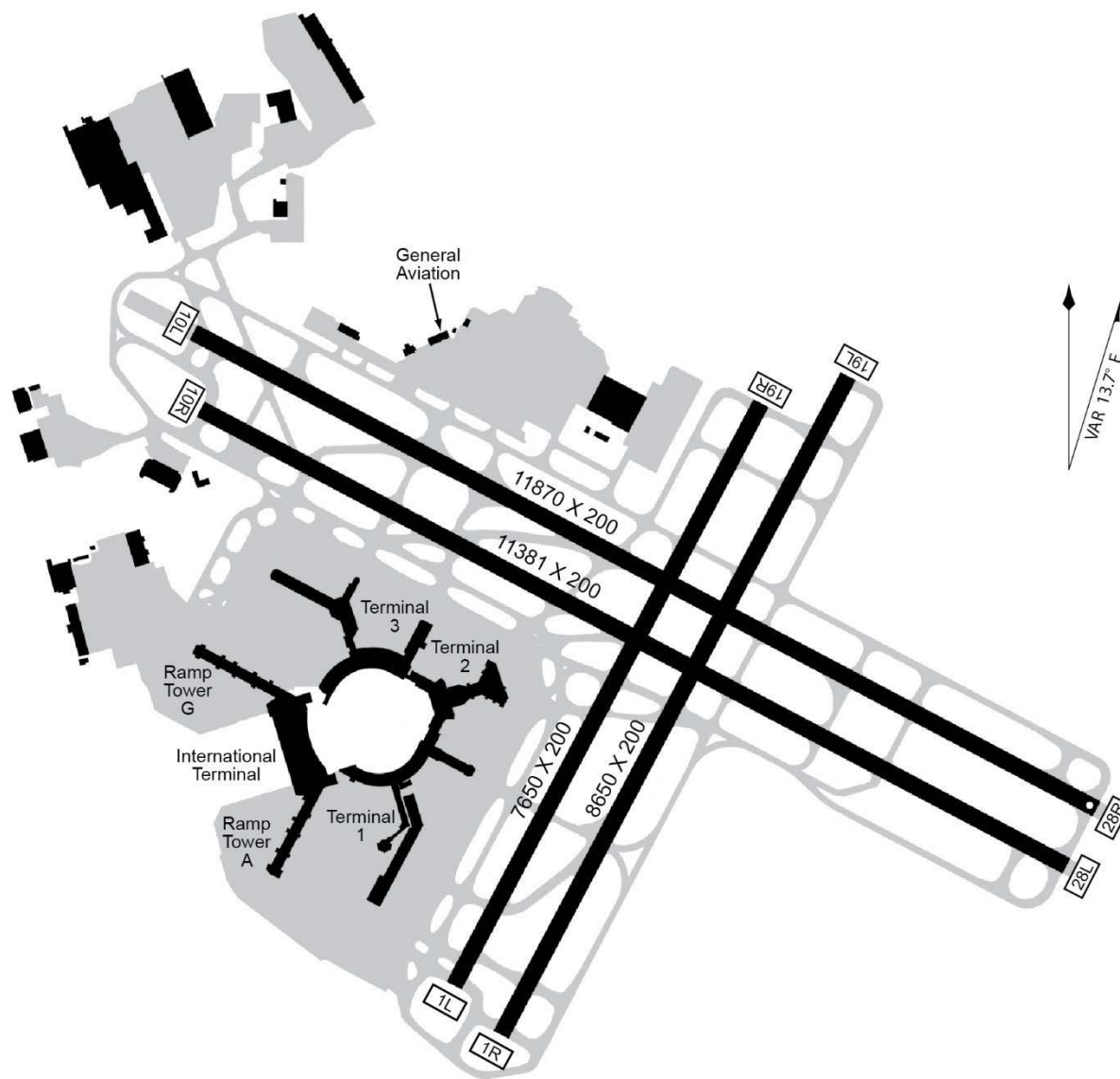


# AIRPORT CAPACITY PROFILE: SAN FRANCISCO INTERNATIONAL AIRPORT



*Airport capacity profile estimates were created using a standard set of performance characteristics and do not take into account non-runway constraints, unless otherwise noted. The capacity estimates developed for this report are not intended to replace the results of any detailed analysis that would precede an environmental, investment, or policy decision.*

***The list of Future Improvements and their expected effects on capacity does not imply FAA commitment to, or approval of, any item on the list.***

# SAN FRANCISCO INTERNATIONAL AIRPORT (SFO) OVERVIEW

## About this Airport Capacity Profile

- The capacity profile shows the hourly throughput that an airport is able to sustain during periods of high demand, represented as the range between the model-estimated capacity and the ATC facility-reported rate (called rate). Each weather condition has a capacity rate range.
- For each weather scenario, capacity estimates are based on information provided by ATC, including reported arrival and departure rates.

## Recent Capacity Improvements at SFO

- *Time-Based Flow Management (TBFM)* helps to improve the flow of arrivals to the runways.
- *Wake Recategorization Phase 1\** assigns aircraft to new wake turbulence classifications based on their wake turbulence characteristics, such as wake generation, wake decay, and encounter effects. This results in closer longitudinal separation for certain aircraft types without sacrificing safety.
- *7110.308* allows for reduced separation between SFO's closely spaced parallel arrivals between specific aircraft pairs. This procedure is only applied at SFO in Instrument conditions.

