



Airport Capacity Benchmark Report 2001

FLIGHT NUMBER	DESTINATION	TIME
117	BOSTON	0935
12	LA GUARDIA	0935
4916	NEWARK	0935
296	KENNEDY	0935
377	PHILADELPHIA	0935
576	ATLANTA	0940
213	CHICAGO	0940
385	SAN FRANCISCO	0940



Executive Summary

Setting the Framework for Benchmarks

The benchmarks in this report are a relatively simple expression of a complex quantity, airport capacity. They serve primarily as a reference point on the state of the airport system at a specific time. They can be updated in the future to mark progress. They can also be used to identify and compare specific types of airports, for instance to determine which airports are most severely affected by adverse weather or to compare the prospects for airports that plan to build new runways to those that do not. The benchmarks also provide a starting point for public policy discussions, because they give a succinct report on the current and future state of major airport capacity.

Benchmarks are useful data that help frame discussions. However, they are not a substitute for the more detailed analysis that should precede major investment and policy decisions. In this sense they might be compared to a vital sign of human health, such as blood pressure. That simple indicator might be the starting point for a diagnosis, but more information would be wanted before recommending surgery. Similarly, capacity benchmarks help identify problem areas but are not, in themselves, an adequate basis for selecting remedies.

This issue is apparent in the case of Atlanta Hartsfield International Airport. The scheduled operations exceed the benchmarks several times daily in optimum weather and frequently under reduced rate conditions. The simple comparison of schedule to benchmarks suggests that some action is needed to curtail the schedule. However, air traffic controllers, airlines, and the airport operator have indicated in discussions that they are relatively comfortable with the current schedule and believe that it makes efficient use of the airport. Their judgment is based on vast experience and a broad understanding of air transportation. Some of the considerations are specific to Atlanta (favorable runway configuration, weather patterns, and airspace structure), some are applicable to transfer hub airports in general (the concentration of traffic into schedule peaks to allow passengers to make convenient transfer between flights, the ability to catch up with traffic between peaks in the schedule, and the ability of hubbing carriers to cancel and consolidate some flights during reduced rate conditions), and some are applicable to all busy airports (the premise that some amount of congestion and delay is not inconsistent with efficient and affordable air transportation).

Purpose

- The FAA has developed capacity benchmarks for 31 of the nation's busiest airports to understand the relationship between airline demand and airport runway capacity and what we in the aviation community can do about it.
- Capacity benchmarks are defined as the maximum number of flights an airport can routinely handle in an hour.
 - These benchmarks are estimates of a complex quantity that varies widely with weather conditions, runway configurations, and the mix of aircraft types. Capacity benchmarks assume there are no constraints in the en route system or the airport terminal area. They are useful for broad policy discussions and the development of long-term strategies.

Methodology

- Between October 2000 and April 2001, the FAA and MITRE/CAASD developed capacity benchmarks for 31 airports.
- There are two rates for each airport – an optimum rate based on good weather conditions and a reduced rate based on adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.

- The optimum rate is defined as the maximum number of aircraft that can be routinely handled using visual approaches during periods of unlimited ceiling and visibility.
- The reduced rate is defined as the maximum number of aircraft that can be routinely handled during reduced visibility conditions when radar is required to provide separation between aircraft. This rate was determined for the most commonly used runway configuration in adverse weather conditions.
- The benchmarks reflect the number of takeoffs and landings per hour for the given conditions. These benchmarks can be exceeded occasionally and lower rates can be expected under adverse conditions.
- The FAA confirmed capacity benchmark rates in three ways:
 - Benchmark rates for each airport were provided by the air traffic team at the facility and the airport operator and were based on their collective operational experience.
 - Benchmark rates provided by the air traffic teams were compared to historical arrival and departure data (Aviation System Performance Metrics) to confirm that they represent the best performance of the airport.
 - Using the FAA's widely accepted airfield capacity computer model, benchmark rates were also calculated based on a set of standard performance characteristics.
- The resulting capacity benchmarks were then compared to carrier schedule data from the Official Airline Guide. Scheduled carrier operations constitute a significant part, but not all, of an airport's traffic. Excluded are general aviation and military operations, non-scheduled flights and some cargo operations. These typically account for between 1 and 30% of the total traffic at the 31 airports studied.
- Human factors play a critical role in the benchmark rates reported by the air traffic facility. Benchmarks are strongly affected by how busy the airport is and how aggressively the management team sets target rates.
- Six airports were selected for on-site visits to validate the methodology: Atlanta, Chicago, Dallas-Fort Worth, St. Louis, Memphis, and Detroit. These on-site visits included discussions with local air traffic personnel, airport authorities, and air carriers serving the airport. For the other airports, discussions were conducted with managers at the local air traffic facility.
- The individual benchmark summaries compare projected growth in capacity with projected growth in demand to understand the relationship between future airline demand and airport capacity. Demand is based on the Terminal Area Forecast, the FAA's projection of aviation activity at select U.S. airports, and is revised annually to reflect current and anticipated economic and social conditions.
- Historically, there are several measures of delay commonly used. (See appendix) The measure used herein to identify the most delayed airports is the percent of aircraft delayed more than 15 minutes from the FAA's Operations Network (OPSNET).

Assumptions

- The improvements that were considered as part of the study included new runways for which plans are sufficiently advanced, and the following technologies and procedures, where they were appropriate to the specific airport:
 - Automatic Dependent Surveillance-Broadcast/Cockpit Display of Traffic Information with Local Area Augmentation System (ADS-B/CDTI with LAAS) – provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - Flight Management System/Area Navigation (FMS/RNAV) Routes – allow a more consistent flow of aircraft to the runway.

- Passive Final Approach Spacing Tool (pFAST) – assists the controller with runway assignment and sequencing for aircraft and better flow of traffic into the terminal area.
- Simultaneous instrument approaches – allow full independent use of two or more runways for landings in adverse weather conditions.
- Precision Runway Monitor (PRM) – a high update radar system that allows simultaneous instrument approaches to parallel runways as close as 3000 feet apart. Also helps in procedural applications such as Simultaneous Offset Instrument Approaches (SOIA) where applicable.
- Land and Hold Short Operations (LAHSO) – allows independent arrivals for specific aircraft types on intersecting runways, where runway geometries permit.
- Benefits from planned improvements assume that all required infrastructure and regulatory approvals will be in place including aircraft equipment, airspace design, environmental reviews, radio frequencies, training, etc. as needed.
- In general, the benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the National Airspace System. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity;
 - Terminal airspace, especially limited departure headings;
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather, or congestion problems at other airports; and
 - Seasonal limitations due to high temperatures that restrict aircraft climb rates.

Observations across all 31 Airports

- The nature and extent of the problem and discussions of potential solutions are site-specific and different for each of the airports. However, there is a general pattern that as the airport traffic volume approaches capacity, delays increase. Thus, airports can achieve maximum capacity only at a reduced quality of service.
- Today there are eight airports that experience significant passenger delays – where three percent or more of the operations experience delays in excess of 15 minutes:
 - New York LaGuardia
 - Newark
 - New York Kennedy
 - Chicago O’Hare
 - San Francisco
 - Philadelphia
 - Atlanta
 - Boston
- The benchmark study predicts that, in 10 years, the first 6 of the 8 airports above plus Los Angeles will still have significant passenger delays. New runways at Atlanta and Boston should alleviate delays at those two airports.
- Table 1 shows the capacity benchmarks for the 31 airports studied.
- The capacity of airports decreases in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation. The reduced rate reflects the capacity benchmark for the

most commonly used configuration in adverse weather. Under very low ceiling/visibility in Instrument Meteorological Conditions (IMC), capacity is even lower.

- Extent of capacity loss during operations at reduced rates (as compared to the optimum) varies widely across the 31 airports, e.g.,
 - At Cincinnati and Minneapolis-St. Paul, it is minimal (2 percent)
 - At some airports like Detroit, Washington Dulles, and Houston, it is relatively small (10 percent or less)
 - At other airports like St. Louis and San Francisco it is very high (about 40 percent)

These differences are due to different runway configurations and operational procedures in adverse weather at each airport.

- Most airports are able to handle demand under good weather conditions (i.e., optimum capacity). New York LaGuardia is an exception and is the highest ranked airport for delay rates in the year 2000. Looking at the number of aircraft delayed significantly (i.e., greater than 15 minutes), LaGuardia had 156 delays per 1,000 aircraft operations and Newark was a distant second at 81 delays per 1,000 aircraft operations (Table 2).
- During good weather, delays are generally small and manageable.
- During bad weather, capacity is lower and results in even more delays. Overall, LaGuardia, Newark, Chicago O'Hare, and San Francisco have the highest delay rates (57 to 156 delays per 1,000 aircraft operations). Several airports such as Las Vegas, Baltimore-Washington, Denver, and Salt Lake City do not have any significant delay problems (less than 10 delays per 1,000 aircraft operations).
- New runways planned for 14 airports provide significant capacity increases but the amount of the increase varies from site to site.
 - Detailed plans for new runways in the next 10 years were available for Atlanta, Houston, Dallas/Fort Worth, Phoenix, Washington Dulles, St. Louis, Detroit, Cincinnati, Minneapolis-St. Paul, Miami, Seattle-Tacoma, Orlando, Charlotte, and Denver. Additional airport operators are considering new runways, but their plans are not advanced to the point where the impact can be estimated.
 - Nominal increases are in the range of 30 to 60 percent at Atlanta, Houston, Phoenix, Washington Dulles, Seattle-Tacoma, and Minneapolis-St. Paul.
 - Some airports with high capacity configurations at their disposal today have a lower percentage of capacity increase from new runways (e.g., Denver).
- Technology improvements also provide capacity increases – most are in the 3 to 8 percent range.
- Procedural enhancements also hold promise. Depending on the airport, the enhancements could account for an additional 5 to 10 percent improvement in operations.
- For those airports operating close to capacity, technology and procedural changes could have a significant impact in improving capacity.
- Projected demand growth to 2010 at these 31 airports varies from 4 percent at Washington National Airport to 42 percent at Orlando.

Table 1
Capacity Benchmarks for Today's Operations at 31 Airports

Airport		Optimum	Reduced
ATL	Atlanta Hartsfield International	185–200	167-174
BOS	Boston Logan International	118–126	78–88
BWI	Baltimore-Washington International	111–120	72–75
CLT	Charlotte/Douglas International	130–140	108–116
CVG	Cincinnati-Northern Kentucky	123–125	121–125
DCA	Washington Reagan National	76–80	62–66
DEN	Denver International	204–218	160–196
DFW	Dallas-Fort Worth International	261-270	183-185
DTW	Detroit Metro Wayne County	143–146	136–138
EWR	Newark International	92–108	74–78
HNL	Honolulu International	120–126	60–60
IAD	Washington Dulles International	120–121	105–117
IAH	Houston Bush Intercontinental	120–123	112–113
JFK	New York Kennedy International	88–98	71–71
LAS	Las Vegas McCarran International	84–85	52–57
LAX	Los Angeles International	148–150	127–128
LGA	New York LaGuardia	80–81	62–64
MCO	Orlando International	144–145	104–112
MEM	Memphis International	150–152	112–120
MIA	Miami International	124–134	95–108
MSP	Minneapolis-St. Paul International	115–120	112–112
ORD	Chicago O'Hare International	200–202	157–160
PHL	Philadelphia International	100–110	91–96
PHX	Phoenix Sky Harbor International	101–110	60–65
PIT	Greater Pittsburgh International	140–160	110–131
SAN	San Diego Lindbergh Field	43–57	38–49
SEA	Seattle-Tacoma International	90–91	78–81
SFO	San Francisco International	95-99	67–72
SLC	Salt Lake City International	130–132	95–105
STL	Lambert St. Louis International	104–112	64–65
TPA	Tampa International	110–119	80–87

**Table 2
Capacity Benchmark Summary**

Airport (ranked by delay in 2000)	Capacity Improvement (percent)						Projected Growth to 2010 (percent)	Delays per 1000 operations (2000)
	New Runway (if planned)		New Technology*		New Runway Plus New Technology**			
	Optimum	Reduced	Optimum	Reduced	Optimum	Reduced		
LGA	—	—	10	3	10	3	17	155.9
EWR	—	—	10	7	10	7	20	81.2
ORD	—	—	6	12	6	12	18	63.3
SFO	—	—	0	3	0	3	18	56.8
BOS	0	0	4	4	4	4	6	47.5
PHL	—	—	17	11	17	11	23	44.5
JFK	—	—	2	3	2	3	18	38.8
ATL	31	27	5	6	37	34	28	30.9
IAH	35	37	5	3	42	41	34	28.1
DFW	3	17	1	3	4	21	21	23.8
PHX	36	60	3	0	40	60	31	22.0
LAX	—	—	11	4	11	4	25	21.9
IAD	46	54	2	4	49	60	20	19.5
STL	14	84	11	3	27	89	30	18.2
DTW	25	17	5	6	31	24	31	17.6
CVG	26	26	2	1	28	27	40	15.4
MSP	29	26	4	4	34	31	32	12.7
MIA	10	20	12	6	24	27	23	11.3
SEA	52	46	3	4	57	51	17	10.4
LAS	—	—	0	12	0	12	30	8.0
DCA	—	—	4	8	4	8	4	8.0
BWI	—	—	0	0	0	0	27	6.9
MCO	23	34	5	3	28	38	42	6.3
CLT	25	15	4	8	30	24	15	6.0
PIT	—	—	3	1	3	1	15	3.8
SAN	—	—	2	3	2	3	33	2.5
DEN	18	4	6	13	25	17	23	2.2
SLC	—	—	5	4	5	4	34	2.0
TPA	—	—	0	19	0	19	18	1.6
MEM	—	—	3	4	3	4	30	0.4
HNL	—	—	2	7	2	7	25	0.0

* Estimates assume that new runways (where applicable) are in place

** Numbers include compounding effects of new runways and new technologies and are not strictly additive

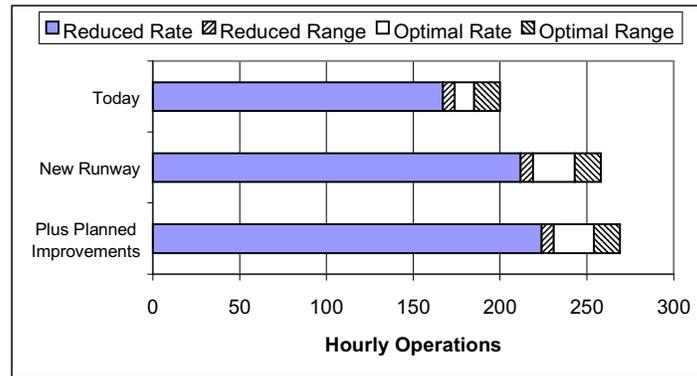
Atlanta Hartsfield International Airport Benchmarks

- The current capacity benchmark at Atlanta Hartsfield is 185-200 flights per hour in good weather.
- Current capacity falls to 167-174 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.
- In 2000, Atlanta was ranked eighth most delayed airport in the country overall, slightly less than 3% of all flights were delayed significantly (more than 15 minutes).
- Scheduled operations at Atlanta are at or above good-weather capacity for almost two hours of the day.
- Atlanta has eight well-defined periods of highly concentrated arrival and departure traffic during the day.
- In adverse weather, capacity is lower and scheduled traffic exceeds capacity more than 8 hours of the day and the percentage of significantly delayed flights doubles to 6%.
- A new runway, planned for completion in 2005, is expected to improve Atlanta's capacity benchmark by 31% (to 243-258 flights per hour) in good weather and by 27% (to 212-219 flights per hour) in adverse weather. This assumes that airspace, ground infrastructure, and environmental constraints allow full use of the runway.
- In addition, technology and procedural improvements, when combined with the new runway are expected to increase Hartsfield's capacity benchmark by a total of 37% (to 254-269 flights per hour) in good weather over the next 10 years.
- The adverse weather capacity benchmark will increase by a total of 34% (to 224-231 flights per hour) compared to today.
- These capacity increases could be brought about as a result of:
 - PRM, which will allow triple simultaneous approaches with the new runway.
 - pFAST, which assists the controller with sequencing aircraft, for a better flow of traffic into the terminal area.
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- Demand at Atlanta is expected to grow by 28% over the next 10 years. Capacity at Atlanta is expected to keep pace with the growth in demand, due primarily to the new runway at the airport.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	185-200	167-174
New Runway	243-258	212-219
Plus planned improvements	254-269	224-231



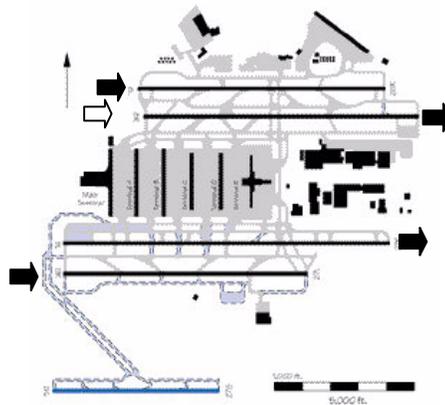
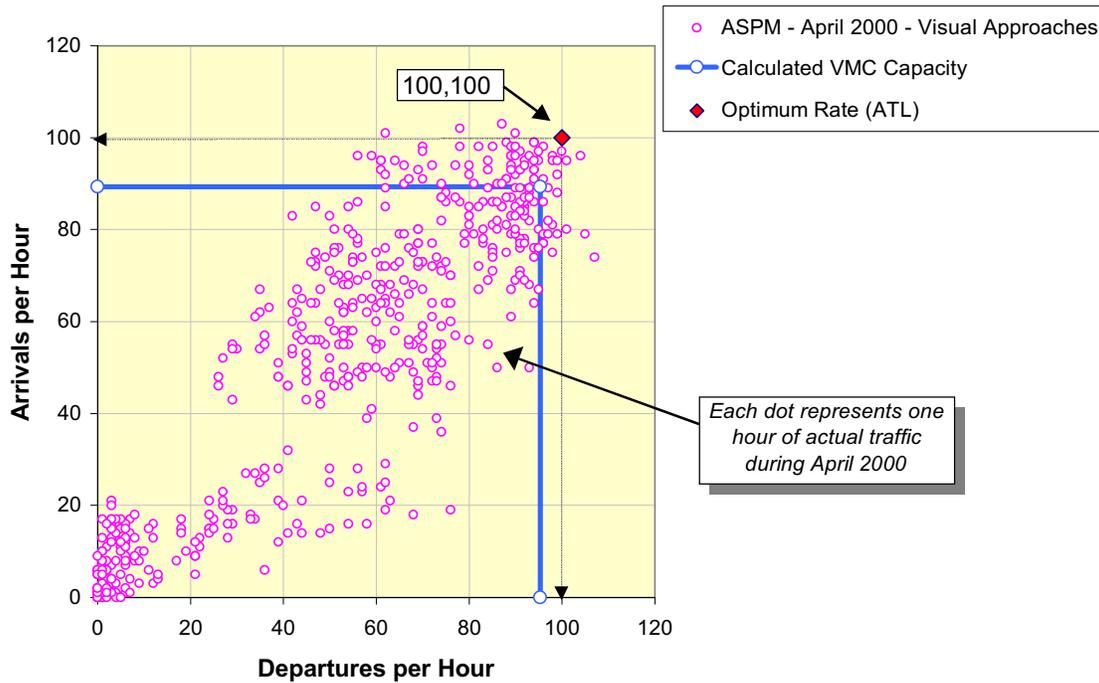
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - PRM, which will allow triple simultaneous approaches with the new runway
 - pFAST, which assists the controller with sequencing aircraft, for a better flow of traffic into the terminal area
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

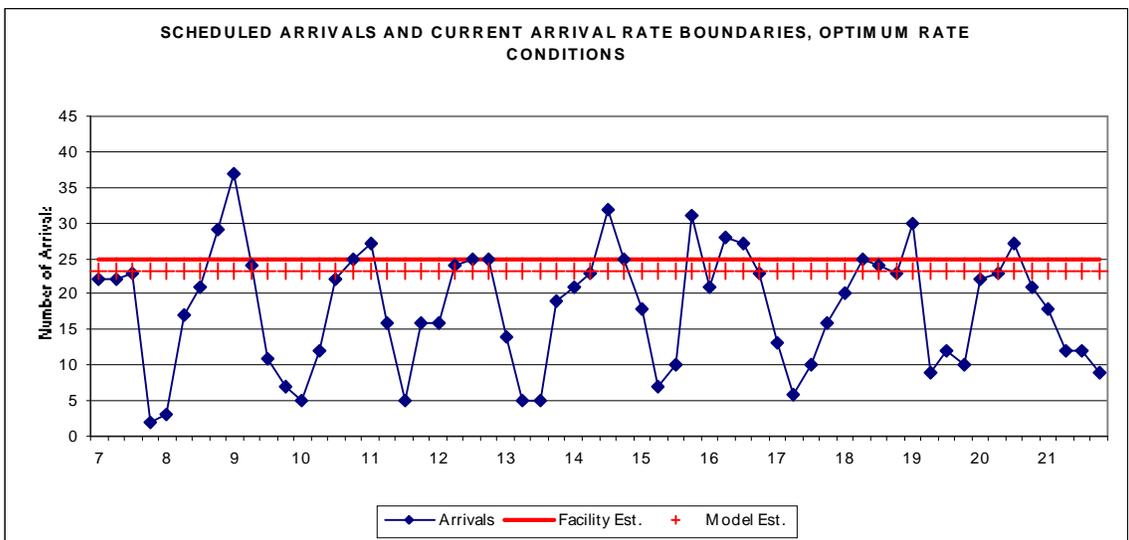
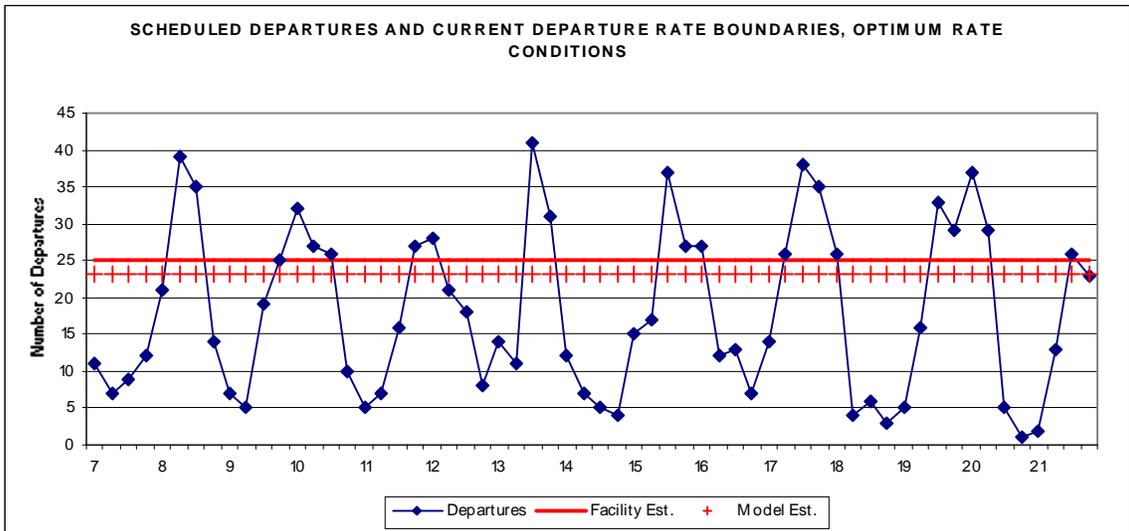
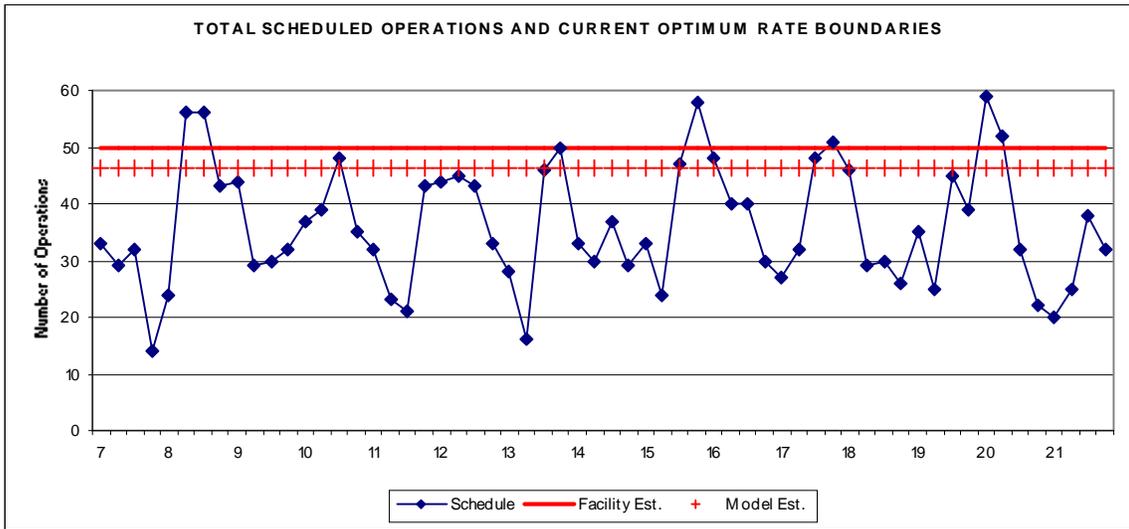
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – Optimum Rate of (100,100) was reported by the facility
 - Arrivals primarily to the two outer runways
 - Departures from two inner runways
- ASPM data is actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
 - ATL frequently operates at close to maximum rate
- Solid line represents the calculated airport capacity during a busy hour, and the tradeoff between arrivals and departure rates
 - ATL controllers are more flexible than the model, actively manage traffic for maximum throughput

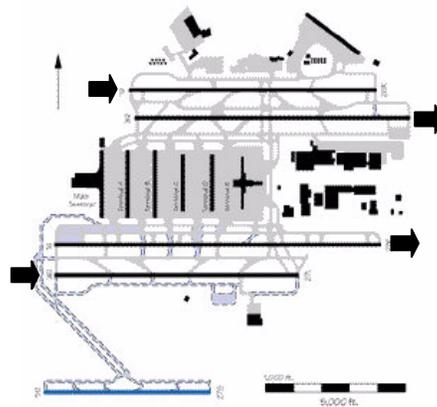
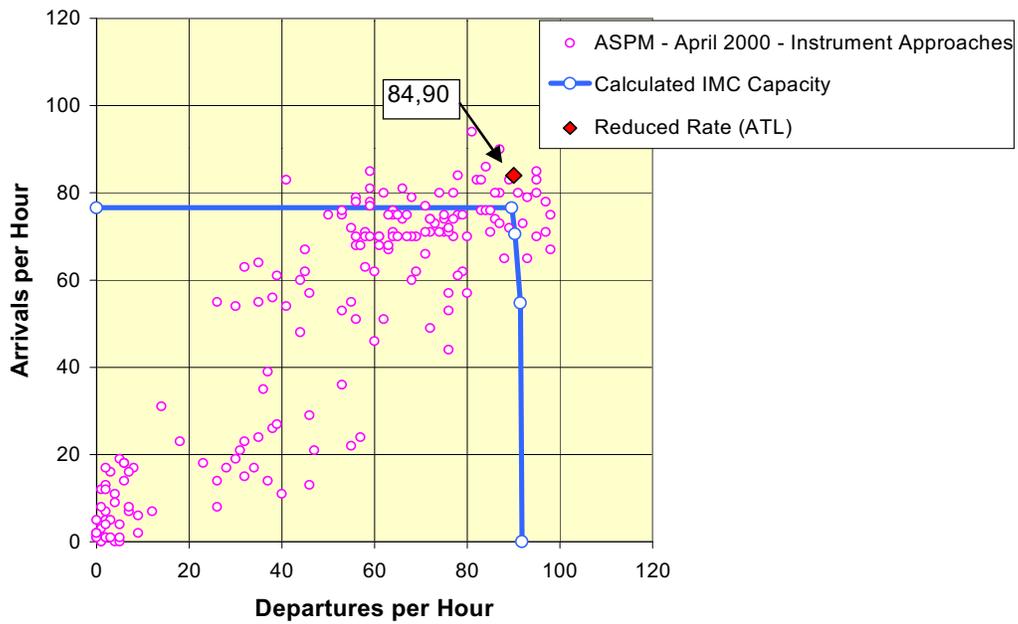


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

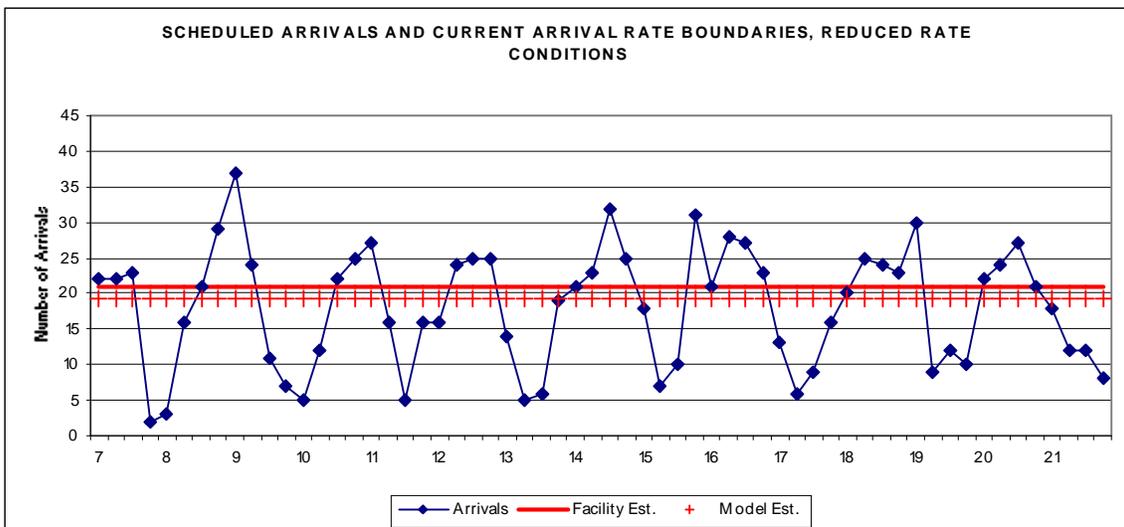
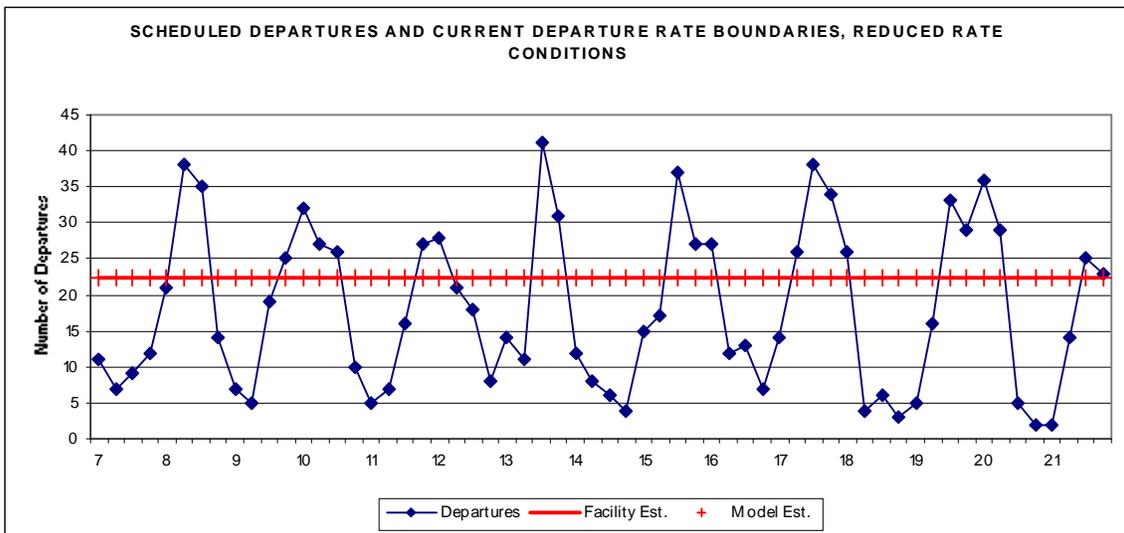
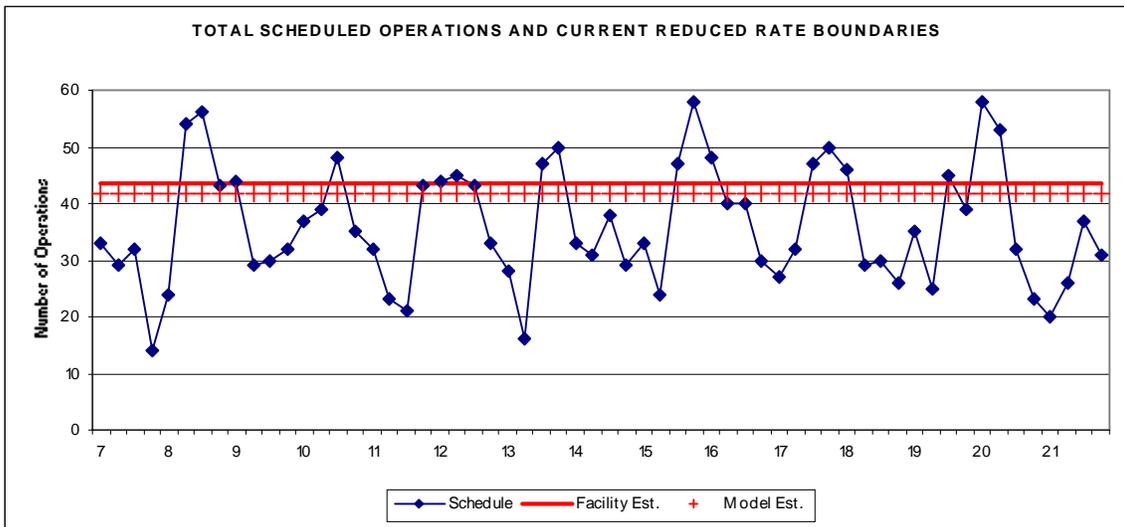


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Arrivals to the two outer runways
 - Departures from two inner runways
- Reduced Rate of (84,90) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



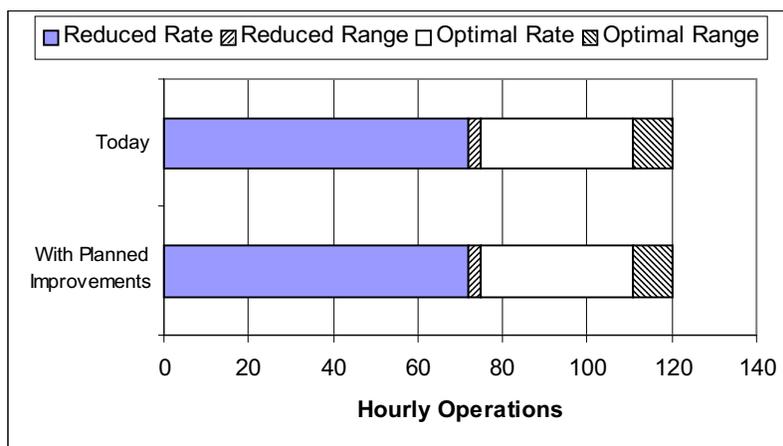
Baltimore Washington International Airport Benchmarks

- The current capacity benchmark at Baltimore Washington is 111-120 flights per hour in good weather.
- Current capacity falls to 72-75 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.
- Carrier schedules at Baltimore Washington are well below capacity throughout the day when the weather is good.
- In adverse weather, scheduled departures occasionally exceed departure capacity but the limited number of arrivals during those time periods prevent serious delay.
- Fewer than 1% of flights were delayed more than 15 minutes at Baltimore Washington in the year 2000.
- Because of the unique runway configuration at Baltimore Washington, the potential gain in future arrivals due to technology and procedural improvements over the next ten years cannot be achieved without a decline in departures. These improvements will therefore not increase the future capacity benchmarks at Baltimore Washington.
- Demand is projected to grow by 27% over the next ten years suggesting that delays may grow significantly in the future.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	111-120	72-75
New Runway	N/A	N/A
With planned improvements	111-120	72-75



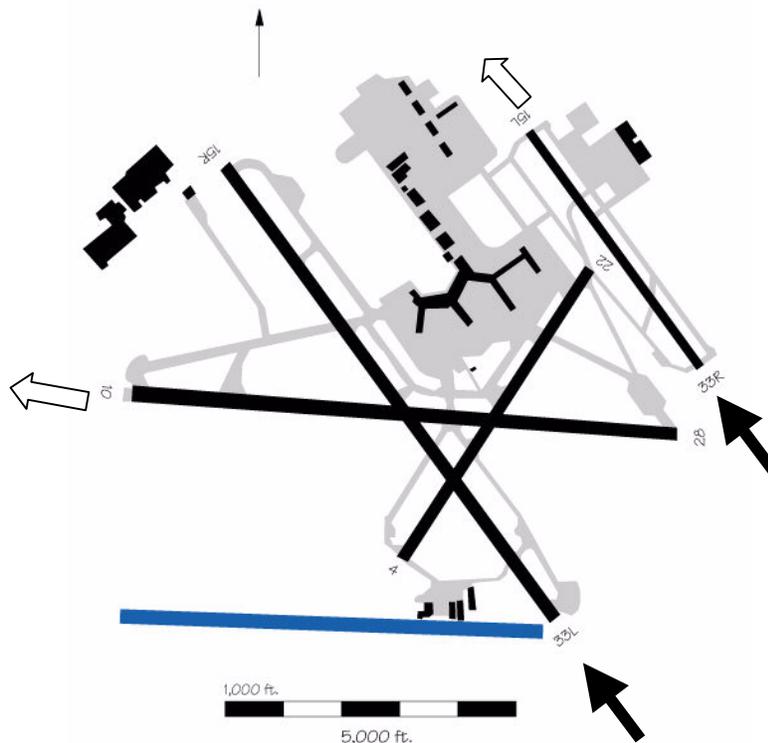
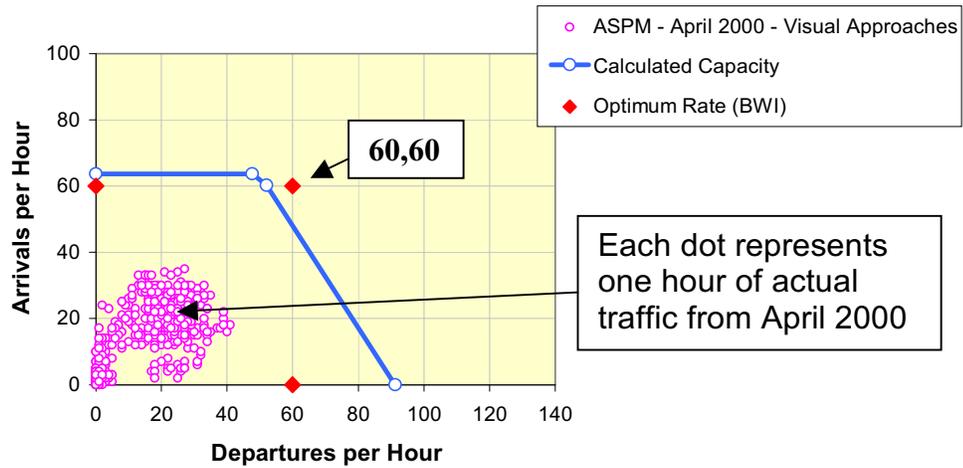
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

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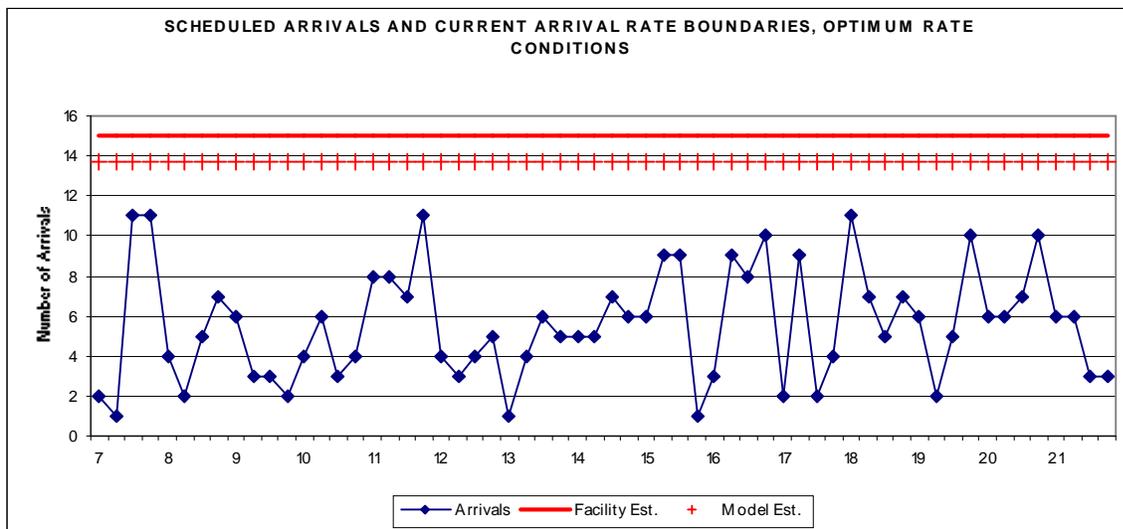
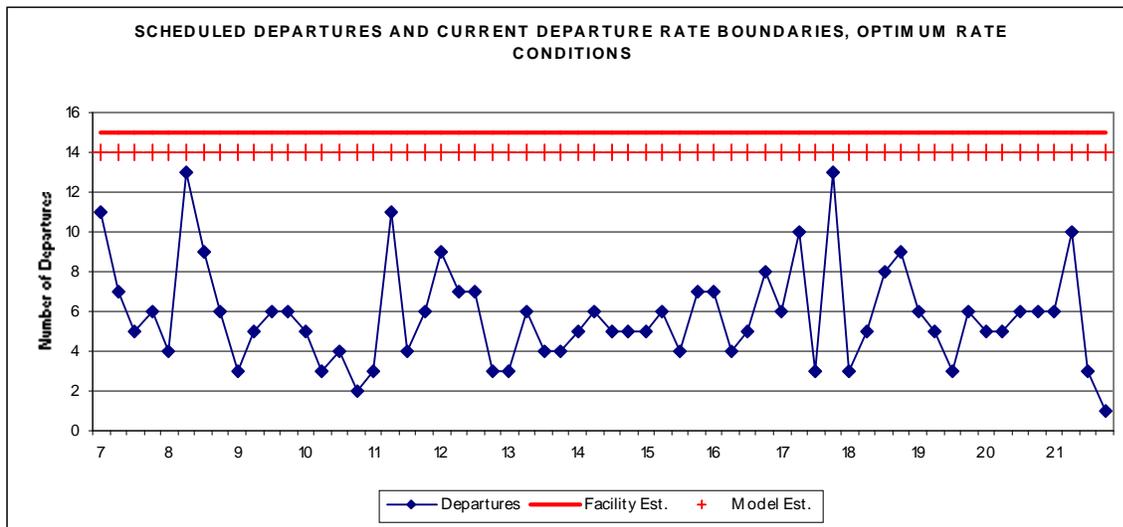
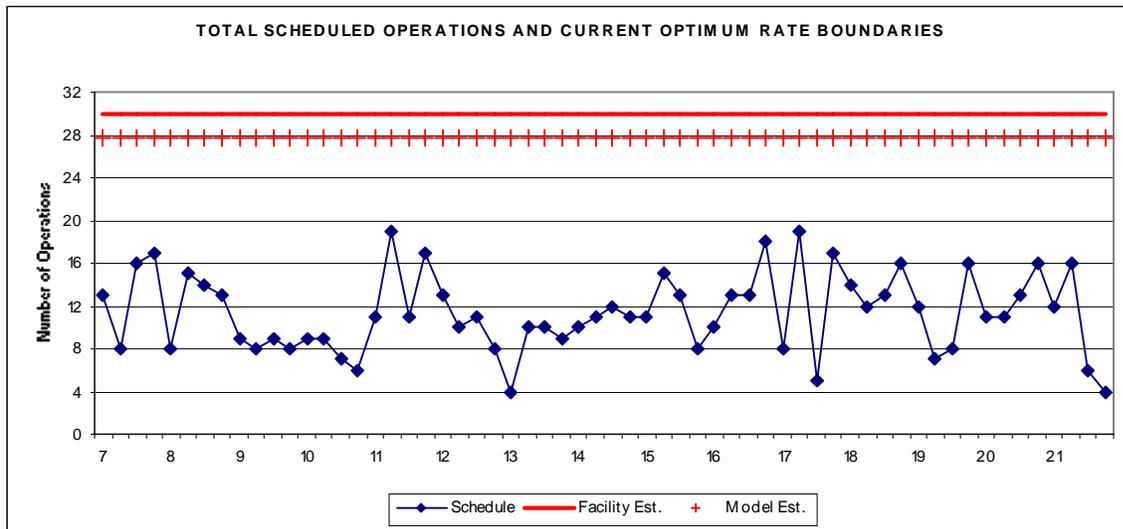
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation - Optimum rate of (60, 60) was reported by the facility
- ASPM data is actual hourly traffic counts
- Chart below represents observed hourly traffic and expected rates in terms of operations per hour. Solid line represents the expected limit of hourly operations: RW33LR&28

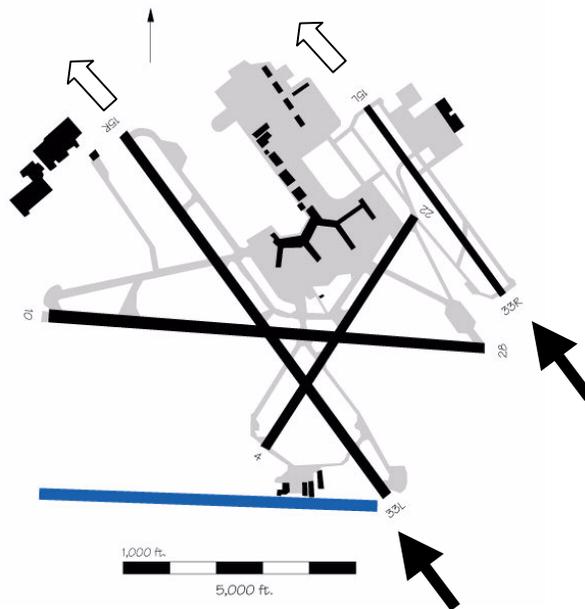
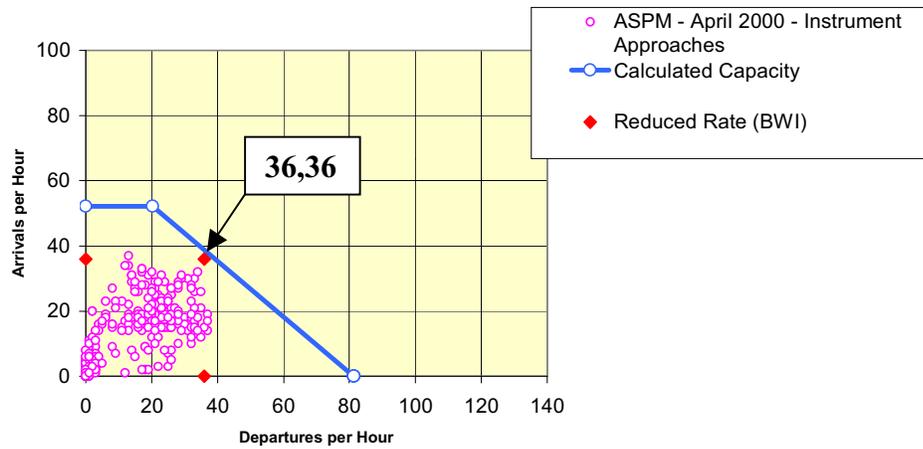


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

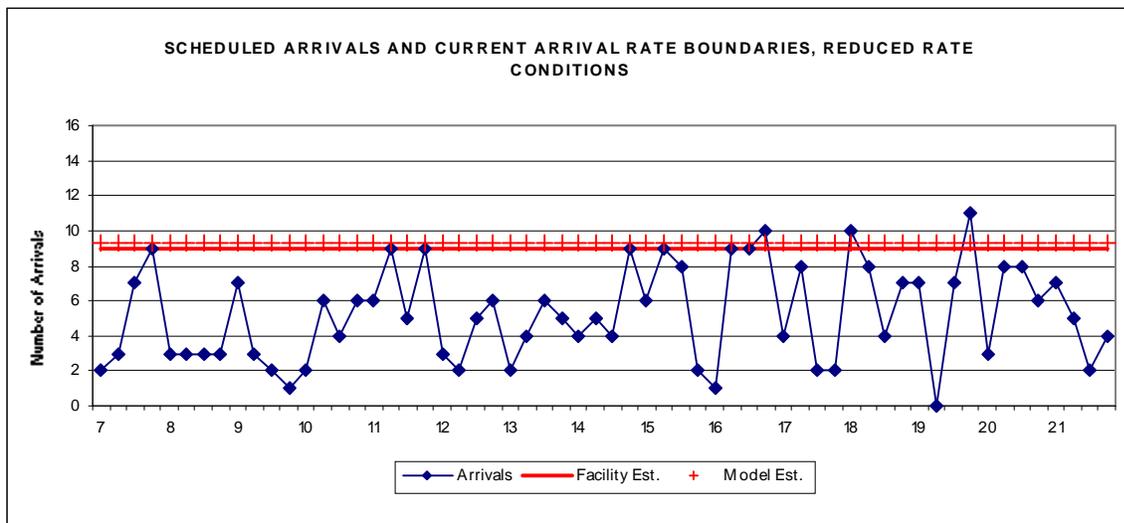
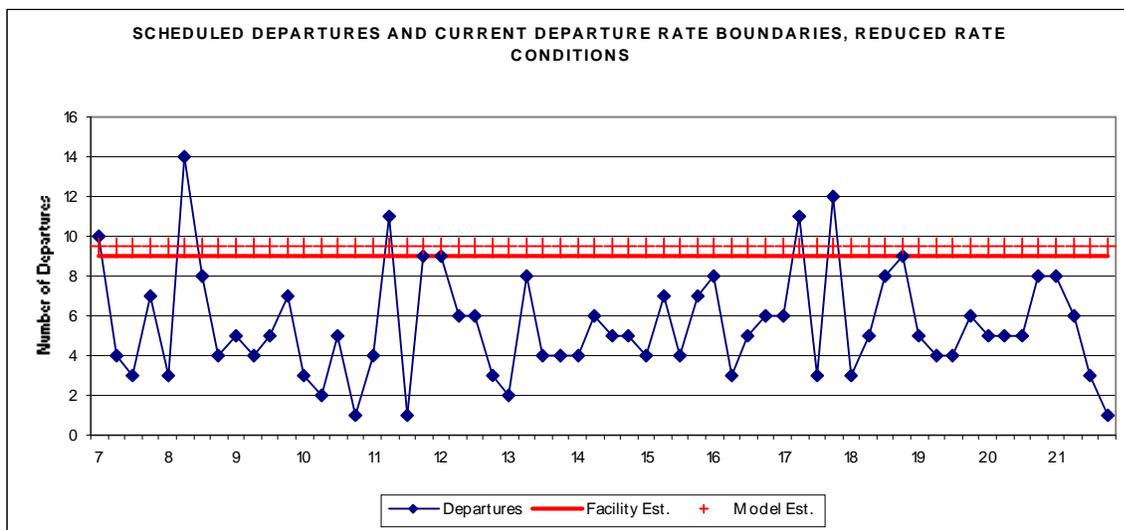
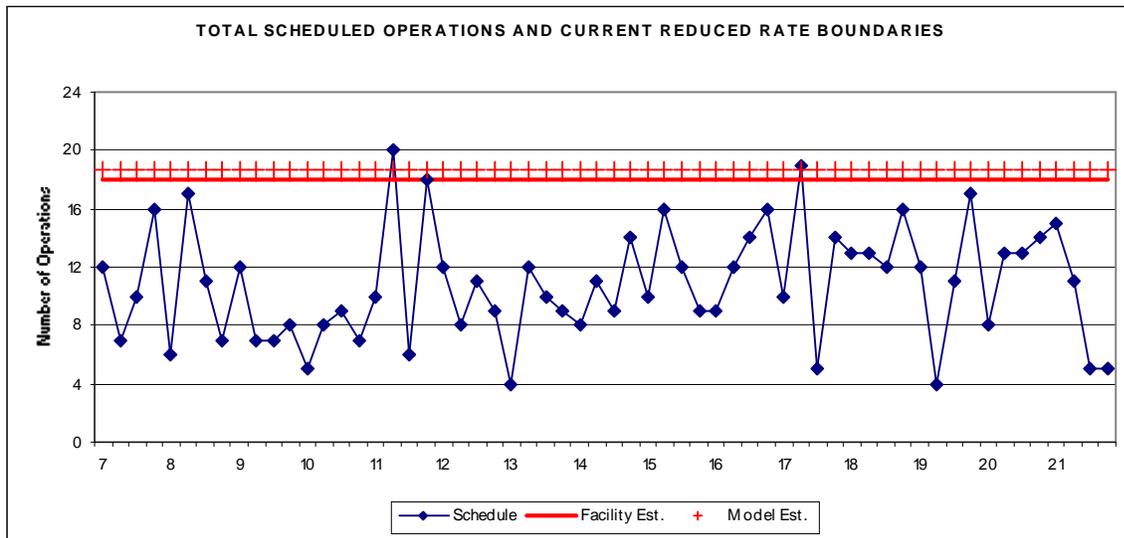


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima) - Reduced rate of (36, 36) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed hourly traffic and expected rates in terms of operations per hour. Solid line represents the expected limit of hourly operations: RW15LR OR 33LR



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



Boston Logan International Airport Benchmarks

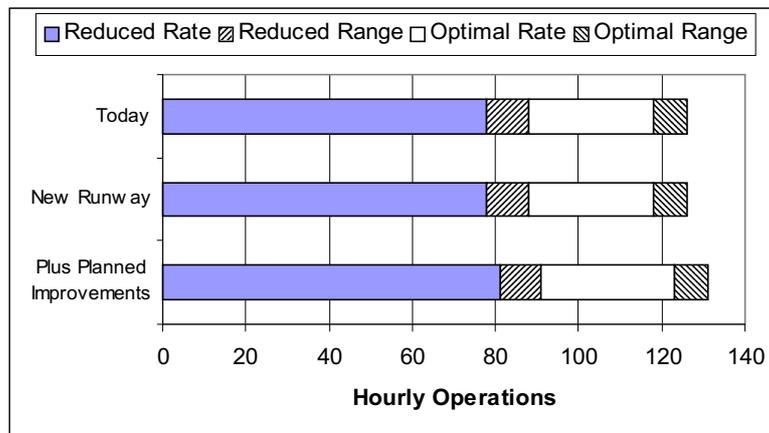
- The current capacity benchmark at Boston Logan is 118-126 flights per hour in good weather.
- Current capacity falls to 78-88 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.
- Traffic peaks at Boston can be handled today under good weather conditions when the winds favor the most efficient runway configuration. Peaks are periods of high concentration of arrival and/or departure traffic.
- During adverse weather, capacity is lower and these peaks cannot be handled as well.
- In 2000, Boston was ranked fifth in the country in number of flights significantly delayed (more than 15 minutes). Roughly 5% of aircraft are delayed 15 minutes or longer.
- In adverse weather, capacity is lower and scheduled traffic exceeds capacity 8 hours of the day and the percentage of significantly delayed flights jumps to 12%.
- A new runway, planned for completion in 2005, will not affect the Boston capacity benchmarks. Instead, this runway will help mitigate delays normally encountered during adverse wind conditions when the airport is reduced to a single runway operation today. This assumes that airspace, ground infrastructure, and environmental constraints allow planned use of the runway.
- In addition to the new runway, technology and procedural improvements are expected to increase the Boston capacity benchmark by 4% in both good and adverse weather over the next 10 years.
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- Demand is expected to grow by 6% over the next decade but delays are not expected to increase primarily due to the construction of the new runway.

