the representative intercity demand assigned to that airport and an average gate capacity utilization factor. Average gate capacity is based on existing airport operation in California and is consistent with current Federal Aviation Administration (FAA) planning/design guidelines (FAA Terminal Planning Advisory Circular [AC 150/5360-13; April 22, 1988]). The FAA defines planning guidelines for gate capacity based on a range of planning horizons and levels of utilization. It is important that the gate capacity assumed for the purposes of estimating hypothetical improvements account for the type of airport and services offered (regional versus international, plane size and type, etc.). It is also important that the capacity assumptions reflect short turn-around intrastate or regionally oriented service that would be anticipated in the study area as well as the highest level of efficiency to be expected in the 20-year horizon.

For planning purposes, a gate utilization factor of 525,000 passengers per gate per year (ppgpy) was developed to estimate the number of additional gates providing an equivalent level of capacity to serve the representative demand that would travel by air. This factor represents the maximum gate capacity achieved at commute oriented airports such as John Wayne airport in Orange County, where aircraft sizes and turn around times emulate the assumptions utilized herein. The factor also represents the mid-point between an actual average of gate utilization at a sample California airport (400,000 ppgpy) and a theoretical maximum gate utilization capacity (650,000 ppgpy). A sensitivity analysis was prepared to test the impact of different gate utilization factors. As shown on Table 2-G-2 below, 70 fewer gates are required between 400,000 ppgpy and 525,000 ppgpy and 30 fewer gates are required between 525,000 ppgpy and 650,000 ppgpy. For this analysis it is assumed a gate utilization factor of 525,000 ppgpy is a valid planning assumption and an accepted planning tool to measure the relative differences between alternatives.

Table 2-G-2
Sensitivity Analysis for Gate Utilization Factors

Gate Utilization Factor (ppgpy)[1]	Number of Additional Gates Required[2]
400,000	299
525,000	229
650,0003	187

[1] ppgpy = passengers per gate per year.
[2] Representative intercity travel demand assumed under the high-end sensitivity analysis completed for the high-speed train ridership forecasts in the Year 2020, based on the California High Speed Rail Authority's final business plan.
[3] The theoretical maximum gate utilization factor was calculated as 650,000 ppgpy and assumes: a typical aircraft gate will serve between six mixed and ten short length flights a day, an average load factor of 75%, a typical aircraft with 135 seats, a typical gate serves 2000 passengers a day for 325 days per year (average day peak month).

The estimation of additional or new runway facilities is more complex due to the wide range of factors influencing the capacity of a given runway such as weather conditions, location/orientation, and the mix of operations (i.e., passengers per plane, the number of general aviation aircraft not accounted for in this analysis). To simplify this analysis, an overall average relationship between passenger gates and runways at maximum utilization was assumed to estimate additional/new runways considering the existing and No Project levels of utilization, and general FAA guidelines (FAA Terminal Planning Advisory Circular [AC 150/5060-5]). Existing operations data suggests a wide variance (15 to 45) in numbers of gates per runway at airports in the study area. For the purposes of this analysis we have assumed an overall planning average relationship of gates to runways of 30 to 1 for determining runway

requirements, based on passenger volumes/service levels and gate numbers at a regional level. A sensitivity analysis was prepared to test the impact of different gate to runway ratios. As shown on Table 2-G-3, 8 fewer runways are required between a ratio of 15:1 and 30:1 and 3 fewer runways are required between a ratio of 30:1 and 45:1. For this analysis it is assumed a gate to runway ratio of 30 to 1 is a valid planning assumption and an accepted planning tool to measure the relative impacts between alternatives.

Table 2-G-3
Sensitivity Analysis for Runway Utilization Factors

Gate to Runway ratio	Number of Additional Runways Required*
15:1	18
30:1	10
45:1	7

* Calculated assuming a gate utilization factor of 525,000 ppgpy and representative intercity travel demand assumed under the high-end sensitivity analysis completed for the high-speed train ridership forecasts in the Year 2020, based on the California High Speed Rail Authority's final business plan