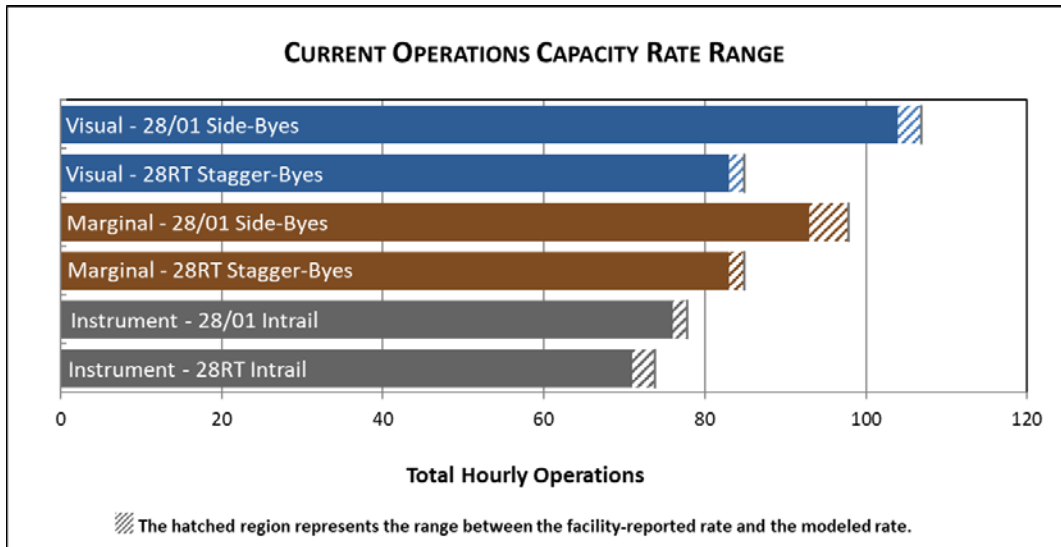
## Future Improvements at SFO

- *Improved Runway Delivery Accuracy:* The combined effects of several new capabilities, including Automatic Dependent Surveillance-Broadcast (ADS-B) Out, Cockpit Display of Traffic Information (CDTI), and Terminal Sequencing and Spacing (TSAS) in the terminal area, will improve the ability of controllers to deliver aircraft to the runway with the desired separation from the preceding aircraft. This will reduce the average spacing between arrivals and boost arrival capacity.
- *Consolidated Wake Turbulence Recategorization* assigns aircraft to new wake turbulence classifications based on their wake turbulence characteristics, such as wake generation, wake decay, and encounter effects. This results in closer longitudinal separation for certain aircraft types without sacrificing safety.

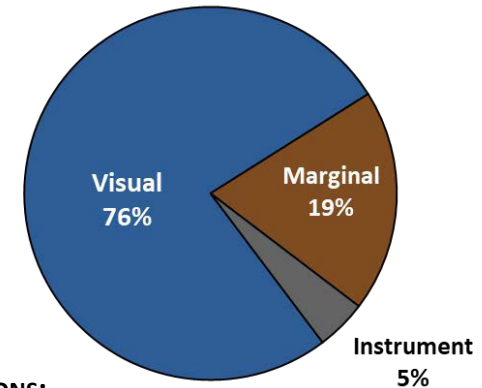
\*Known as Wake Recategorization Phase 1.5 at the facility, due to minor changes in the separation matrix from the original Wake Recategorization Phase 1 separations.

# SAN FRANCISCO INTERNATIONAL AIRPORT OVERVIEW - 2

## CURRENT OPERATIONS CAPACITY RATE RANGE



## ANNUAL WEATHER CONDITIONS



### VISUAL CONDITIONS:

- Ceiling and visibility allow for visual approaches: at least 3500 feet ceiling and 8 miles visibility

### MARGINAL CONDITIONS:

- Ceiling and visibility below visual approach minima but better than Instrument conditions