BOS – Boston Logan International Airport

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	118-126	78-88
New Runway	118-126	78-88
Plus planned improvements	123-131	81-91



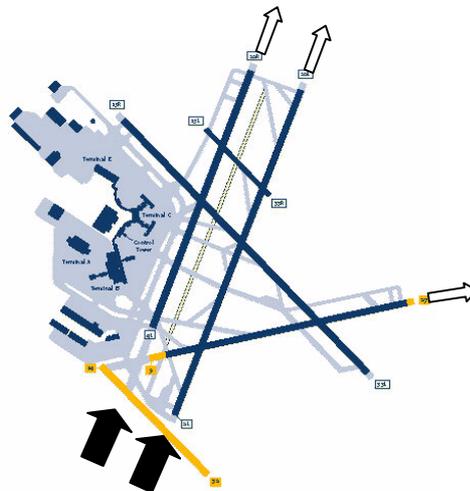
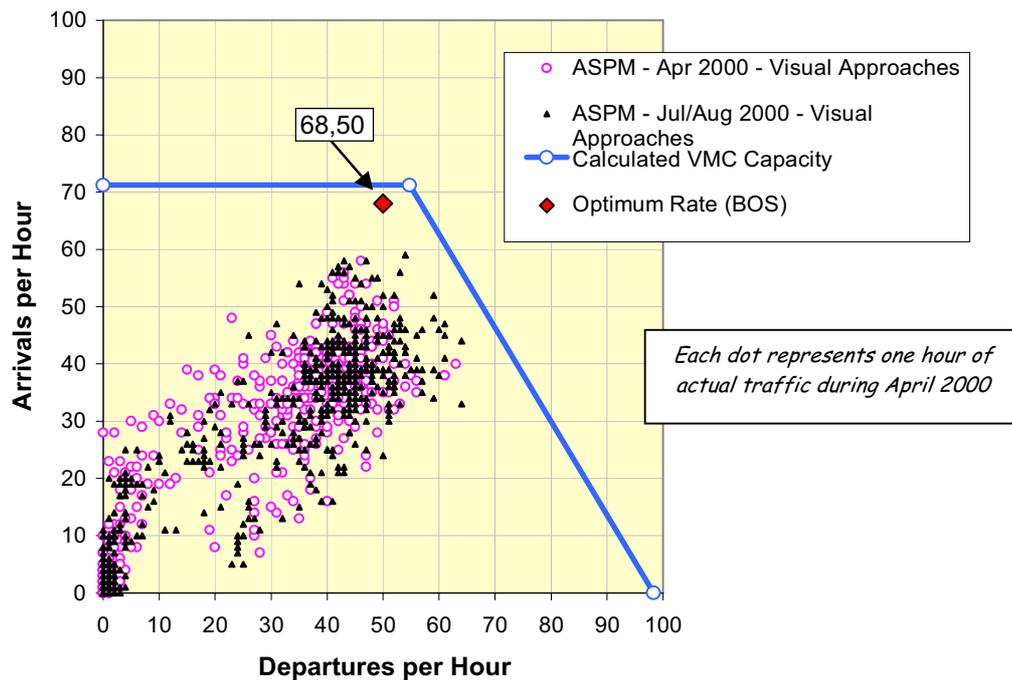
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

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

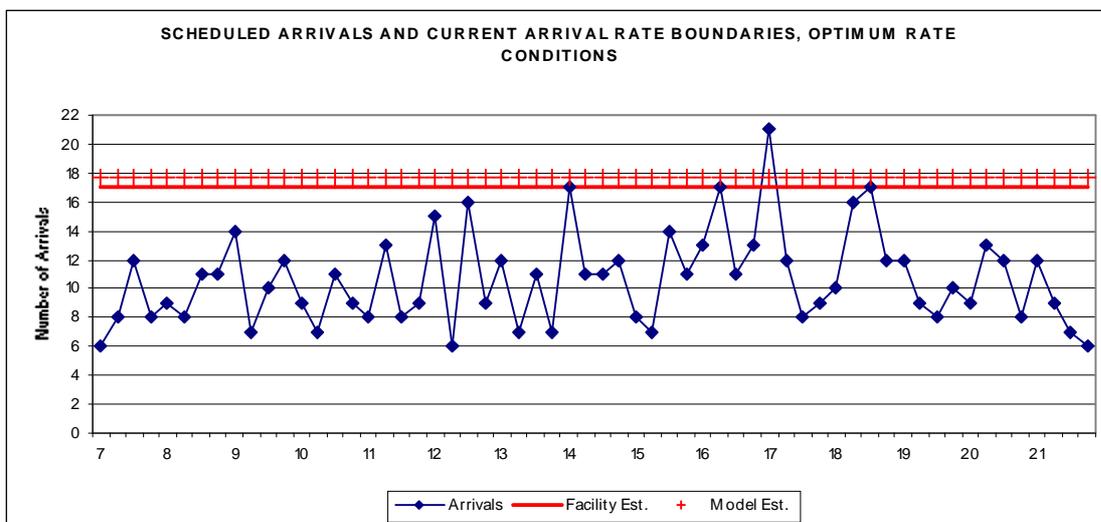
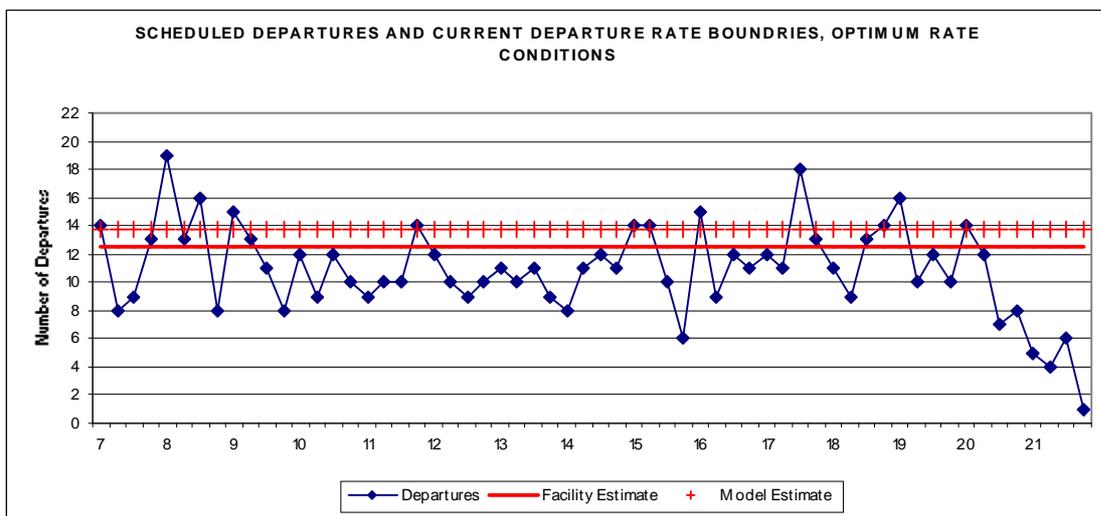
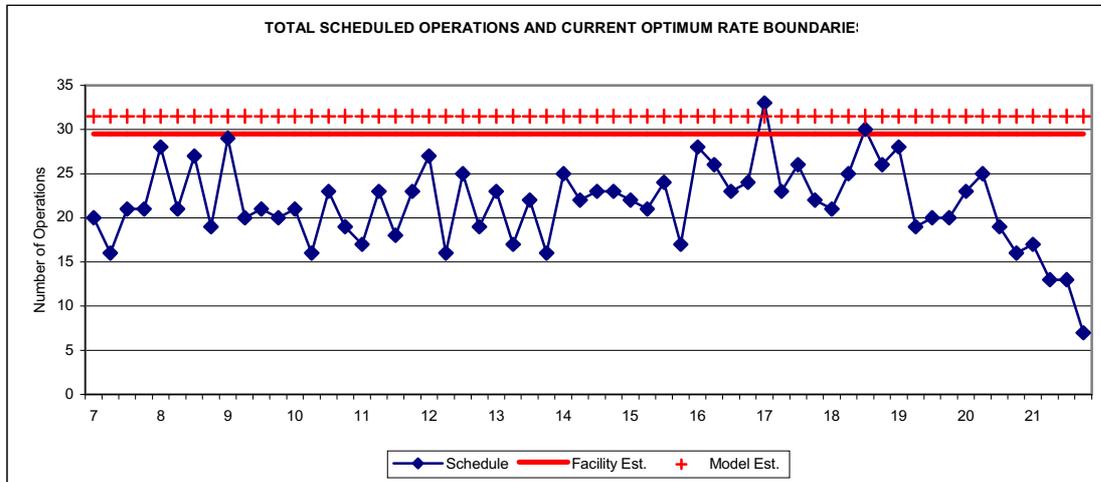
Current Operations – Optimum Rate

- Visual approaches, visual separation – Runway 4R, 4L, 9
 - Optimum rate of (68,50) was reported by the facility
- ASPM data is actual hourly traffic counts for the month of April 2000 (and for July/August 2000) for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- Solid line represents the calculated airport capacity during a busy hour, and the tradeoff between arrivals and departure rates
- The capacity model can only approximate the complex operations at BOS
- Demand at BOS may reach or exceed the calculated capacity during short periods (15 minutes) during busy hours



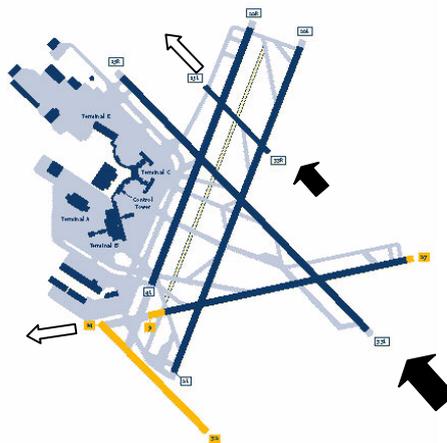
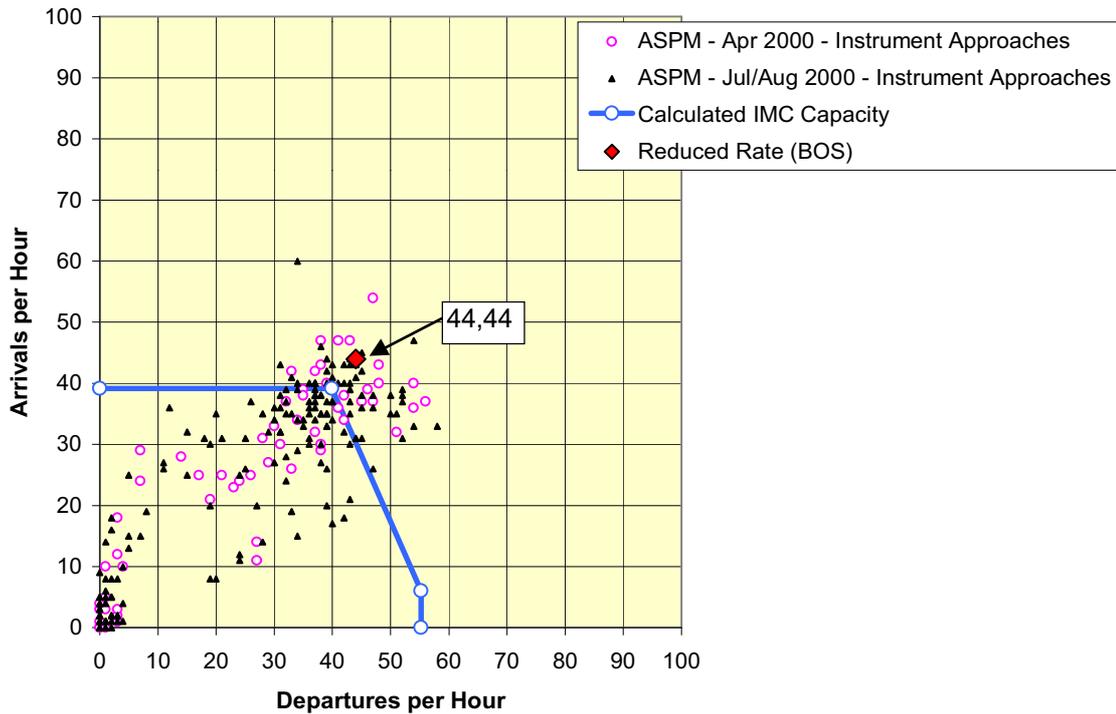
BOS – Boston Logan International Airport

Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions



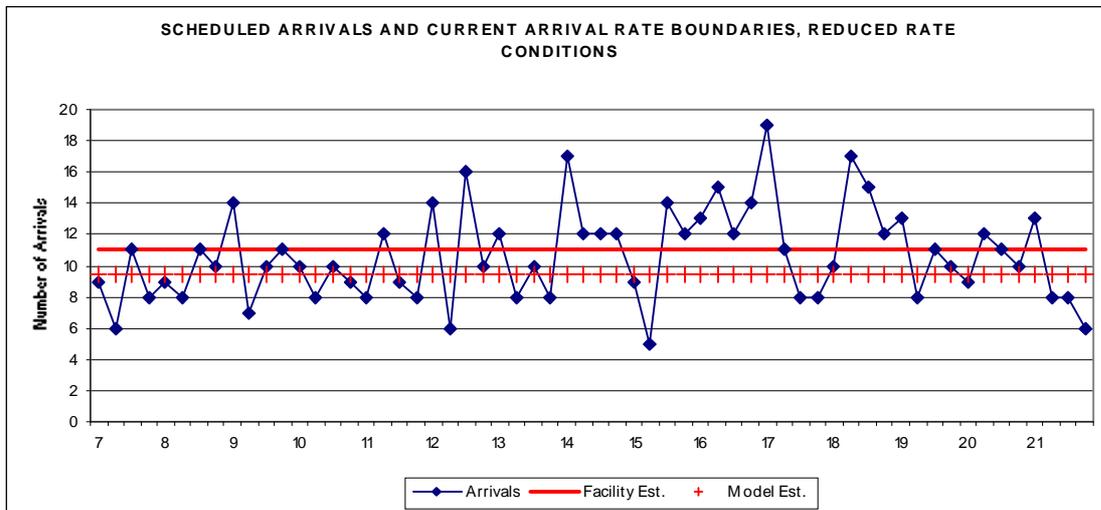
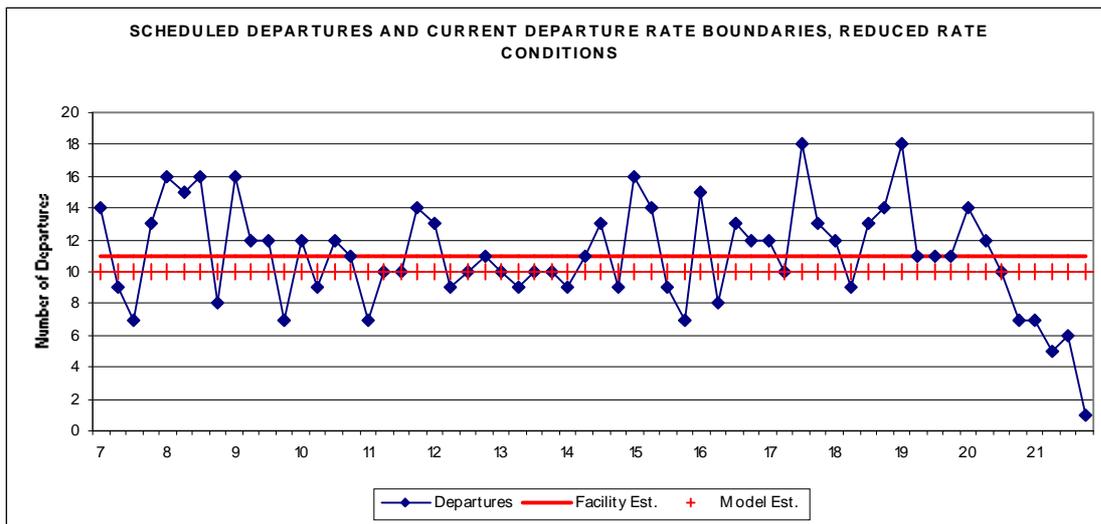
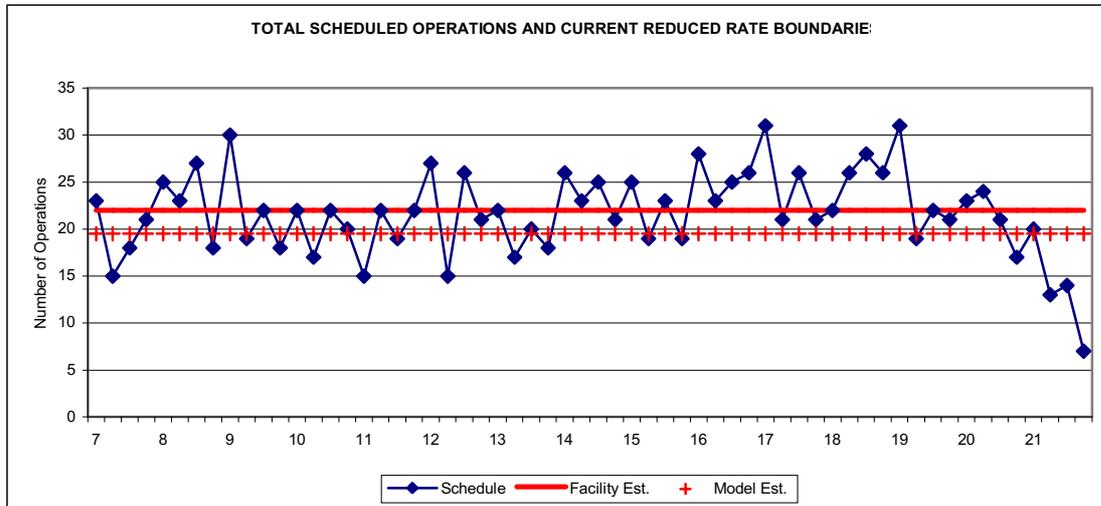
Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima) – Runway 33L/R, 27
- Hourly rate of (44, 44) was reported by the facility
- ASPM data for “Instrument Approaches” can include other configurations or marginal VFR, with higher acceptance rates
- The capacity model can only approximate the complex operations at BOS
 - Model results assume 6 arrivals and 6 departures per hour on Runway 33R, as reported by the facility
- Chart below represents observed traffic and expected rates in terms of operations per hour



BOS – Boston Logan International Airport

Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



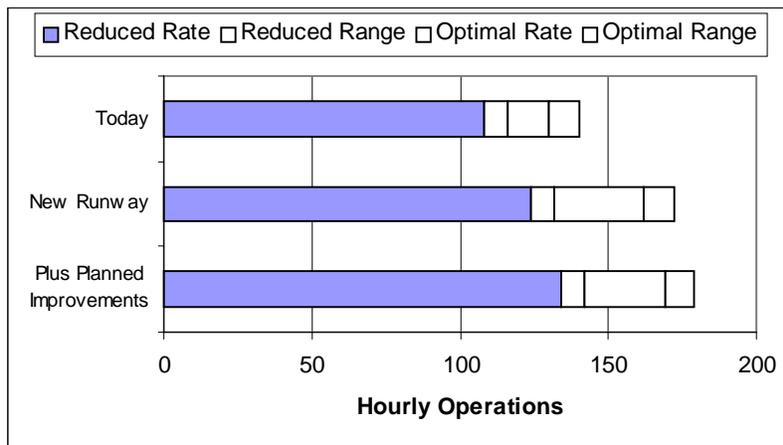
Charlotte Douglas International Airport Benchmarks

- The current capacity benchmark at Charlotte is 130-140 flights per hour in good weather.
- Current capacity falls to 108-116 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.
- In good weather, Charlotte has substantial excess capacity despite a large number of departure and arrival peaks. Peaks are periods of high concentration of arrival and/or departure traffic.
- When capacity declines in adverse weather, Charlotte sometimes has trouble getting departures out on time.
- Less than 1% of Charlotte's flights were delayed more than 15 minutes in 2000.
- A new runway, scheduled to open in 2004, is expected to improve Charlotte's capacity benchmark in good weather by 25% (to 162-172 flights per hour) and by 15% (to 124-132 flights per hour) in adverse weather. This assumes that airspace, ground infrastructure, and environmental constraints allow full use of the runway.
- In addition, optimal utilization of the new runway, as enabled by technology and procedural improvements, is expected to increase Charlotte's good weather capacity benchmark by a total of 30% (to 169-179 flights per hour) in good weather over the next 10 years.
- The adverse weather capacity benchmark will increase by a total of 24% (to 134-142 flights per hour) compared to today.
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- Demand is expected to grow by 15% over the same time period so delays are not expected to become a problem at Charlotte, due primarily to the new runway at the airport.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	130-140	108-116
New Runway	162-172	124-132
Plus planned improvements	169-179	134-142



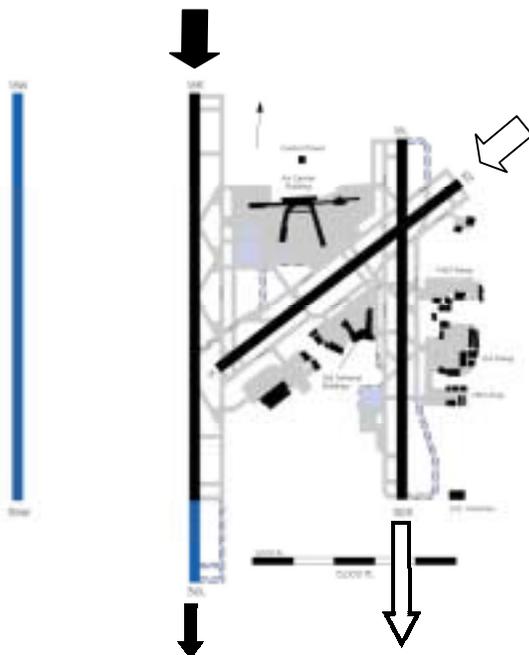
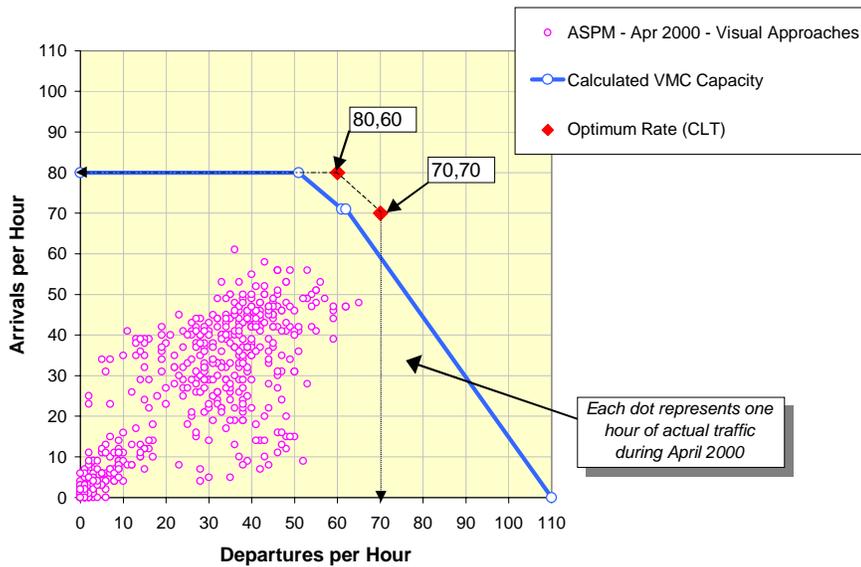
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

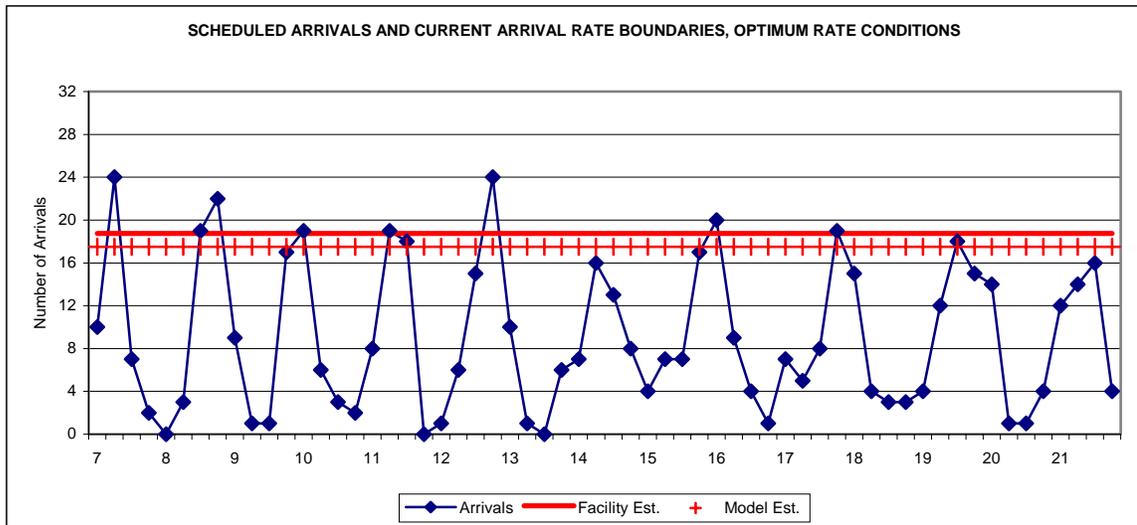
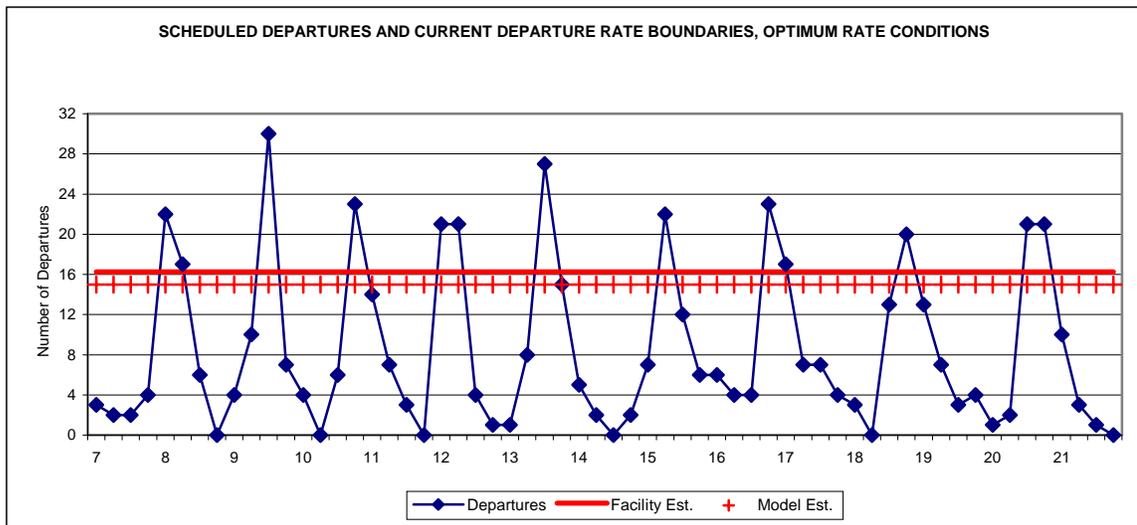
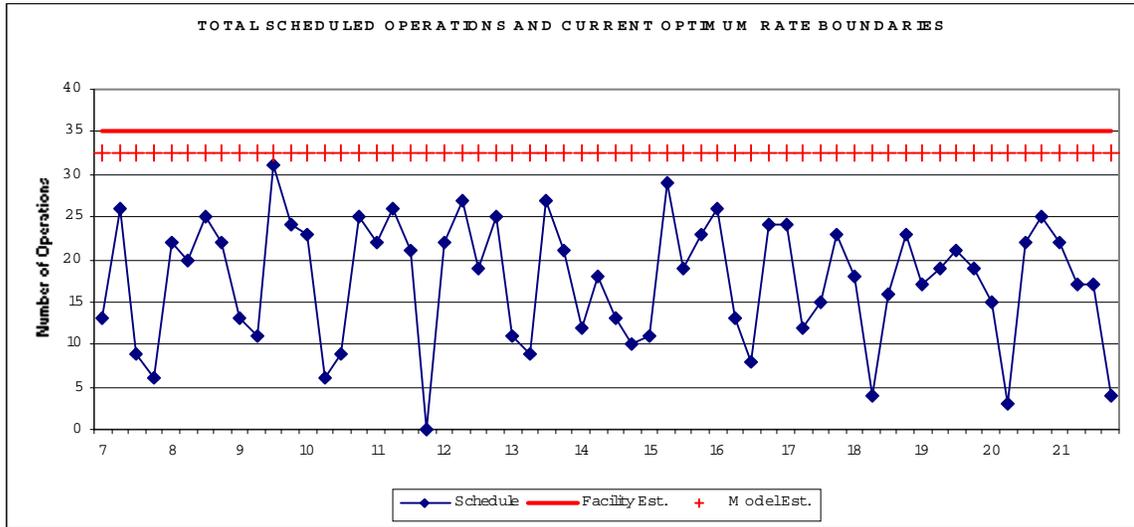
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations- Optimum Rate

- Visual approaches, visual separation – Optimum Rate of (80, 70-maximums) was reported by the facility
- Arrive Runways 18R/23, Depart Runways 18L/R
- ASPM data is actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- Solid line represents the calculated airport capacity during a busy hour, and the tradeoff between arrivals and departure rates
- The capacity model can only approximate the operations at CLT

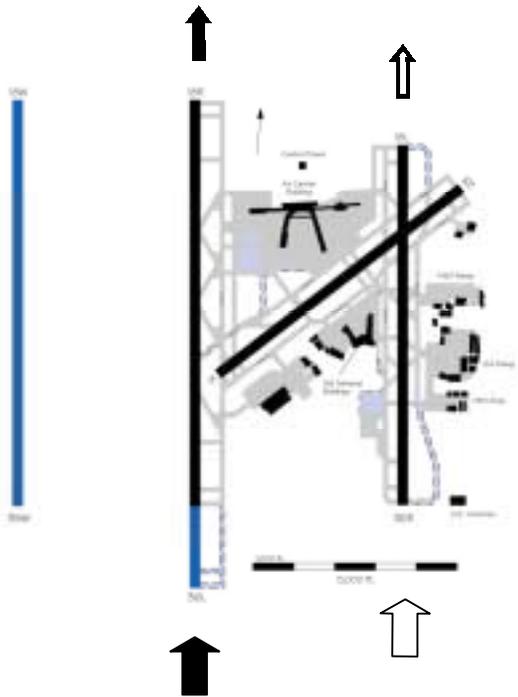
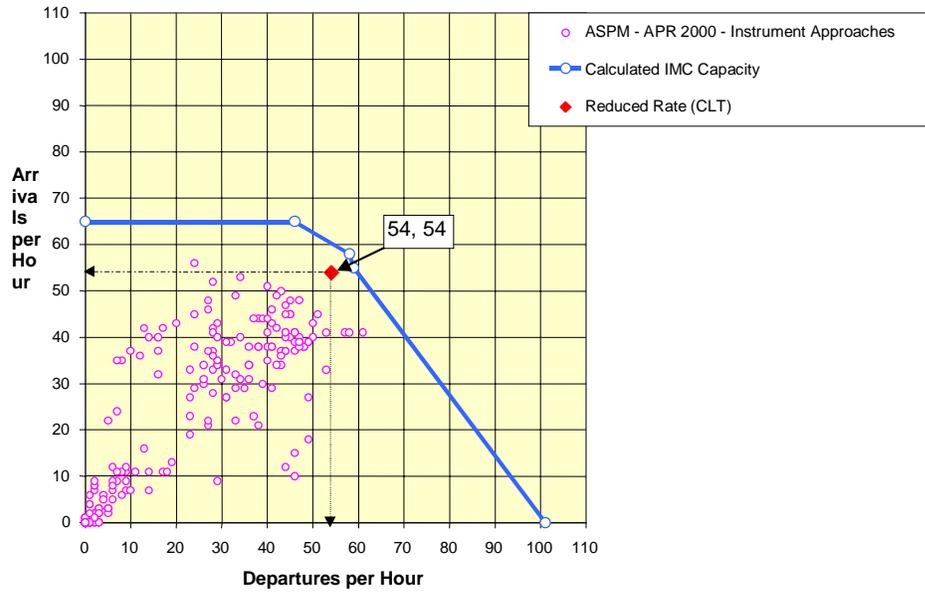


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

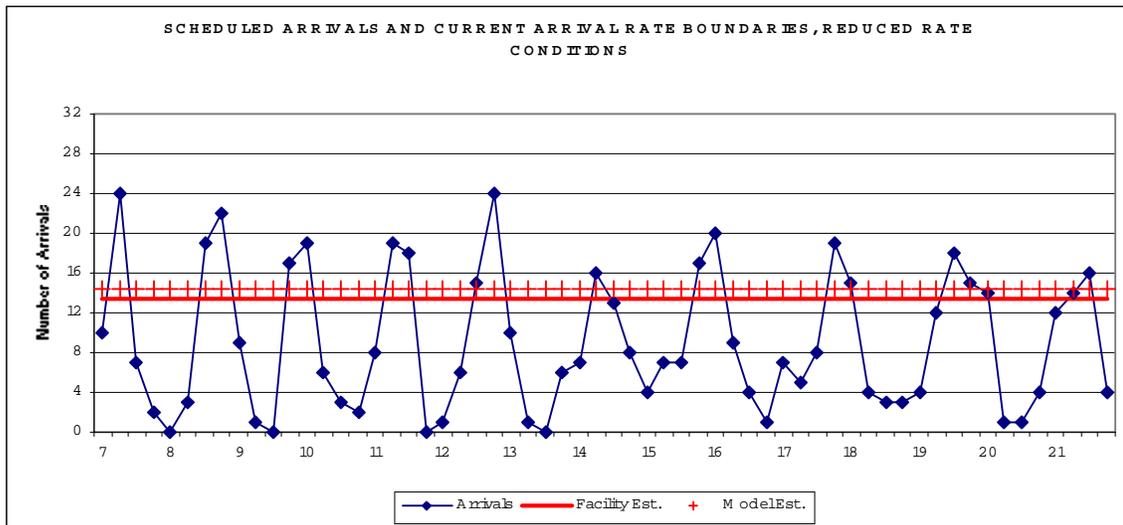
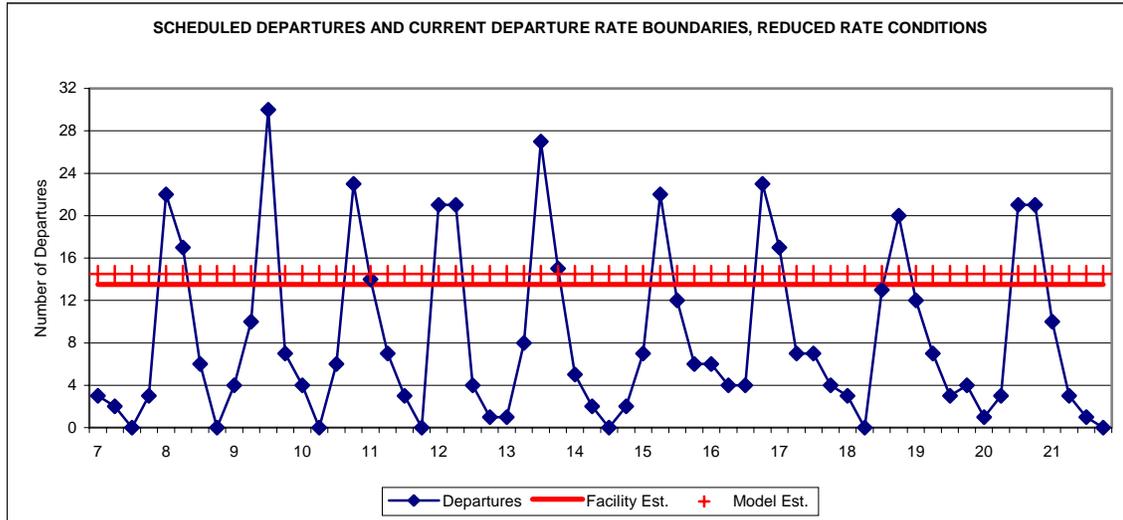
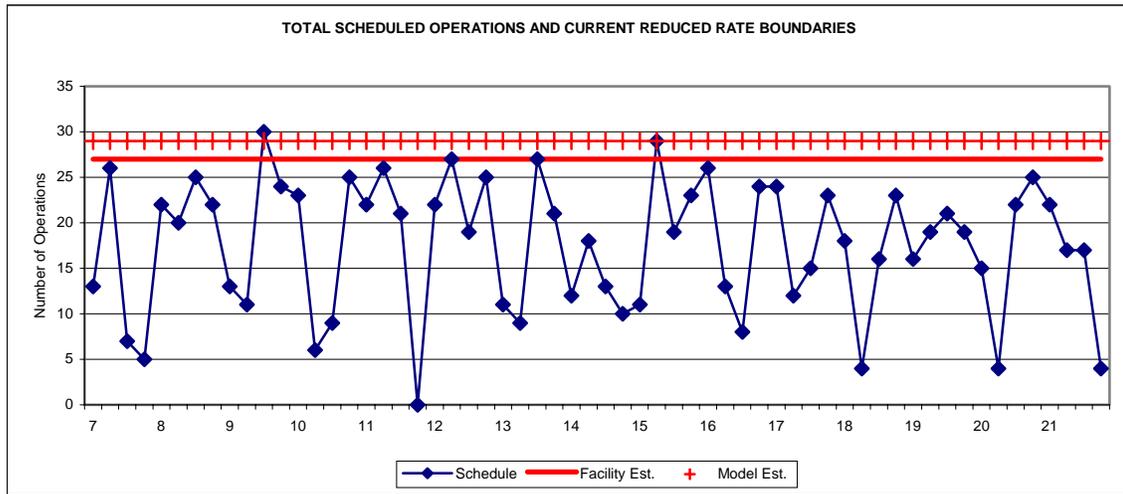


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
- Arrive and Depart Runways 36L/R
- Reduced Rate of (54, 54) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



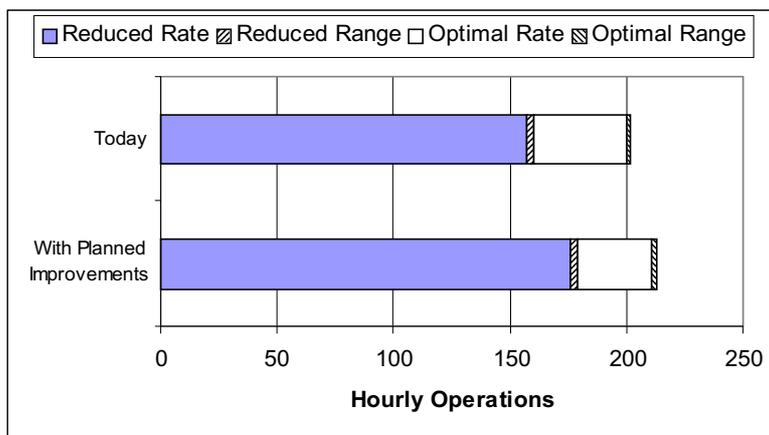
Chicago O'Hare International Airport Benchmarks

- The current capacity benchmark at Chicago O'Hare is 200-202 flights per hour in good weather.
- Current capacity falls to 157-160 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.
- In 2000, O'Hare was ranked third most delayed airport in the country. Overall, slightly more than 6% of all flights were delayed significantly (more than 15 minutes).
- On good weather days, scheduled traffic is at or above the capacity benchmark for 3 ½ hours of the day and about 2% of the flights are delayed significantly.
- In adverse weather, capacity is lower and scheduled traffic exceeds capacity for 8 hours of the day. The number of significantly delayed flights jumps to 12%.
- Technology and procedural improvements are expected to increase O'Hare's capacity benchmark by 6% (211-213 flights per hour) in good weather over the next 10 years.
- The adverse weather capacity benchmark will increase by a total of 12% (176-179 flights per hour) compared to today.
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- Demand at Chicago O'Hare is projected to grow by 18% over the next decade. This imbalance between capacity and demand growth is expected to significantly increase delays at O'Hare.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	200-202	157-160
New Runway	N/A	N/A
With planned improvements	211-213	176-179



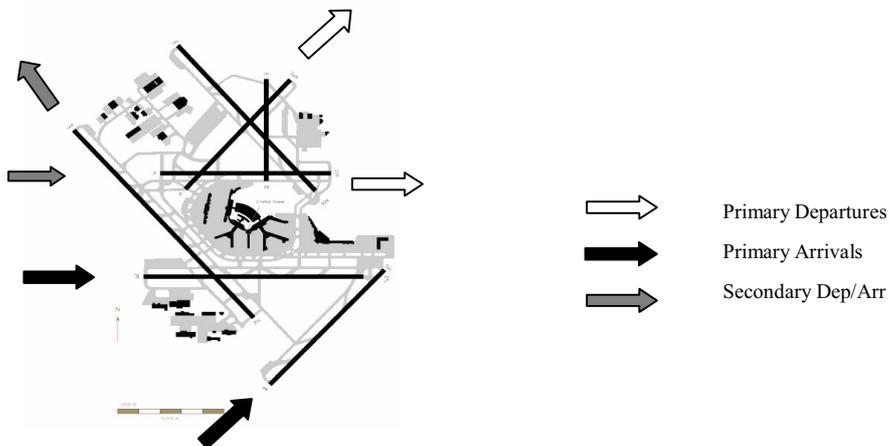
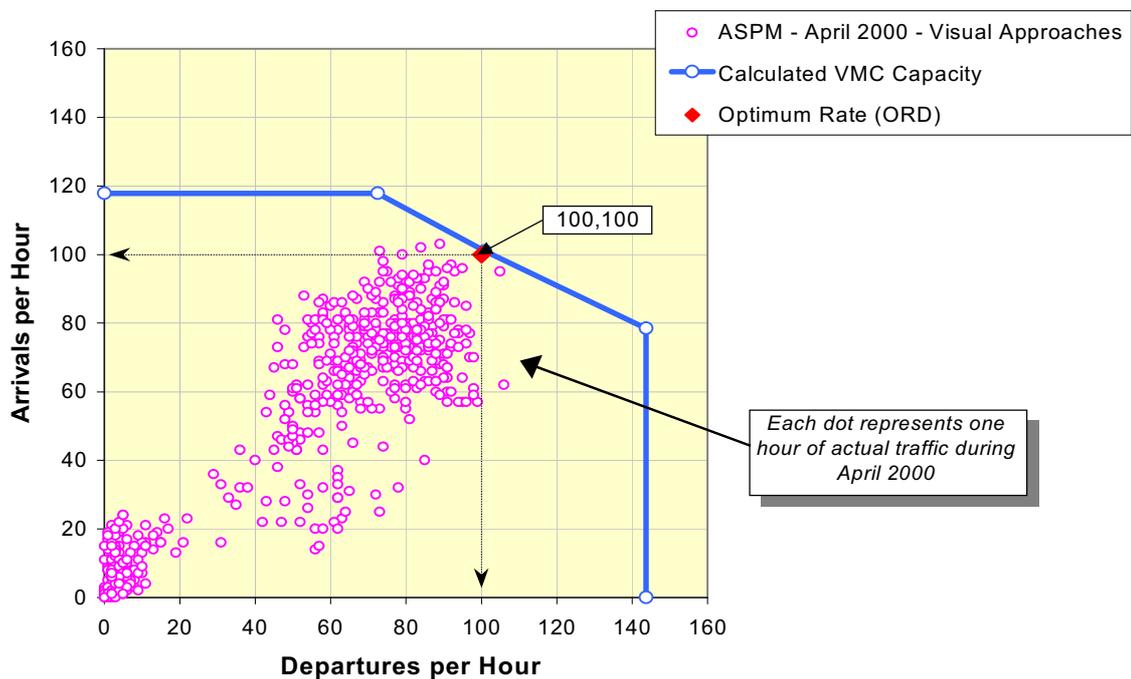
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