### INSTRUMENT CONDITIONS:

- Ceiling and visibility below 1000 feet ceiling or 3 miles visibility

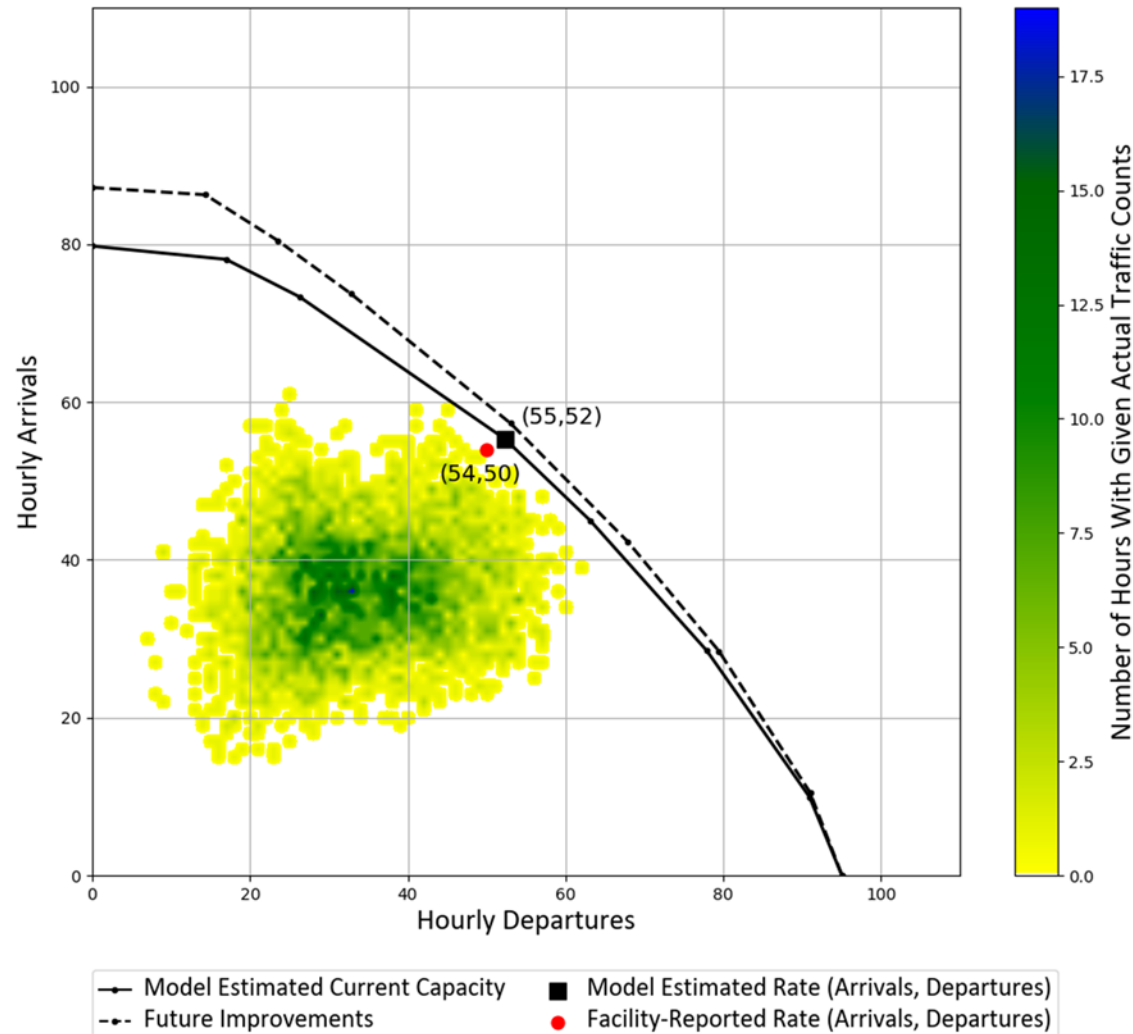
### Data Sources

- Throughout the profile, actual hourly SFO operations, weather and configuration data were obtained from the FAA ASPM database, and represent operational hours from 7am to 11pm local time for December 01, 2017 through November 30, 2018. Actual configuration usage is determined by multiple operational factors, including weather conditions.
- Facility-reported rates were provided by ATC personnel at SFO.
- Model-estimated rates are derived from operational information provided by ATC.
- Future improvements use NextGen performance assumptions current in 2019.

| Operations Type     | Arrival Runways | Departure Runways | Hourly Rate           |                 |
|---------------------|-----------------|-------------------|-----------------------|-----------------|
|                     |                 |                   | ATC Facility-Reported | Model-Estimated |
| CURRENT OPERATIONS  | 28L,28R         | 01L,01R,28L       | 104                   | 107             |
| FUTURE IMPROVEMENTS | 28L,28R         | 01L,01R,28L       | N/A                   | 110             |

- **Future improvements:** Improved Runway Delivery Accuracy, Consolidated Wake Turbulence Recategorization
- The capacity rate range in Visual conditions for 28/01 Side-Byes is currently 104-107 operations per hour.
- Runway 28L is used as a departure runway for long-haul, heavy jet departures only.
- Arrivals to Runways 28L and 28R are paired, meaning the planes fly a slight wingtip to wingtip stagger on final approach. Pairs are visually separated from one another.
- Departures are released from Runways 01L and 01R simultaneously.

### VISUAL WEATHER CONDITIONS

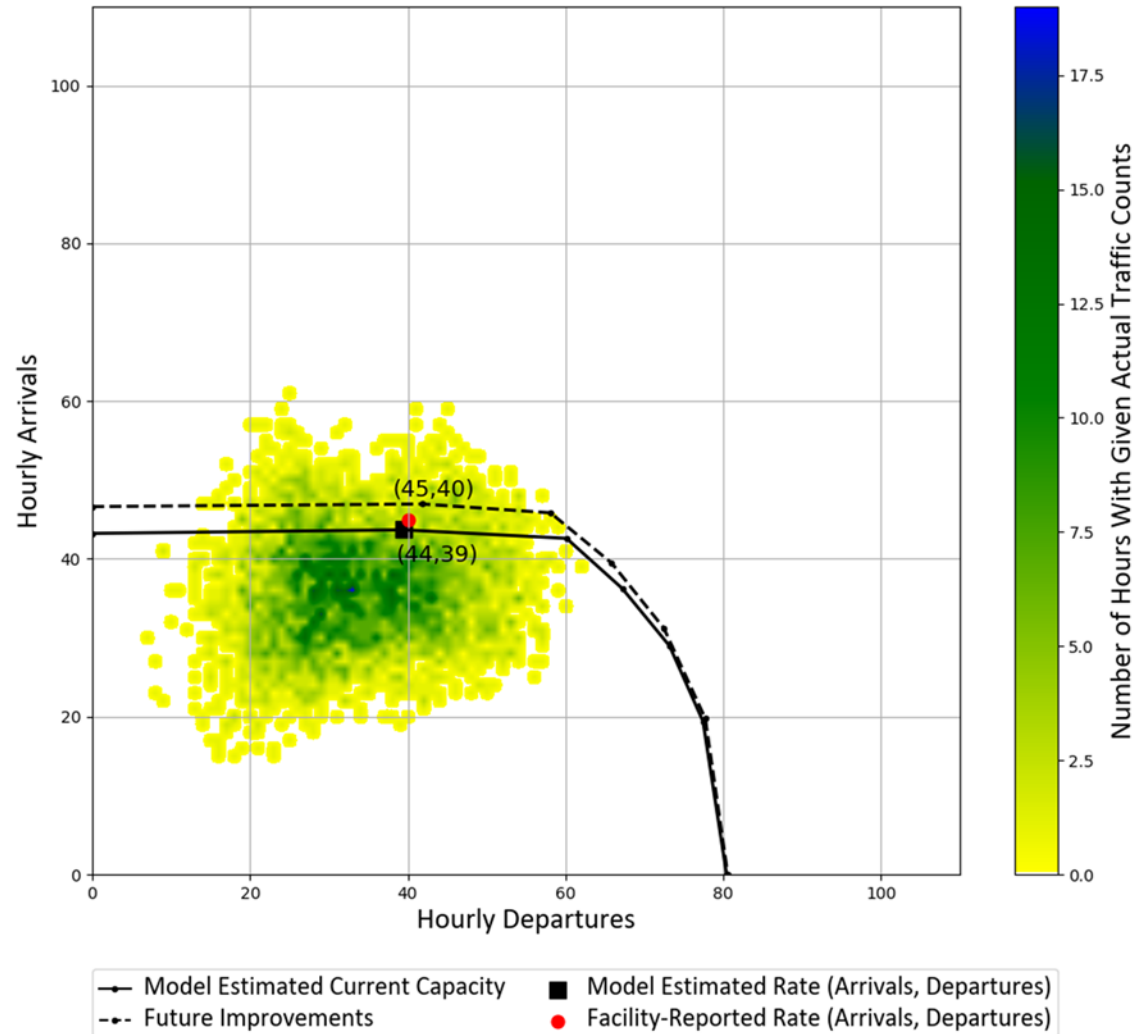


Actual traffic counts shown are for all Visual hours, all configurations.  
For data source information, see page 3.

| Operations Type     | Arrival Runways | Departure Runways | Hourly Rate           |                 |
|---------------------|-----------------|-------------------|-----------------------|-----------------|
|                     |                 |                   | ATC Facility-Reported | Model-Estimated |
| CURRENT OPERATIONS  | 28L,28R         | 28L,28R           | 85                    | 83              |
| FUTURE IMPROVEMENTS | 28L,28R         | 28L,28R           | N/A                   | 89              |

- **Future improvements:** Improved Runway Delivery Accuracy, Consolidated Wake Turbulence Recategorization
- The capacity rate range in Visual conditions for 28RT Stagger-Byes is currently 83-85 operations per hour.
- Arrivals to the same runway are separated by 5 NM. Arrivals to parallel runways are staggered 2.5 NM.