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

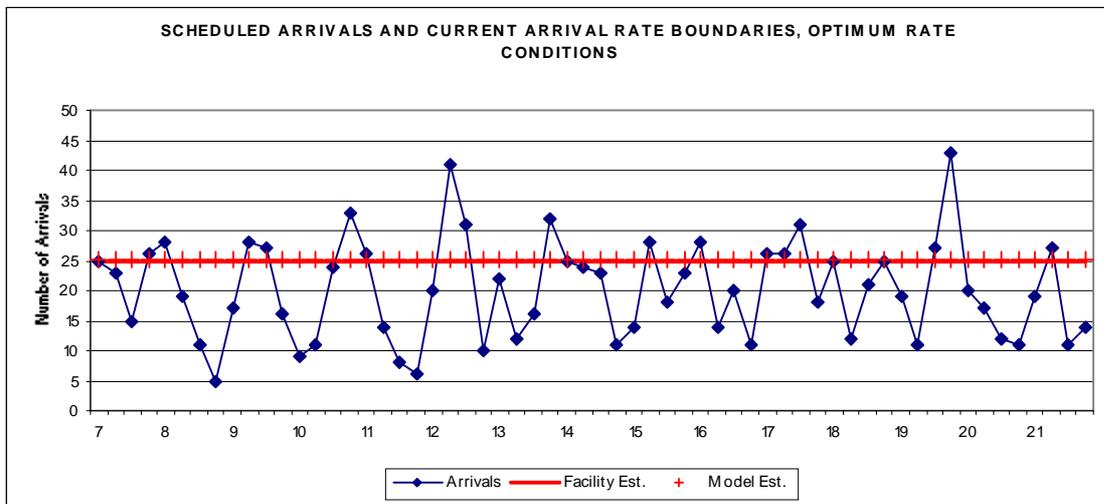
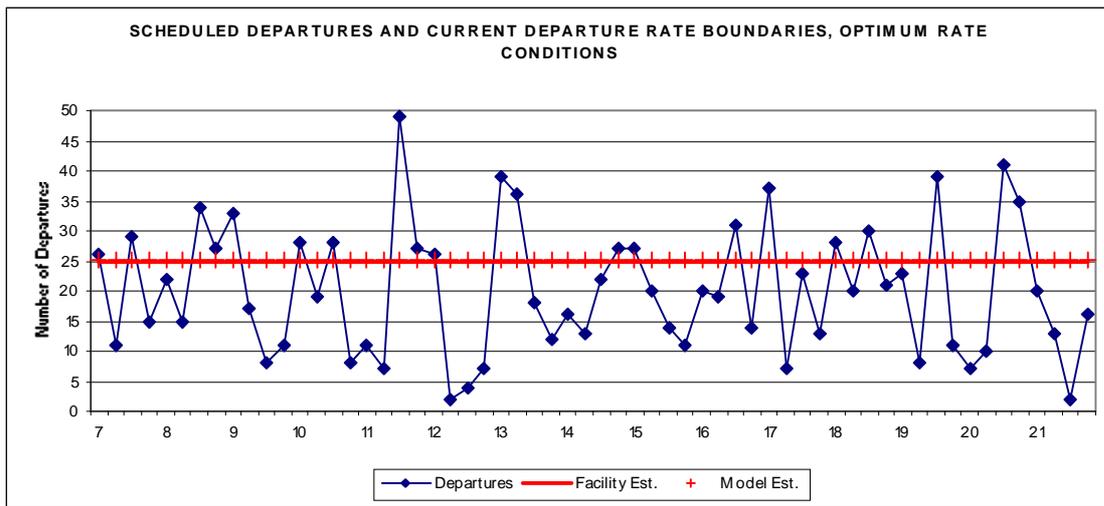
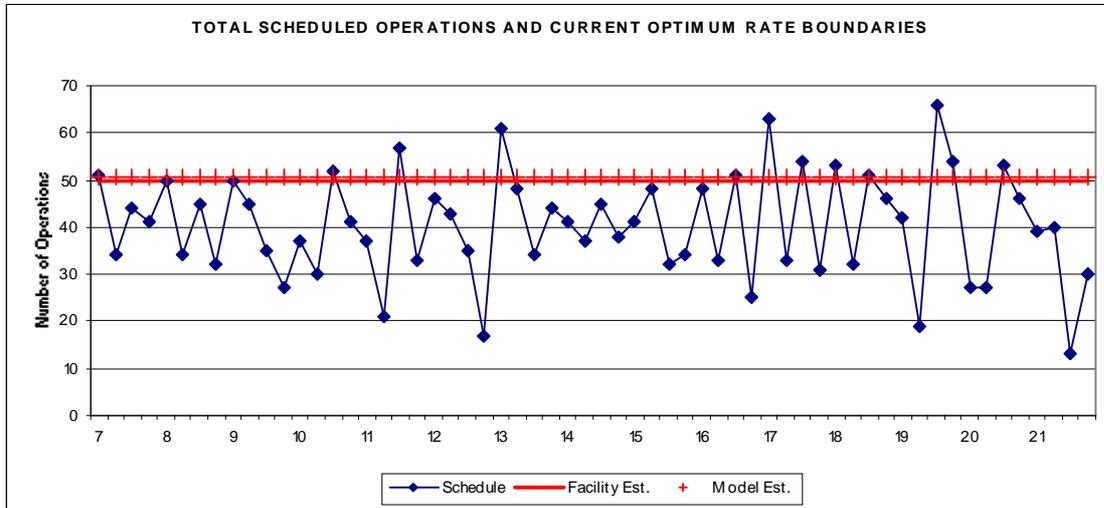
Current Operations – Optimum Rate

- Visual approaches, visual separation
 - Plan X: Arr: 4R/9R/(9L), Dep: 4L/9L/32L
 - Arrivals primarily to two+ parallel runways, depending on wind direction
 - Departures from two or more runways
- ASPM data is actual hourly traffic counts
- ORD frequently operates close to maximum rate
- Modeled capacity is close to actual throughput



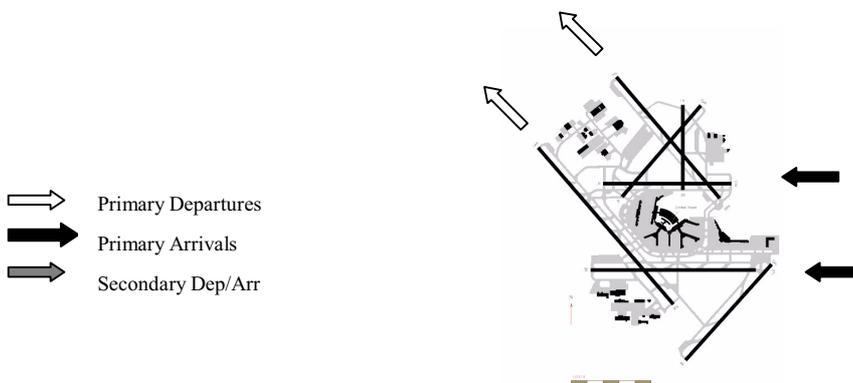
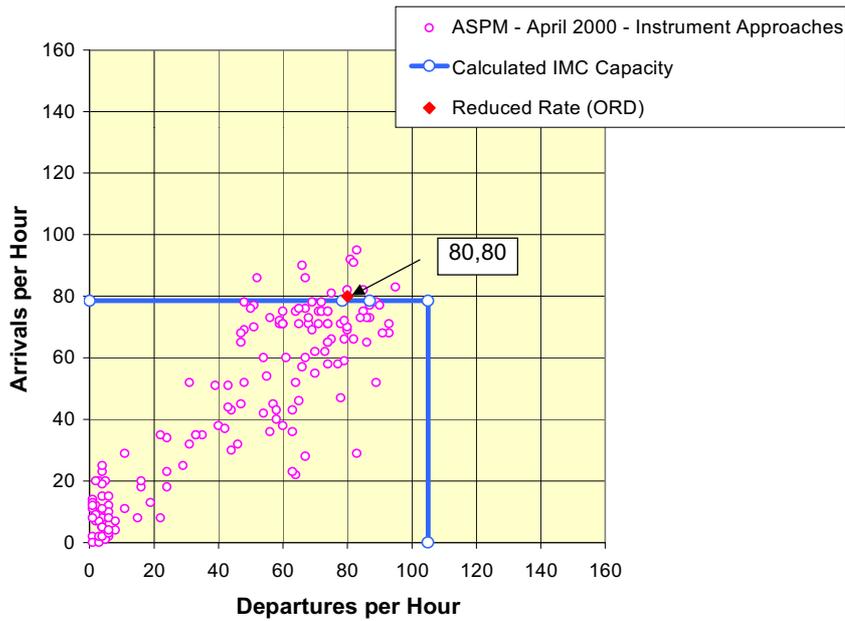
ORD – Chicago O’Hare International Airport

Scheduled Departures and Arrivals and Current Departures and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions



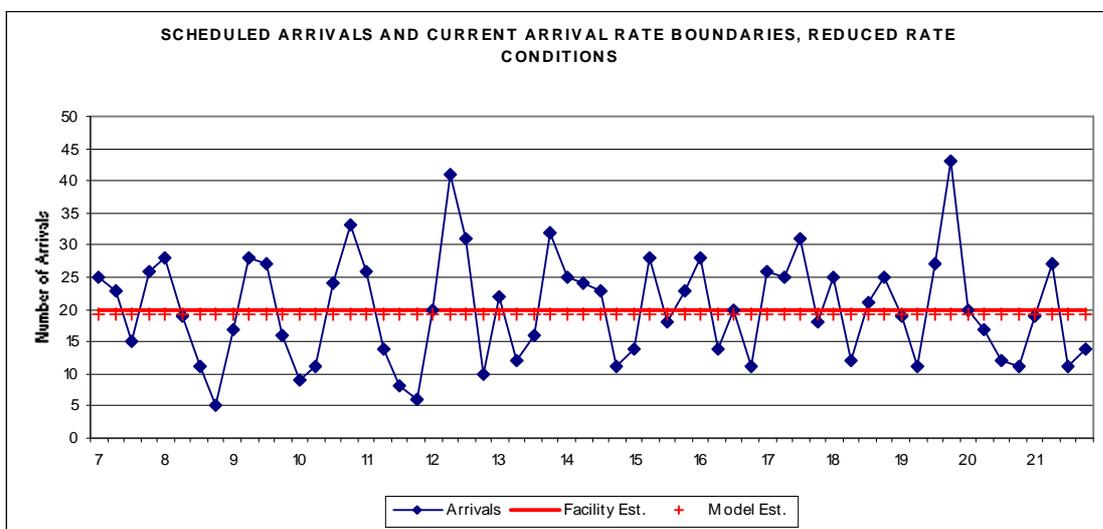
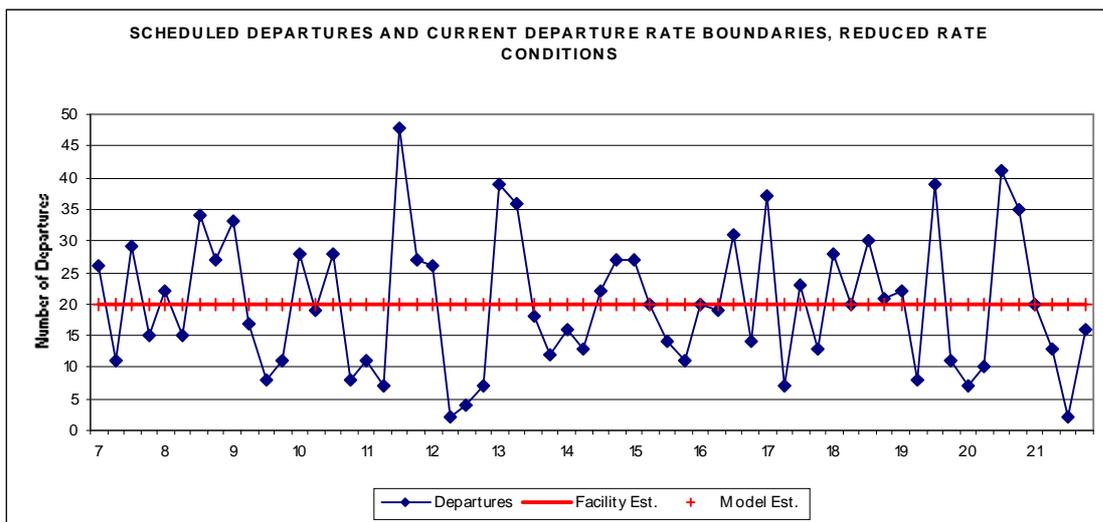
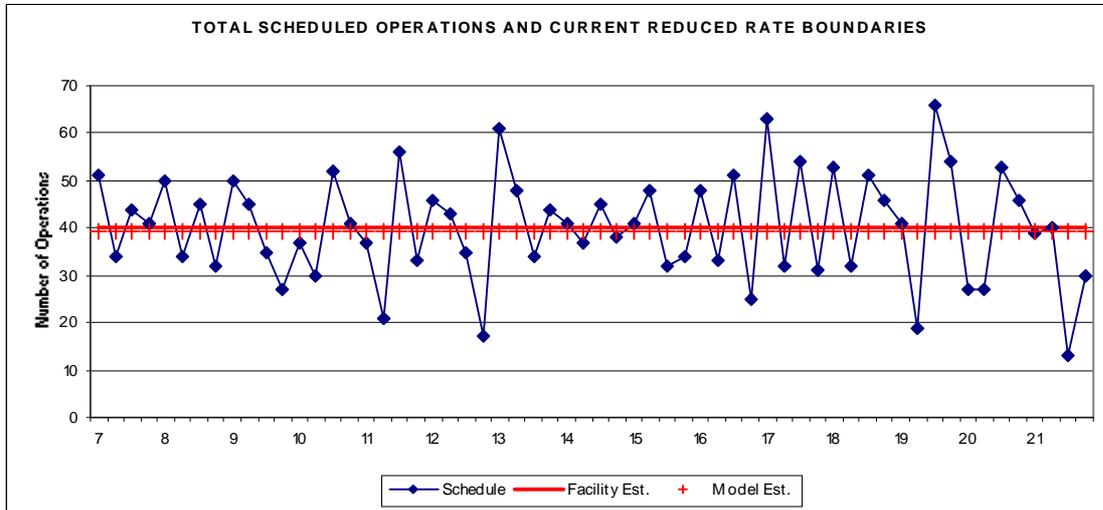
Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Arrivals to two parallel runways
 - Departures from two+ parallel runways
- Calculated capacities are close to reported AAR and ADR
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates.



ORD – Chicago O’Hare International Airport

Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



Cincinnati/Northern Kentucky International Airport Benchmarks

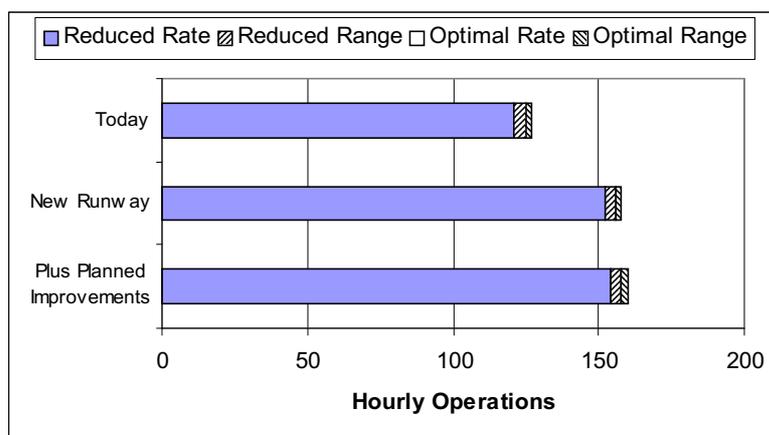
- The current capacity benchmark at Cincinnati is 123-125 flights per hour in good weather.
- Current capacity falls to 121-125 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.
- Cincinnati is one of the few airports whose capacity does not change much when the weather deteriorates.
- The peaks in scheduled departures and arrivals tend to be complementary, as that capacity is adequate to handle current demand with minimal delay. Peaks are periods of high concentration of arrival and/or departure traffic.
- Less than 2% of Cincinnati's flights were delayed more than 15 minutes in 2000.
- A new runway, planned for completion in 2005, is expected to improve Cincinnati's capacity benchmark by 26% in both good and bad weather (to roughly 152-157 flights per hour). This assumes that airspace, ground infrastructure, and environmental constraints allow full use of the runway.
- In addition, technology and procedural improvements, when combined with the new runway, are expected to increase Cincinnati's capacity benchmark by a total of 28% (to 155-157 flights per hour in good and 27% in adverse weather conditions over the next 10 years).
- These capacity increases could be brought about as a result of:
 - Triple simultaneous instrument approaches with the new runway.
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- Demand at Cincinnati is projected to grow 40% over the next decade, which suggests that delays may become more of a problem in the future.

CVG – Cincinnati/Northern Kentucky International Airport

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	123-125	121-125
New Runway	155-157	152-156
Plus planned improvements	158-160	154-158



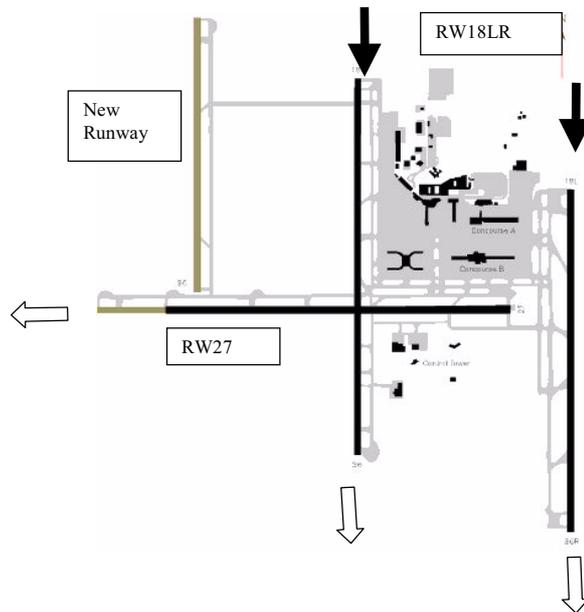
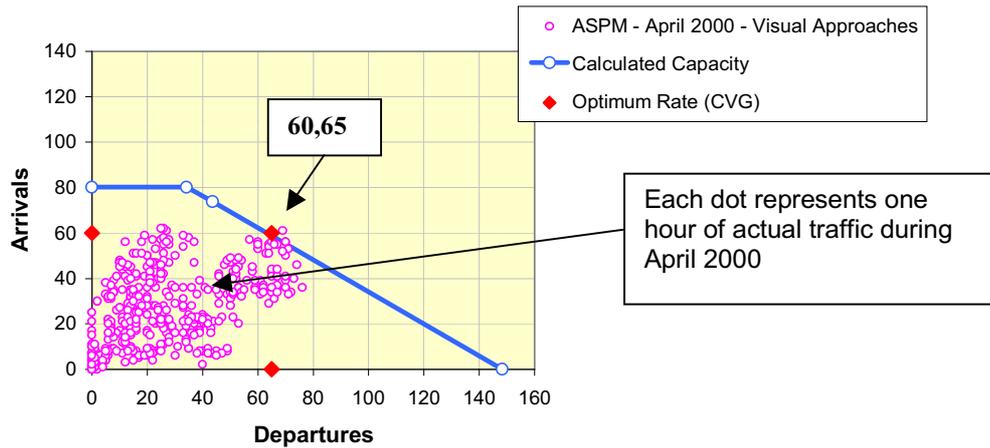
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - Triple simultaneous instrument approaches with the new runway
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

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

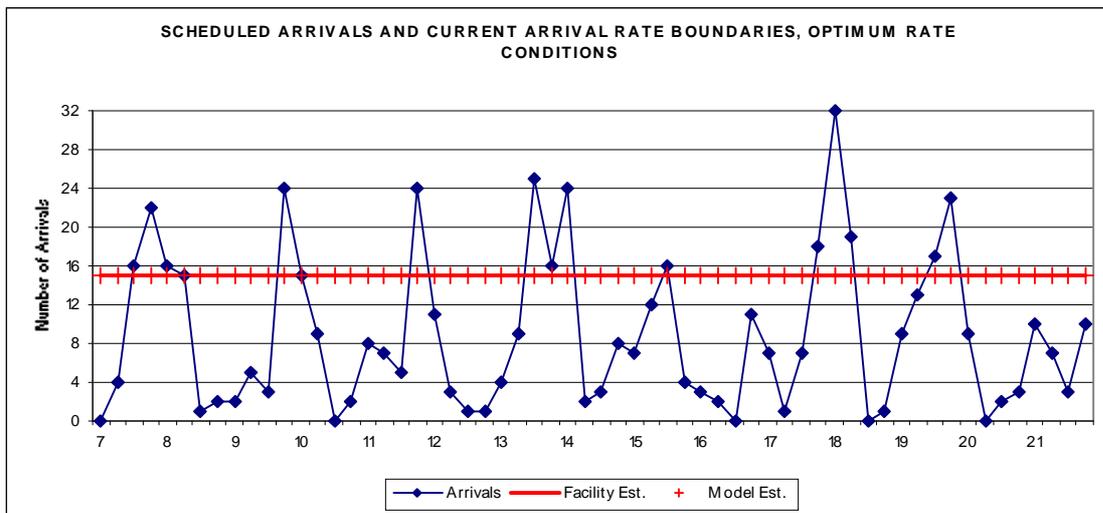
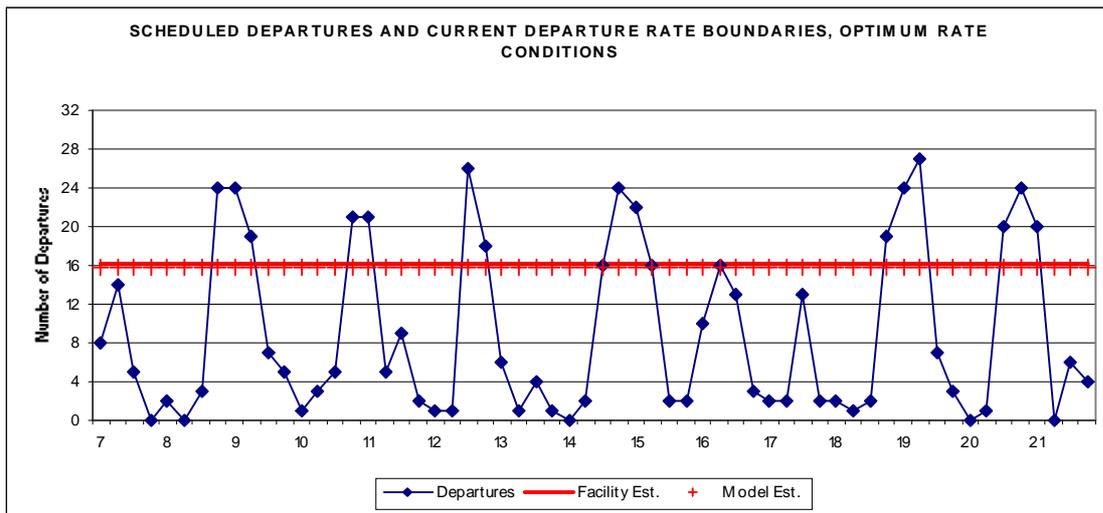
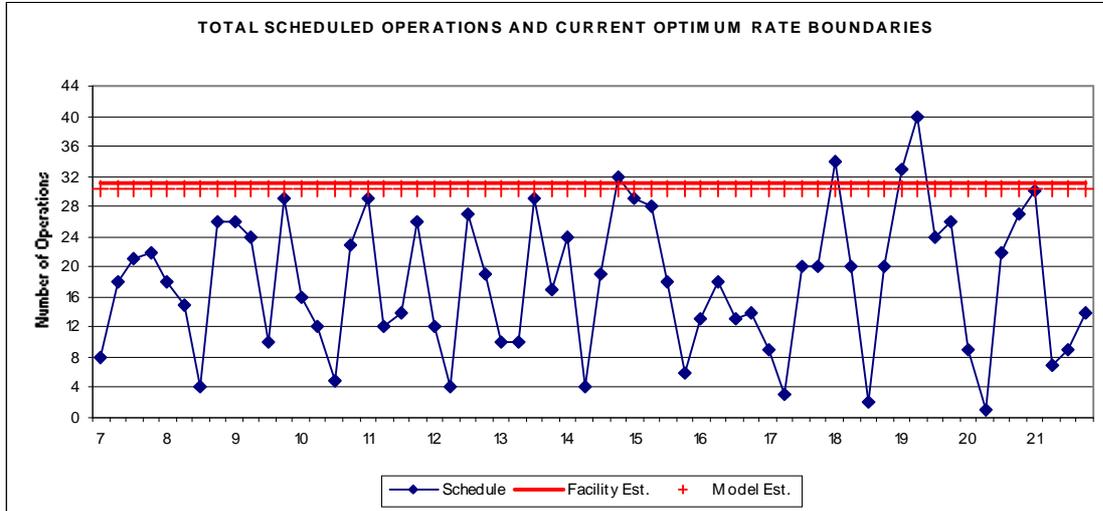
Current Operations – Optimum Rate

- Visual approaches, visual separation - Optimum rate of (60,65) was reported by the facility. RW18LR/27 is RWY configuration reported by facility.
- ASPM data is actual hourly traffic counts
- Chart below represents observed hourly traffic and expected rates in terms of operations per hour. Solid line represents the expected limit of hourly operations: RW18LR/27.



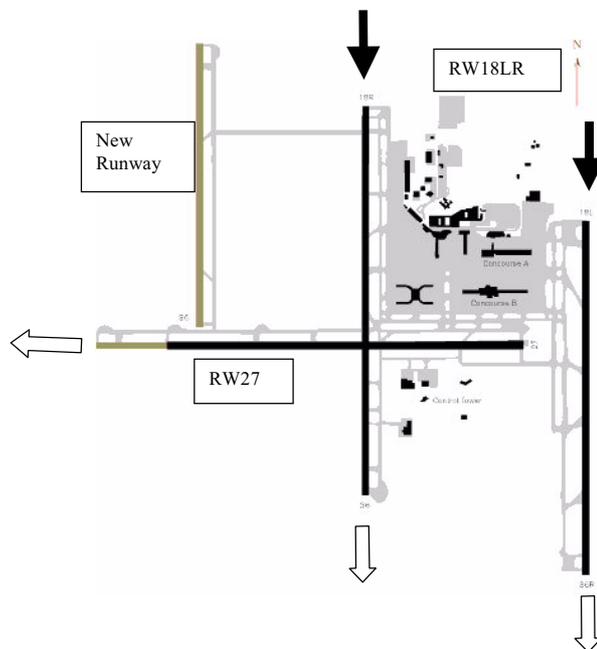
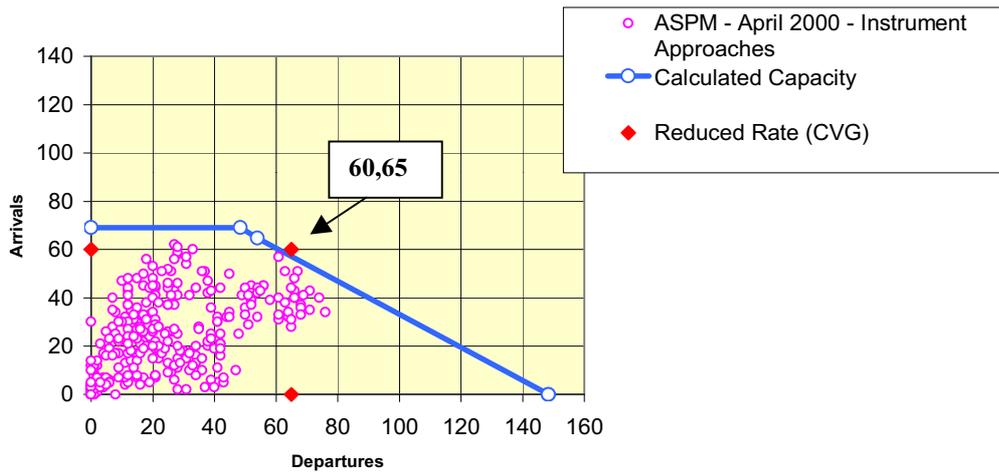
CVG – Cincinnati/Northern Kentucky International Airport

Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions



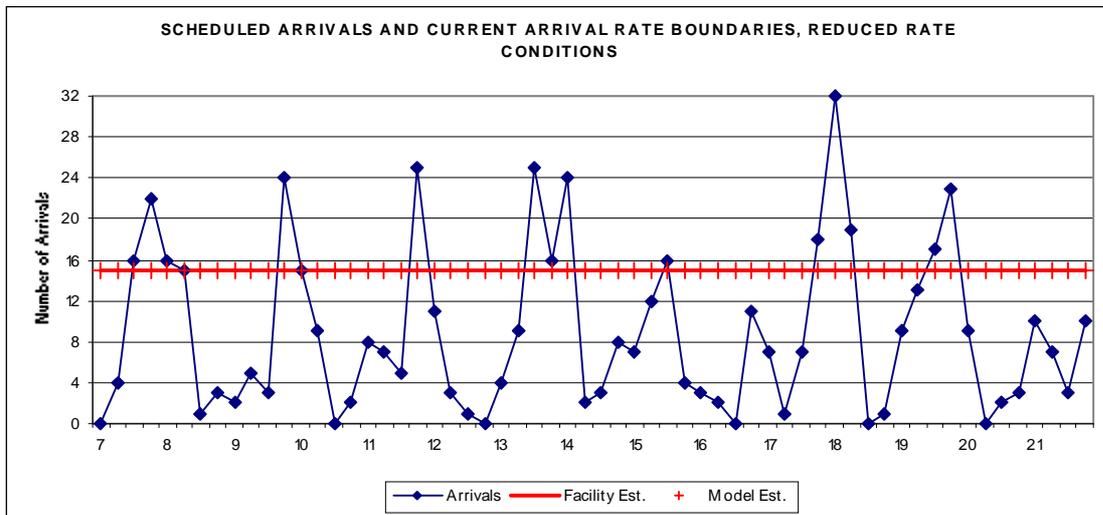
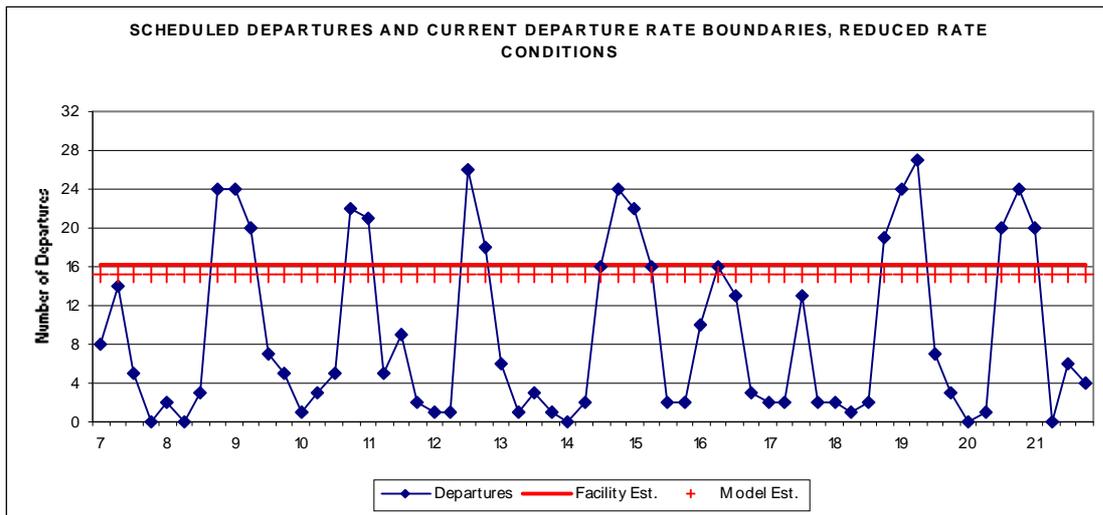
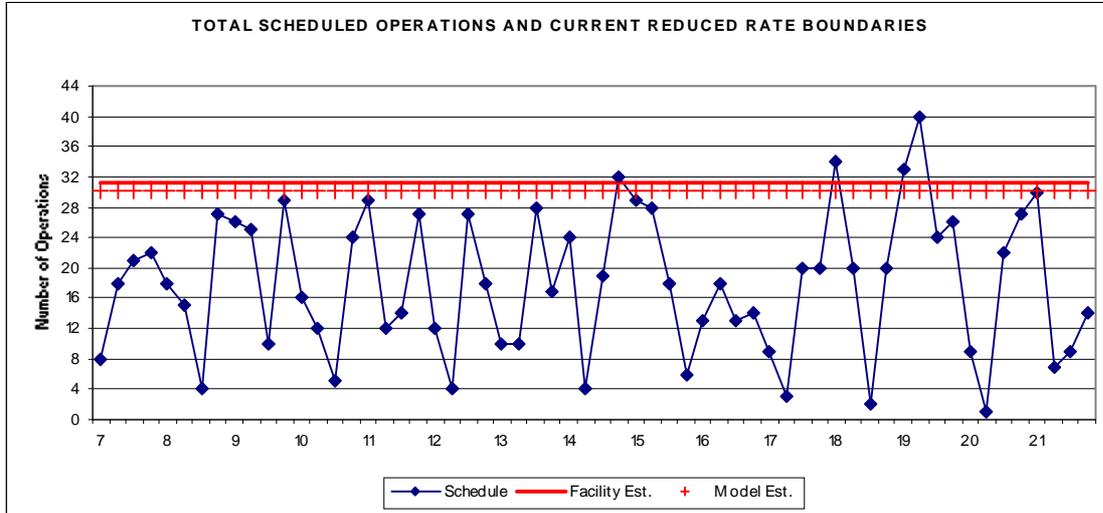
Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Reduced rate of (60,65) was reported by the facility
 - RW18LR/27 is RWY configuration reported by facility.
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates.
- Chart below represents observed hourly traffic and expected rates in terms of operations per hour. Solid line represents the expected limit of hourly operations: RW18LR/27.



CVG – Cincinnati/Northern Kentucky International Airport

Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



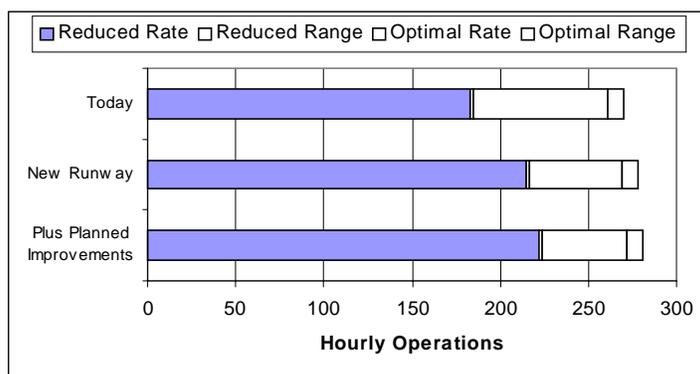
Dallas – Fort Worth International Airport Benchmarks

- The current capacity benchmark at Dallas-Ft. Worth is 261-270 flights per hour in good weather.
- Current capacity falls to 183-185 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.
- Dallas operates below its good-weather capacity throughout the day but these traffic rates cannot be sustained in adverse weather.
- In 2000, Dallas was ranked tenth in the country in number of flights significantly delayed (more than 15 minutes). It has slightly more than 2% of its flight delayed significantly.
- Dallas has 9 well-defined periods of highly concentrated arrival and departure traffic during the day.
- In adverse weather, capacity is lower and scheduled traffic exceeds capacity roughly 5 hours of the day. The percentage of significantly delayed flights doubles to 4%.
- A new runway, scheduled to open in 2007, is expected to improve Dallas capacity benchmark by 3% (to 269-278 flights per hour) in good weather and by 17% (to 215-217 flights per hour) in adverse weather. This assumes that airspace, ground infrastructure, and environmental constraints allow full use of the runway.
- In addition, technology and procedural improvements, when combined with the new runway are expected to increase the Dallas capacity benchmark by a total of 4% (to 272-281 flights per hour) in good weather over the next 10 years.
- The adverse weather capacity benchmark will increase by a total of 21% (to 222-224 flights per hour) compared to today.
- These capacity increases could be brought about as a result of:
 - Quadruple parallel instrument approaches.
 - pFAST, which assists the controller with sequencing aircraft, for a better flow of traffic into the terminal area.
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- Demand at Dallas – Fort Worth is expected to grow by 21% over the next decade. The planned improvements, particularly those related to adverse weather, are expected to keep delays at or below current levels despite relatively high demand growth.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	261-270	183-185
New Runway	269-278	215-217
Plus planned improvements	272-281	222-224



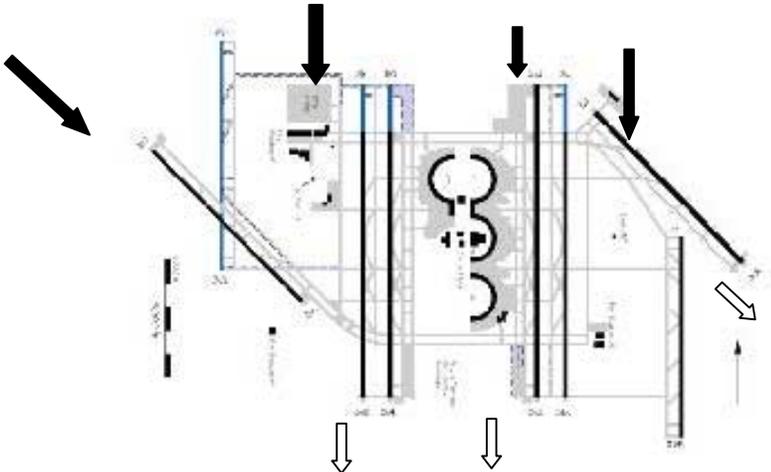
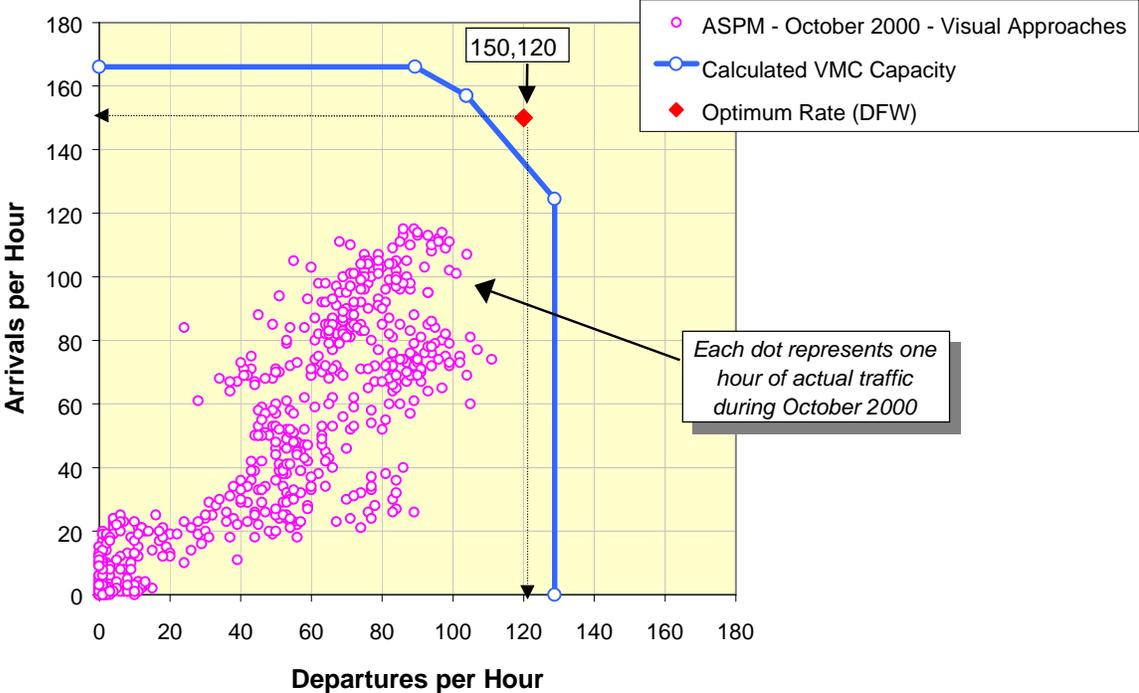
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - Quadruple parallel instrument approaches
 - pFAST, which assists the controller with sequencing aircraft, for a better flow of traffic into the terminal area
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

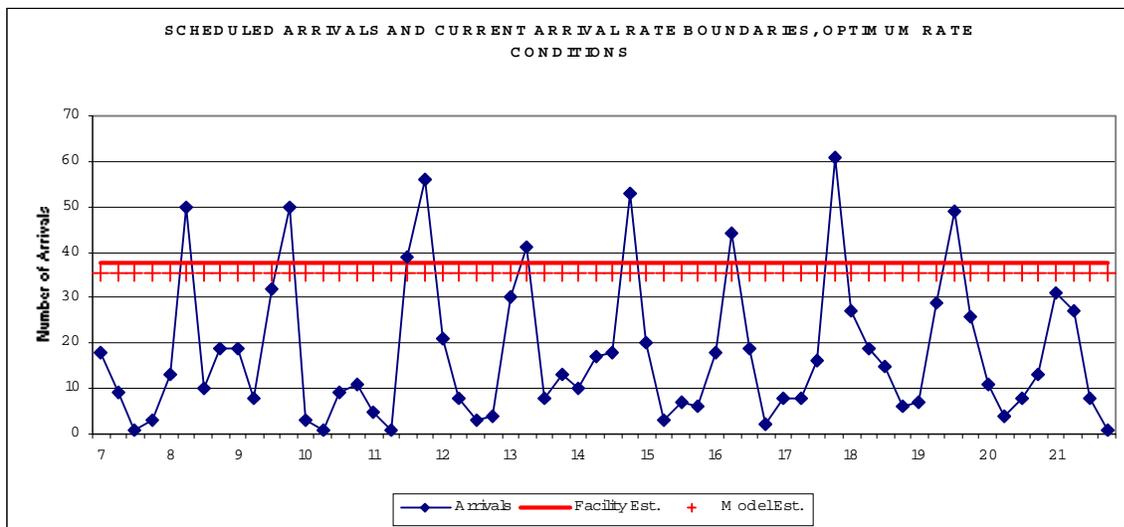
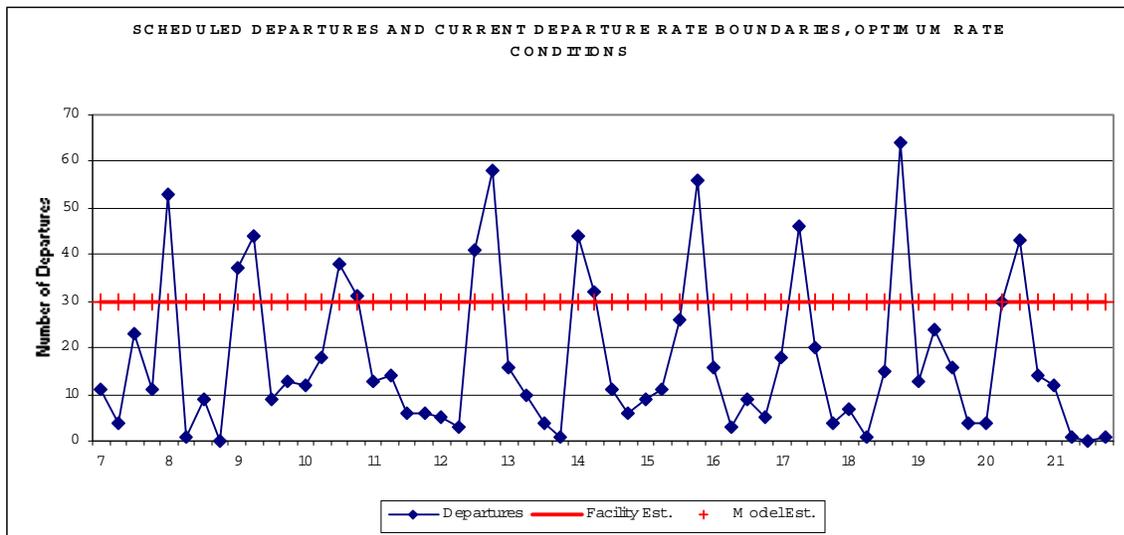
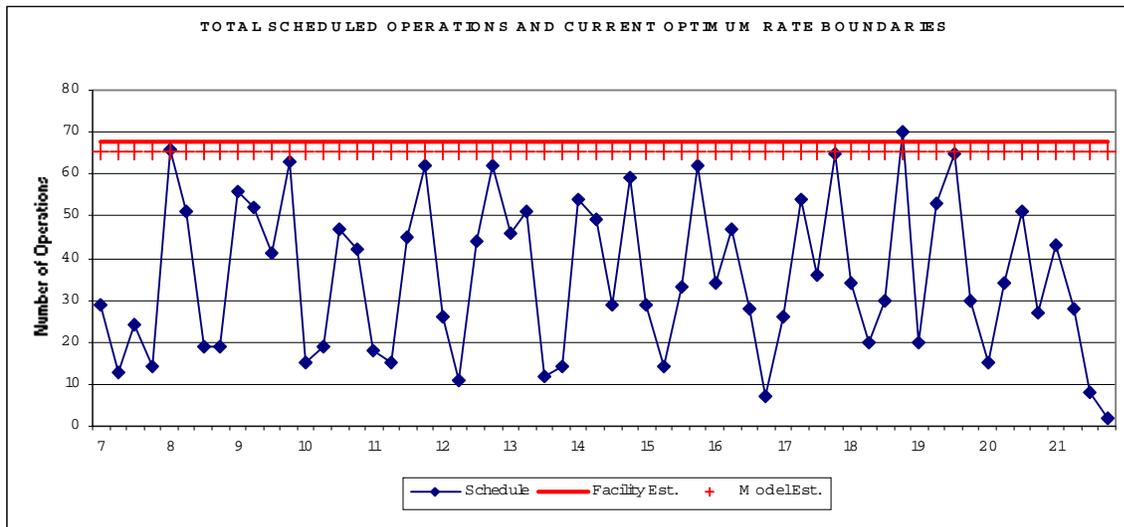
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – South Flow
- ASPM data is actual hourly traffic counts
- Solid line represents the expected limit of hourly operations
- Demand at DFW utilizes maximum rate only for short time intervals, due to taxiway and gate capacity – operational rate over an hour can therefore fall below the estimated capacity