### VISUAL WEATHER CONDITIONS

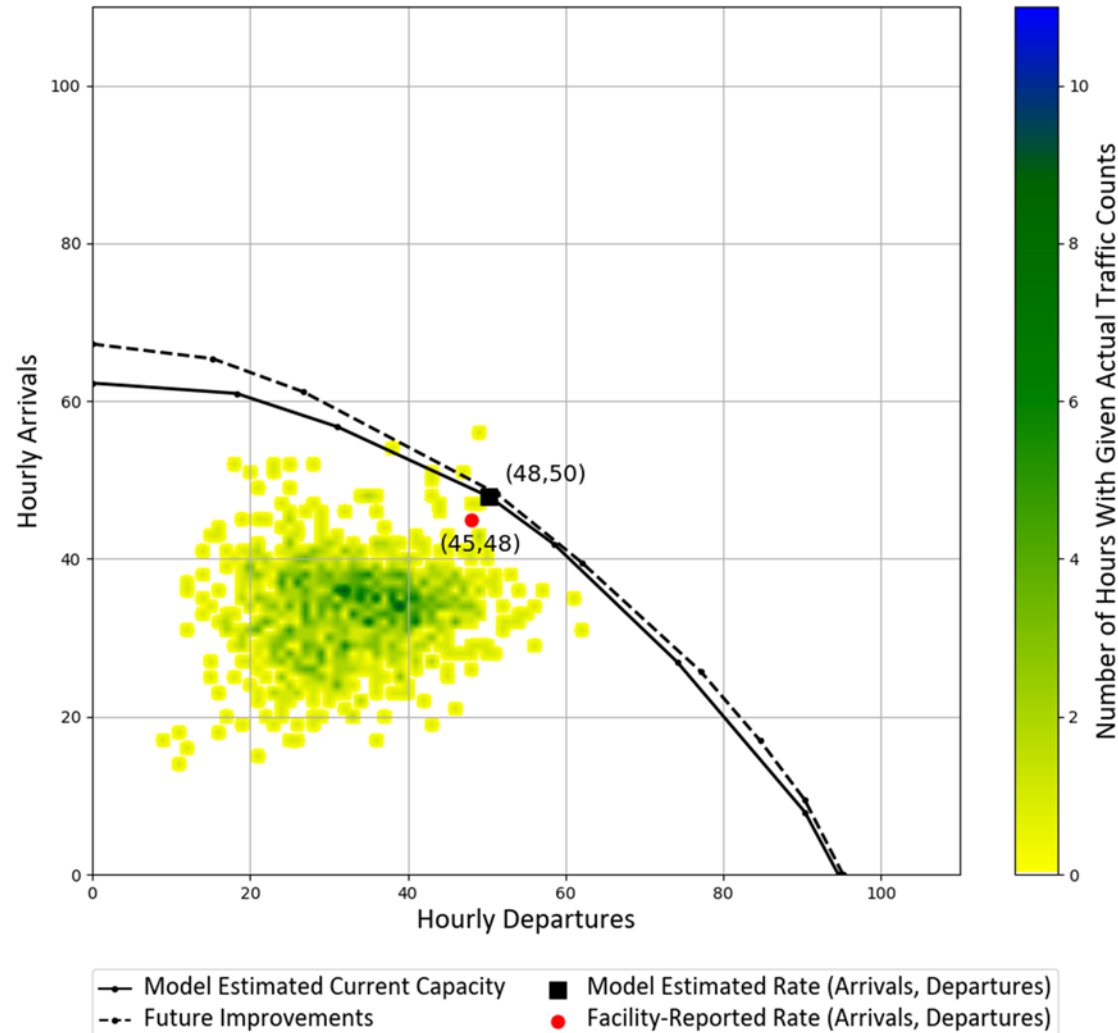


Actual traffic counts shown are for all Visual hours, all configurations.  
For data source information, see page 3.

| Operations Type     | Arrival Runways | Departure Runways | Hourly Rate           |                 |
|---------------------|-----------------|-------------------|-----------------------|-----------------|
|                     |                 |                   | ATC Facility-Reported | Model-Estimated |
| CURRENT OPERATIONS  | 28L,28R         | 01L,01R,28L       | 93                    | 98              |
| FUTURE IMPROVEMENTS | 28L,28R         | 01L,01R,28L       | N/A                   | 99              |

- **Future improvements:** Improved Runway Delivery Accuracy, Consolidated Wake Turbulence Recategorization
- The capacity rate range in Marginal conditions for 28/01 Side-Byes is currently 93-98 operations per hour.
- Runway 28L is used as a departure runway for long-haul, heavy jet departures only.
- Arrivals to Runways 28L and 28R are paired, meaning the planes fly a slight wingtip to wingtip stagger on final approach. Radar separation is used between each pair.

### MARGINAL WEATHER CONDITIONS

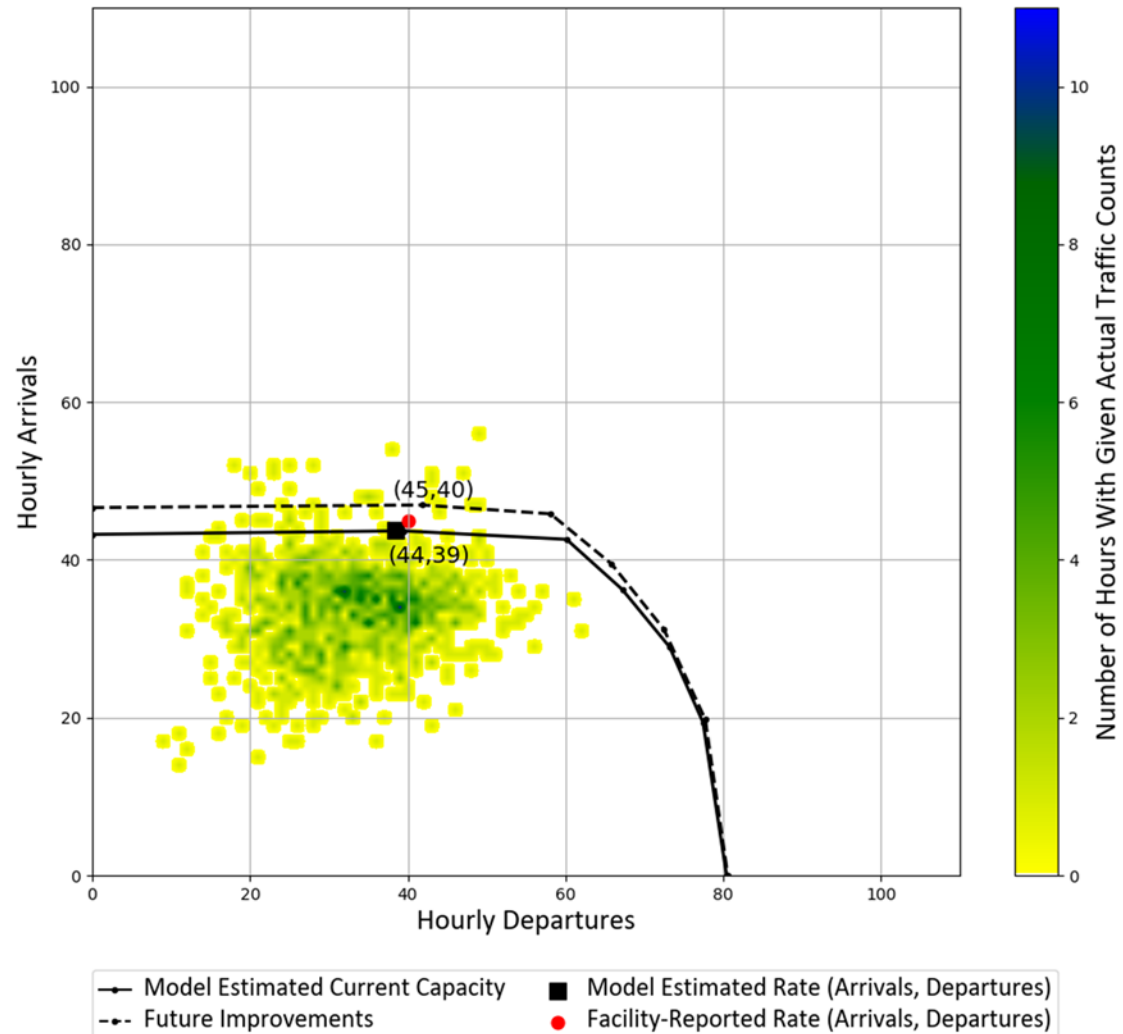


Actual traffic counts shown are for all Marginal hours, all configurations.  
For data source information, see page 3.

| Operations Type     | Arrival Runways | Departure Runways | Hourly Rate           |                 |
|---------------------|-----------------|-------------------|-----------------------|-----------------|
|                     |                 |                   | ATC Facility-Reported | Model-Estimated |
| CURRENT OPERATIONS  | 28L,28R         | 28L,28R           | 85                    | 83              |
| FUTURE IMPROVEMENTS | 28L,28R         | 28L,28R           | N/A                   | 89              |

- **Future improvements:** Improved Runway Delivery Accuracy, Consolidated Wake Turbulence Recategorization
- The capacity rate range in Marginal conditions for 28RT Stagger-Byes is currently 83-89 operations per hour.
- Arrivals to the same runway are separated by 5 NM. Arrivals to parallel runways are staggered 2.5 NM.

### MARGINAL WEATHER CONDITIONS

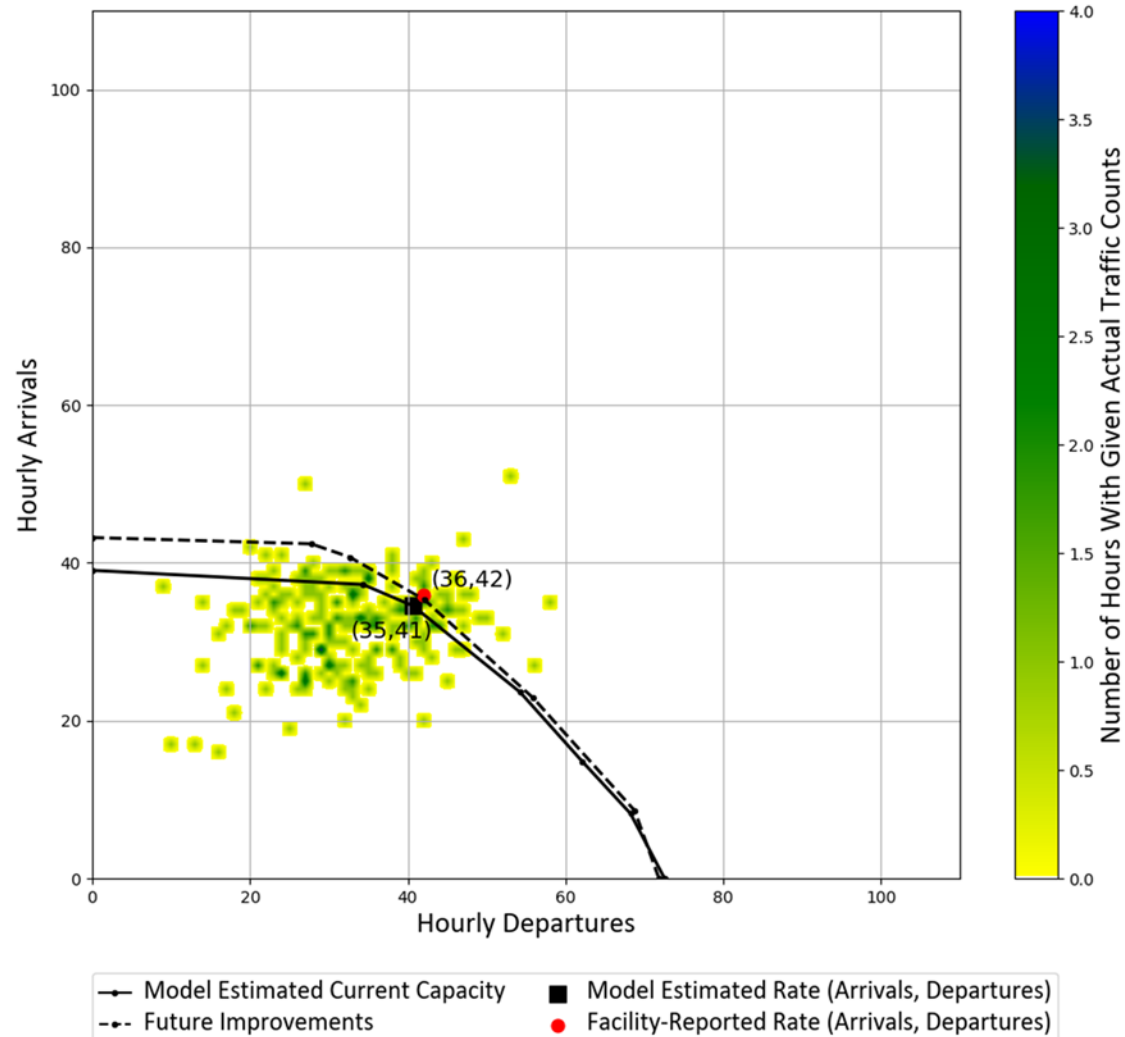


Actual traffic counts shown are for all Marginal hours, all configurations.  
For data source information, see page 3.

| Operations Type     | Arrival Runways | Departure Runways | Hourly Rate           |                 |
|---------------------|-----------------|-------------------|-----------------------|-----------------|
|                     |                 |                   | ATC Facility-Reported | Model-Estimated |
| CURRENT OPERATIONS  | 28L,28R         | 01L,01R,28L       | 78                    | 76              |
| FUTURE IMPROVEMENTS | 28L,28R         | 01L,01R,28L       | N/A                   | 77              |

- **Future improvements:** Improved Runway Delivery Accuracy, Consolidated Wake Turbulence Recategorization
- The capacity rate range in Instrument conditions for 28/01 Intrail is currently 76-78 operations per hour.
- Runway 28L is used as a departure runway for long-haul, heavy jet departures only.
- Arrivals to Runways 28L and 28R are separated using spacings dictated by FAA J.O. 7110.308, which allows for reduced diagonal spacing between certain pairs of arrivals to the parallel runways.