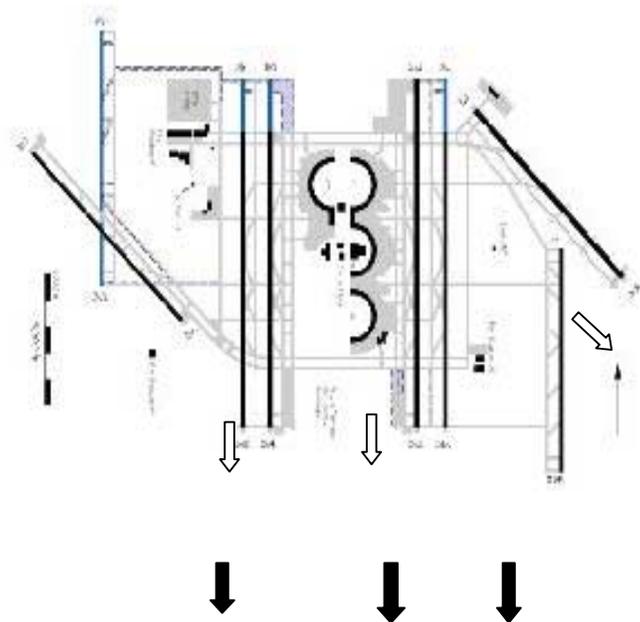
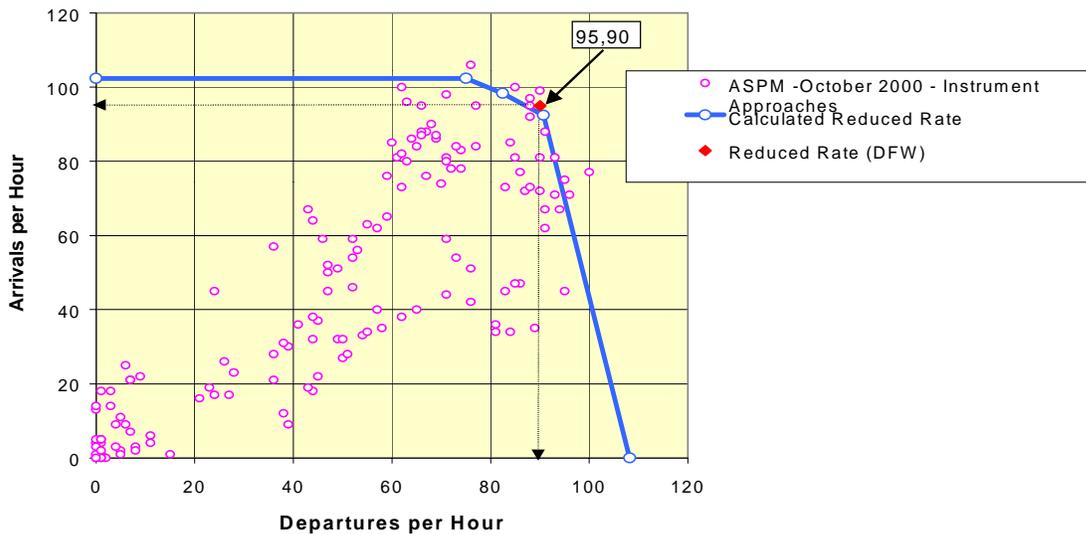


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

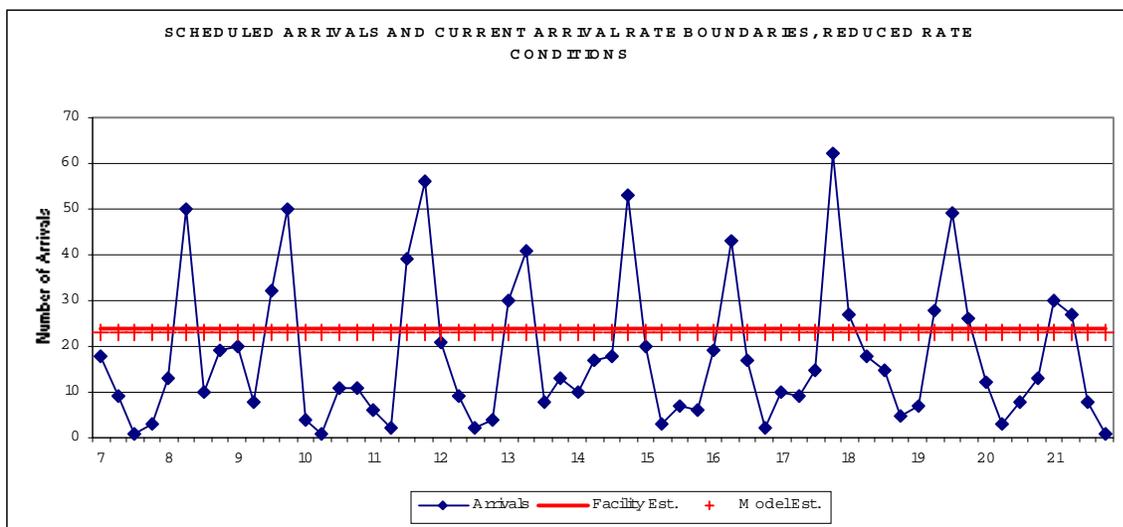
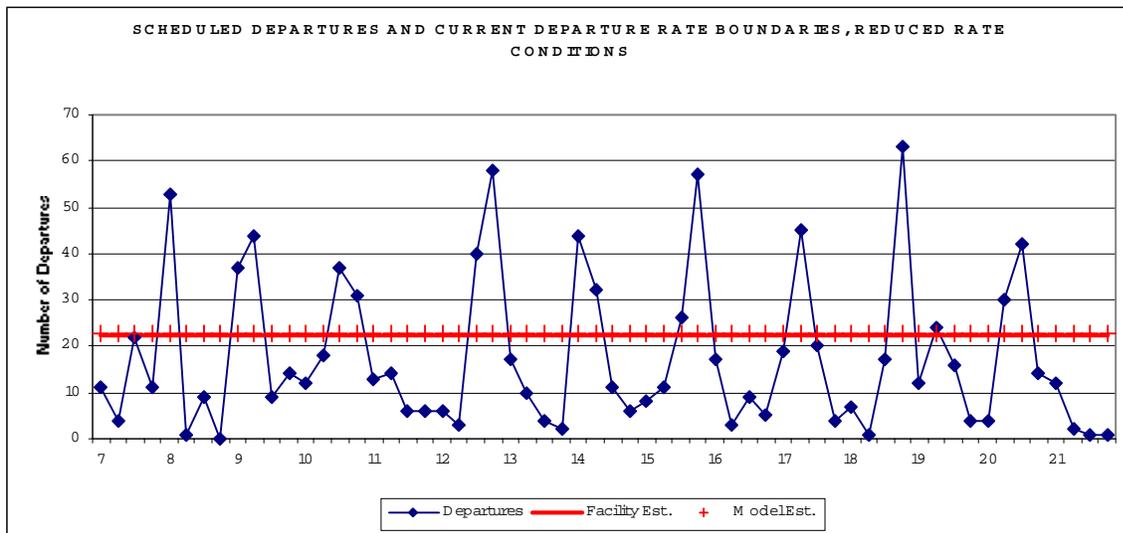
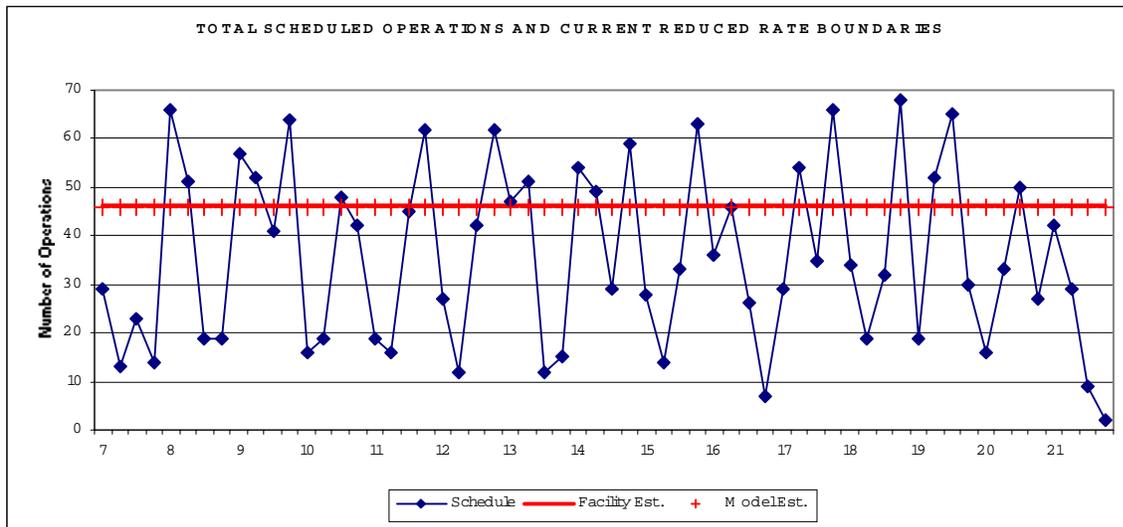


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima) – South Flow
- **Calculated rate:** Below minima for 13R, above minima for independent operations on close-spaced parallels
- **DFW Reduced rate:** Below minima for 13R, dependent operations on close-spaced parallels
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed hourly traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



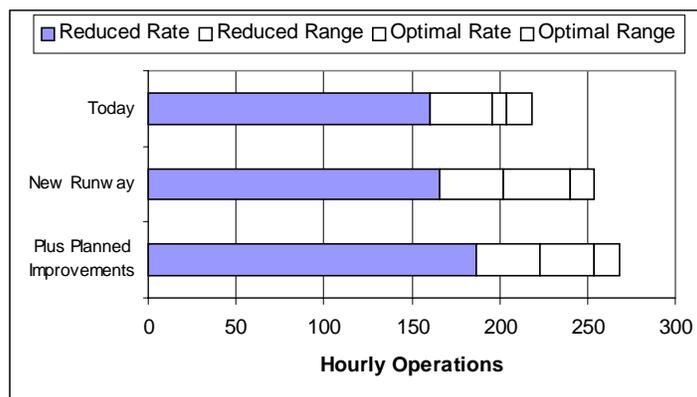
Denver International Airport Benchmarks

- The current capacity benchmark at Denver is 204-218 flights per hour in good weather.
- Current capacity falls to 160-196 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.
- Denver has sufficient capacity to handle demand in both good and adverse weather without significant delays.
- During adverse weather conditions, there are periods when departure demand exceeds capacity and departures may encounter brief delays. Today less than 0.25% of aircraft are delayed significantly (greater than 15 minutes).
- A new runway, scheduled to open in 2003, is expected to improve Denver's capacity benchmark by 18% (240-254 flights per hour) in good weather and by 4% (166-202 flights per hour) in adverse weather. This assumes that airspace, ground infrastructure, and environmental constraints allow full use of the runway.
- In addition, technology and procedural improvements, when combined with the new runway are expected to increase Denver's capacity benchmark by a total 25% (to 254-268 flights per hour) in good weather over the next 10 years. The adverse weather capacity benchmark will increase by a total of 17% (to 187-223 flights per hour) compared to today.
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
 - pFAST, which assists the controller with sequencing aircraft, for a better flow of traffic into the terminal area.
- Demand at Denver is expected to grow 23% over the next decade suggesting that delays will not become a problem at Denver once the planned improvements are implemented.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	204-218	160-196
New Runway	240-254	166-202
Plus planned improvements	254-268	187-223



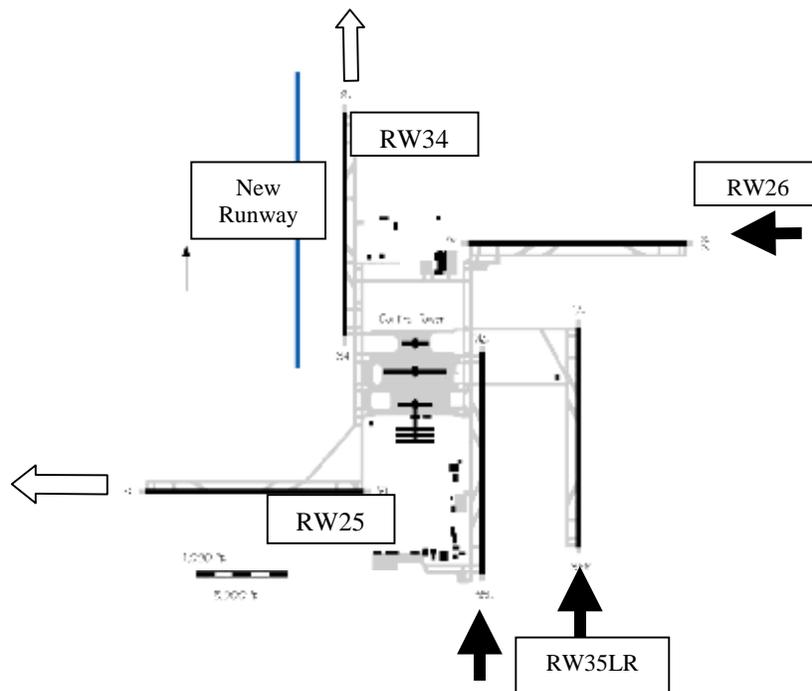
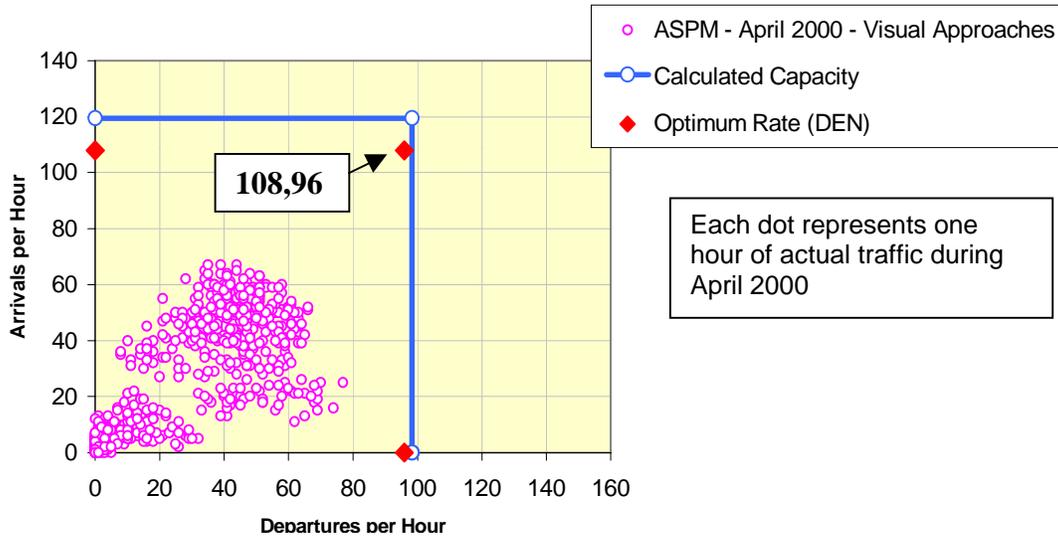
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
 - pFAST, which assists the controller with sequencing aircraft, for a better flow of traffic into the terminal area
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

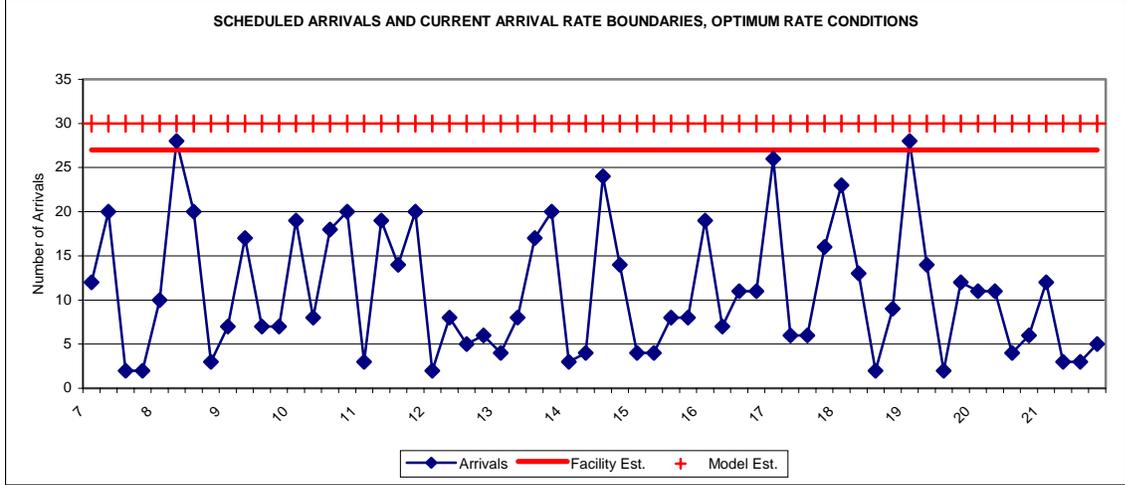
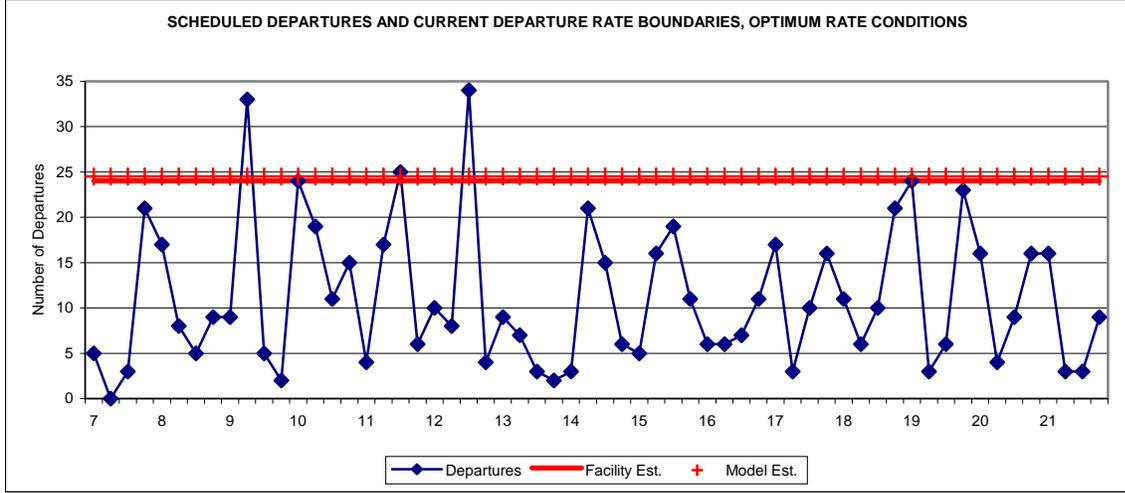
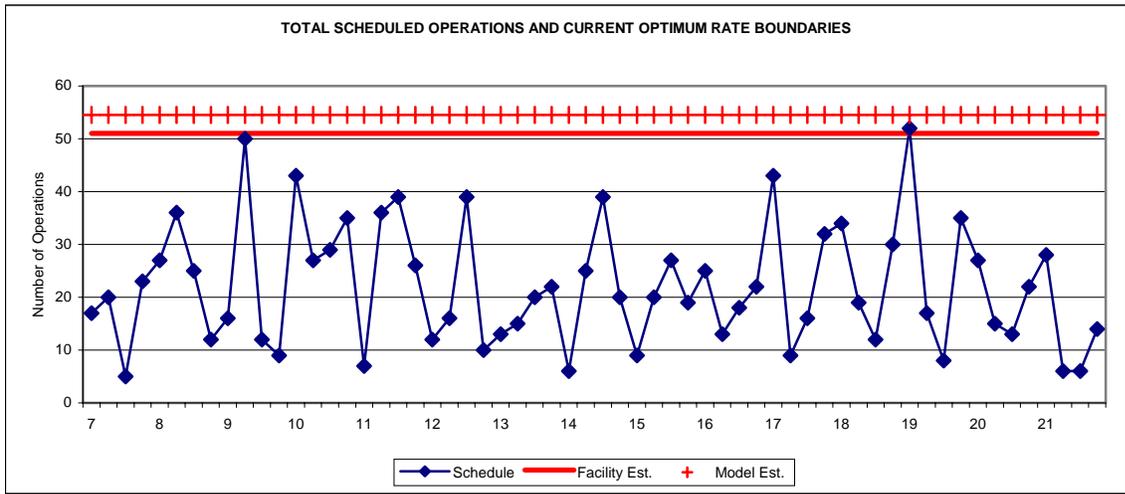
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation
 - Optimum rate of (108,96) was reported by the facility.
 - Configuration shown is configuration reported by facility.
 - Other configurations or adverse winds can reduce these optimal rates.
- ASPM data is actual hourly traffic counts
- Chart below represents observed hourly traffic and expected rates in terms of operations per hour. Solid line represents the expected limit of hourly operations.

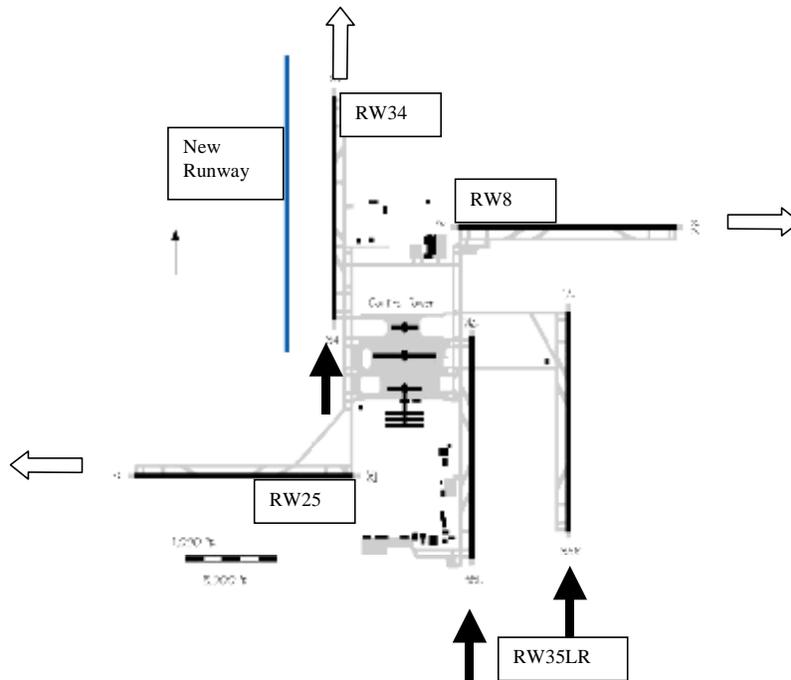
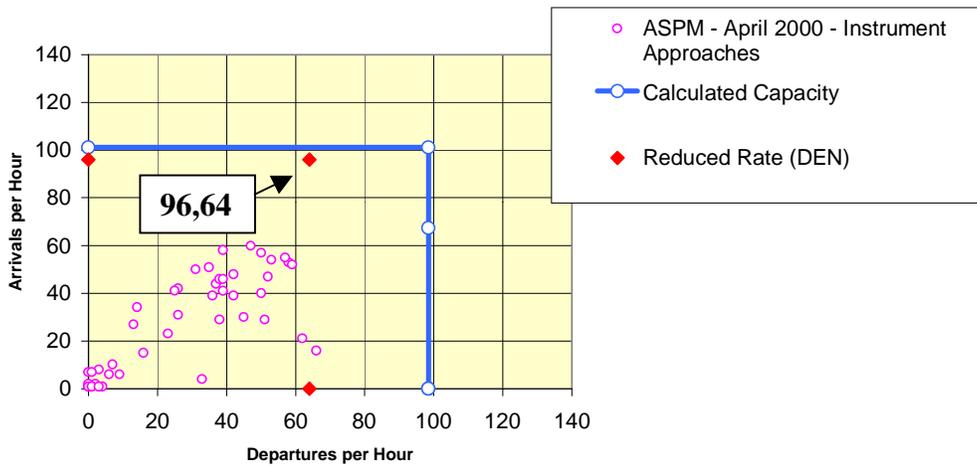


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

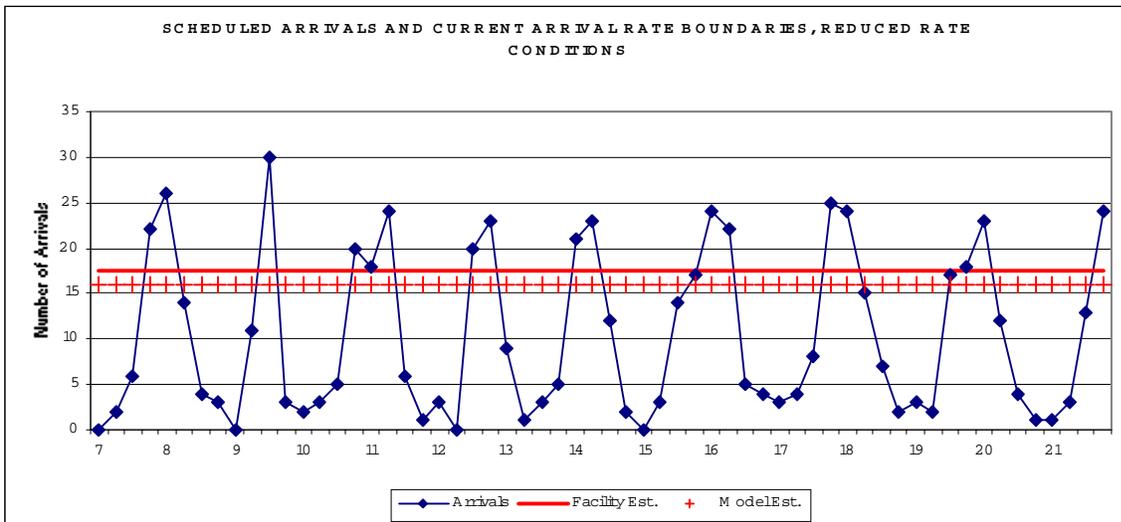
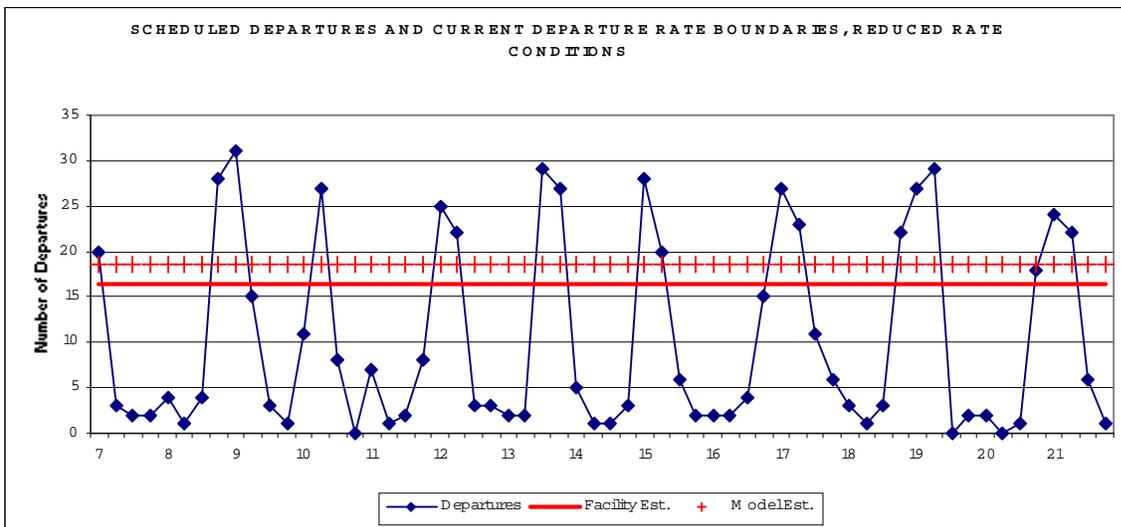
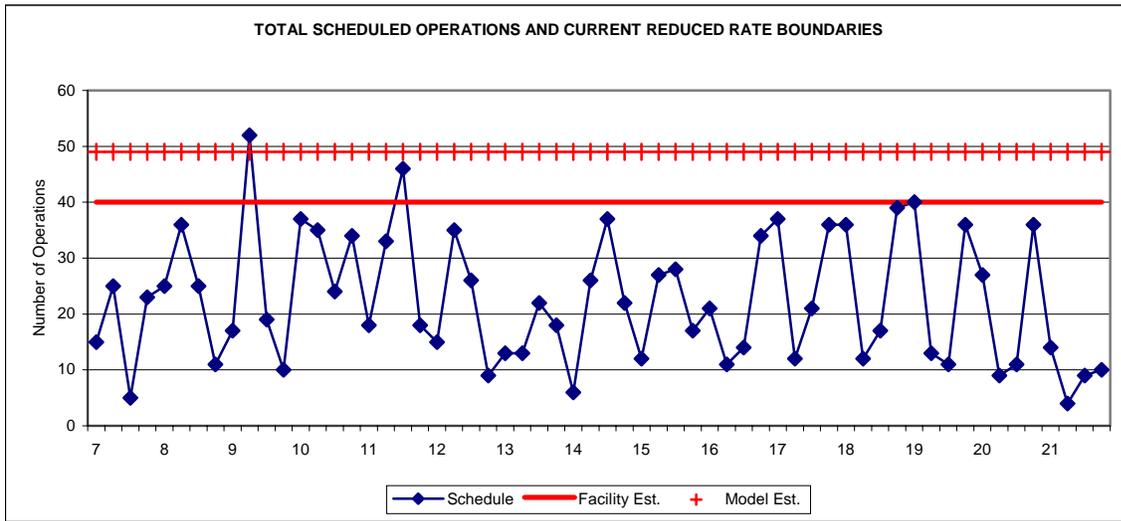


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Reduced rate of (96,64) was reported by the facility.
 - Configuration shown is configuration reported by facility.
 - Other configurations or adverse winds can reduce these optimal rates.
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed hourly traffic and expected rates in terms of operations per hour. Reduced arrivals on RW34 will lower the arrival capacity.



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



Detroit Metro Wayne County International Airport Benchmarks

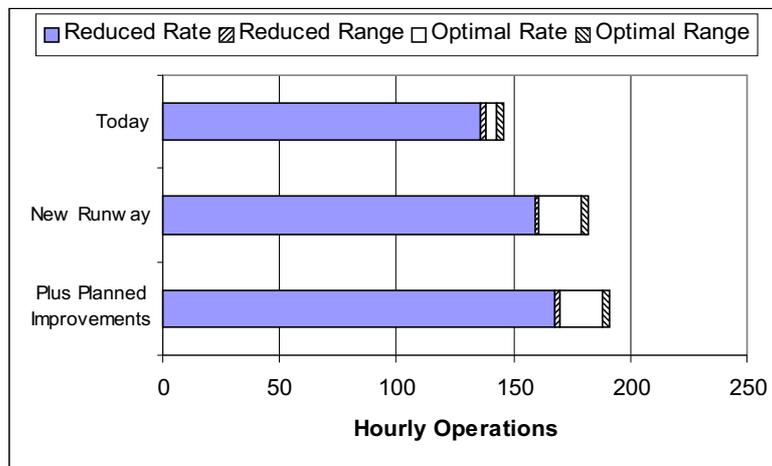
- The current capacity benchmark at Detroit Metro Wayne County Airport is 143-146 flights per hour in good weather.
- Current capacity falls to 136-138 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.
- Arrival and departure demand tend to be complementary at Detroit so that capacity is adequate to handle current demand.
- Less than 2% of Detroit's flights are delayed more than 15 minutes.
- The planned new runway is expected to improve Detroit's capacity benchmark by 25% (to 179-182 flights per hour) in good weather and by 17% (to 159-161 flights per hour) in adverse weather. This assumes that airspace, ground infrastructure, and environmental constraints allow full use of the runway.
- In addition, technology and procedural improvements, when combined with the new runway are expected to increase Detroit's capacity benchmark by a total of 31% (to 188-191 flights per hour) in good weather over the next 10 years.
- The adverse weather capacity benchmark will increase by a total of 24% (to 168-170 flights per hour) compared to today.
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- Demand at Detroit is projected to grow by 31% over the next decade, but it appears that capacity will keep pace with demand.

DTW – Detroit Metro Wayne County International Airport

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	143-146	136-138
New Runway	179-182	159-161
Plus planned improvements	188-191	168-170



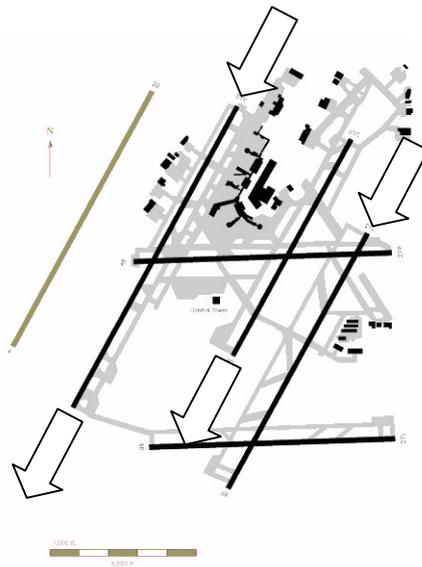
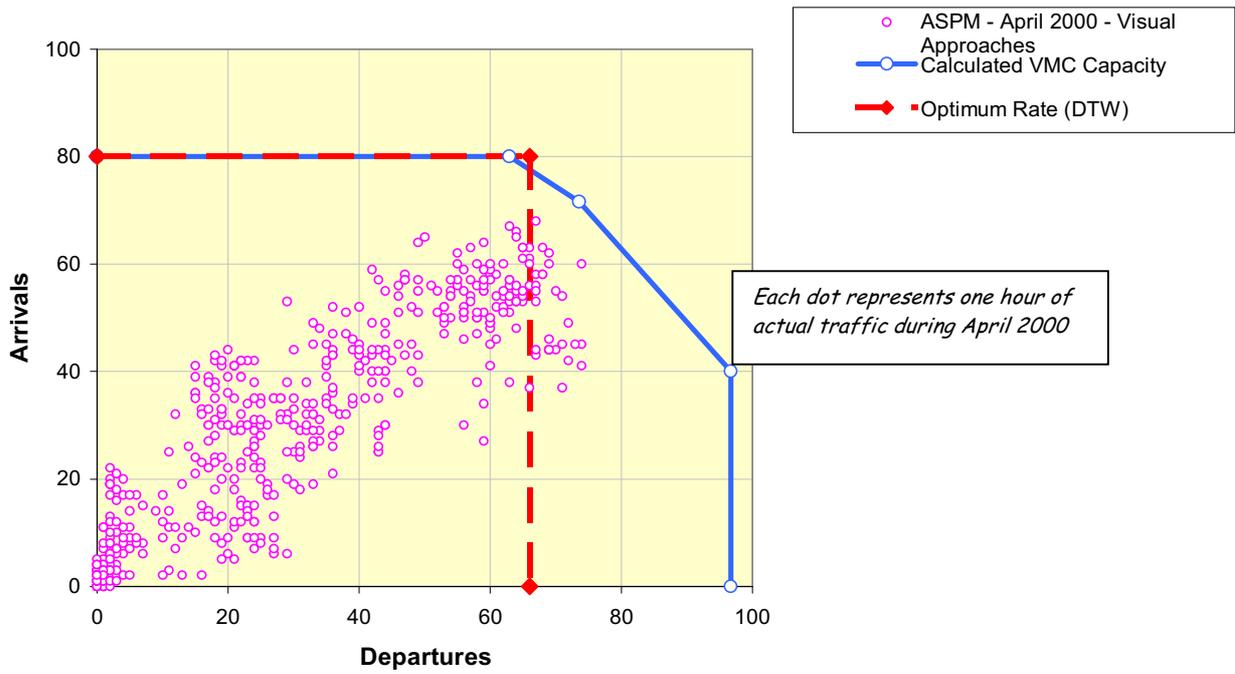
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

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

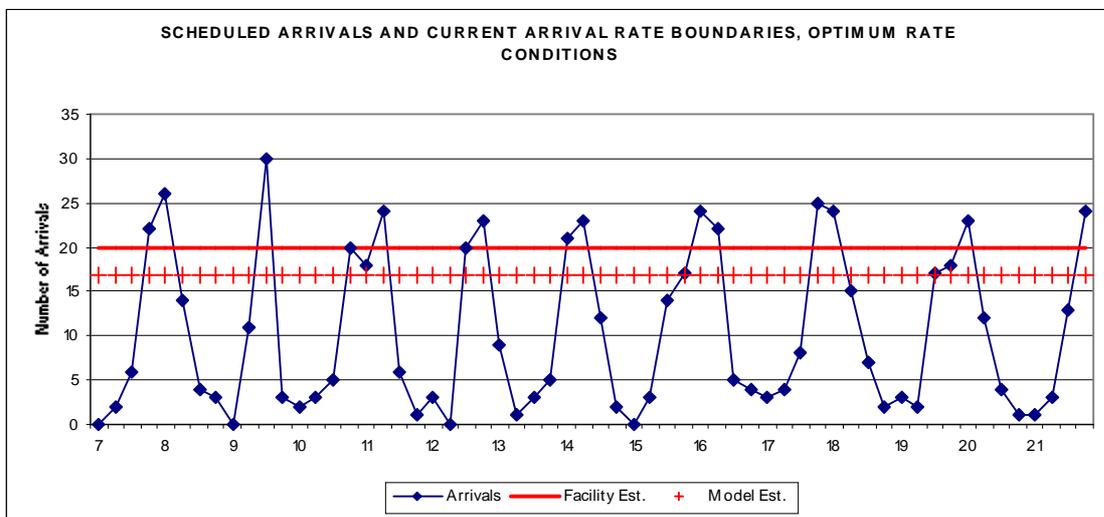
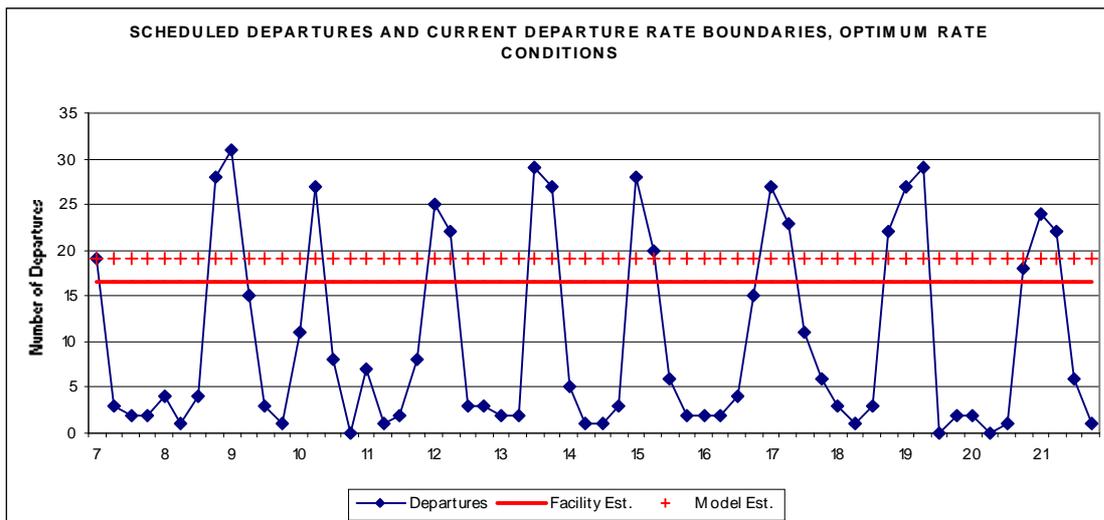
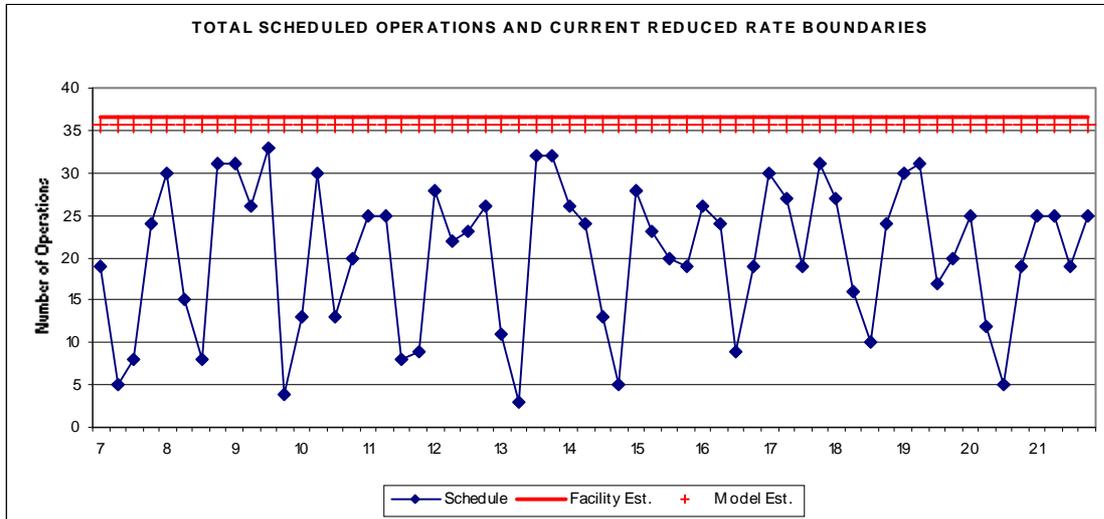
Current Operations – Optimum Rate

- Visual approaches, visual separation
 - Using 21L/C/R
- ASPM data is actual hourly traffic count



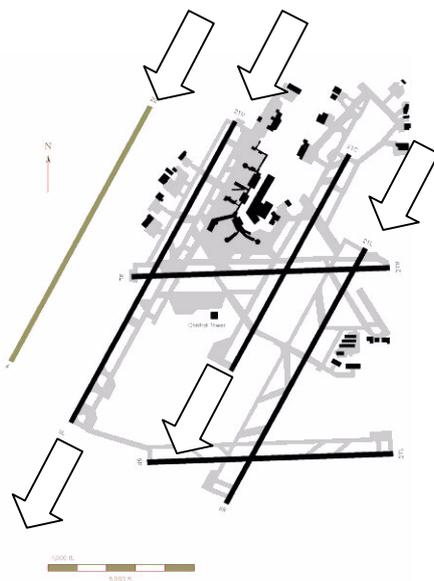
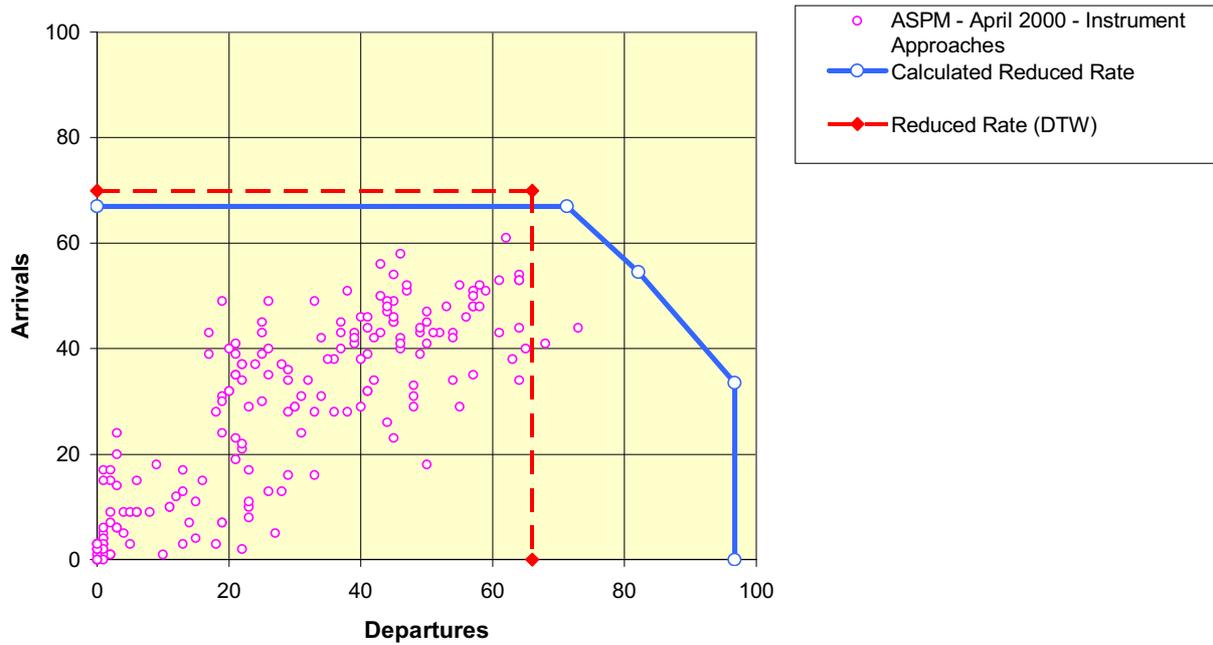
DTW – Detroit Metro Wayne County International Airport

Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions



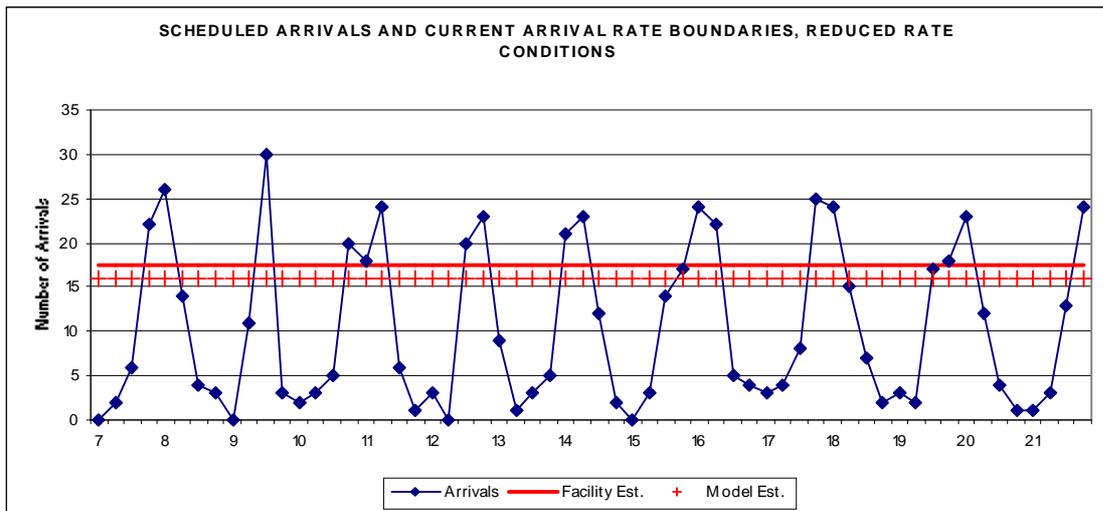
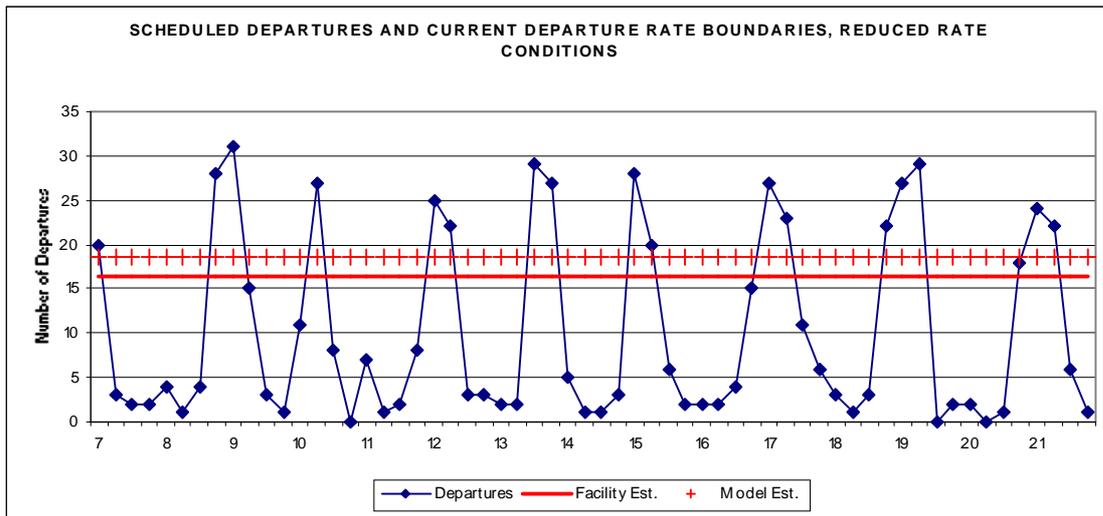
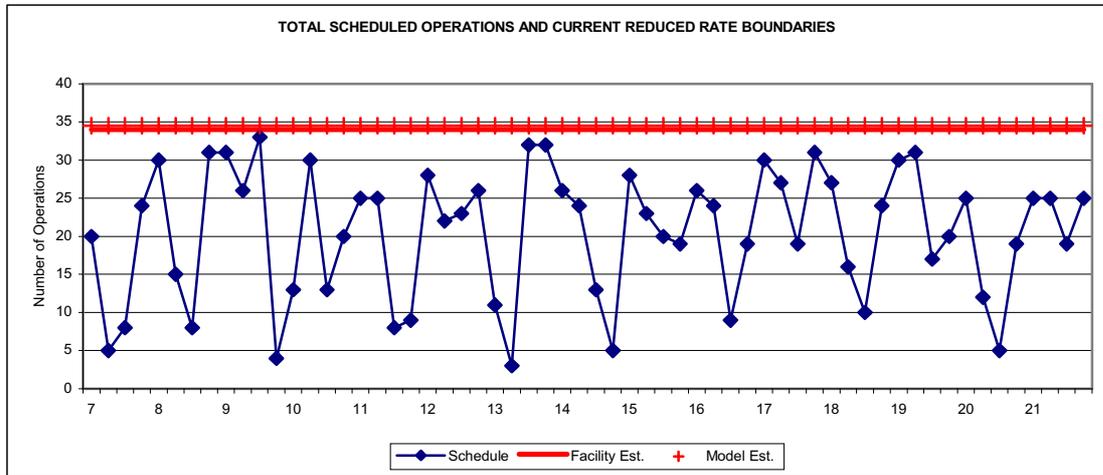
Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Using 21L/C/R
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates.



DTW – Detroit Metro Wayne County International Airport

Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



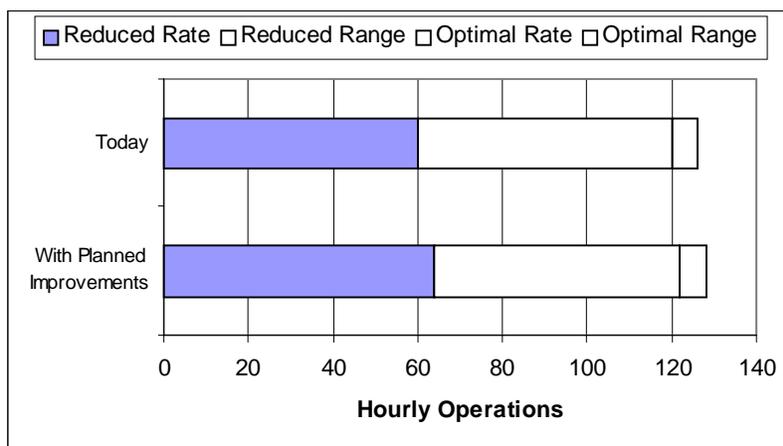
Honolulu International Airport Benchmarks

- The current capacity benchmark at Honolulu is 120-126 flights per hour in good weather.
- Current capacity falls to 60 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation. Such conditions exist only about 1% of the times.
- Because of the predominately good weather in Hawaii, hardly any flights are delayed more than 15 minutes.
- Technology and procedural improvements are expected to increase Honolulu's capacity benchmark by 2% (to 120-128 flights per hour) in good weather over the next 10 years.
- The adverse weather capacity benchmark will increase by 7% (to 64 flights per hour) over the same period.
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- According to the FAA's Terminal Area Forecast, demand at Honolulu is expected to grow by 25% over the next decade. However, since today's operation is so far below the good weather capacity, future delays are only an issue in adverse weather.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	120-126	60
New Runway	N/A	N/A
With planned improvements	122-128	64



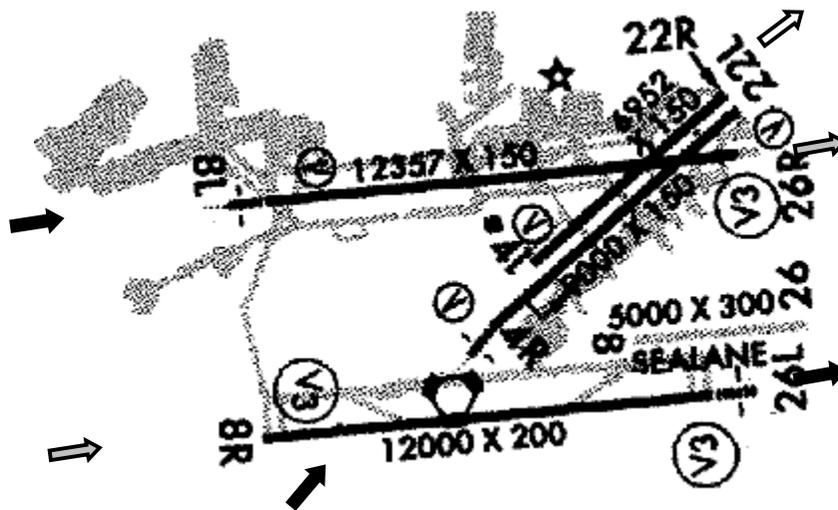
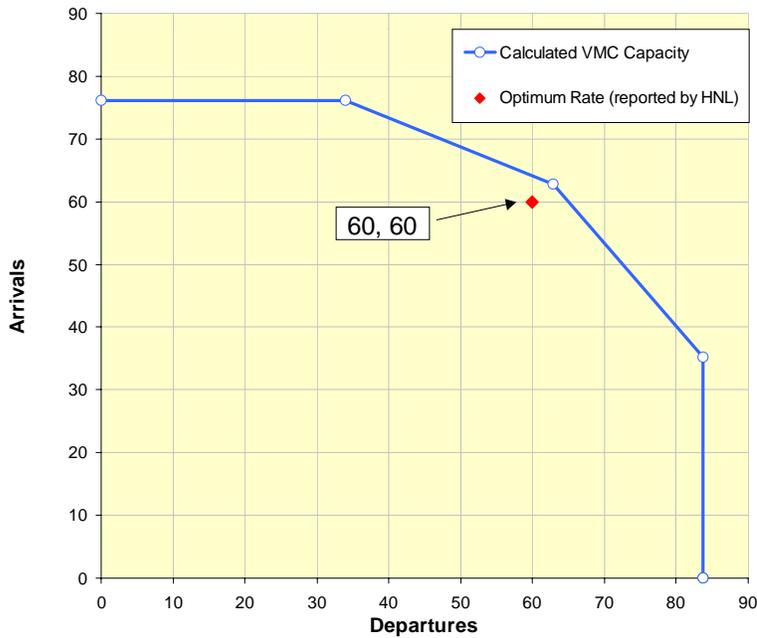
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

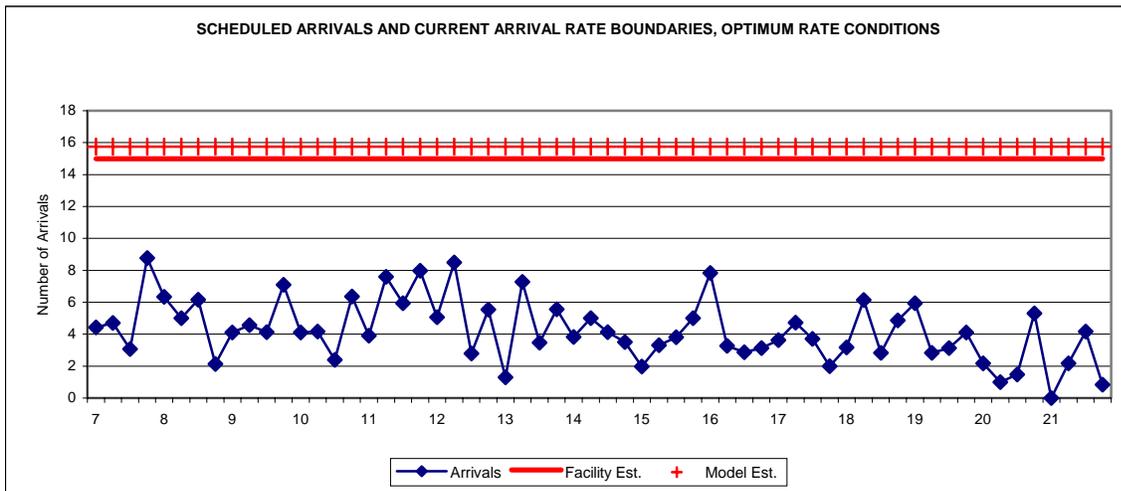
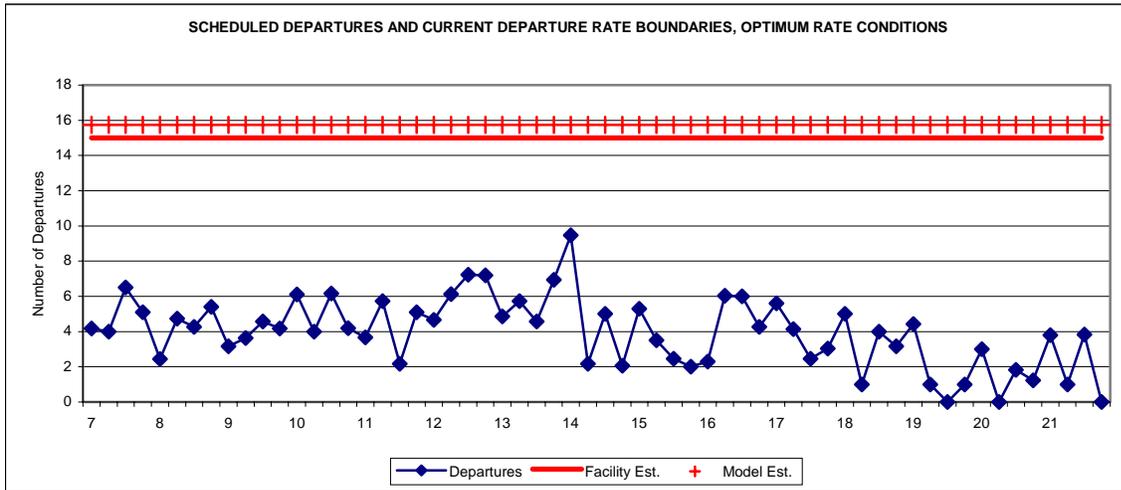
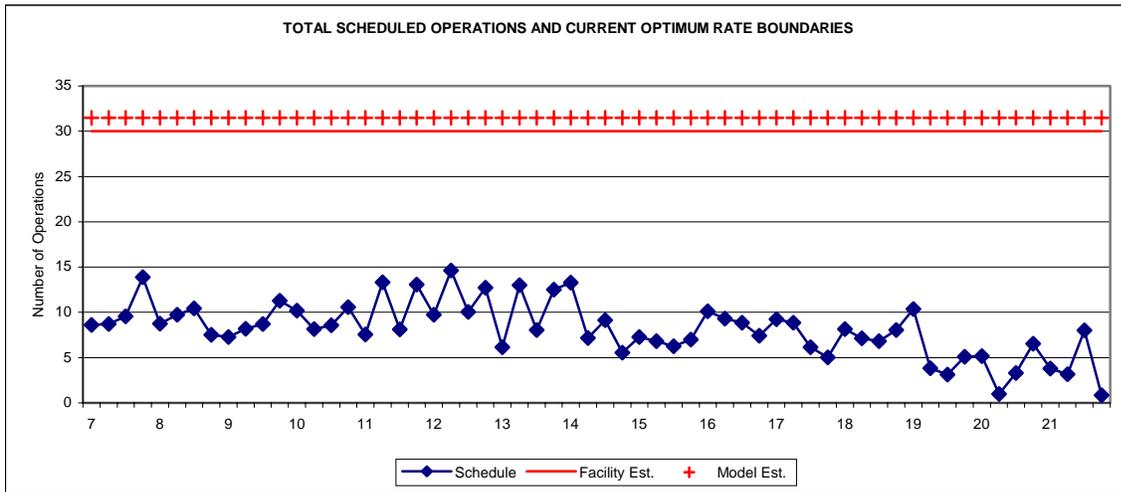
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – Optimum Rate of Optimum Rate:
 - Arrive: 8L, 4L/R = 60 Arrivals
 - Depart: 8L/R, 4L/R (under 22,500 lbs): = 60 Departures
- Actual hourly traffic counts for the month of April 2000 were not available
- Solid line represents the airport capacity during a busy hour calculated by the FAA Airport Capacity Model, assuming two independent arrival operations, showing the tradeoff between arrival and departure rates
- The capacity model can only approximate the operations at HNL

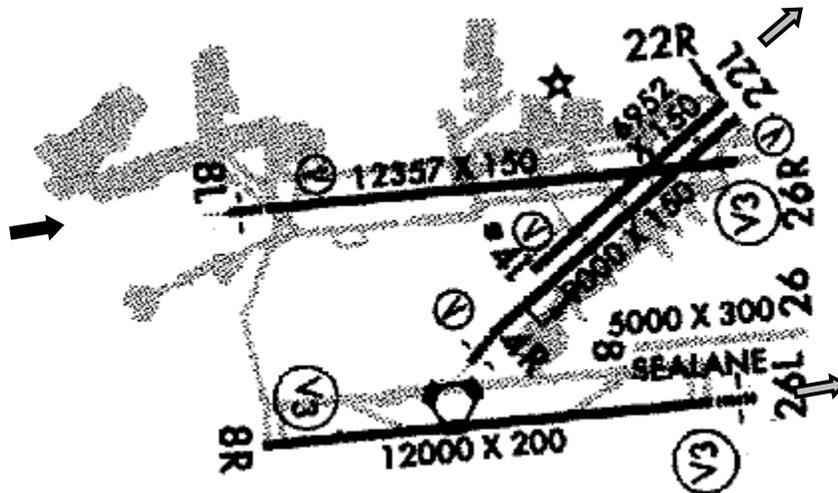
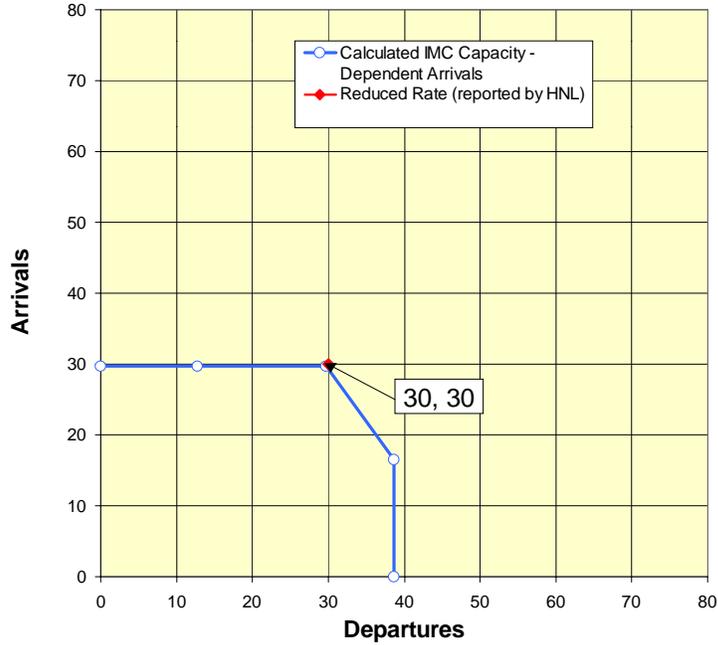


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

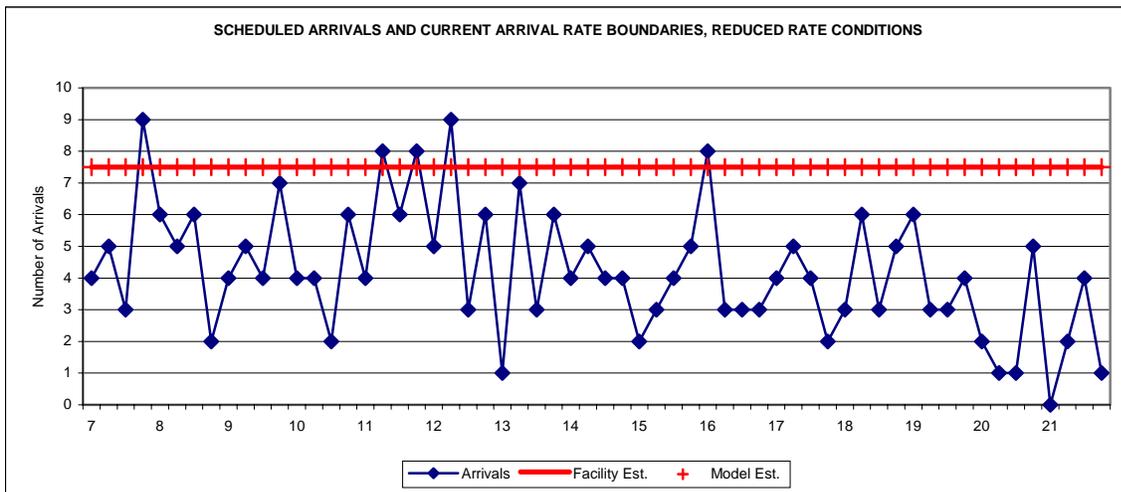
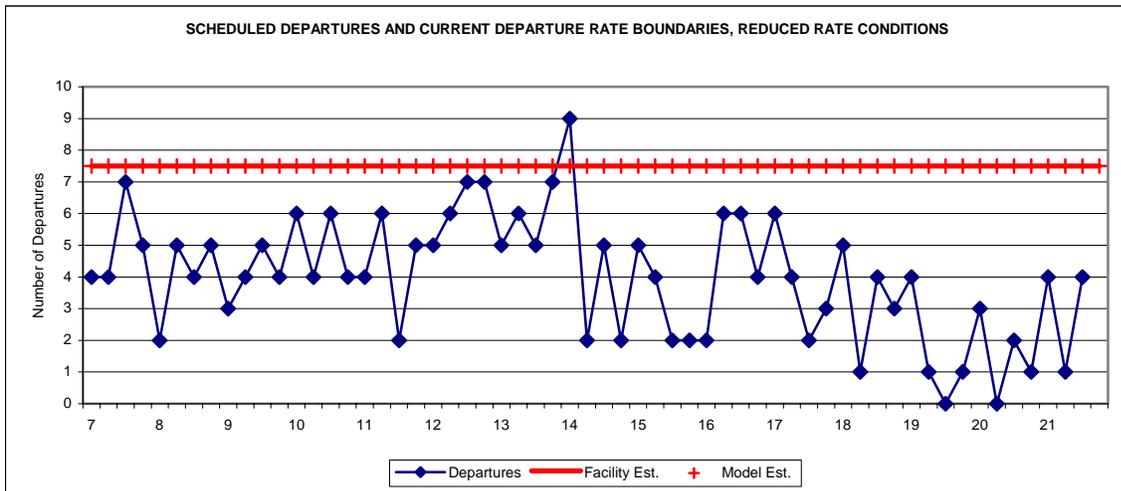
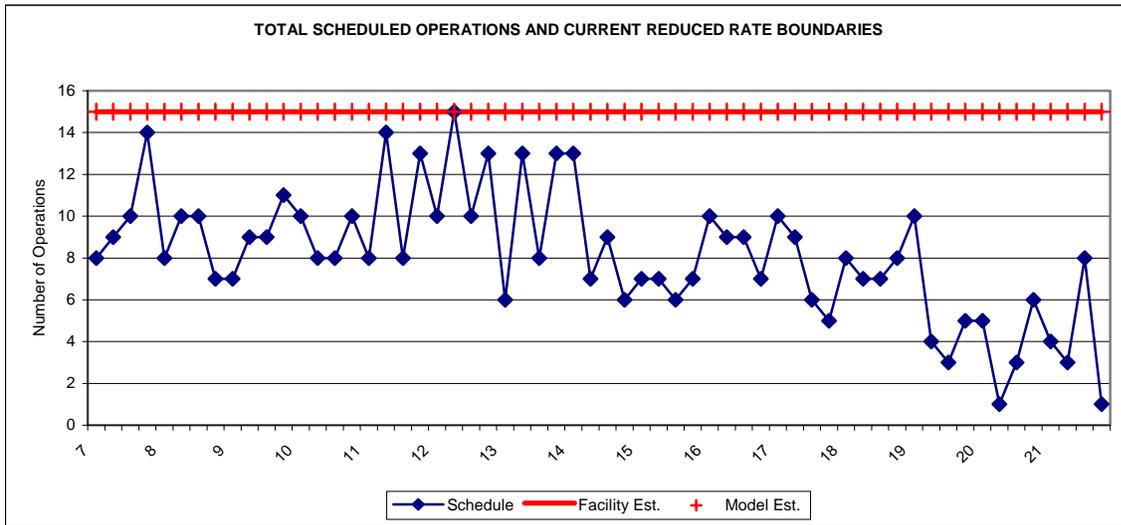


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Arrive: 8L 30 arrivals
 - Depart: 8L 30 Departures
- The Departure Rate is reduced because currently HNL cannot conduct Arrival/Departure LAHSO
- ASPM data for “Instrument Approaches” not available
- Chart below represents expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



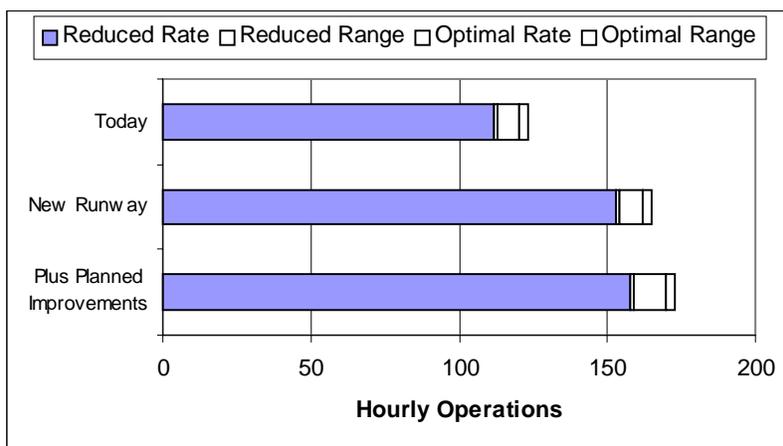
Houston – George Bush Intercontinental Airport Benchmarks

- The current capacity benchmark at Houston is 120-123 flights per hour in good weather.
- Current capacity falls to 112-113 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.
- Scheduled operations at Houston are at or above capacity 4 hours per day (good and adverse weather respectively).
- In 2000, Houston was ranked ninth in the country in number of flights significantly delayed (more than 15 minutes), with nearly 3% of flights significantly delayed.
- A new runway, planned for completion in 2004, is expected to improve Houston's capacity benchmark by 35% (to 162-165 flights per hour) in good weather and by 37% (to 153-154 flights per hour) in adverse weather. This assumes that airspace, ground infrastructure, and environmental constraints allow full use of the runway.
- In addition, technology and procedural improvements, when combined with the new runway are expected to increase Houston's capacity benchmark by a total of 42% (to 170-173 flights per hour) in good weather over the next 10 years.
- The adverse weather capacity benchmark will increase by a total of 41% (to 158-159 flights per hour) compared to today.
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- Capacity improvements at Houston are expected to keep pace with demand, which is expected to grow by 34% over the next decade. Delays are not expected to increase during this period.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minim

Scenario	Optimum Rate	Reduced Rate
Today	120-123	112-113
New Runway	162-165	153-154
Plus planned improvements	170-173	158-159



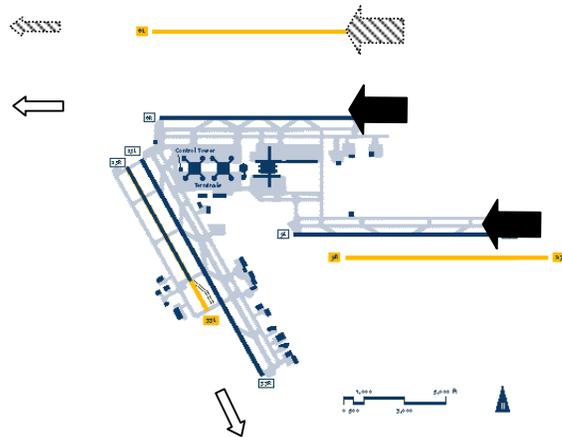
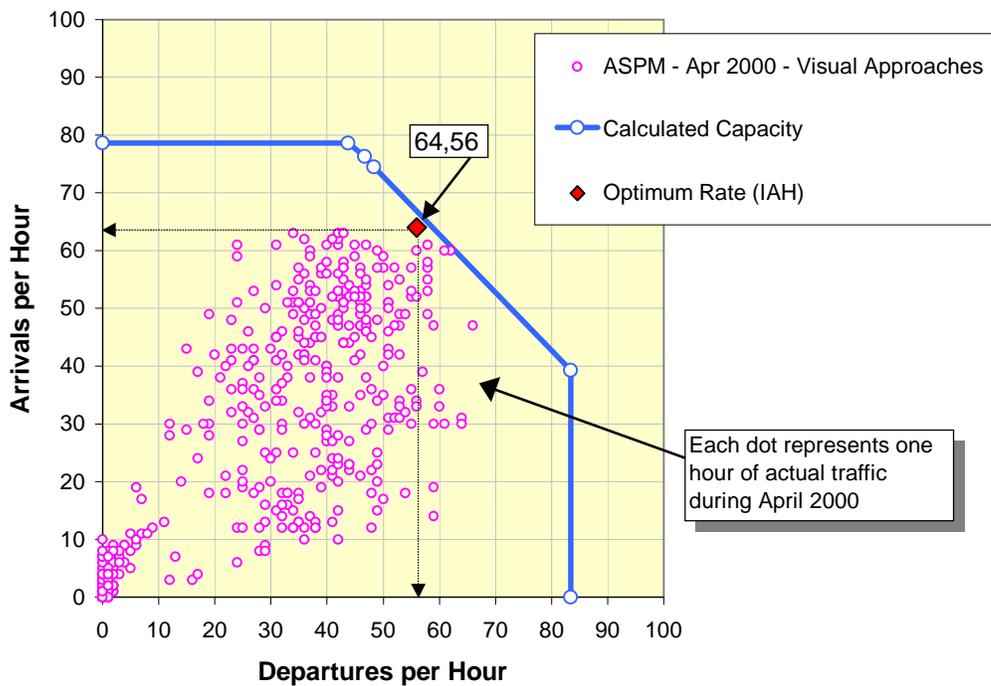
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

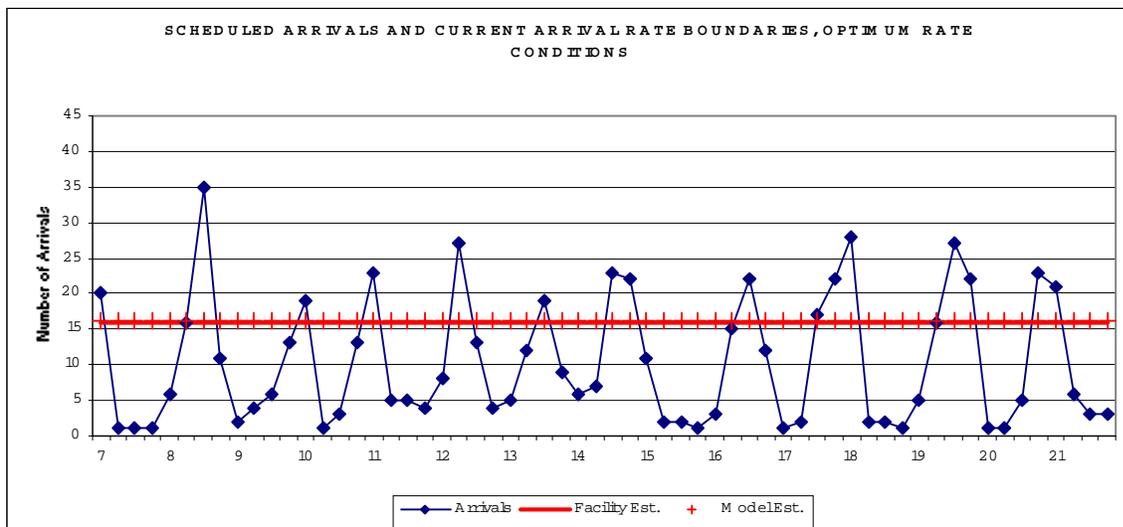
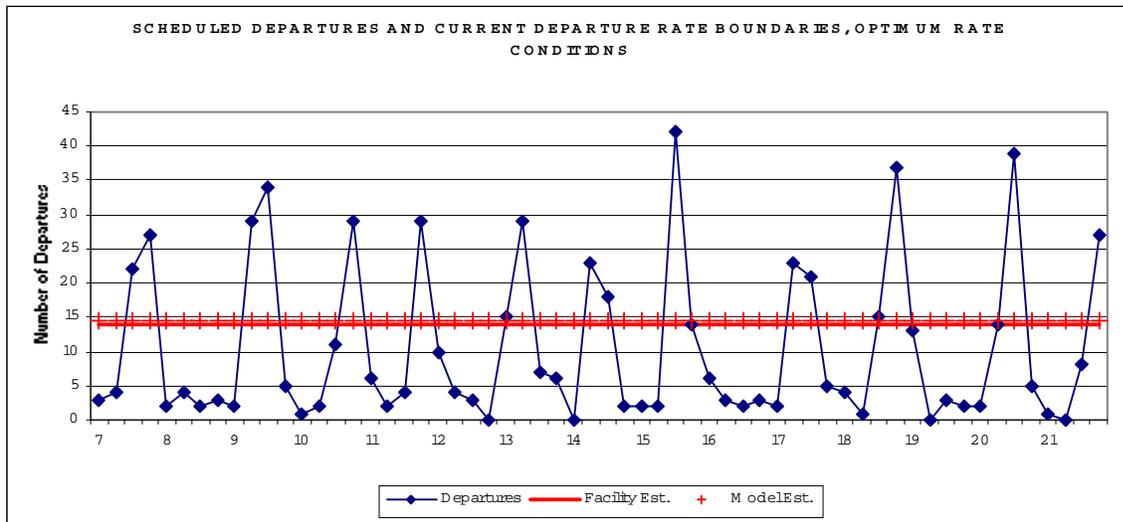
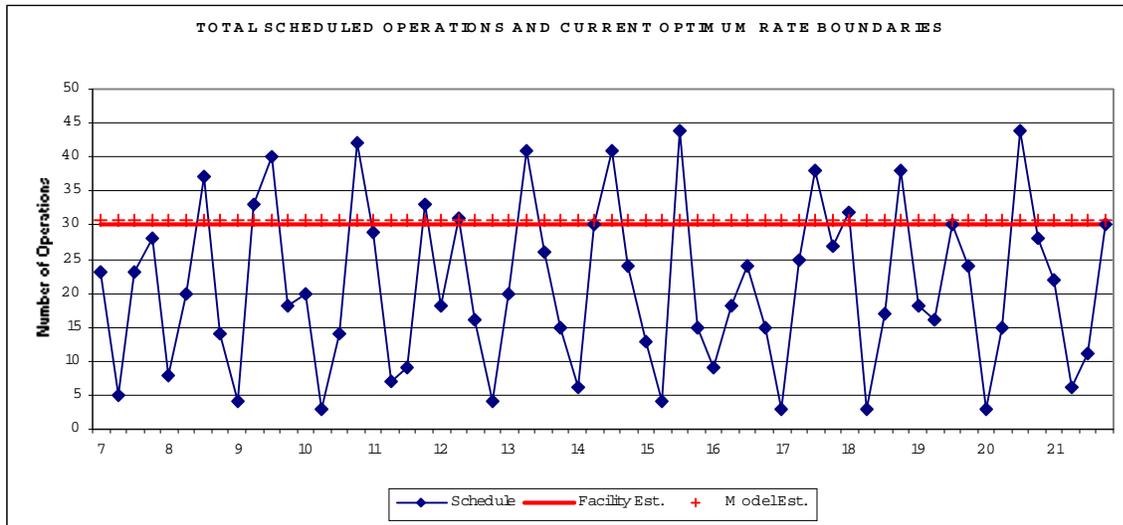
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – Arrivals 27/26, Departures 26/15L
 – Optimum rate of (64,56) was reported by the facility
- ASPM data is actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- Solid line represents the calculated airport capacity during a busy hour, and the tradeoff between arrivals and departure rates
- The capacity model can only approximate the complex operations at IAH
- Demand at IAH may reach or exceed the calculated capacity during short periods (15 minutes) during busy hours

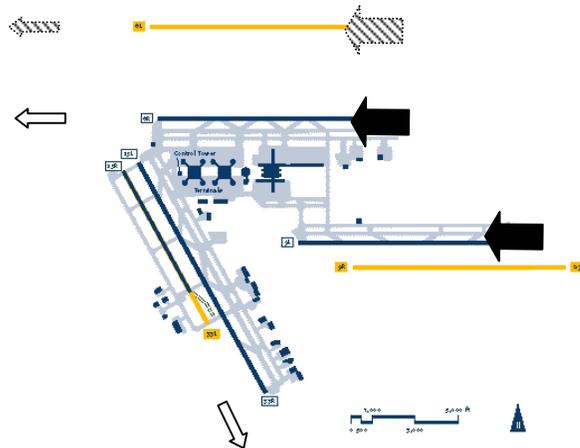
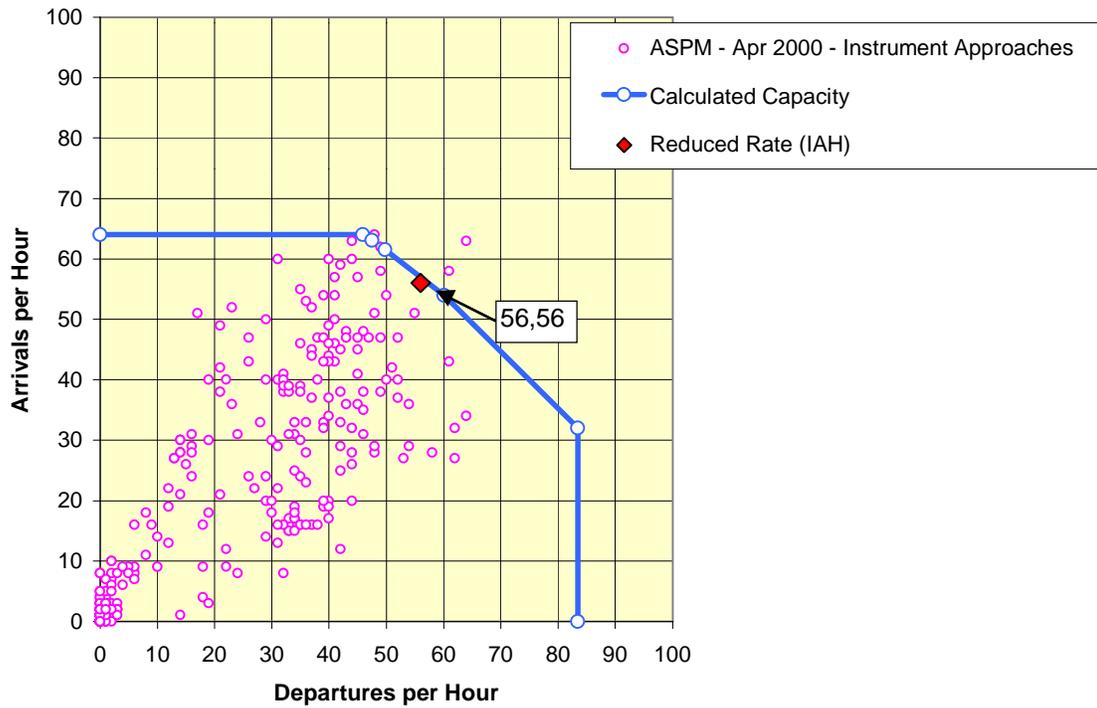


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

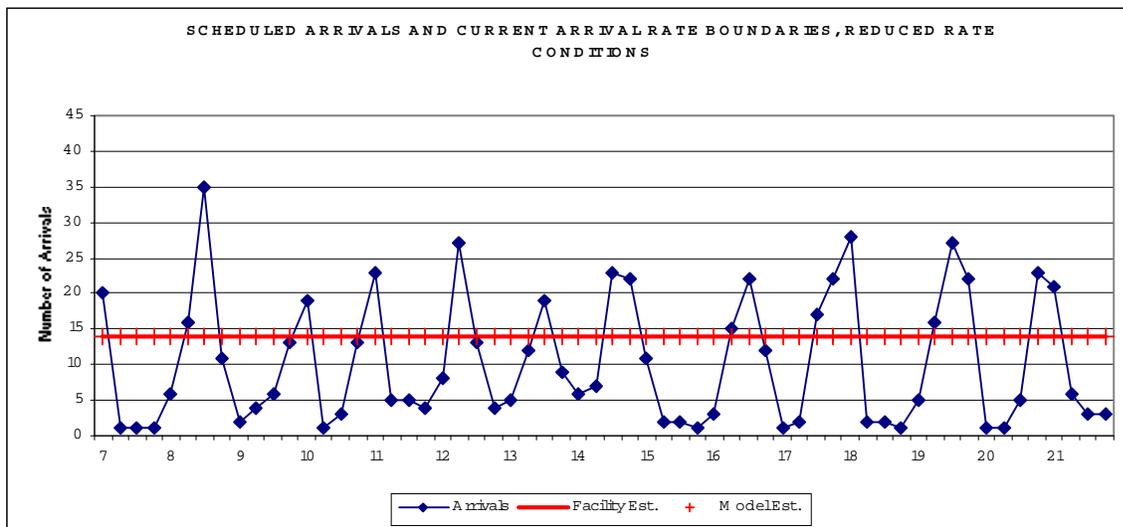
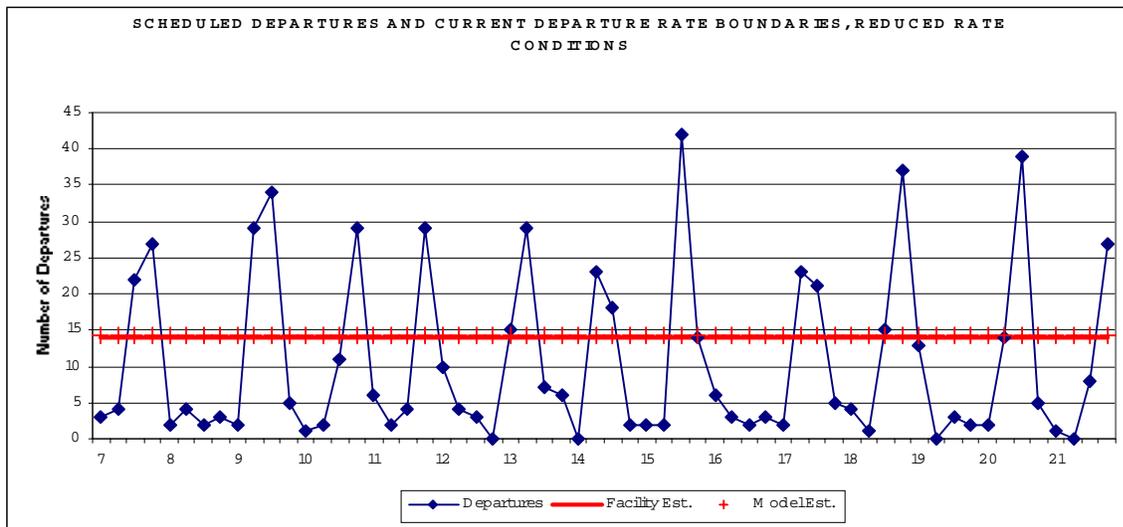
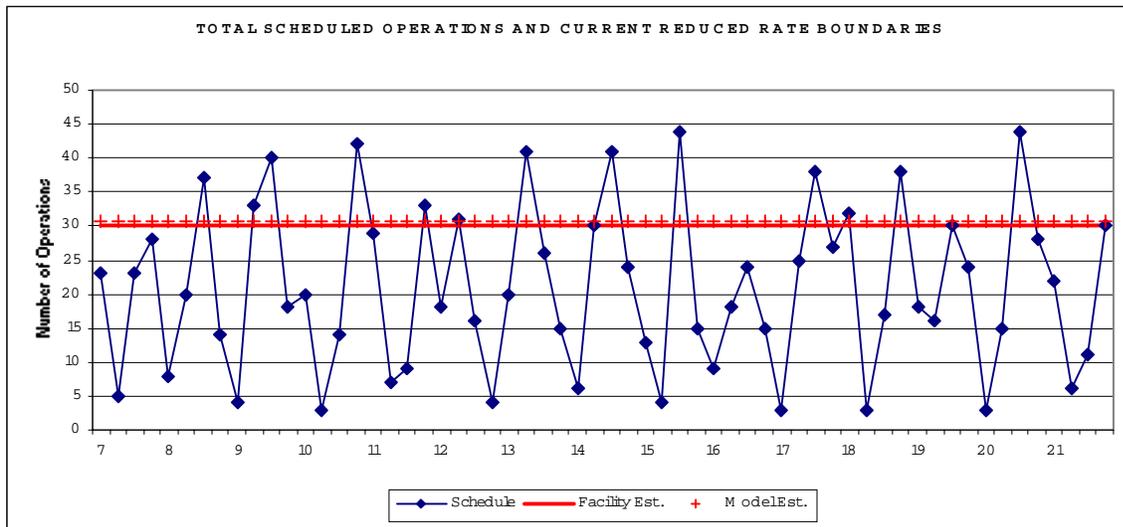


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima) – Arrivals 26/27, Departures 15/26
- Hourly rate of (56,56) was reported by the facility
- ASPM data for “Instrument Approaches” can include other configurations or marginal VFR, with higher acceptance rates
- The capacity model can only approximate the complex operations at IAH
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



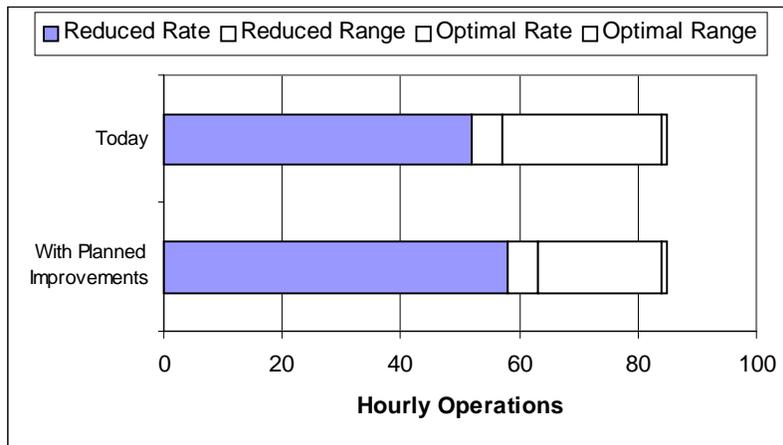
Las Vegas International Airport Benchmarks

- The current capacity benchmark at Las Vegas International Airport is 84-85 flights per hour in good weather.
- Current capacity falls to 52-57 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- In 2000, less than 1% of Las Vegas' flights were delayed longer than 15 minutes.
- In good weather, scheduled traffic at Las Vegas rarely exceeds capacity.
- In adverse weather, scheduled traffic exceeds capacity for roughly 5 hours of the day, resulting in more delays.
- Technology and procedural improvements are not expected to improve the Las Vegas capacity benchmark during good weather conditions over the next 10 years. However, the adverse weather capacity benchmark will increase by 12% (to 58-63 flights per hour).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes, which allow a more consistent flow of aircraft to the runway.
- Demand at Las Vegas is expected to grow by 30% over the next decade, indicating that delays are expected to increase in the future.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	84-85	52-57
New Runway	N/A	N/A
With planned improvements	84-85	58-63

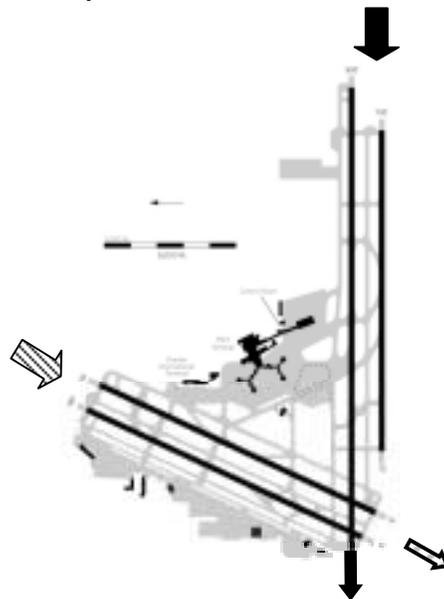
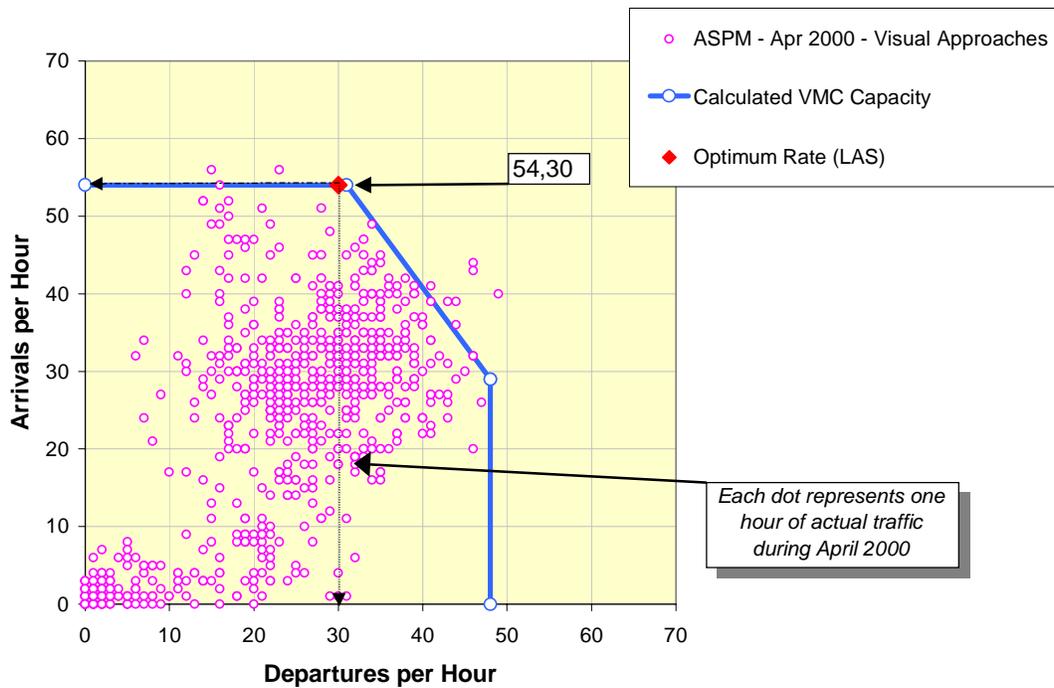


- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports
 - Seasonal limitations due to high temperatures that restrict aircraft climb rates

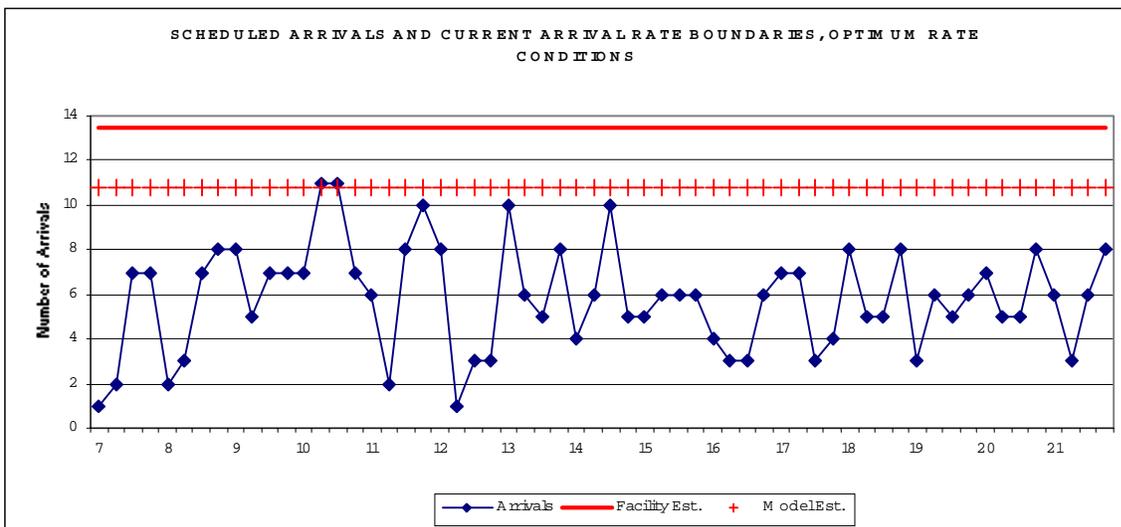
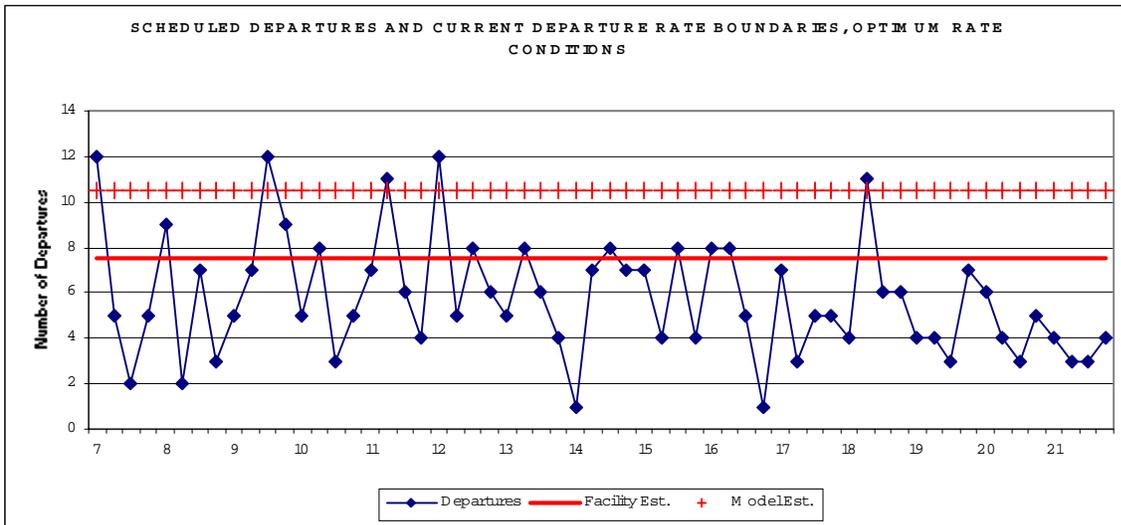
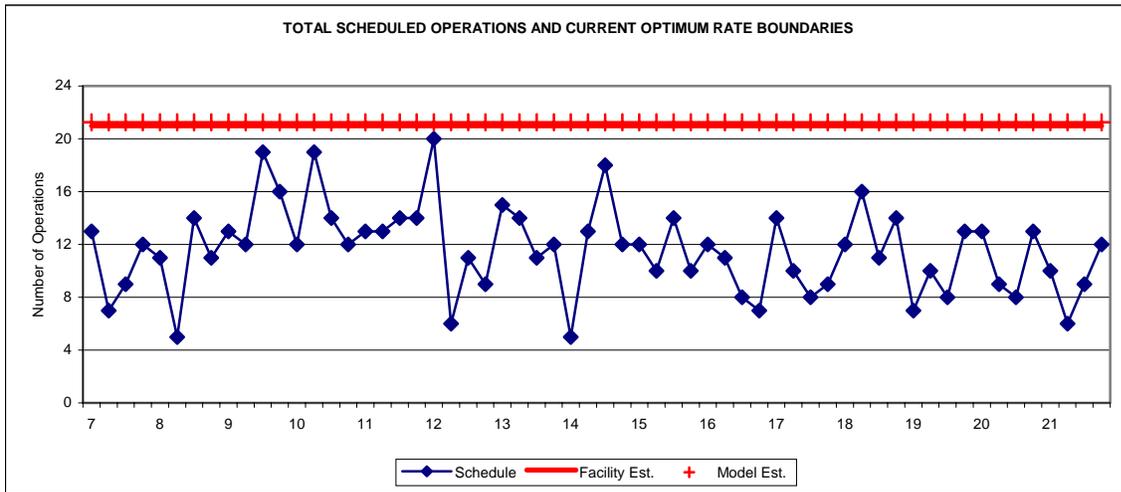
*These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs. **The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.***

Current Operations – Optimum Rate

- Visual approaches, visual separation – Optimum Rate of (54, 30) was reported by the facility
– Arrive Runways 25L/19R, Depart Runway 25R
- ASPM data is actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- Solid line represents the calculated airport capacity during a busy hour, and the tradeoff between arrivals and departure rates
- The capacity model can only approximate the operations at LAS. Specific constraints at LAS include significant non-scheduled helicopter operations, noise abatement procedures, and high terrain.