### INSTRUMENT WEATHER CONDITIONS

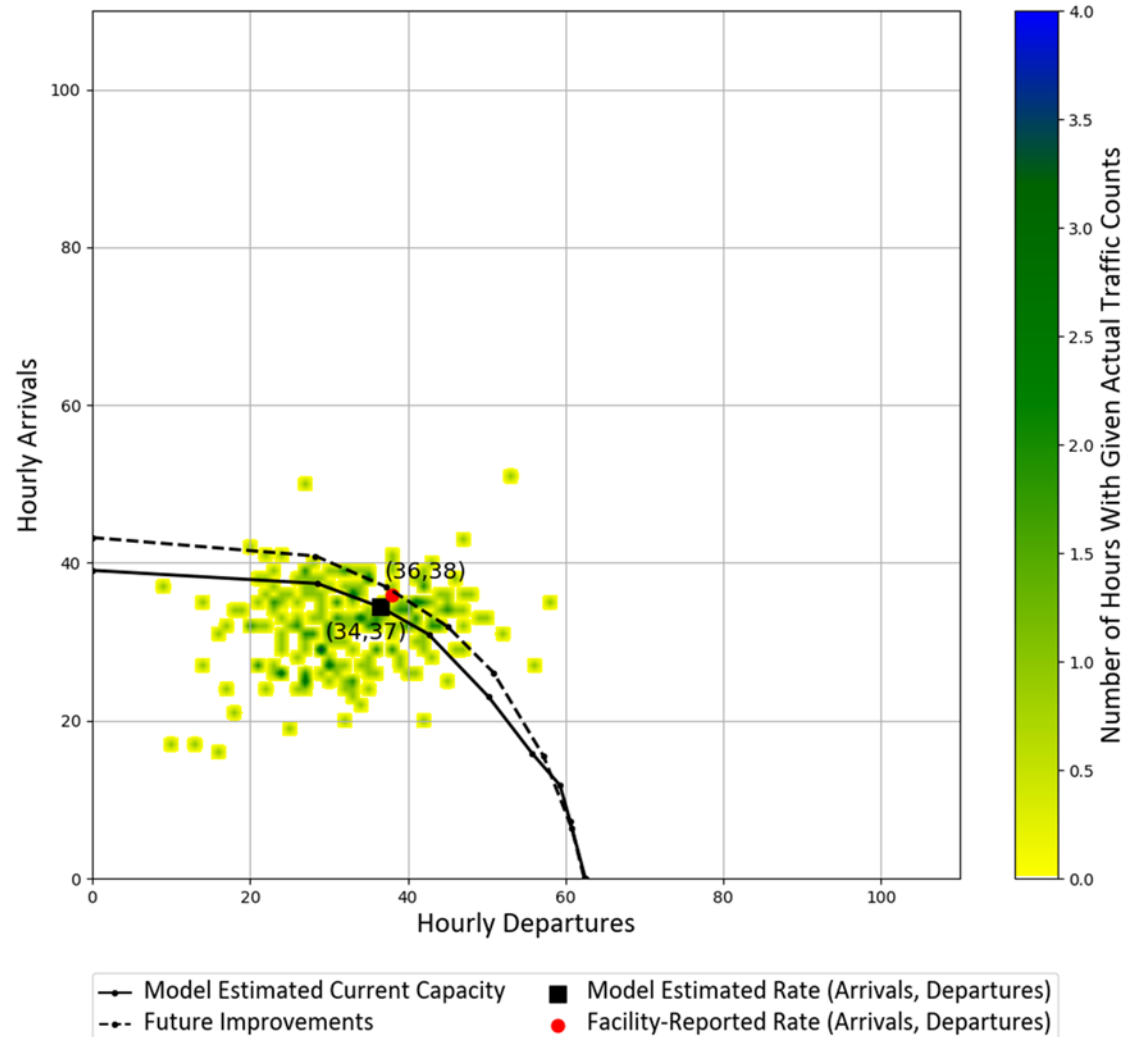


Actual traffic counts shown are for all Instrument hours, all configurations.  
For data source information, see page 3.

| Operations Type     | Arrival Runways | Departure Runways | Hourly Rate           |                 |
|---------------------|-----------------|-------------------|-----------------------|-----------------|
|                     |                 |                   | ATC Facility-Reported | Model-Estimated |
| CURRENT OPERATIONS  | 28L,28R         | 28L,28R           | 74                    | 71              |
| FUTURE IMPROVEMENTS | 28L,28R         | 28L,28R           | N/A                   | 74              |

- **Future improvements:** Improved Runway Delivery Accuracy, Consolidated Wake Turbulence Recategorization
- The capacity rate range in Instrument conditions for 28RT Intrail is currently 71-74 operations per hour.
- Arrivals to Runways 28L and 28R are separated using spacings dictated by FAA J.O. 7110.308, which allows for reduced diagonal spacing between certain pairs of arrivals to the parallel runways.