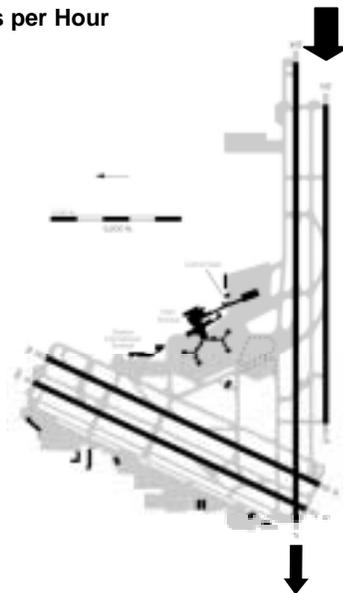
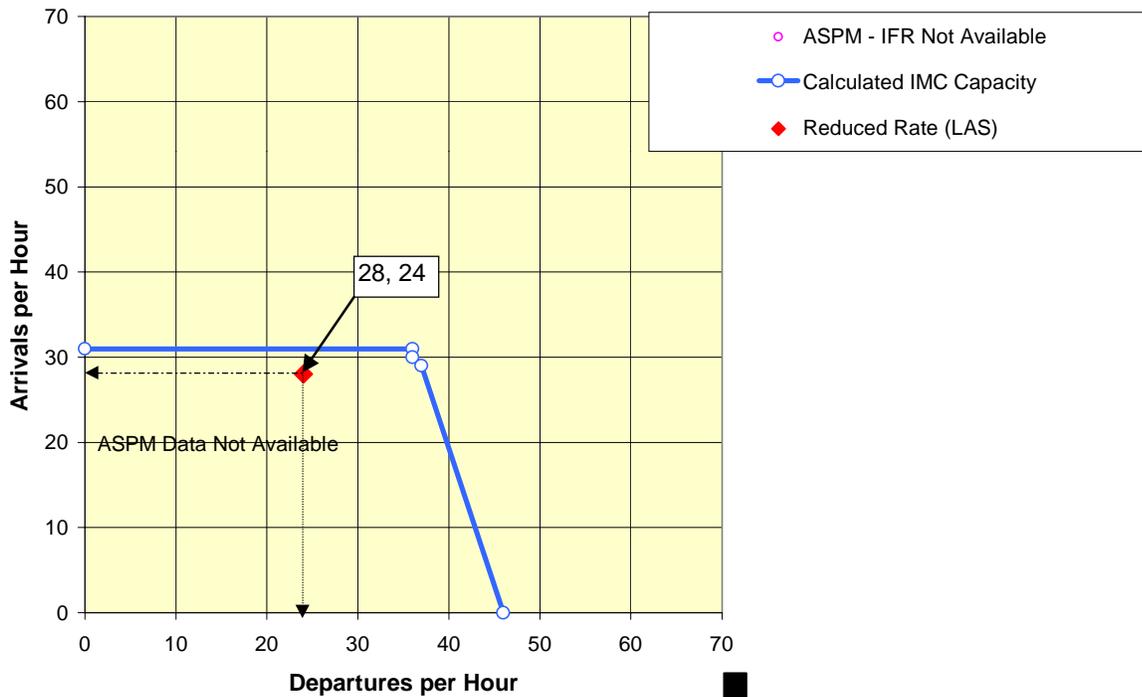


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

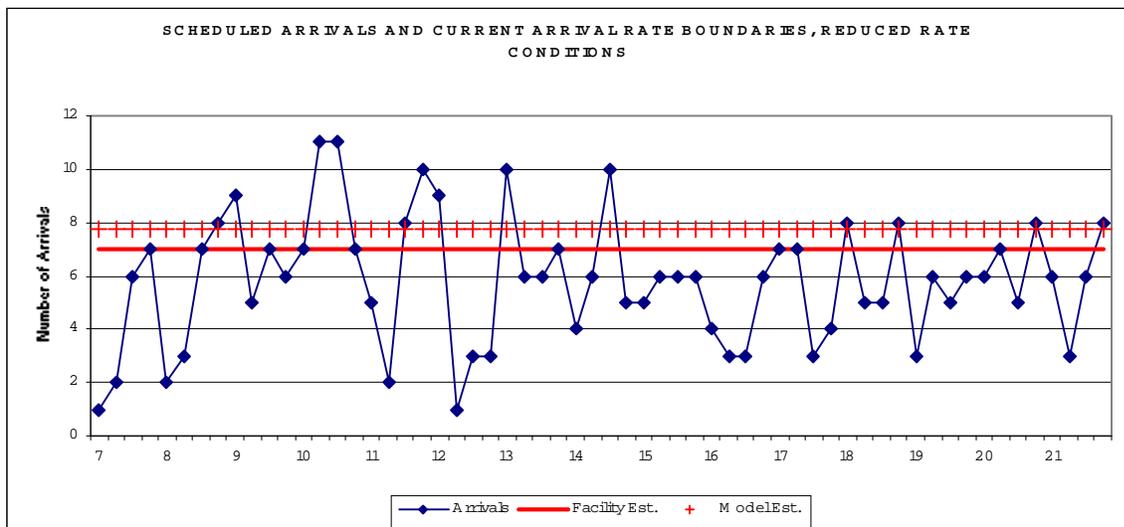
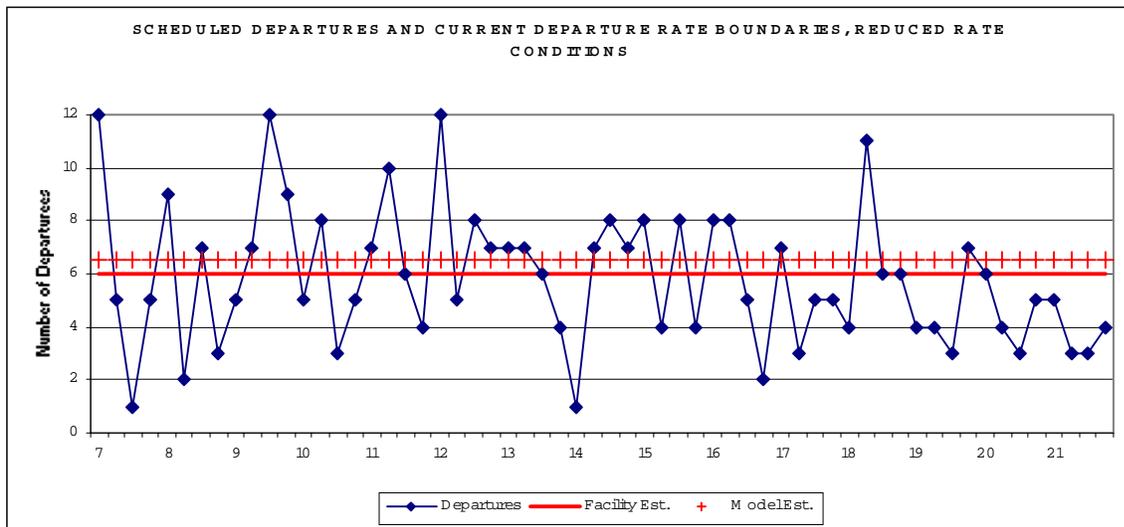
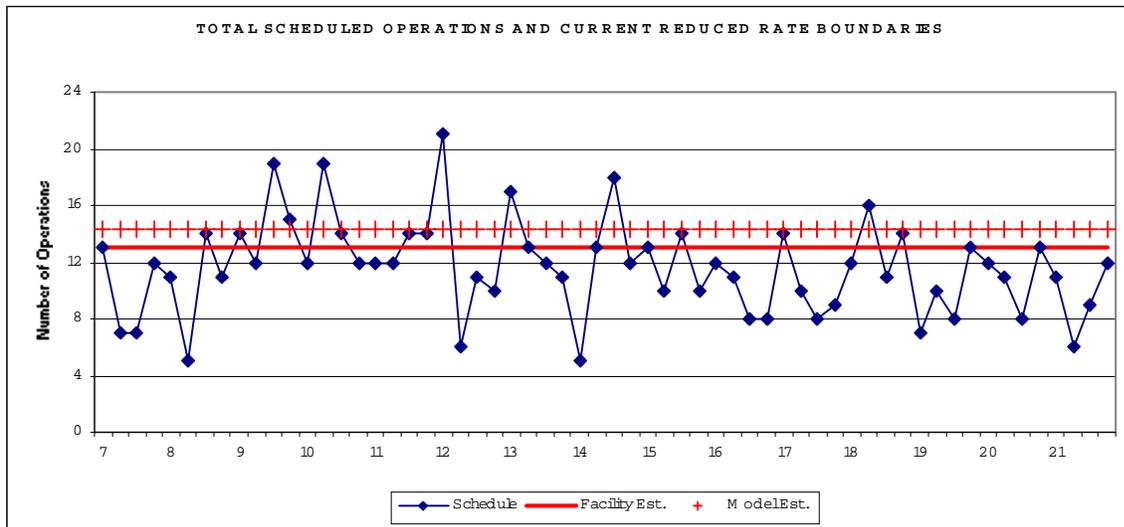


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Arrive Runway 25L, Depart Runway 25R
- Reduced Rate of (28, 24) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



Los Angeles International Airport Benchmarks

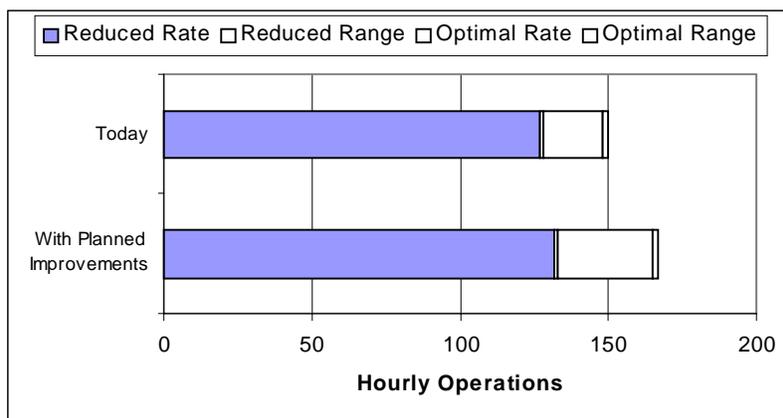
- The current capacity benchmark at Los Angeles is 148-150 flights per hour in good weather.
- Current capacity falls to 127-128 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- In 2000, slightly more than 2% of flights at Los Angeles experienced significant levels of delay (more than 15 minutes).
- In good weather, Los Angeles' scheduled traffic exceeds capacity for only one hour of the day.
- In adverse weather, scheduled traffic exceeds capacity for 7 hours of the day.
- Technology and procedural improvements are expected to improve the Los Angeles capacity benchmark by 11% (165-167 flights per hour) over the next 10 years, while the adverse weather capacity benchmark will increase by 4% (132-133 flights per hour).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes, which allow a more consistent flow of aircraft to the runway.
 - pFAST, assists the controller with sequencing for aircraft and better flow of traffic into the terminal area.
- Demand at Los Angeles is projected to grow by 25% over the next decade, indicating that delays will increase substantially in the future.

LAX – Los Angeles International Airport

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	148-150	127-128
New Runway	N/A	N/A
With planned improvements	165-175	132-133



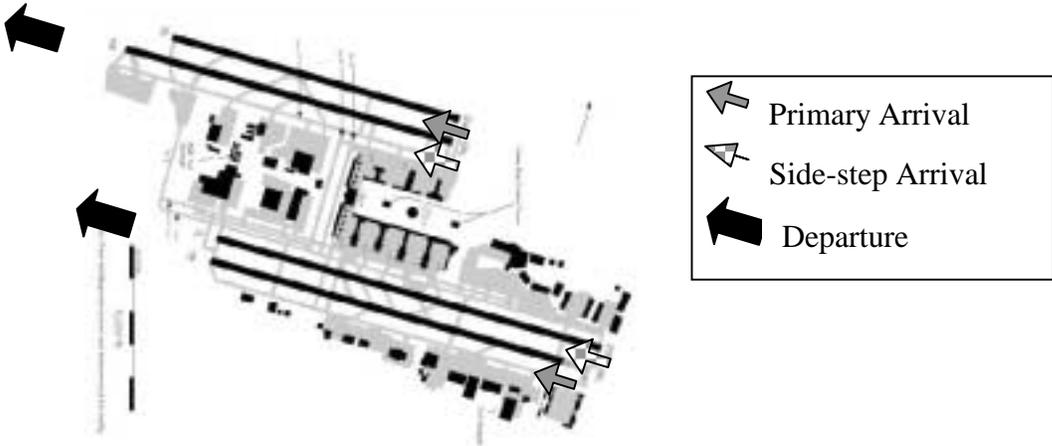
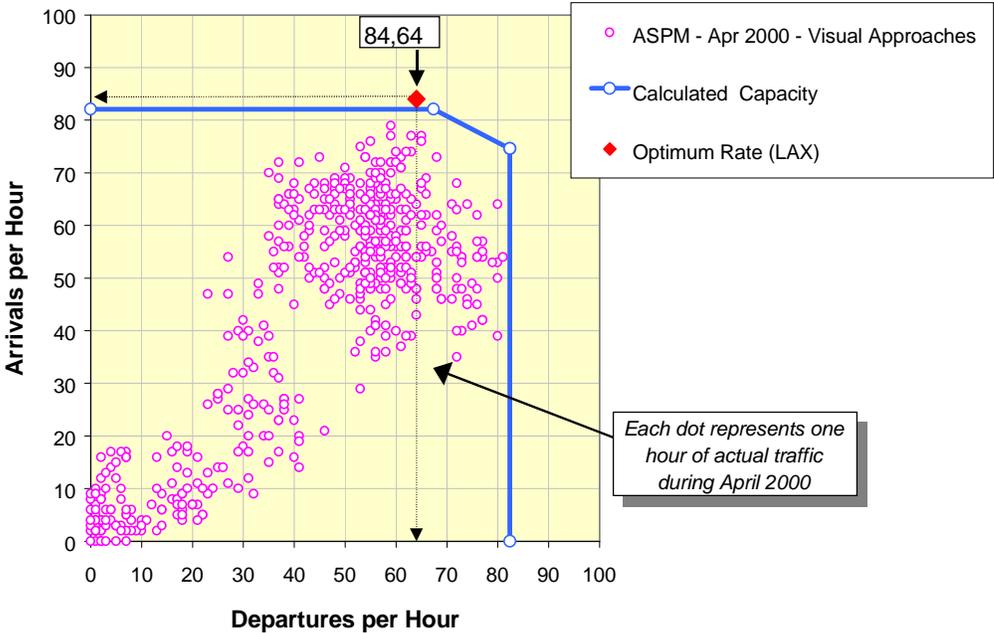
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
 - pFAST, assists the controller with sequencing for aircraft and better flow of traffic into the terminal area
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

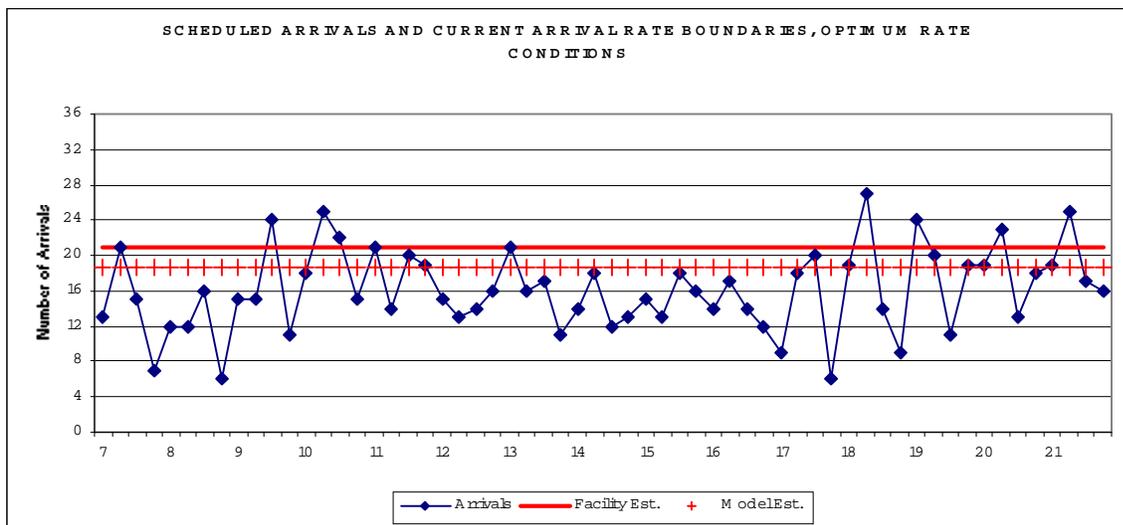
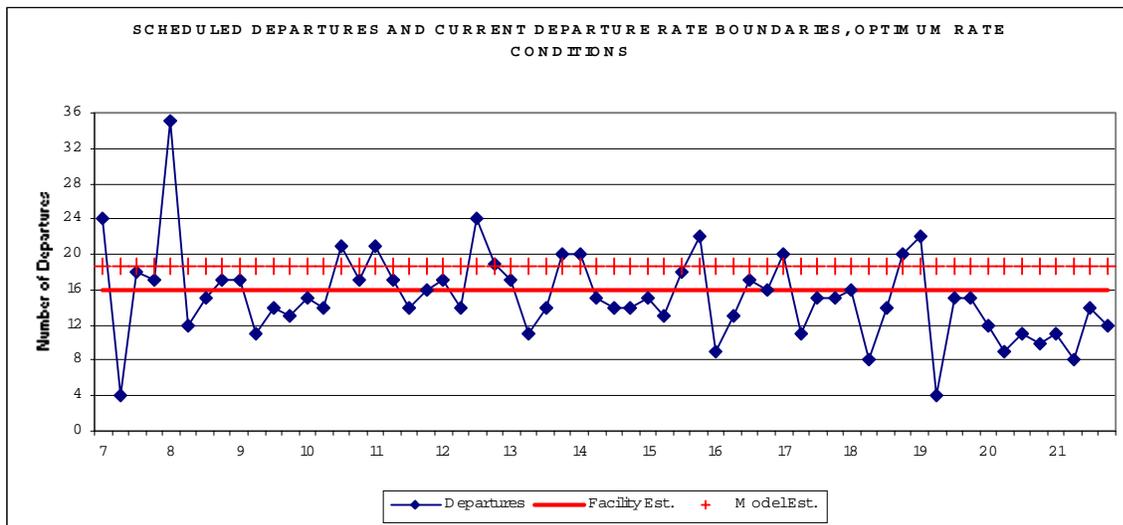
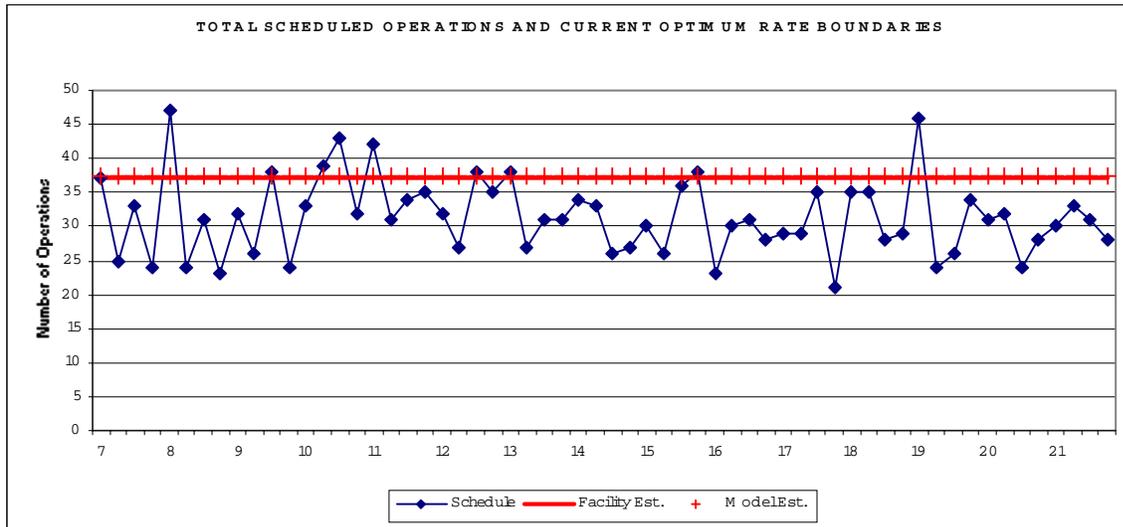
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – Optimum Rate of (84,64) was reported by the facility
 - Arrive from East
- ASPM data is actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- The capacity model can only approximate the complex operations at LAX

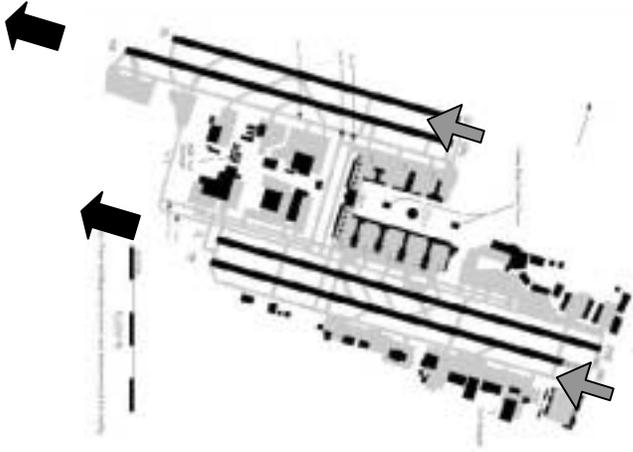
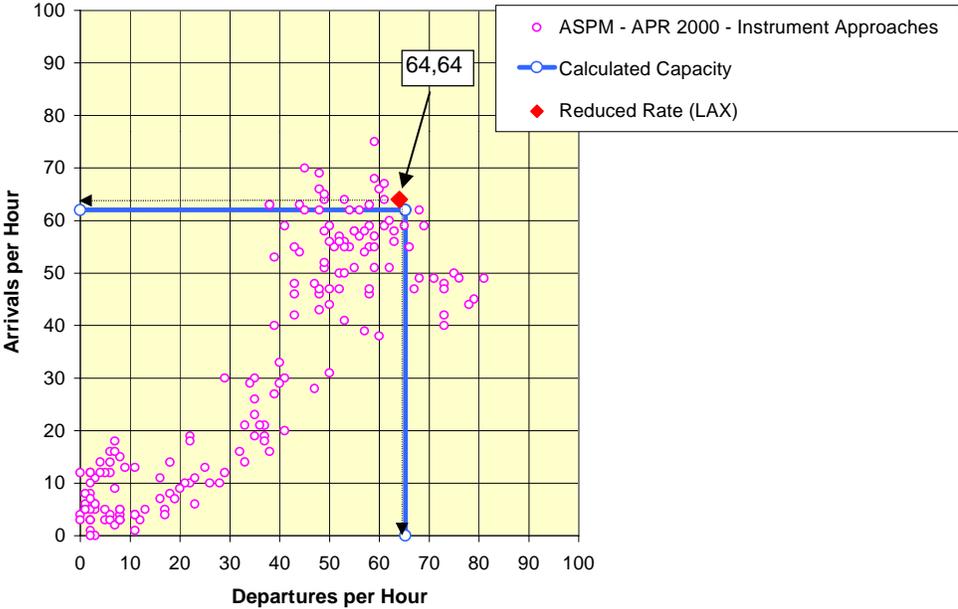


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

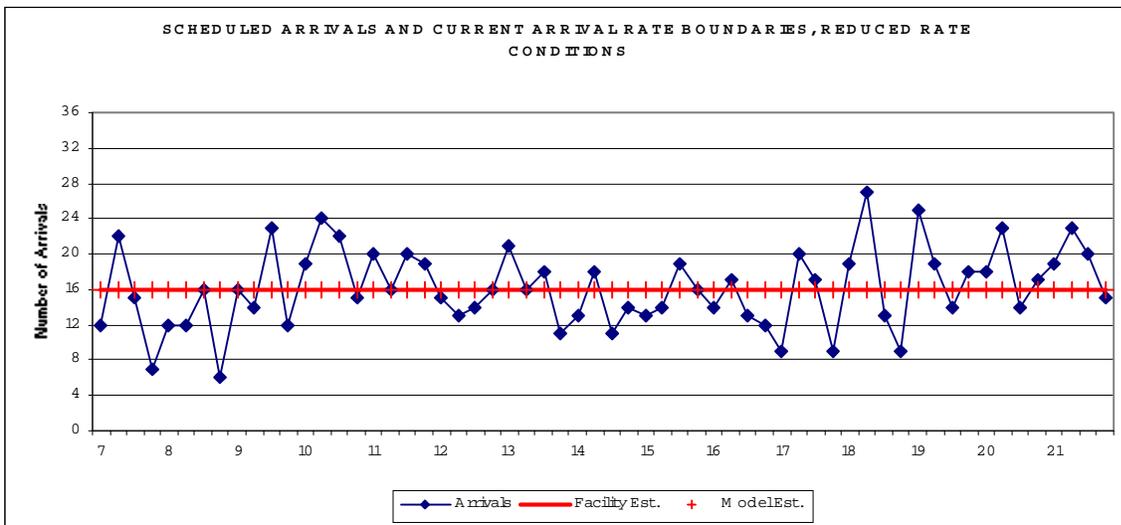
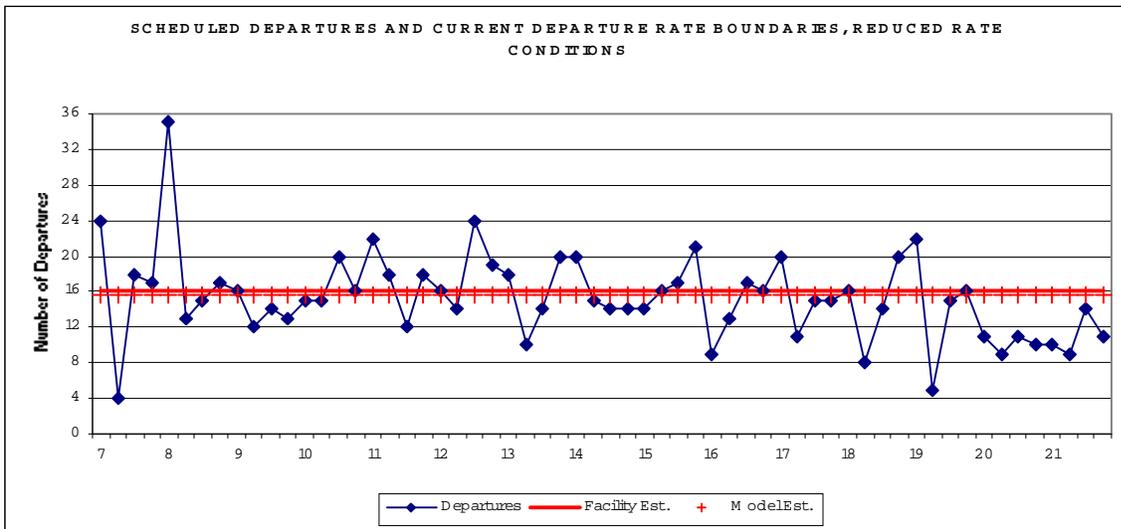
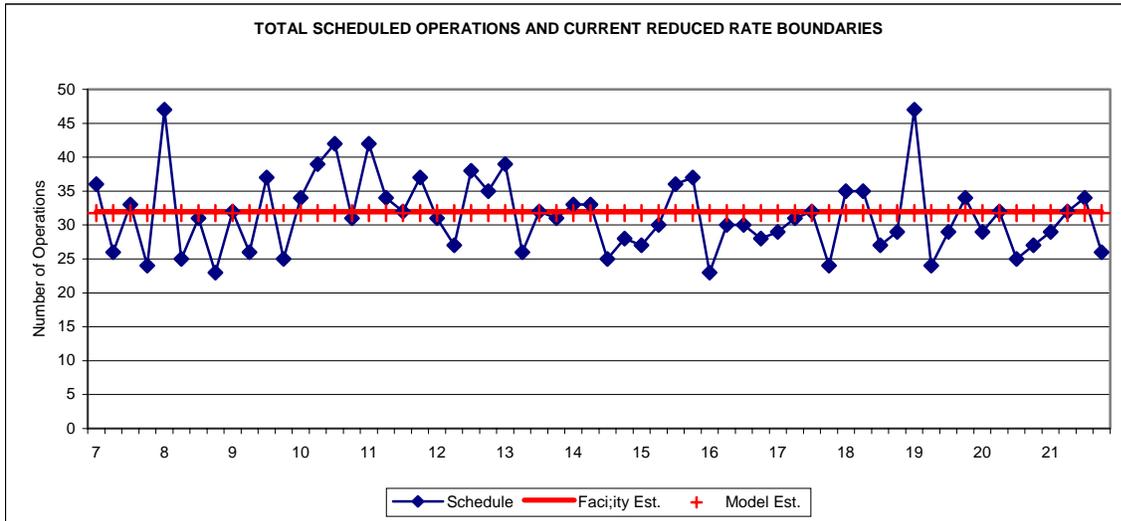


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Arrive from East
- Reduced Arrival Rate of (64,64) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



Memphis International Airport Benchmarks

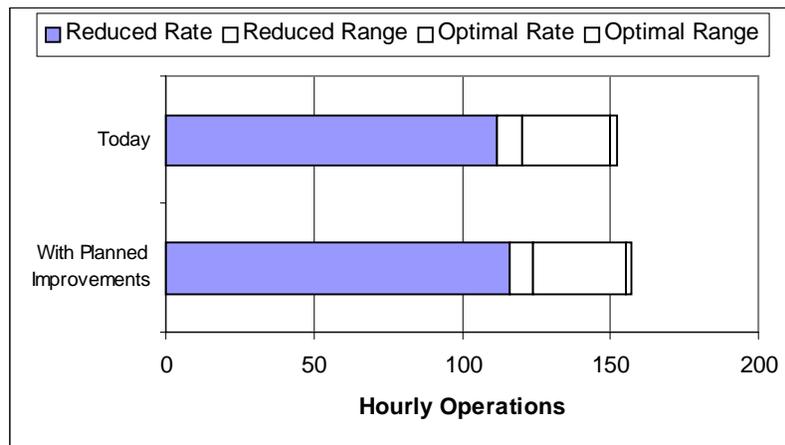
- The current capacity benchmark at Memphis is 150-152 flights per hour in good weather.
- Current capacity falls to 112-120 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- In 2000, less than 0.1% of the flights were delayed significantly (more than 15 minutes).
- In both good and adverse weather, Memphis' scheduled traffic rarely exceeds the current capacity of the airport, as arrival and departure traffic rarely contend for use of the runway at the same time.
- If the characteristics of the arrival and departure demand at the airport were to change so that arrivals and departures were simultaneously close to their current peaks, the airport would be operating close to its good weather capacity.
- Technology and procedural improvements are expected to improve the Memphis capacity benchmark by 3% (to 155-157 flights per hour) over the next 10 years, while the adverse weather capacity benchmark will increase by 4% (to 116-124 flights per hour).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes, which allow a more consistent flow of aircraft to the runway.
- Demand at Memphis is projected to grow by 30% over the next decade, indicating that delays could grow in the future, depending on whether additional traffic is distributed throughout the day or simply added to existing peak periods.

MEM – Memphis International Airport

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	150-152	112-120
New Runway	N/A	N/A
With planned improvements	155-157	116-124



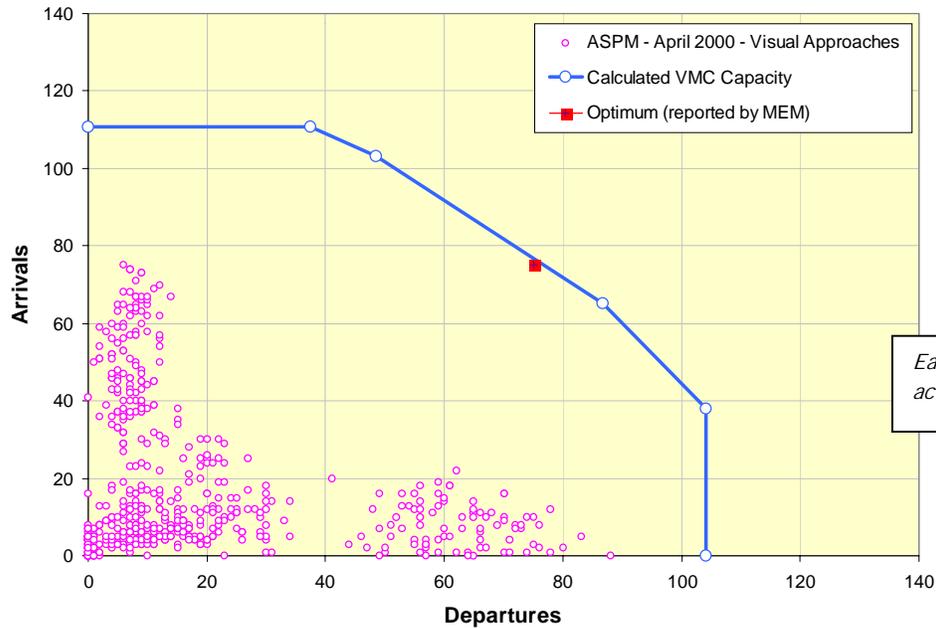
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

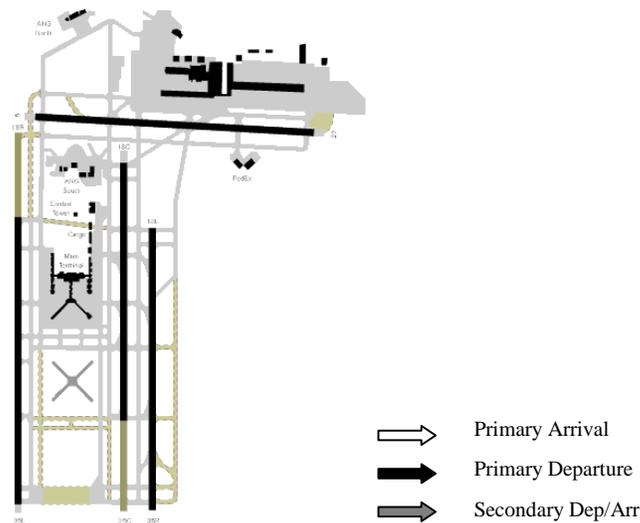
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

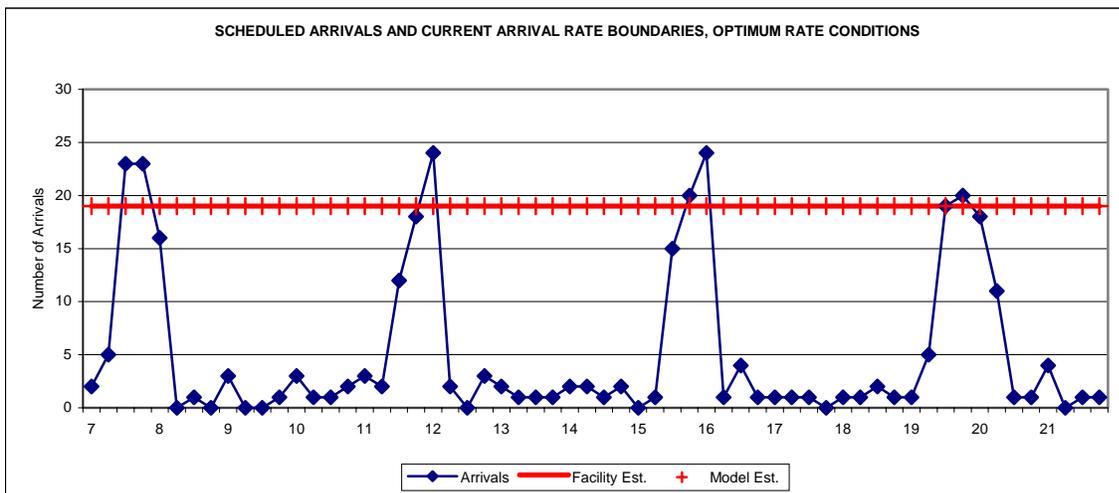
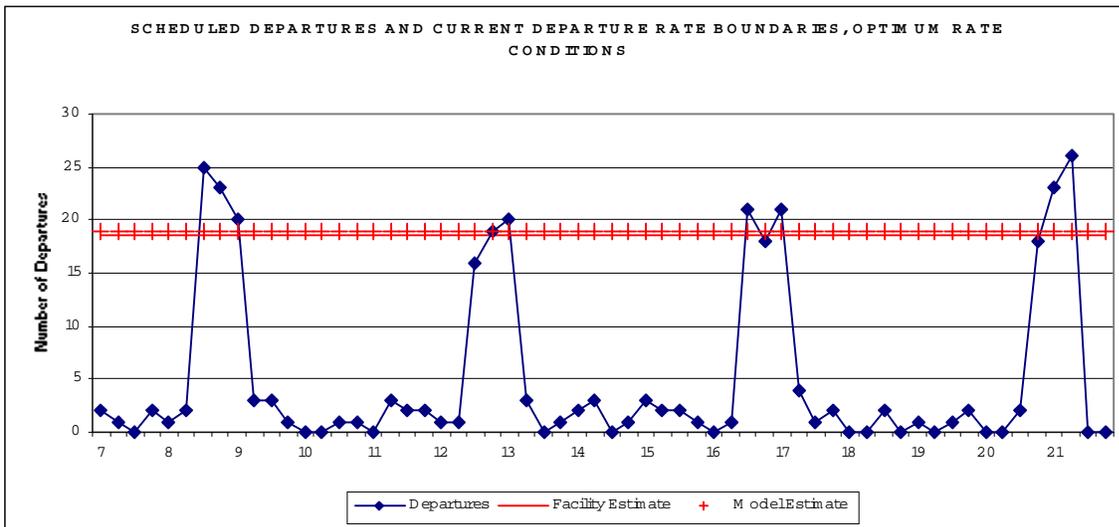
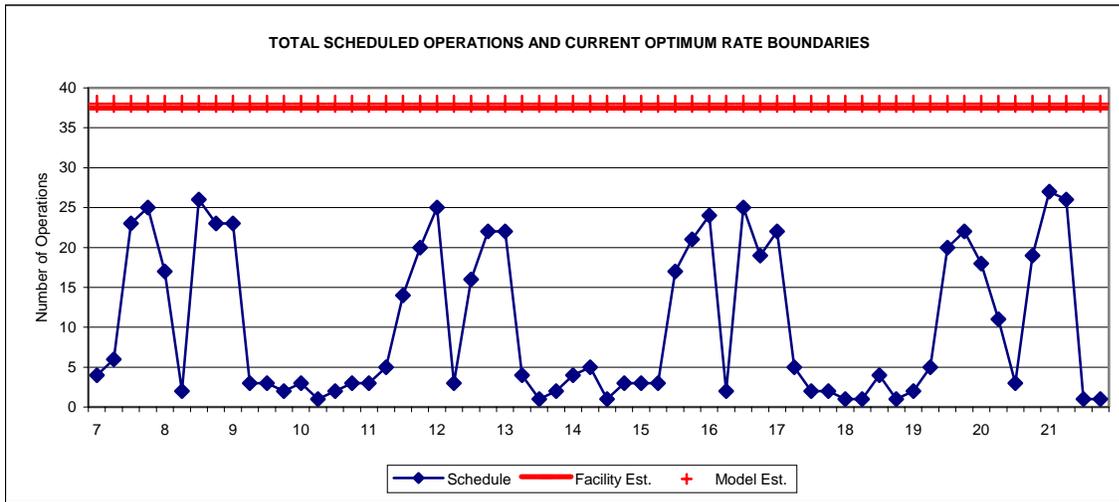
- Visual approaches, visual separation
 - North: Arr: 36R/L, 27 Dep: 36 L/C/R
 - Arrivals primarily to two parallel runways
 - Departures from two or more runways
- ASPM data is actual hourly traffic counts



Each dot represents one hour of actual traffic during April 2000



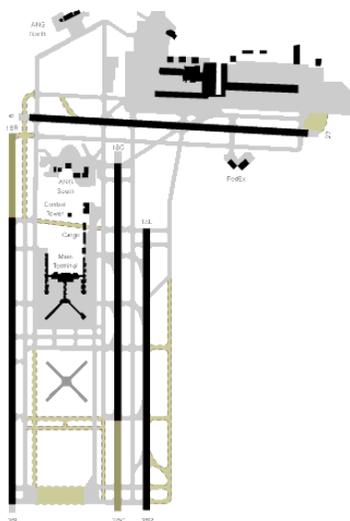
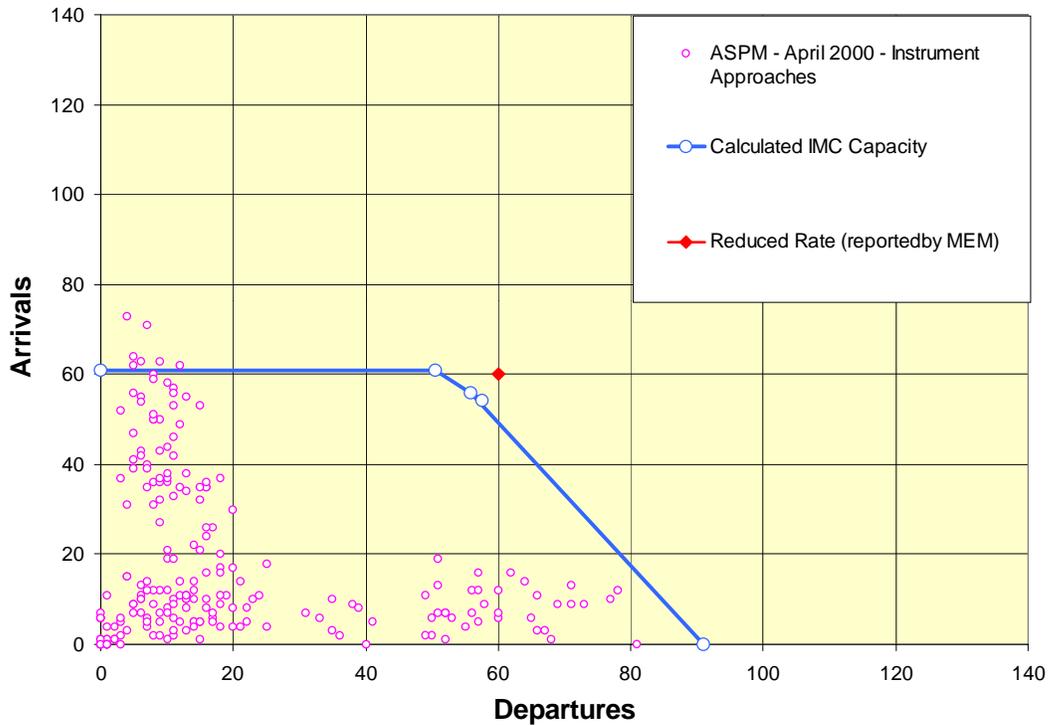
Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions



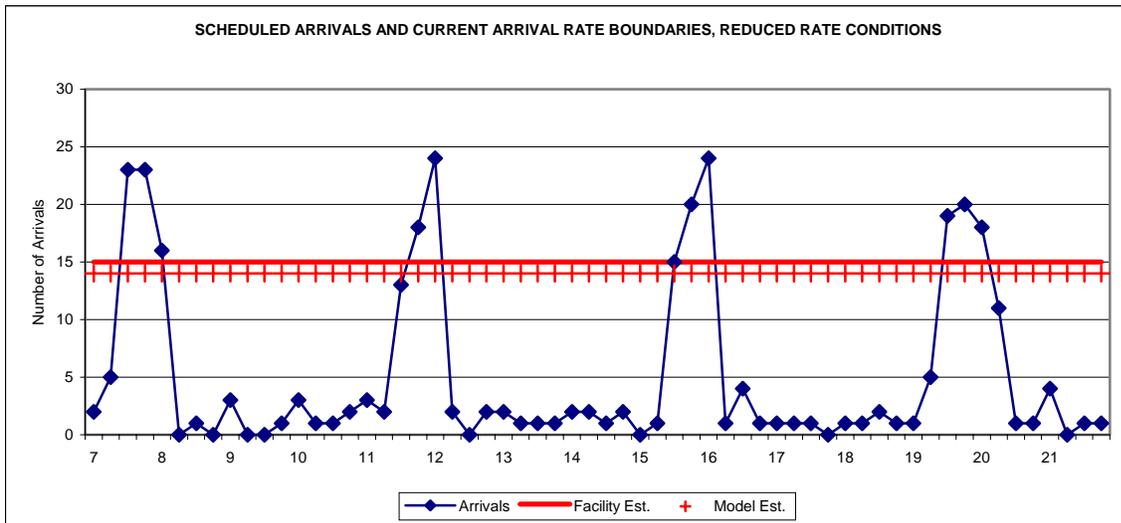
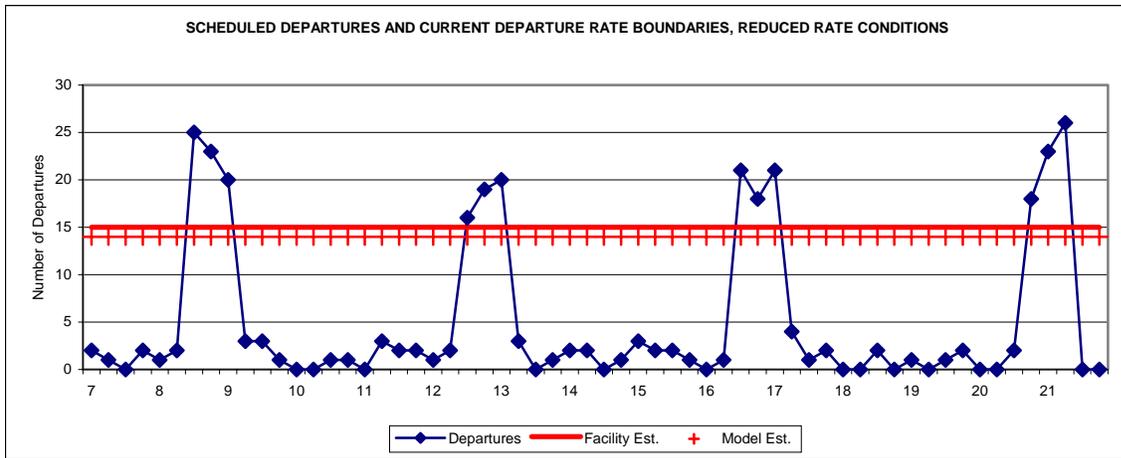
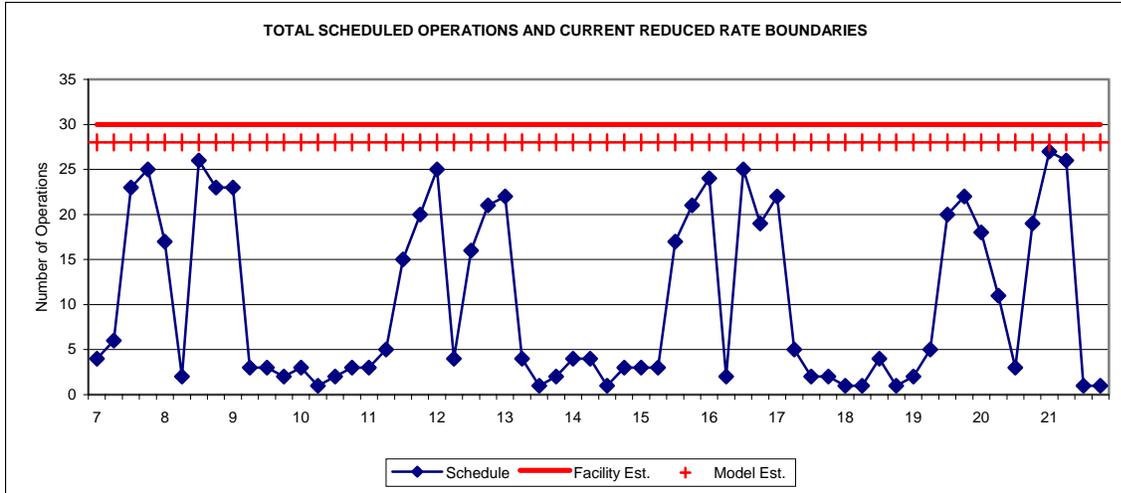
MEM – Memphis International Airport

Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Arrivals to two parallel runways 36 R/L
 - Departures from 36 R/C/L, sometimes 9/27
- Calculated capacities are close to reported AAR and ADR
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



Miami International Airport Benchmarks

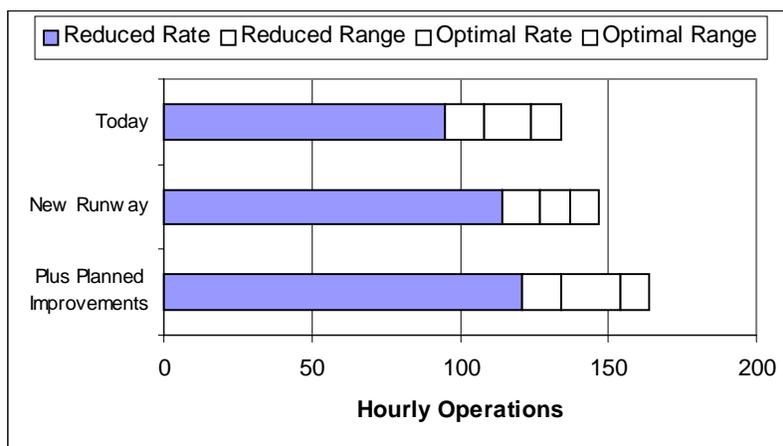
- The current capacity benchmark at Miami is 124-134 flights per hour in good weather.
- Current capacity falls to 95-108 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- In 2000, about 1% of flights at Miami experienced significant levels of delay (more than 15 minutes).
- In good weather, Miami's scheduled traffic rarely exceeds capacity.
- In adverse weather, scheduled traffic occasionally exceeds capacity (one hour per day).
- During adverse weather, capacity is lower and results in more delays.
- A new runway, scheduled for completion in 2003, is expected to improve Miami's capacity by 10% (to 137-147 flights per hour) in good weather and by 20% (to 114-127 flights per hour) in adverse weather.
- Technology and procedural improvements, in addition to a new runway are expected to improve Miami's capacity benchmark by a total of 24% (to 154-164 flights per hour) over the next 10 years, while the adverse weather capacity benchmark will increase by a total of 27% (121-134 flights per hour).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes, which allow a more consistent flow of aircraft to the runway.
- Demand at Miami is expected to grow by 23% over the next decade, indicating that delays are expected to remain about the same.