### INSTRUMENT WEATHER CONDITIONS

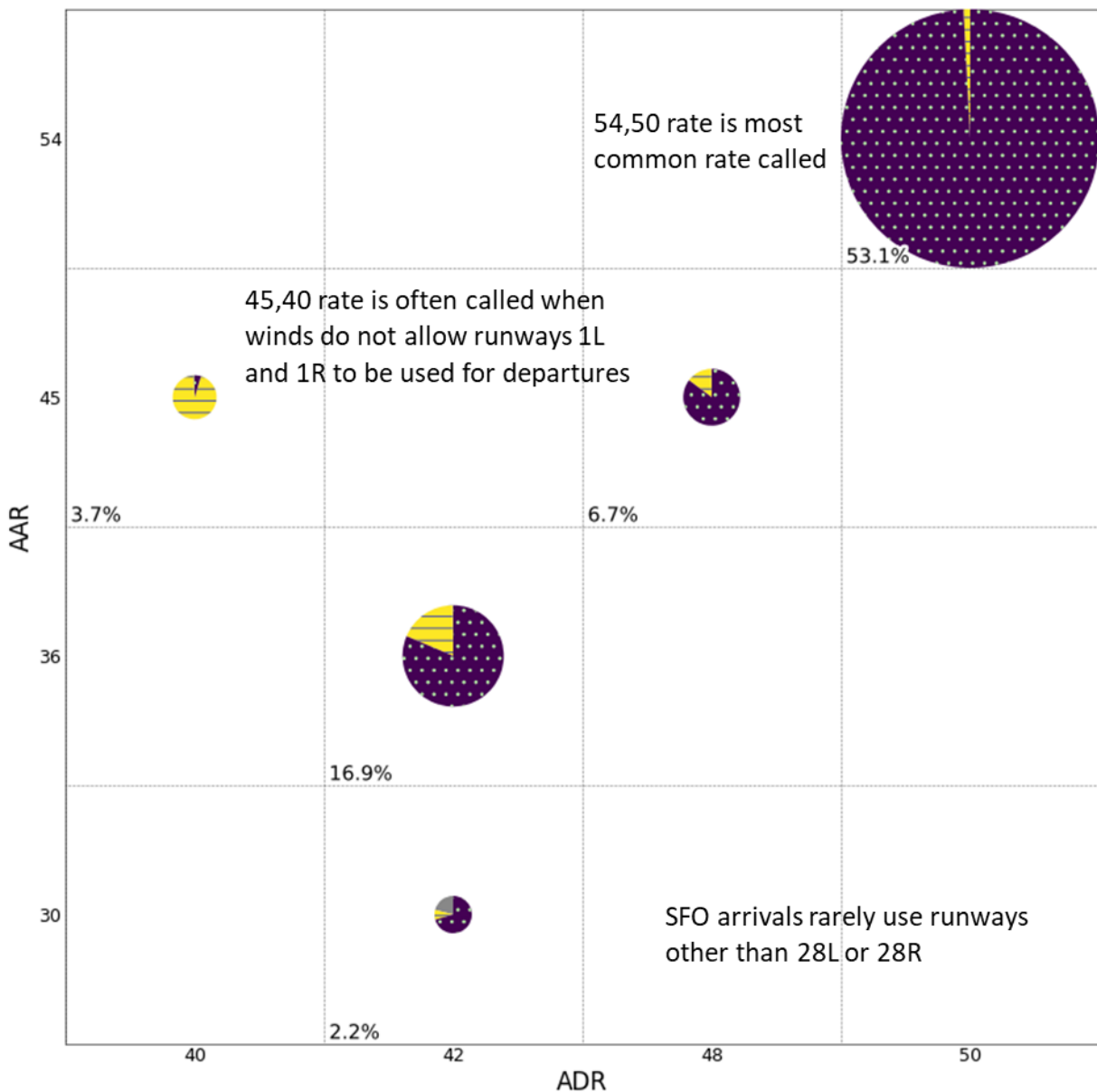


Actual traffic counts shown are for all Instrument hours, all configurations.  
For data source information, see page 3.

# HISTORICAL CALLED RATES AND CONFIGURATION USAGE BY FLOW

# HISTORICAL USAGE

## Called Rates



Other rates: 17.4%

Rates for all hours regardless of configuration, minimum 2% of time

### 28/01 FACILITY REPORTED RATES

|             |             |             |
|-------------|-------------|-------------|
| 54,50 (VMC) | 45,48 (MMC) | 36,42 (IMC) |
|-------------|-------------|-------------|

All data for hours from 1 Dec 2017 – 30 Nov 2018, 7 AM to 11 PM. Excludes variable winds and missing or incomplete data. Only shows rates called at least 2% of all hours.

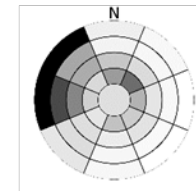
## Configuration Usage

### 28L,28R | 1L,1R (85%)



#### RATES

54,50 (63%)  
36,42 (16%)  
45,48 (7%)



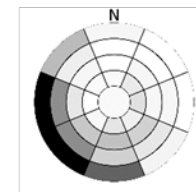
WIND & WEATHER  
VMC: 83%  
MMC: 14%  
IMC: 3%

### 28L,28R | 28L,28R (11%)



#### RATES

45,40 (37%)  
36,42 (31%)  
45,48 (10%)

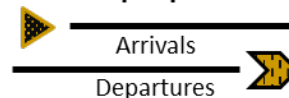


WIND & WEATHER  
VMC: 70%  
MMC: 26%  
IMC: 4%

### Other Configurations

## Key

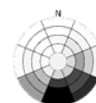
Arrivals | Departures (percent of time in configuration)



#### RATES

90,90 (90%) Rates (AAR, ADR) called at least 5% of time when configuration used

#### WIND & WEATHER



Wind speeds increase away from center (3 knot increments)

More common winds are darker

Percent of time spent in VMC/MMC/IMC when configuration used