MIA – Miami International Airport

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	124-134	95-108
New Runway	137-147	114-127
Plus planned improvements	154-164	121-134



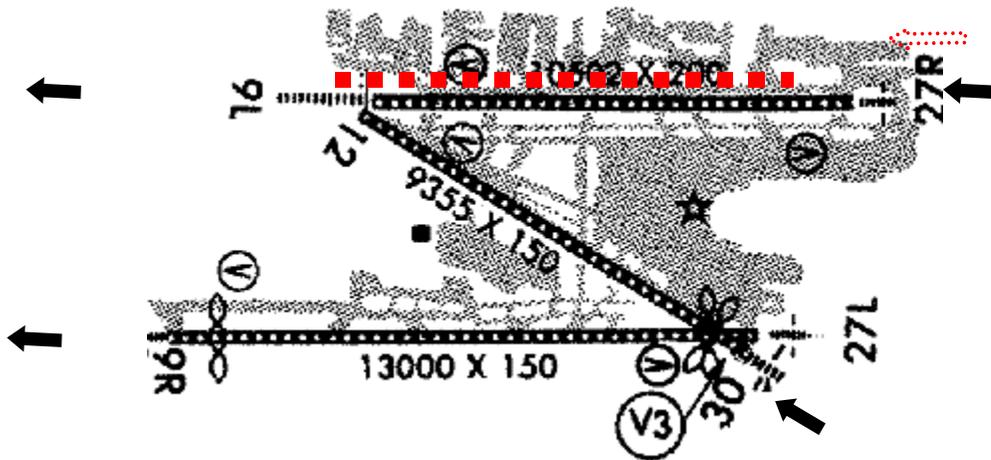
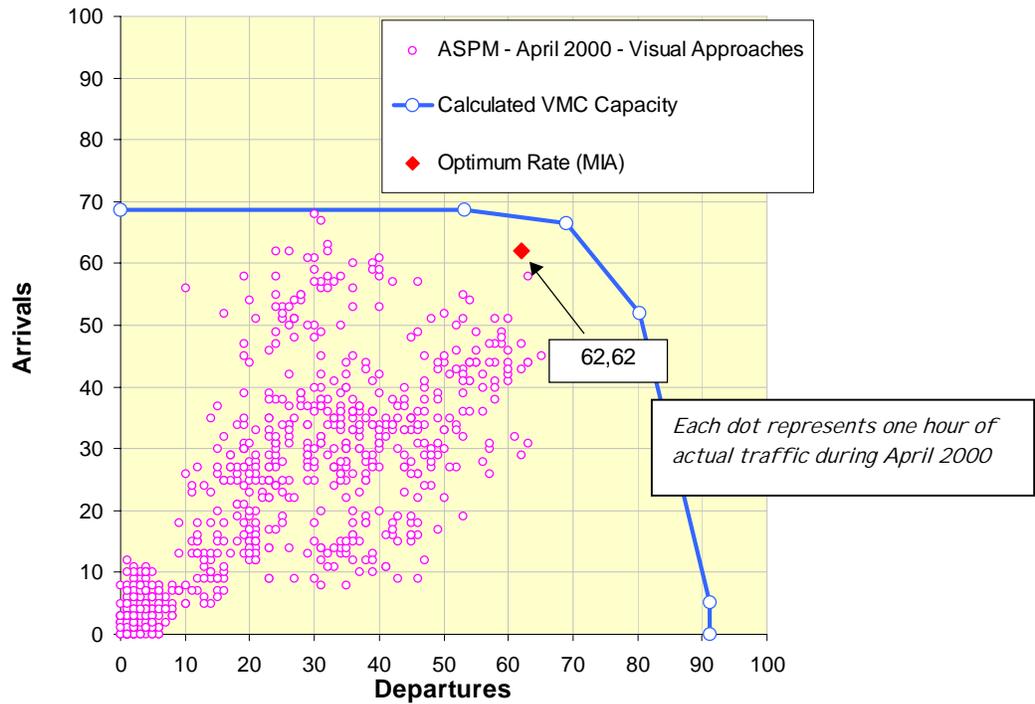
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

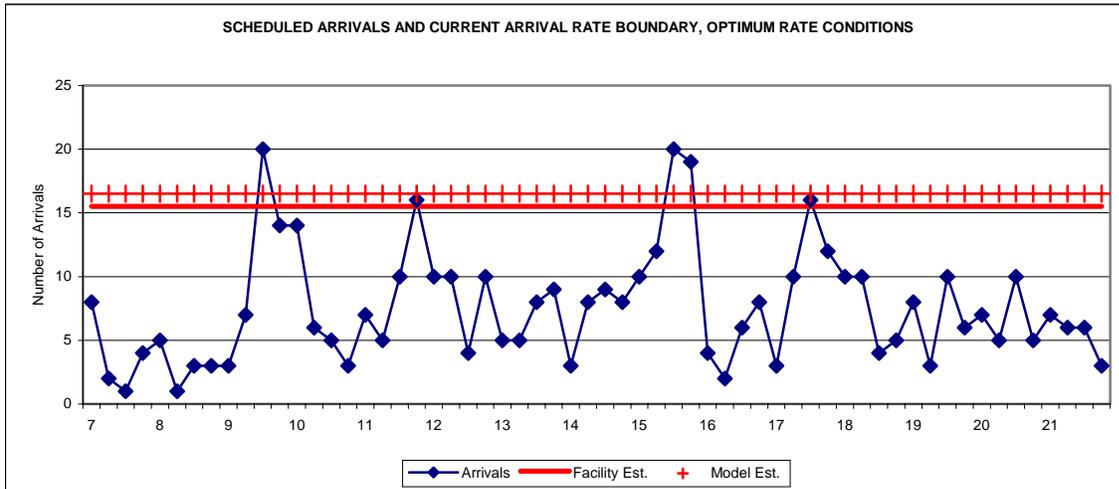
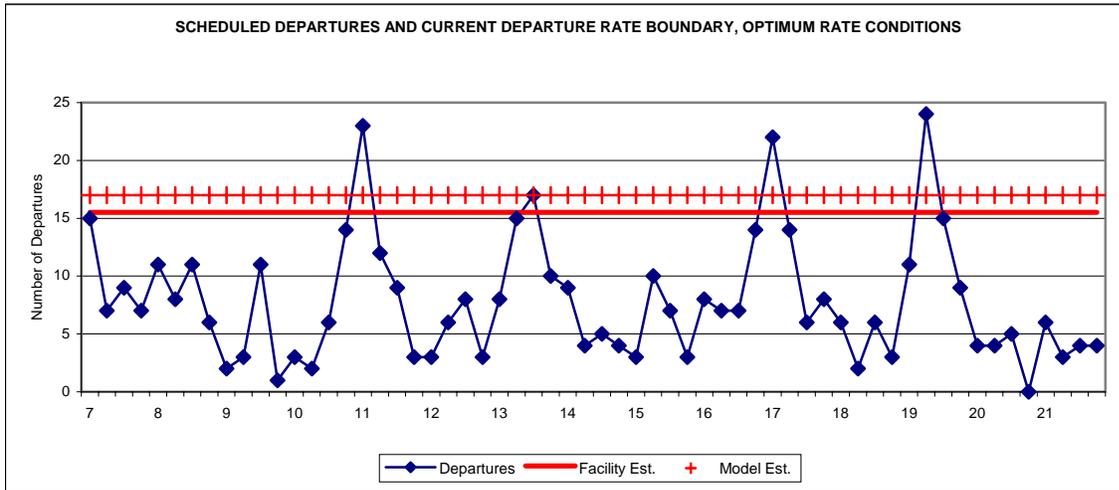
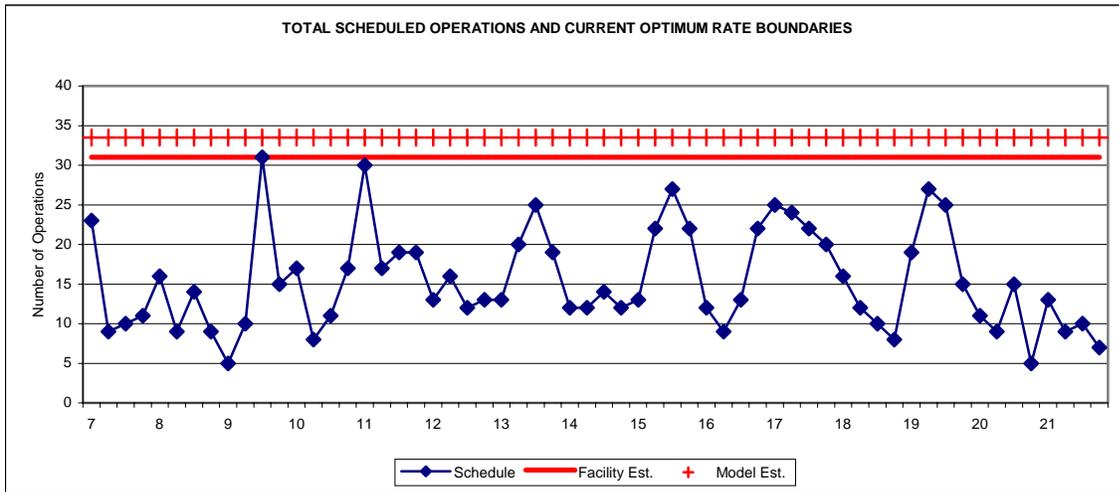
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – Optimum Rate of Optimum Rate:
 - Arrive: 27R, 30 Arrive: 62
 - Depart: 27R, 27L Depart: 63
- ASPM data are actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. These data include other runway configurations and off-peak periods.
- Solid line represents the airport capacity during a busy hour calculated by the FAA Airport Capacity Model, showing the tradeoff between arrival and departure rates
- The capacity model can only approximate the operations at MIA



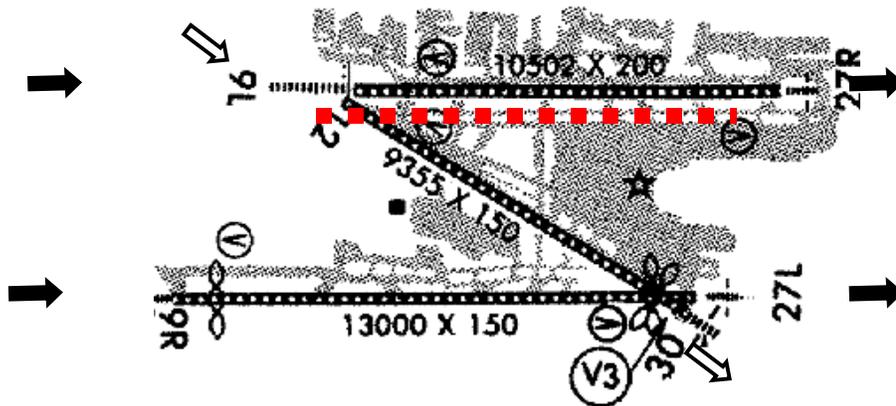
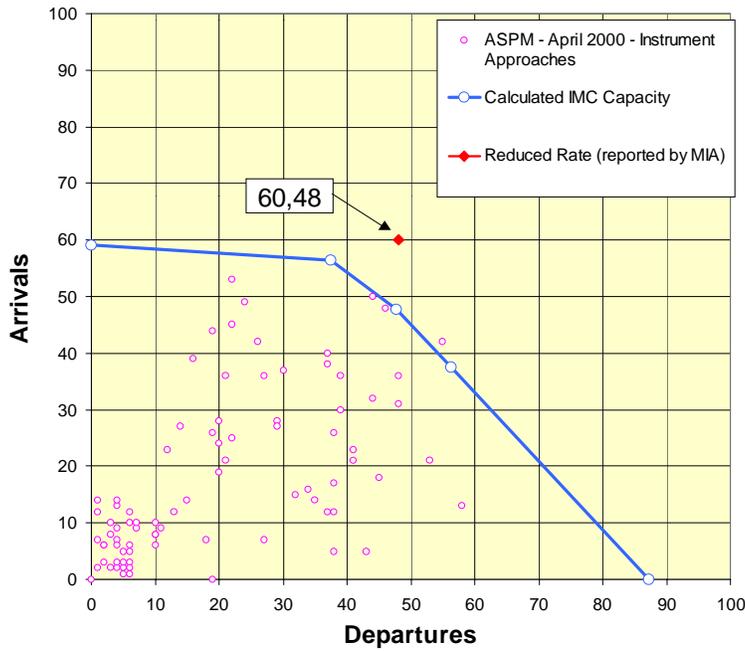
Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions



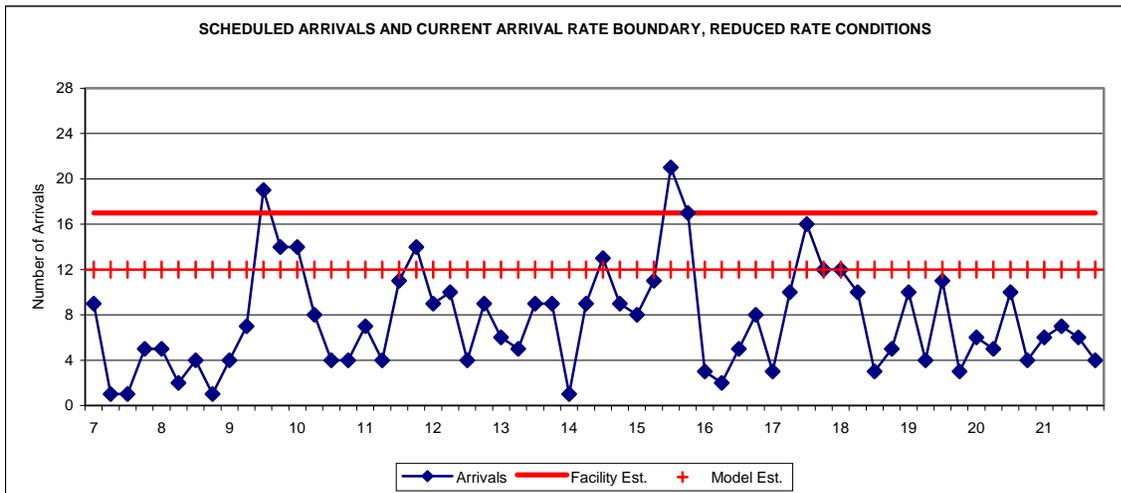
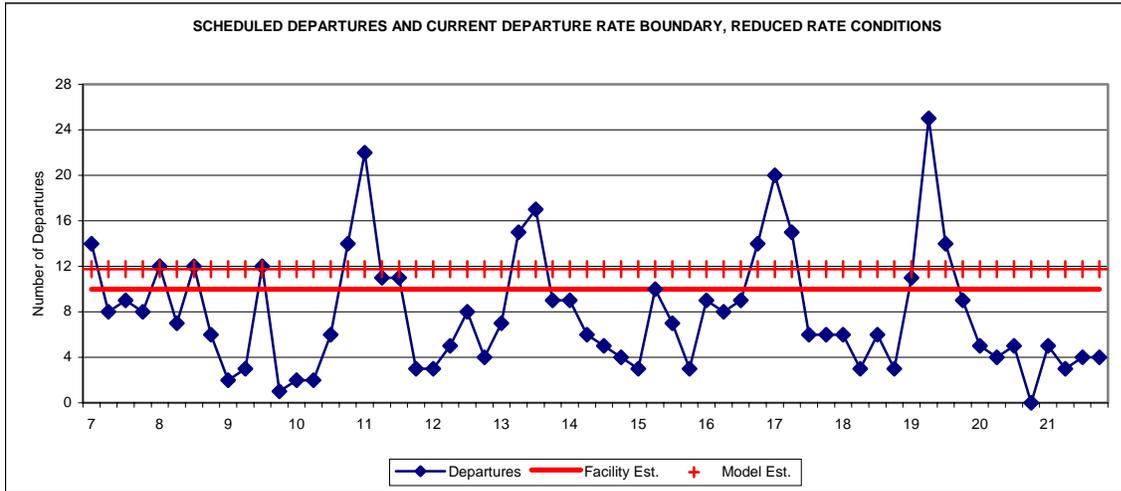
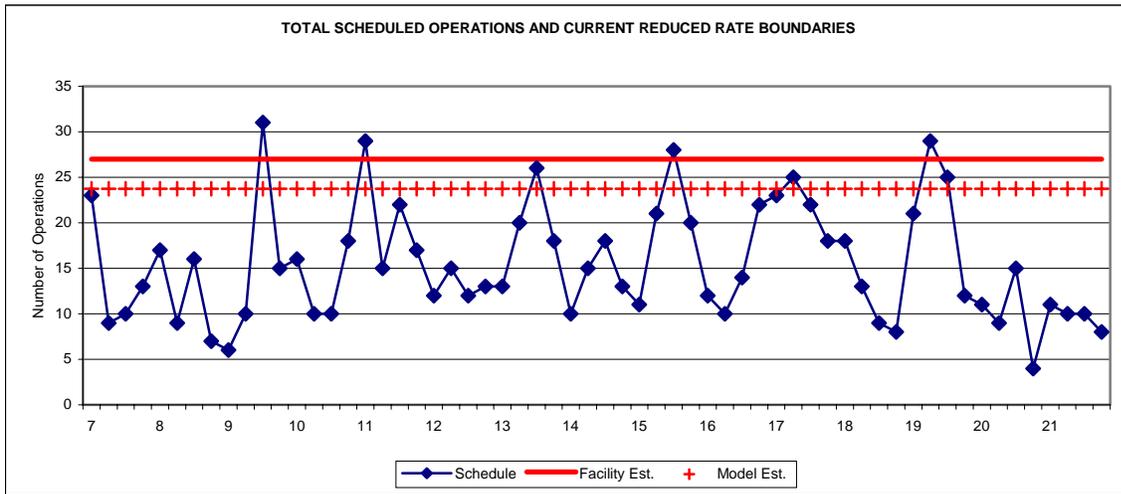
Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Arrive: 9L, 9R, 12* Arrive: 60 (48)
 - Depart: 9L, 9R, 12 Depart: 48
 - The Departure Rate is reduced because currently MIA cannot conduct Arrival/Departure LAHSO (Runways 9R & 12).
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour

*During IFR Conditions Runway 12 not available for arrivals, reducing the arrival rate to 48.



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



Minneapolis-St. Paul International Airport Benchmarks

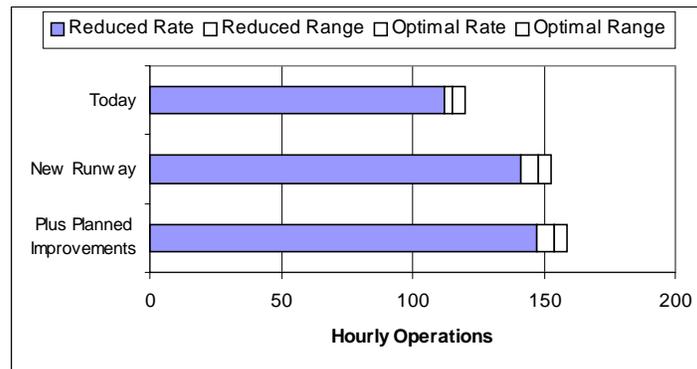
- The current capacity benchmark at Minneapolis-St Paul is 115-120 flights per hour in good weather.
- Current capacity falls to 112 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- In 2000, slightly more than 1% of flights experienced significant levels of delay (more than 15 minutes).
- Scheduled operations at Minneapolis-St. Paul are at or above capacity 1 ½-2 hours per day (good and adverse weather respectively).
- A new runway, scheduled to open in 2003, is expected to improve Minneapolis-St. Paul's capacity by 29% (to 148-153 flights per hour) in good weather and by 26% (to 141 flights per hour) in adverse weather.
- Technology and procedural improvements, in addition to a new runway, are expected to improve Minneapolis-St. Paul's capacity benchmark by a total of 34% (to 154-159 flights per hour) over the next 10 years, while the adverse weather capacity benchmark will increase by a total of 31% (to 147 flights per hour).
- These capacity increases could be brought about as a result of:
 - pFAST, which assists the controller with sequencing aircraft, for a better flow of traffic into the terminal area.
 - PRM is already installed, so effect is included in today's reduced rate benchmarks.
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes, which allow a more consistent flow of aircraft to the runway.
- Demand at Minneapolis-St. Paul is projected to grow by 32% over the next decade, indicating that delays are not expected to increase in the future.

MSP – Minneapolis-St. Paul International Airport

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	115-120	112
New Runway	148-153	141
Plus planned improvements	154-159	147



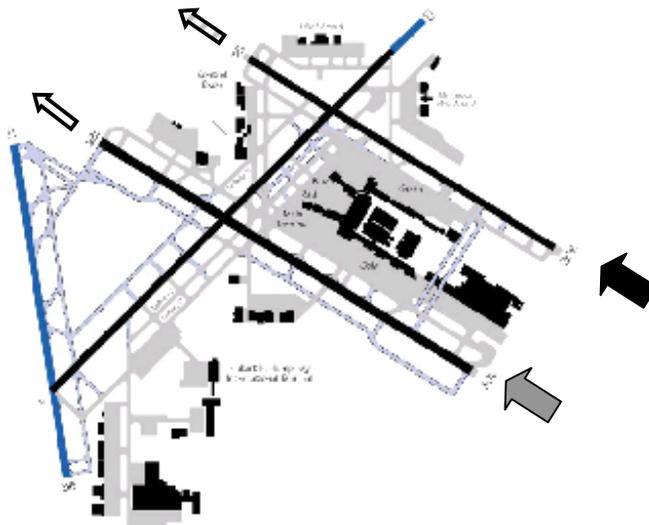
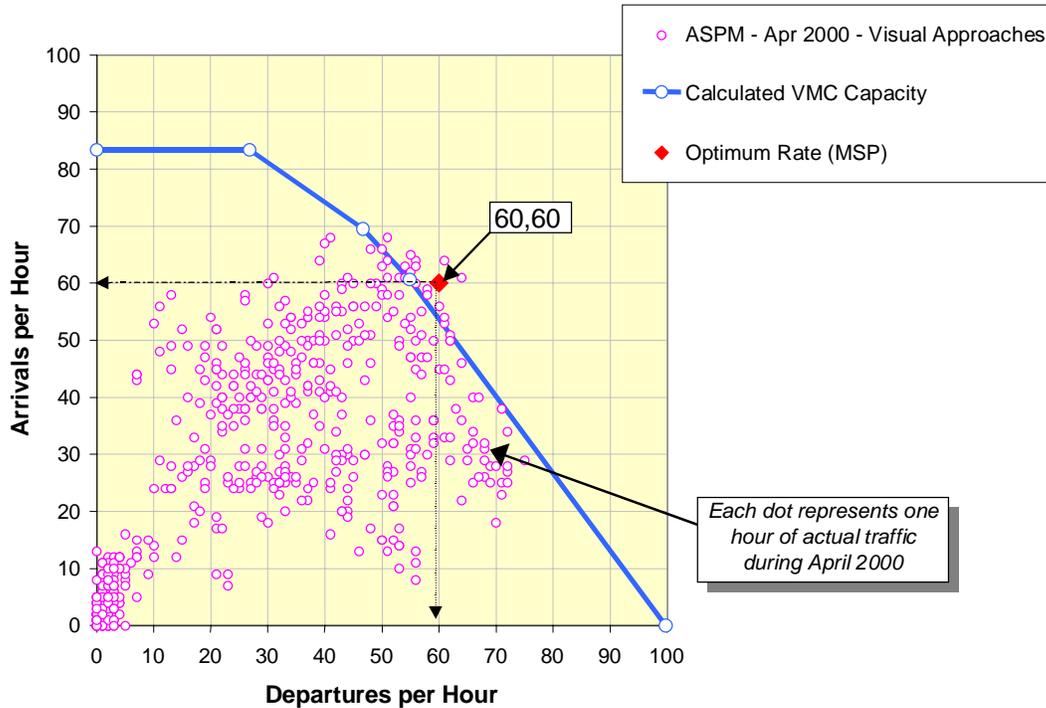
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - pFAST, which assists the controller with sequencing aircraft, for a better flow of traffic into the terminal area
 - PRM is already installed, so effect is included in today's reduced rate benchmarks
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

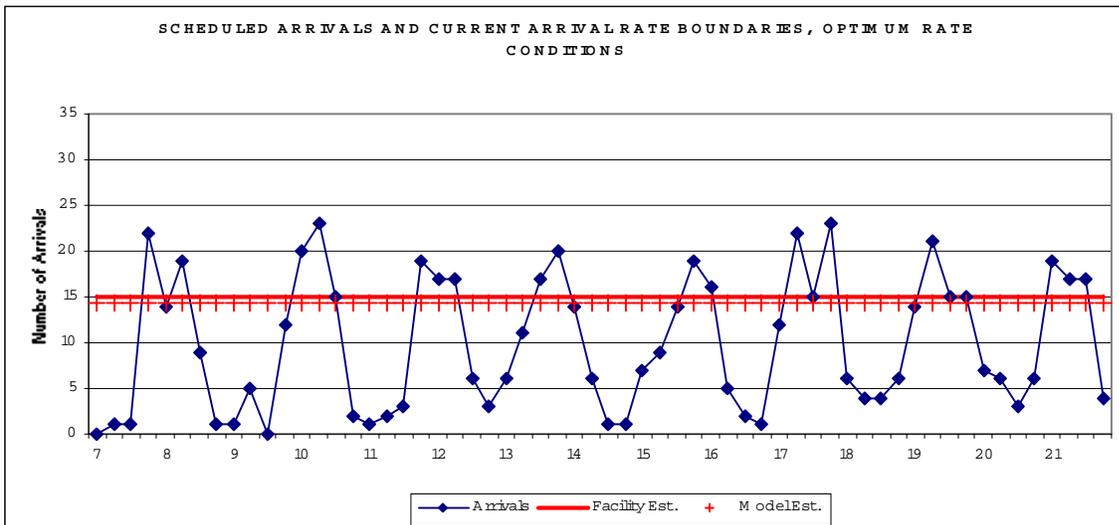
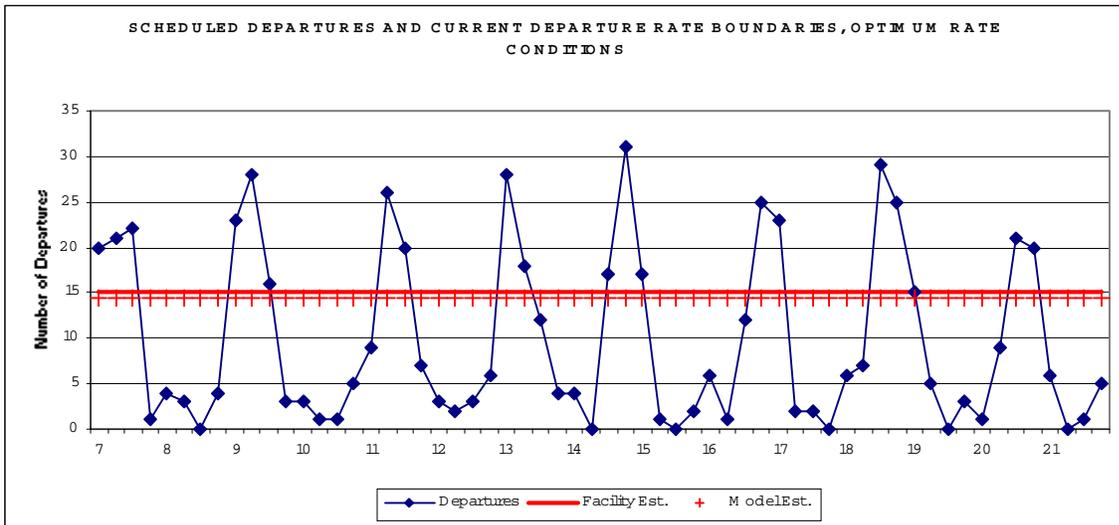
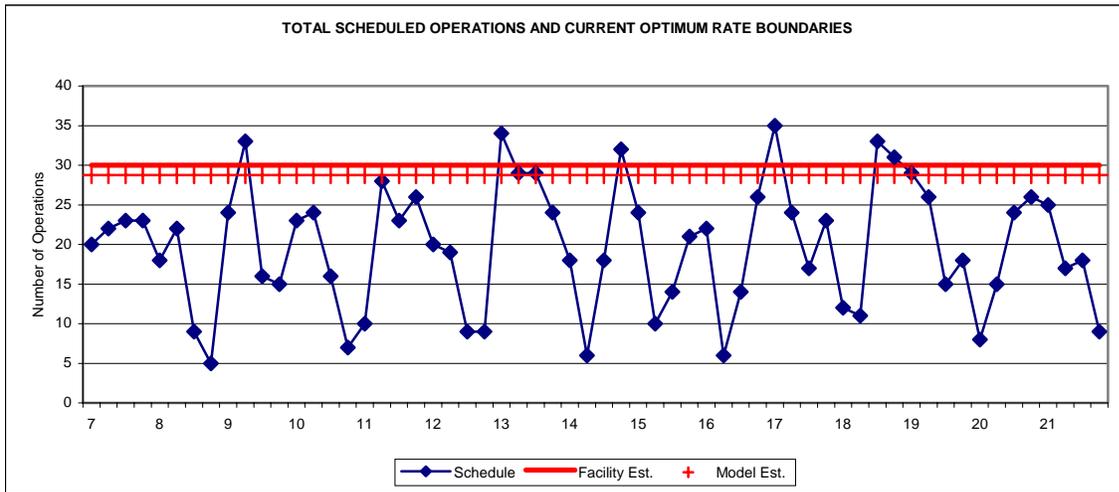
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – Optimum Rate of (60, 60) was reported by the facility – Arrive and Depart Runways 30L/R or 12R/L
- ASPM data is actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- Solid line represents the calculated airport capacity during a busy hour, and the tradeoff between arrivals and departure rates
- The capacity model can only approximate the operations at MSP

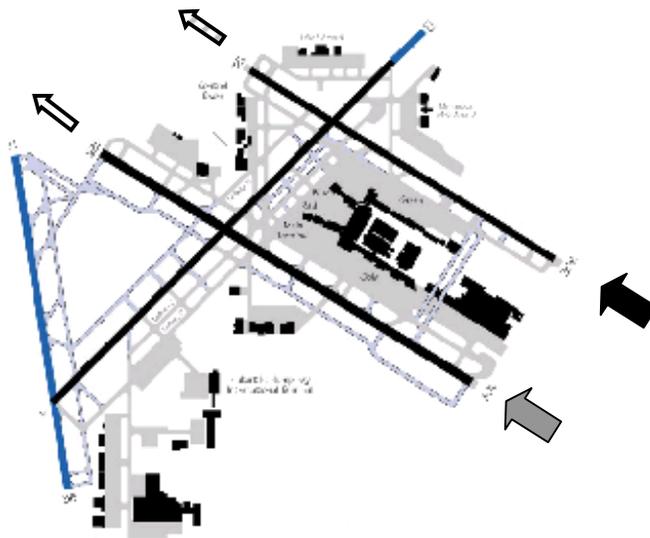
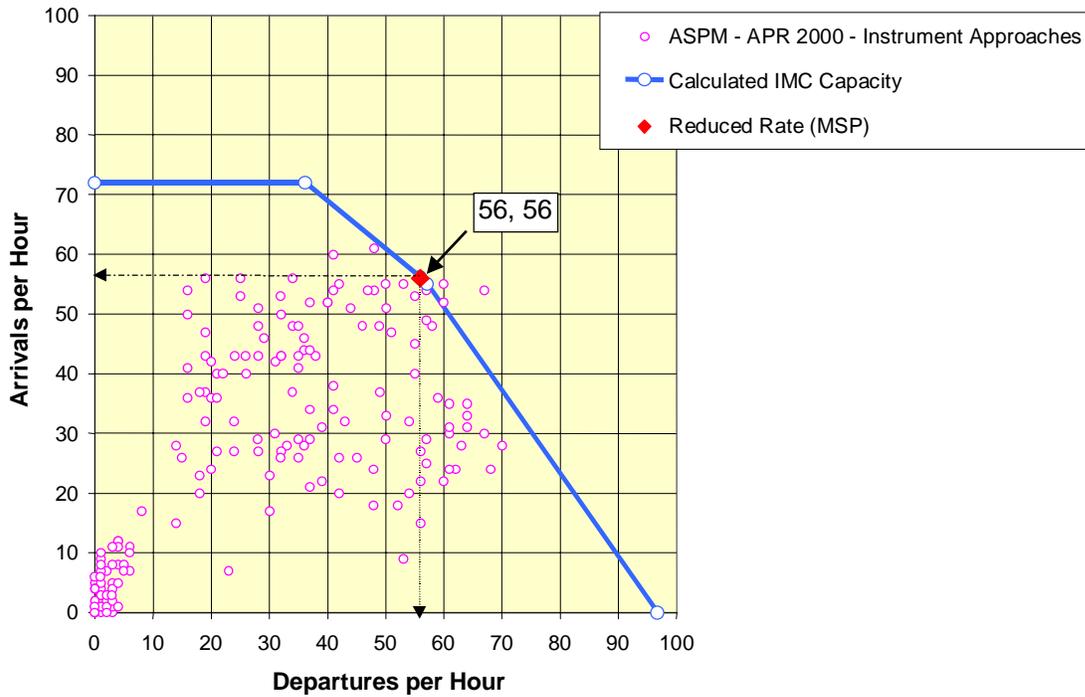


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

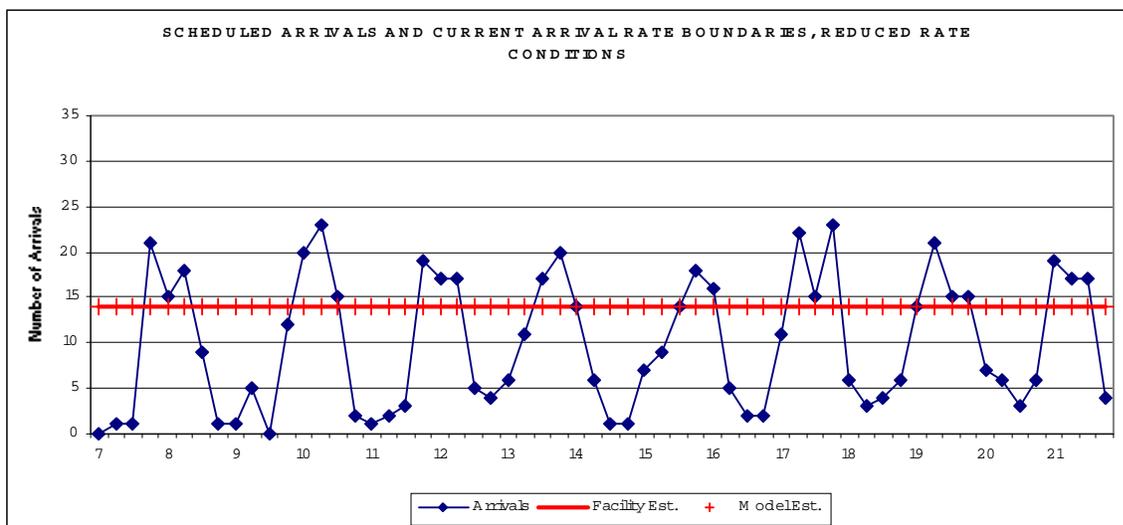
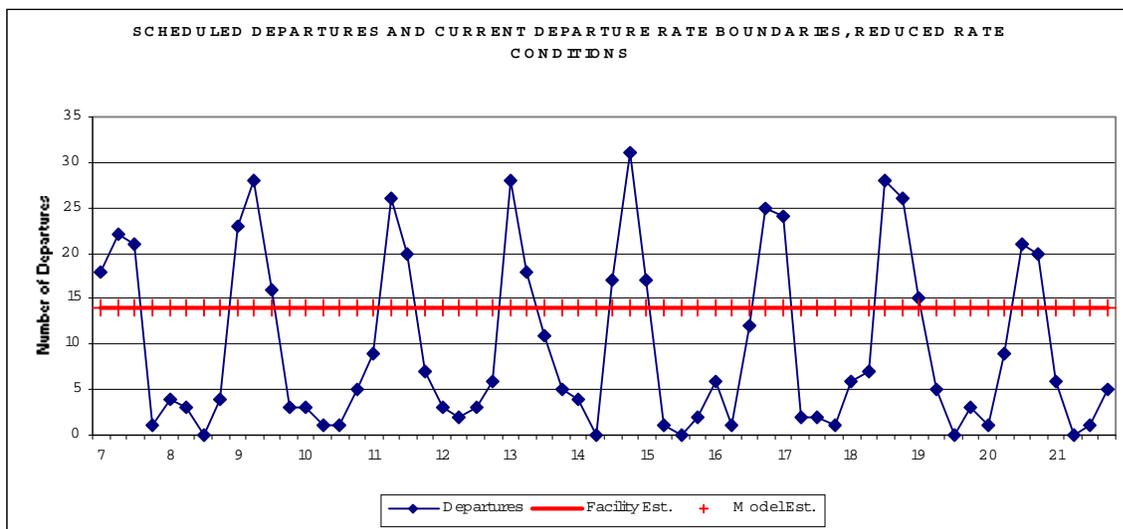
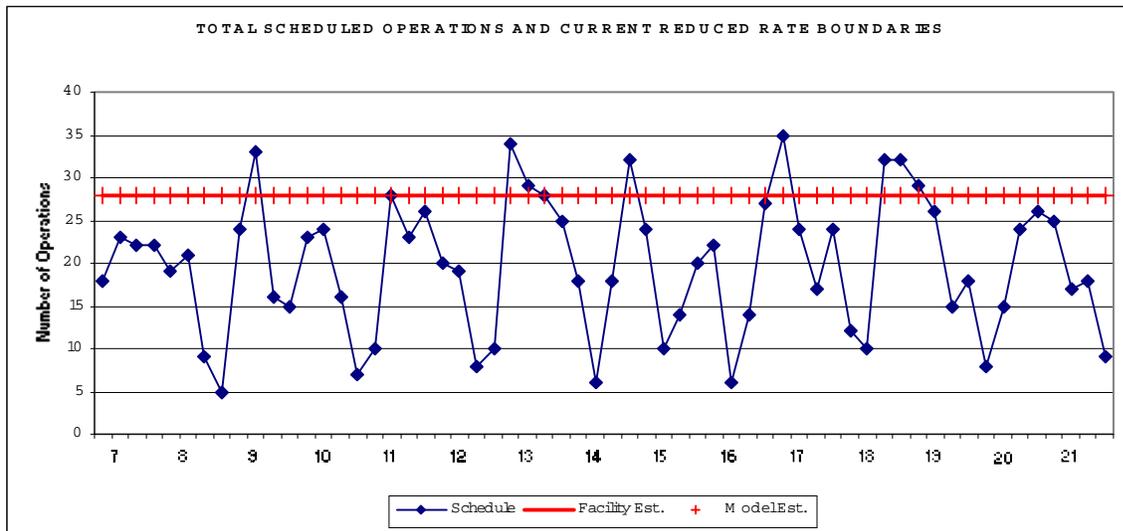


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Arrive and Depart Runways 30L/R or 12L/R
- Reduced Rate of (56,56) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



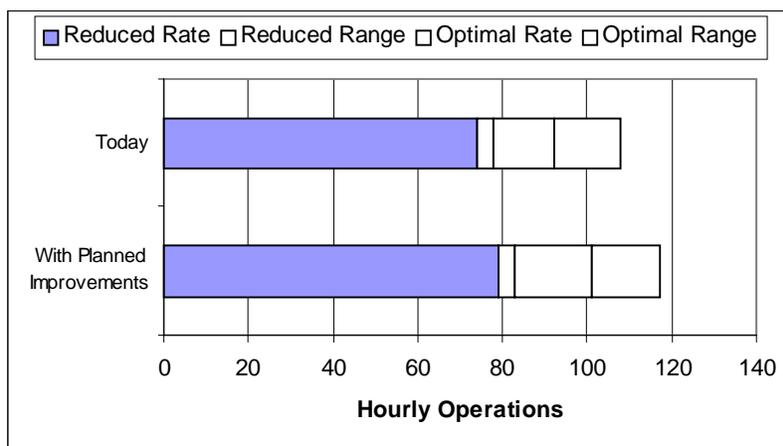
Newark International Airport Benchmarks

- The current capacity benchmark at Newark is 92-108 flights per hour in good weather.
- Current capacity falls to 74-78 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- Newark operates close to its good-weather capacity for about three hours of the day, but these traffic rates cannot be sustained in adverse weather.
- In 2000, Newark had the second highest rate of delays in the country. Over 8% of all flights at Newark experienced significant levels of delay (more than 15 minutes).
- In adverse weather, scheduled traffic exceeds capacity 7 ½ hours of the day.
- On good weather days, about 6% of the flights are delayed significantly (more than 15 minutes).
- On adverse weather days, about 18% of the flights are delayed significantly (more than 15 minutes).
- Technology and procedural improvements are expected to improve Newark's capacity benchmark by 10% (101-117 flights per hour) over the next 10 years, while the adverse weather capacity benchmark will increase by 7% (79-83 flights per hour).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes, which allow a more consistent flow of aircraft to the runway.
- Demand at Newark is projected to grow by 20% over the next decade. The imbalance between capacity and demand growth is expected to increase delays.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	92-108	74-78
New Runway	N/A	N/A
With planned improvements	101-117	79-83



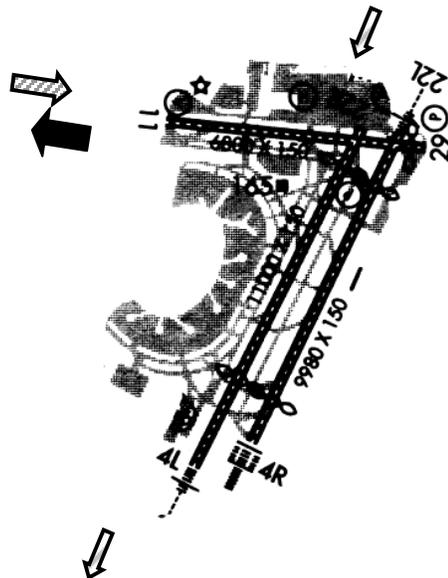
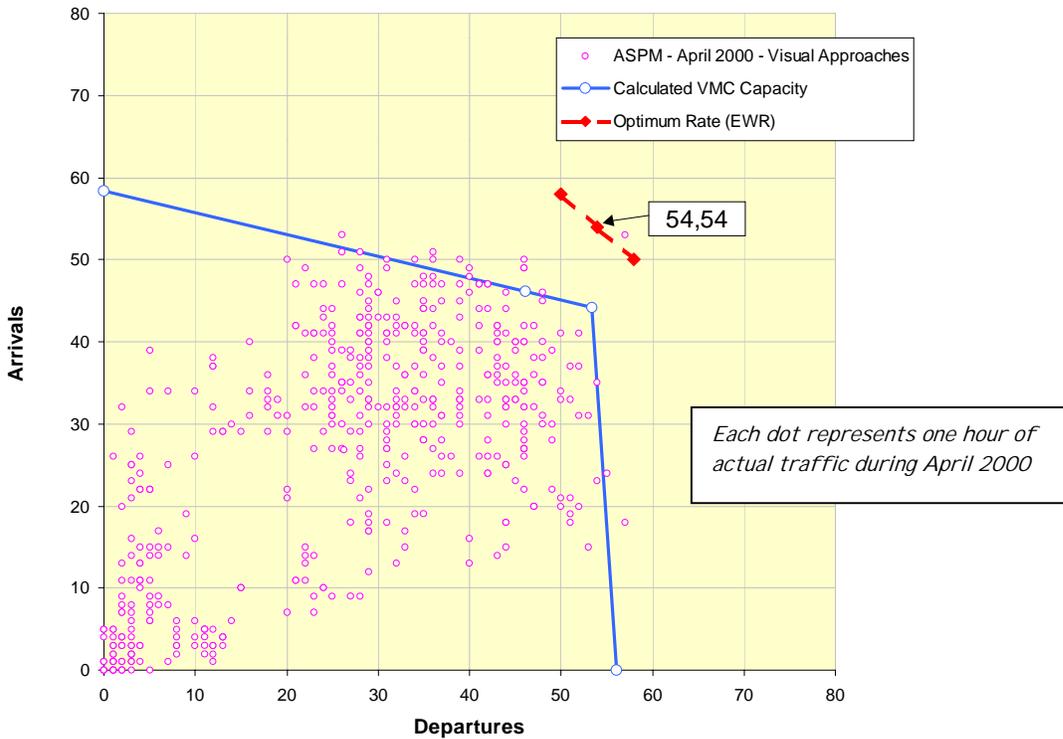
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

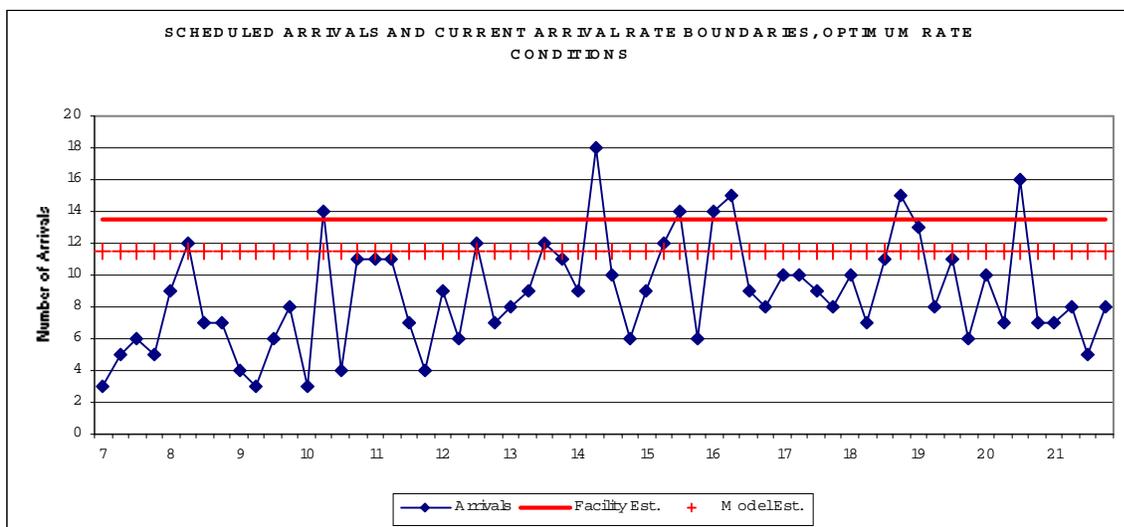
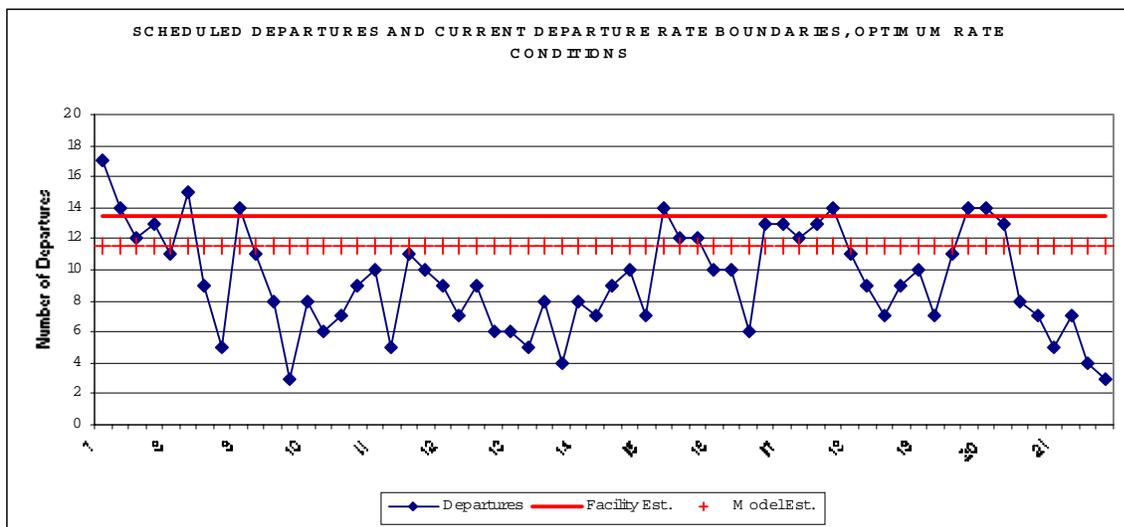
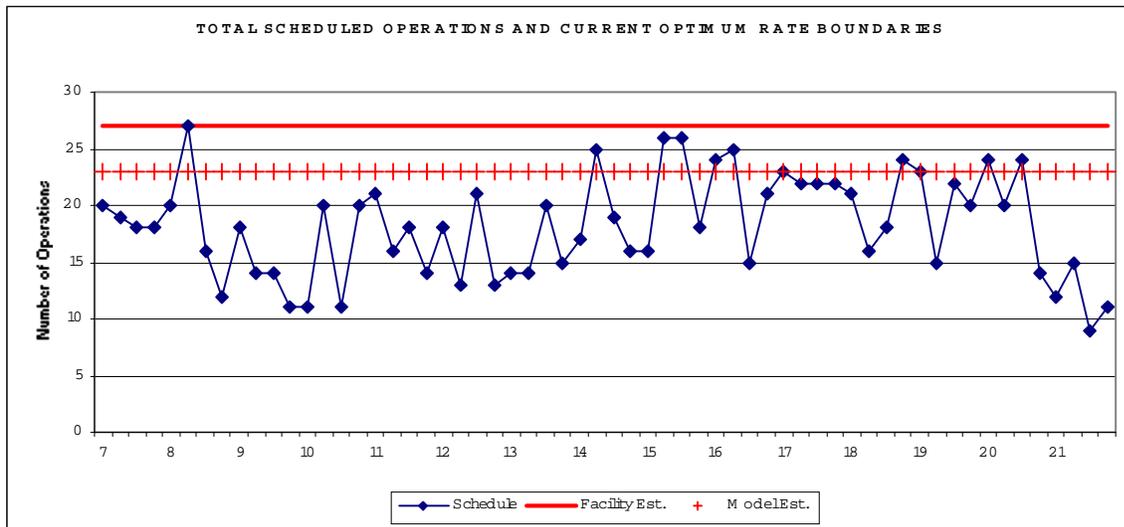
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – Optimum Rate of (58,50) or (50,58) with a balanced rate of (54,54) was reported by the facility
 - Arrive 22L, and as traffic permits, on 11, while aircraft Depart 22R with alternate departures on 29
- ASPM data are actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. These data include other runway configurations and off-peak periods.
- Solid line represents the airport capacity during a busy hour calculated by the FAA Airport Capacity Model, showing the tradeoff between arrival and departure rates
- The capacity model can only approximate the complex operations at EWR

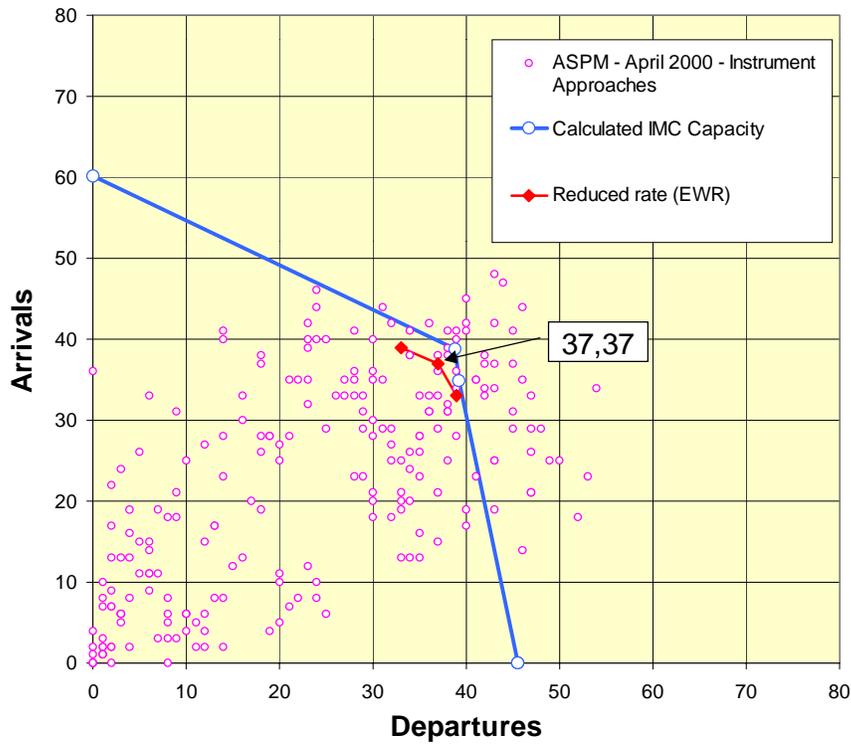


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

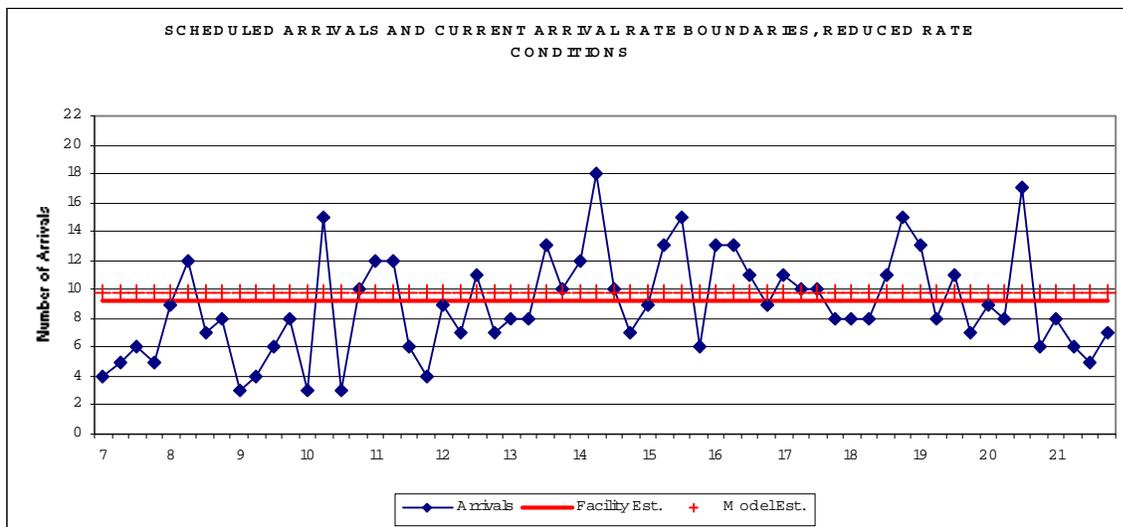
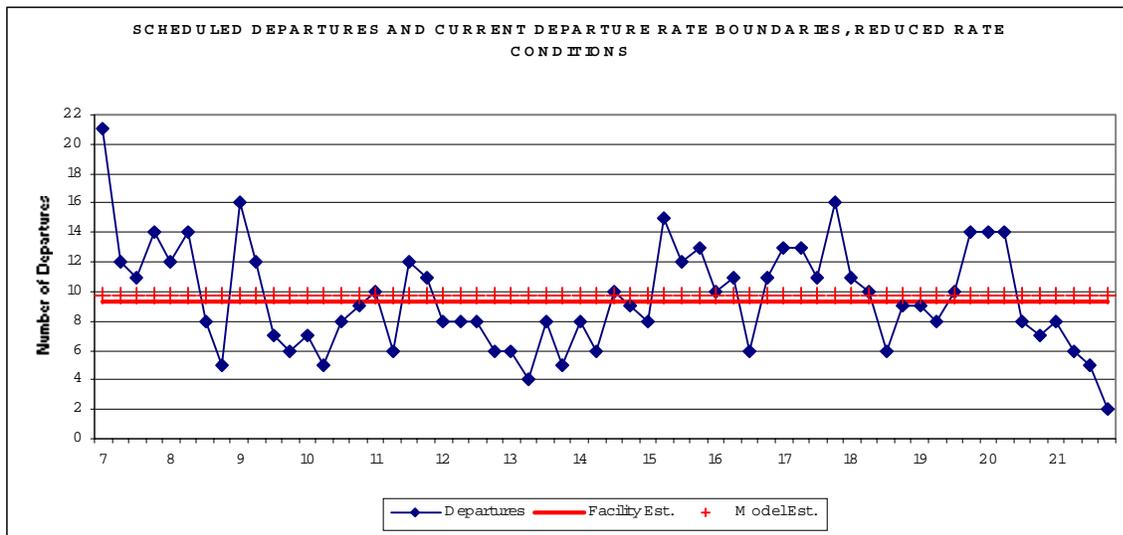
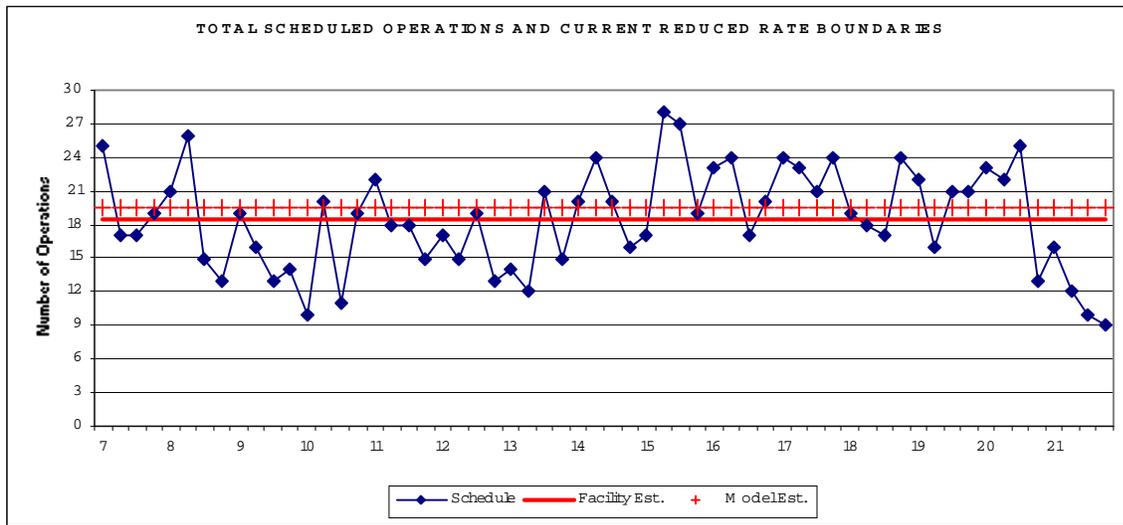


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Arrive 4R, Depart 4L
- Reduced Rate of (39,33) or (33,39) and a balanced rate of (37,37) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



New York John F. Kennedy International Airport Benchmarks

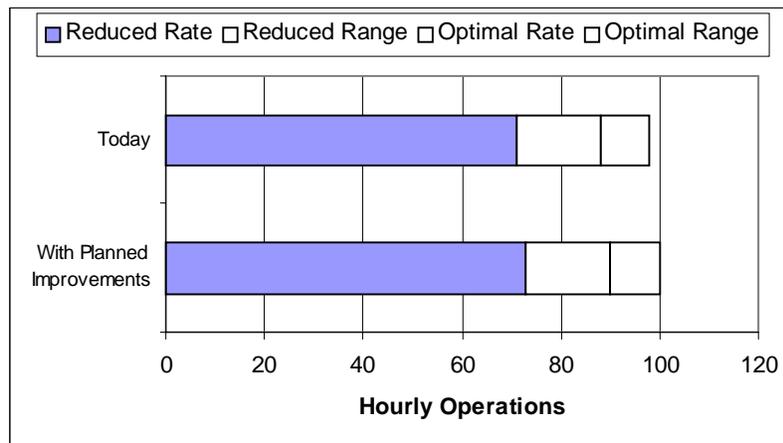
- The current capacity benchmark at John F. Kennedy International Airport is 88-98 flights per hour in good weather.
- Current capacity falls to 71 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- In 2000, almost 4% of all flights at Kennedy experienced significant levels of delay (more than 15 minutes).
- Periods of excess arrival and departure demand can be handled efficiently during good weather conditions, but cannot be sustained in adverse weather.
- In adverse weather, scheduled traffic exceeds capacity for more than 5 hours in the day.
- On adverse weather days, about 9% of the flights are delayed significantly (more than 15 minutes).
- Technology and procedural improvements are expected to improve Kennedy's good weather capacity benchmark by 2% (to 90-100 flights per hour) over the next 10 years.
- The adverse weather capacity benchmark will increase by 3% (to 73 flights per hour).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes, which allow a more consistent flow of aircraft to the runway.
 - Precision Runway Monitor (PRM) – allows use of independent arrivals for some parallel runway configuration. These benefits are not reflected in the benchmark value, however, since they apply to different runway configurations than those identified for the optimum and reduced rates.
- Demand at Kennedy is projected to grow by 18% over the next decade indicating that delays are expected to increase in the future.

JFK - Kennedy International Airport

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	88-98	71
New Runway	N/A	N/A
With planned improvements	90-100	73



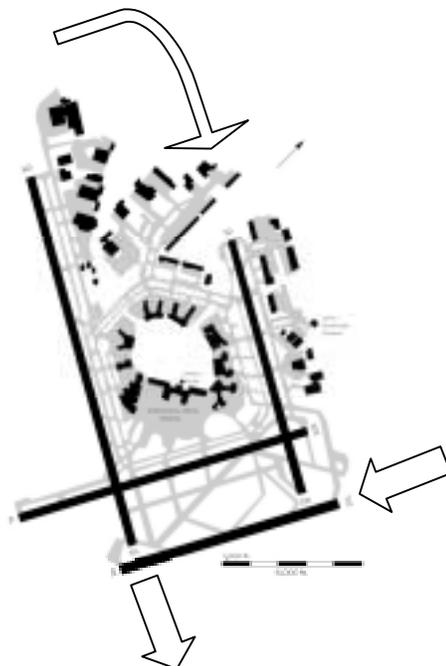
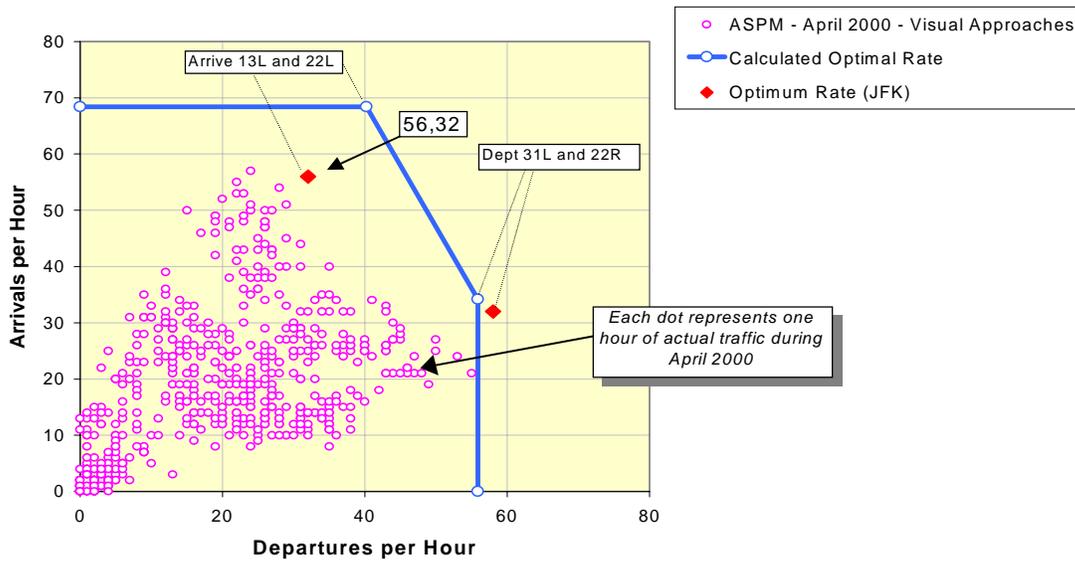
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

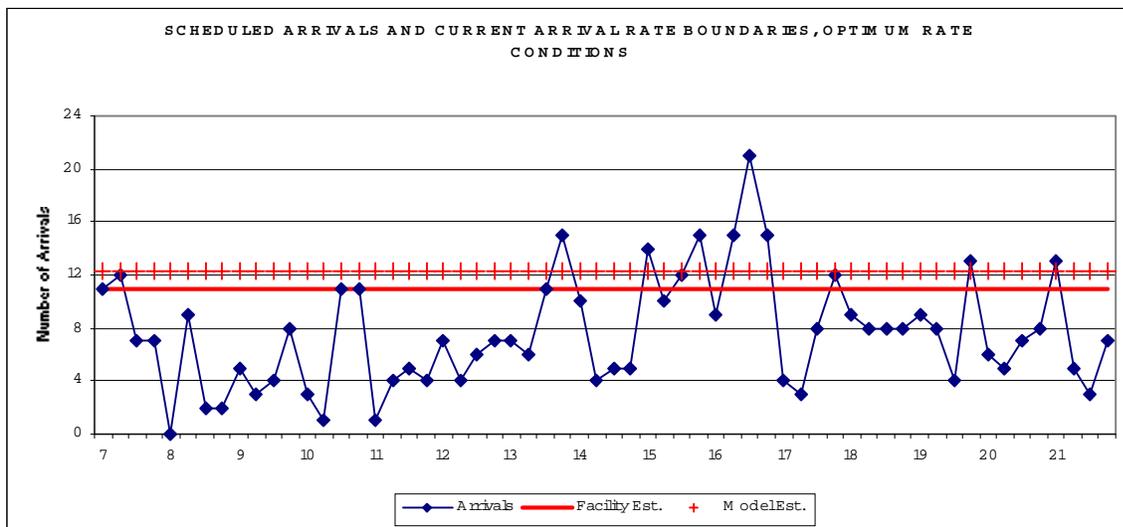
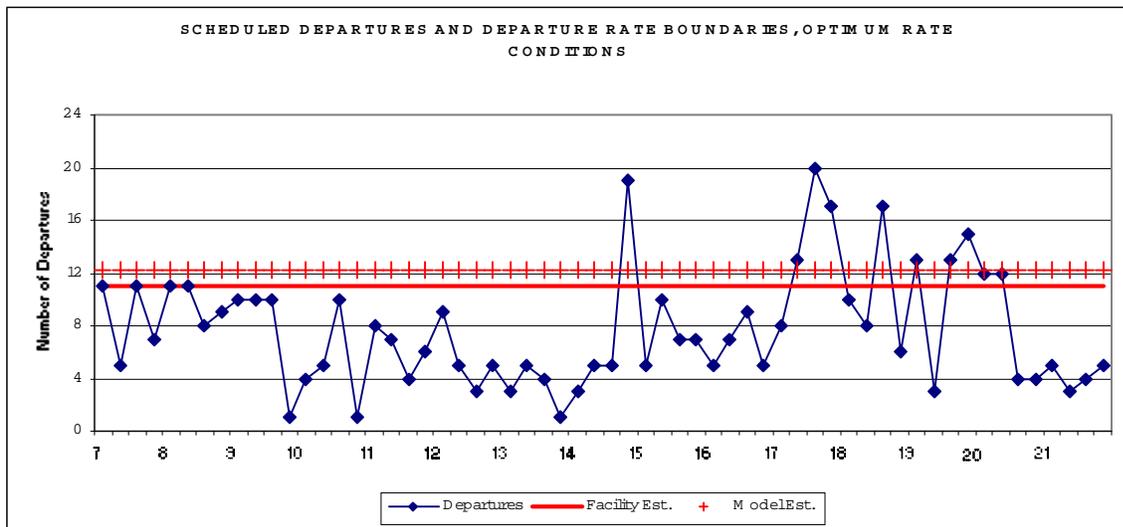
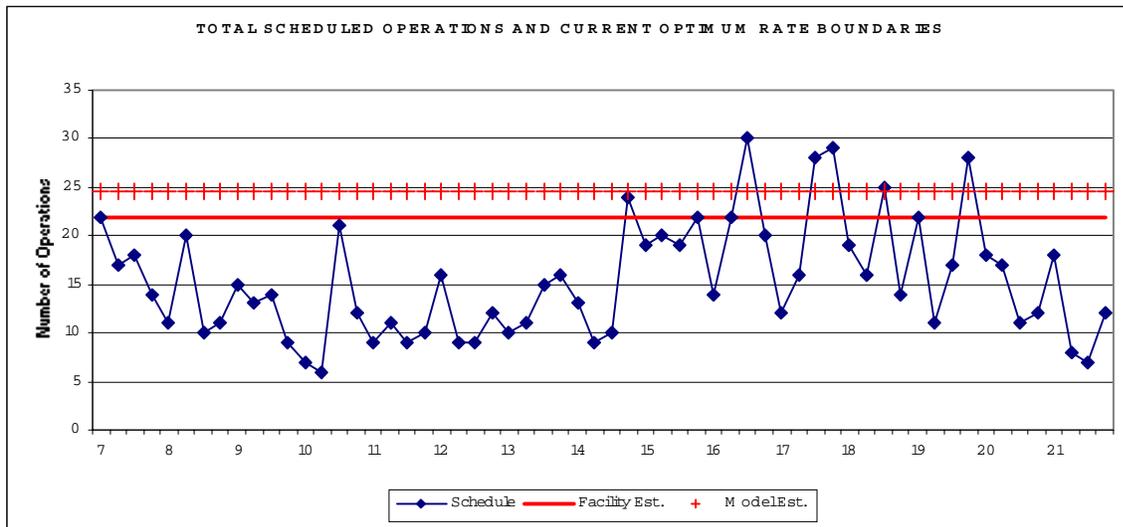
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation
 - Arrive 13L and 22L, depart 13R to favor arrivals
 - Arrive 22L, Depart 22R and 31L to favor departures
- ASPM data is actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- Solid line represents the calculated airport capacity during a busy hour, and the tradeoff between arrivals and departure rates

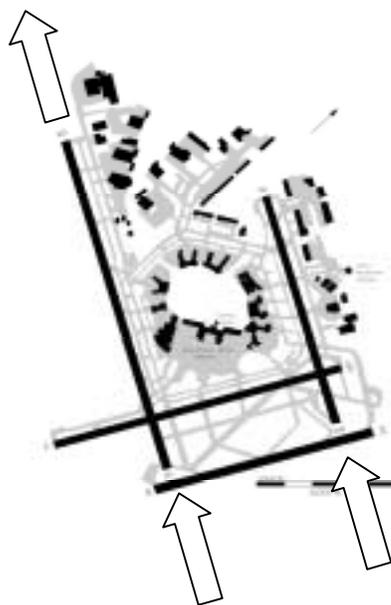
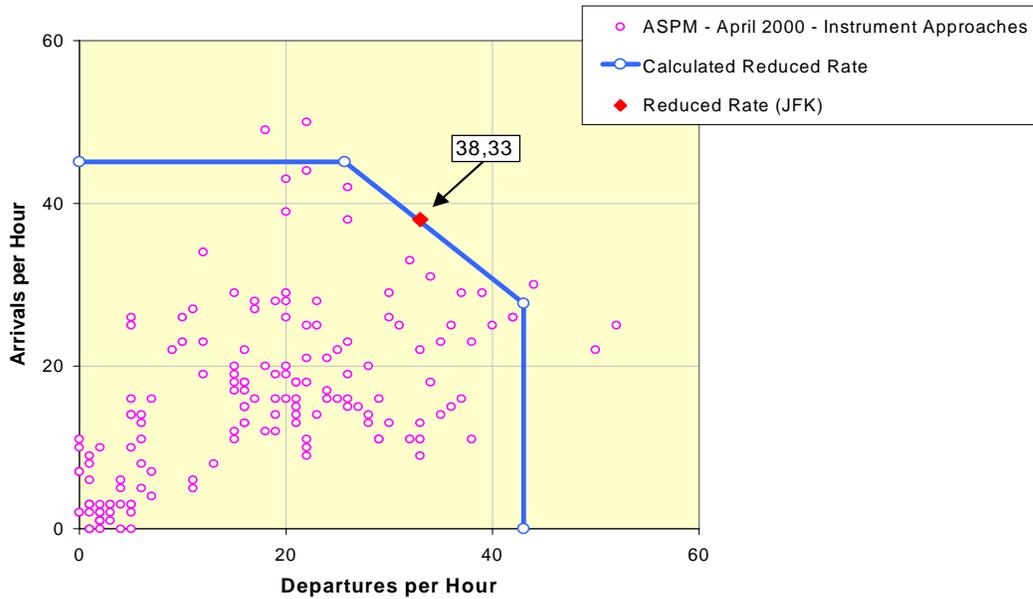


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

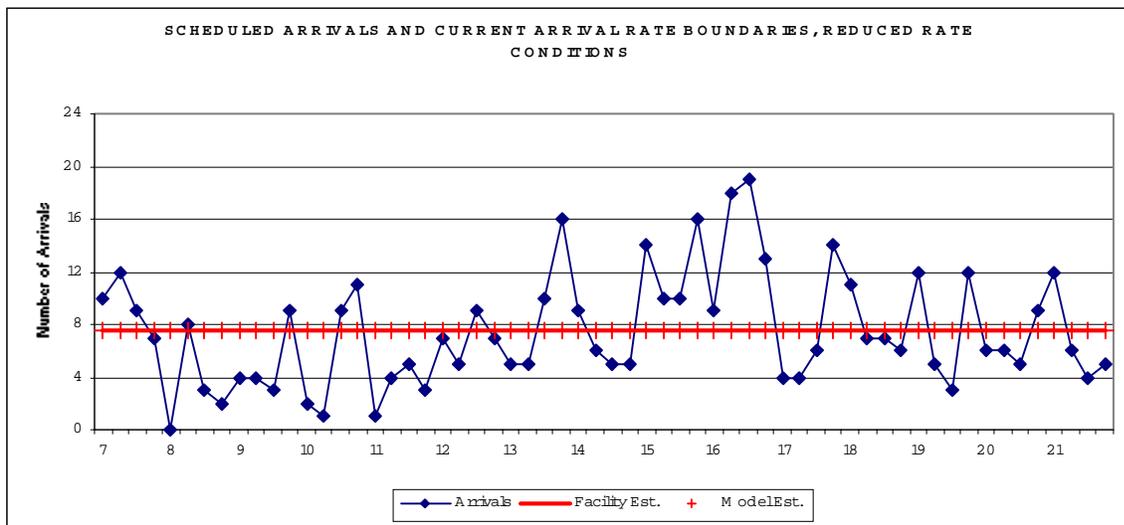
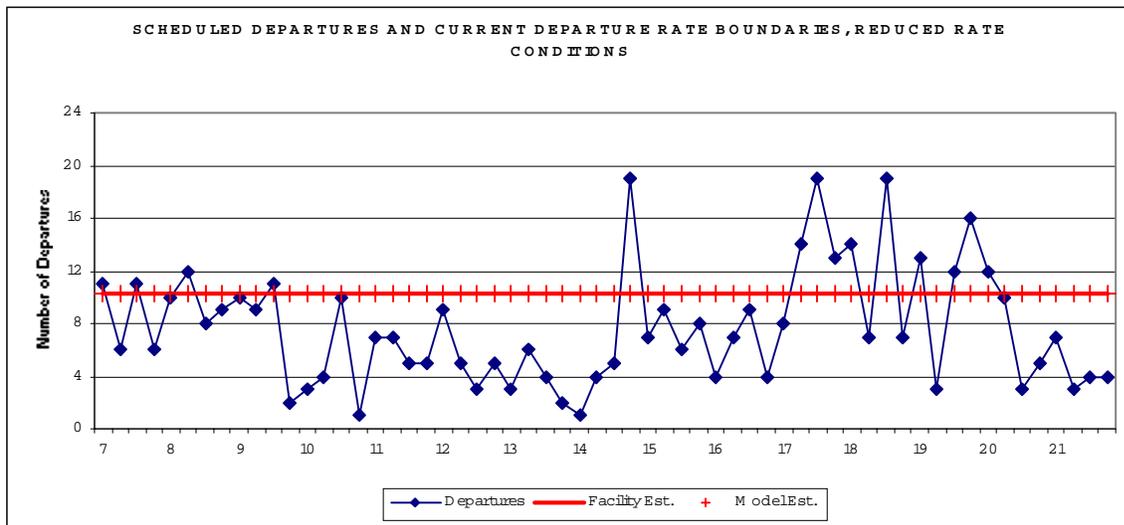
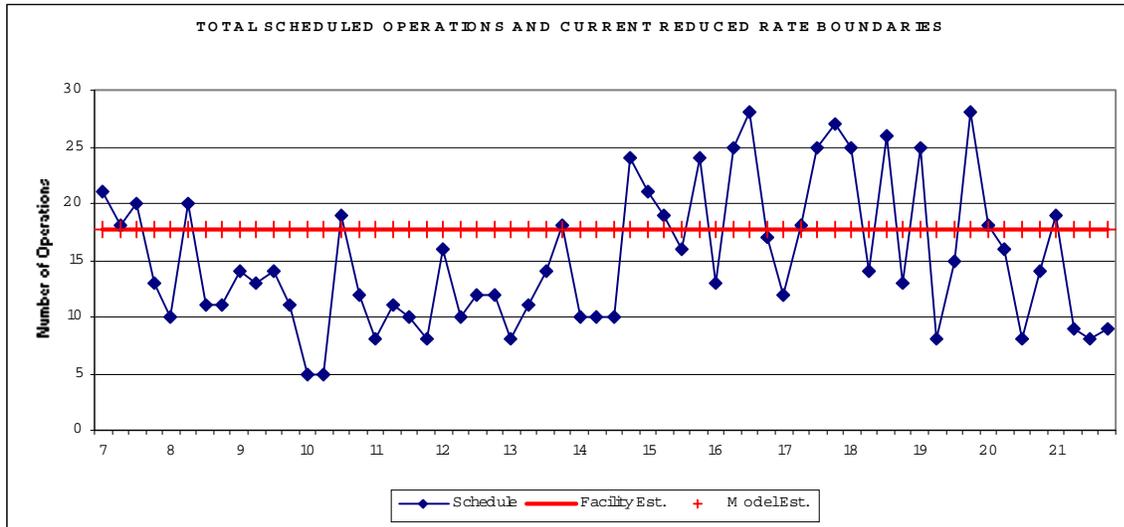


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Arrive 31L/R, depart 31L/R to favor arrivals
 - Depart 31L, 22R, arrive 22L to favor departures
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



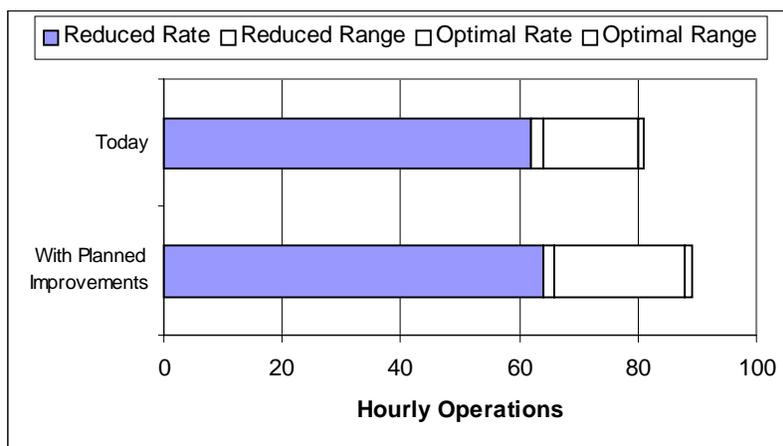
New York LaGuardia Airport Benchmarks

- The current capacity benchmark at New York LaGuardia is 80-81 flights per hour in good weather.
- Current capacity falls to 62-64 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- LaGuardia operates close to its good-weather capacity for nearly 8 hours of the day, but these traffic rates cannot be sustained in adverse weather.
- In 2000, LaGuardia had the highest rate of delays in the country. Over 15% of all flights at LaGuardia experienced significant levels of delay (more than 15 minutes). Average delays vary from 47-52 minutes in both good and adverse weather.
- In good weather, LaGuardia's scheduled traffic is at or exceeds capacity most of the day.
- In adverse weather, scheduled traffic exceeds capacity 12 hours of the day.
- Technology and procedural improvements are expected to improve LaGuardia's capacity benchmark by 10% (88-89 flights per hour) over the next 10 years, while the adverse weather capacity benchmark will increase by 3% (64-66 flights per hour).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes, which allow a more consistent flow of aircraft to the runway.
- Demand at LaGuardia is expected to grow by 17% over the next decade. The imbalance between capacity and demand growth is expected to significantly increase delays.
- This data does not reflect the effects of the slot lottery that took effect recently, on February 1, 2001.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	80-81	62-64
New Runway	N/A	N/A
With planned improvements	88-89	64-66



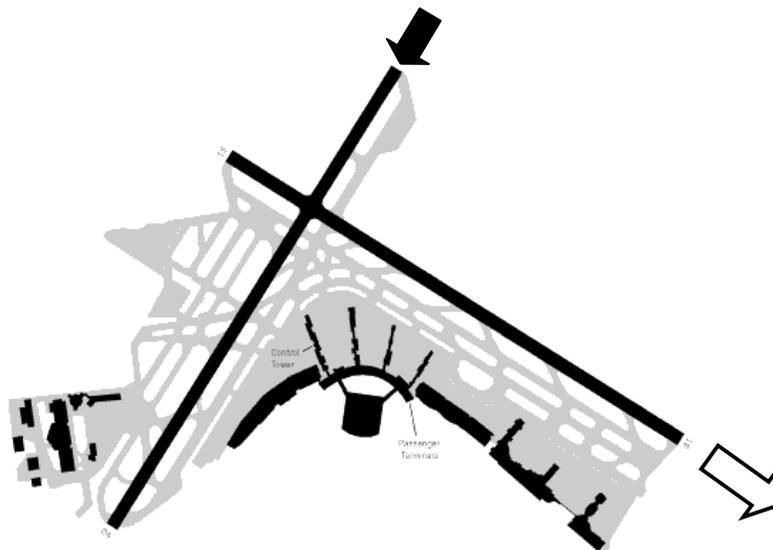
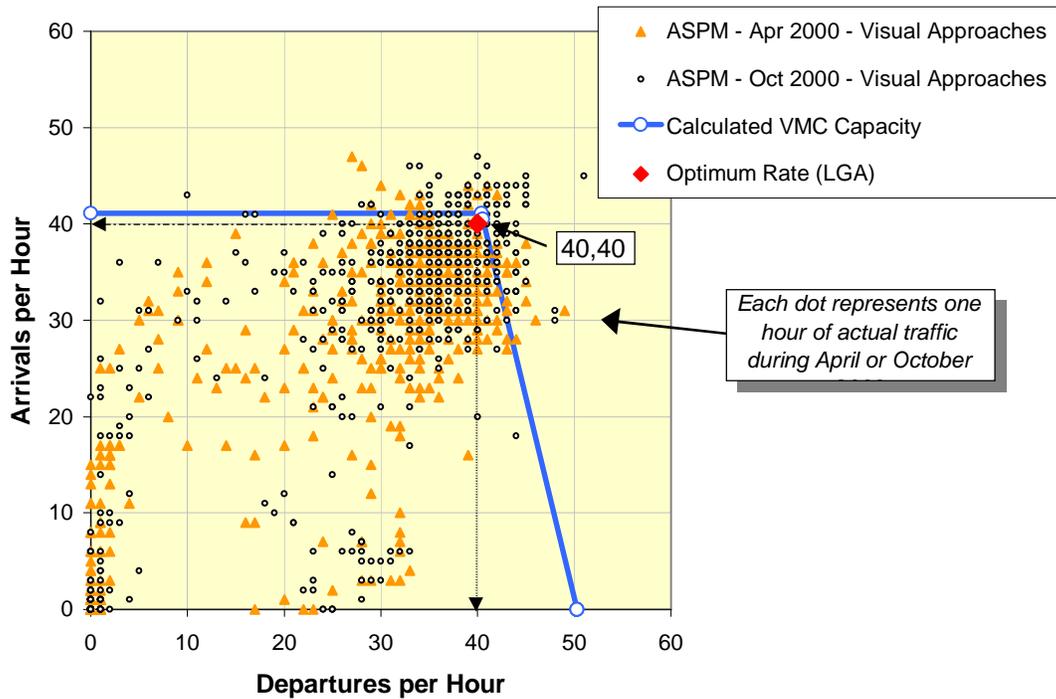
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

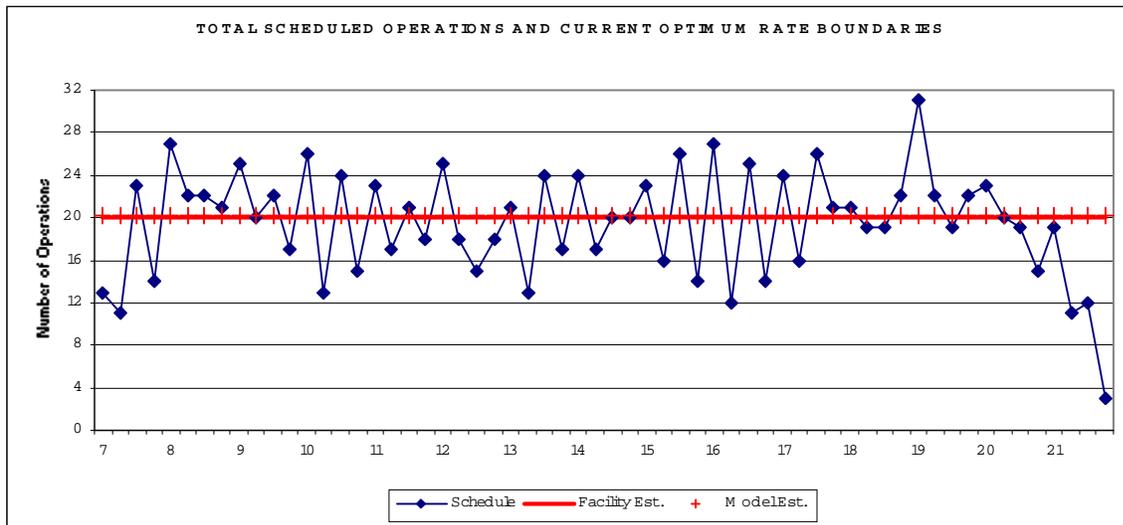
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – Runway 22/13
 - Optimum rate of (40, 40) was reported by the facility
- ASPM data is actual hourly traffic counts for April and October 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- Solid line represents the calculated airport capacity during a busy hour, and the tradeoff between arrivals and departure rates
- Operations at LGA can exceed the calculated capacity in certain hours when conditions are more favorable than average

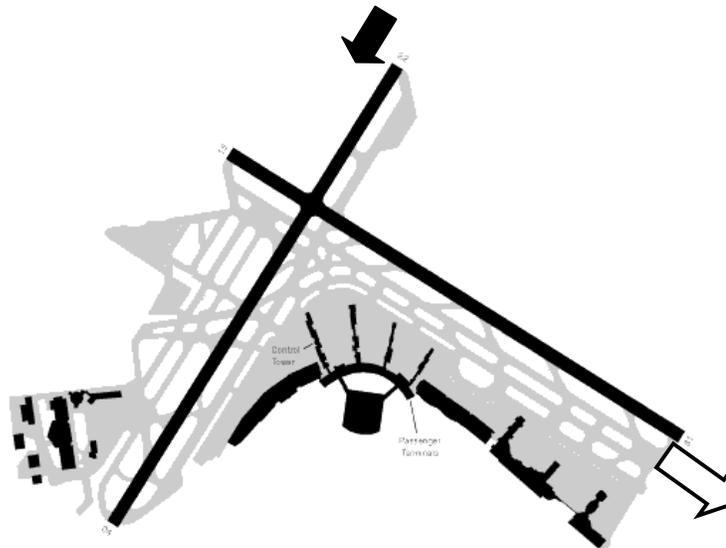
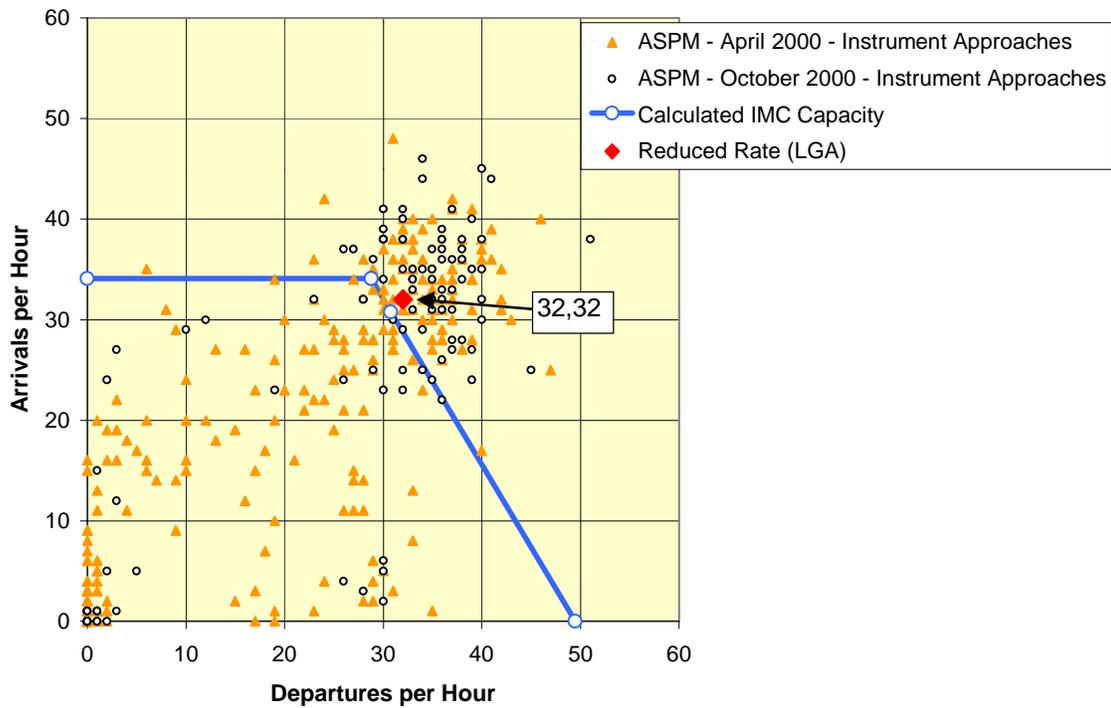


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

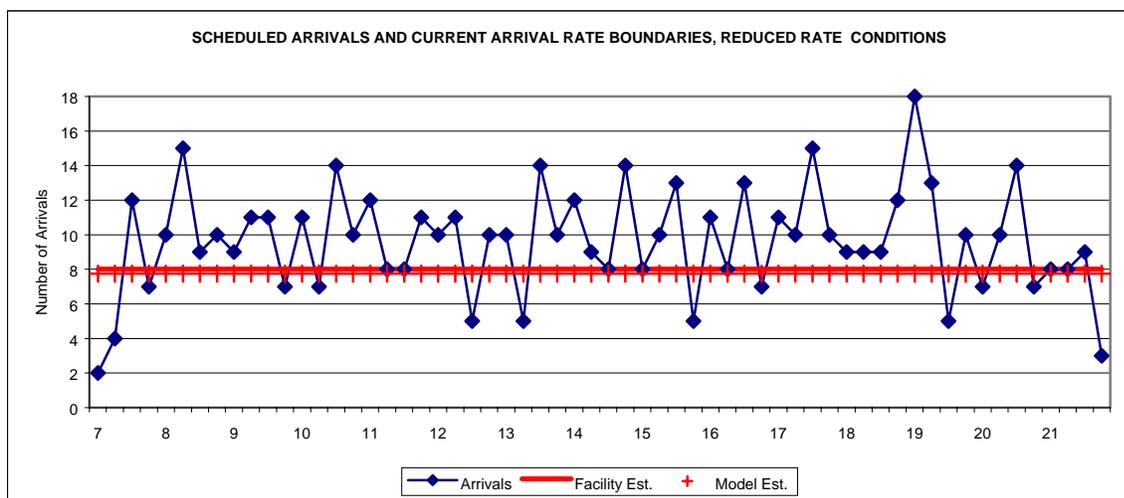
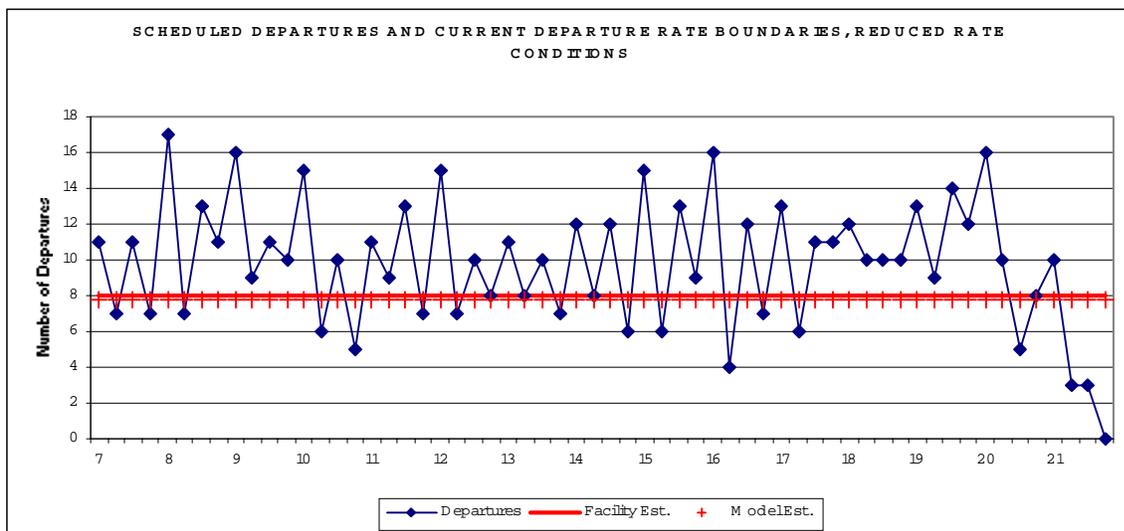
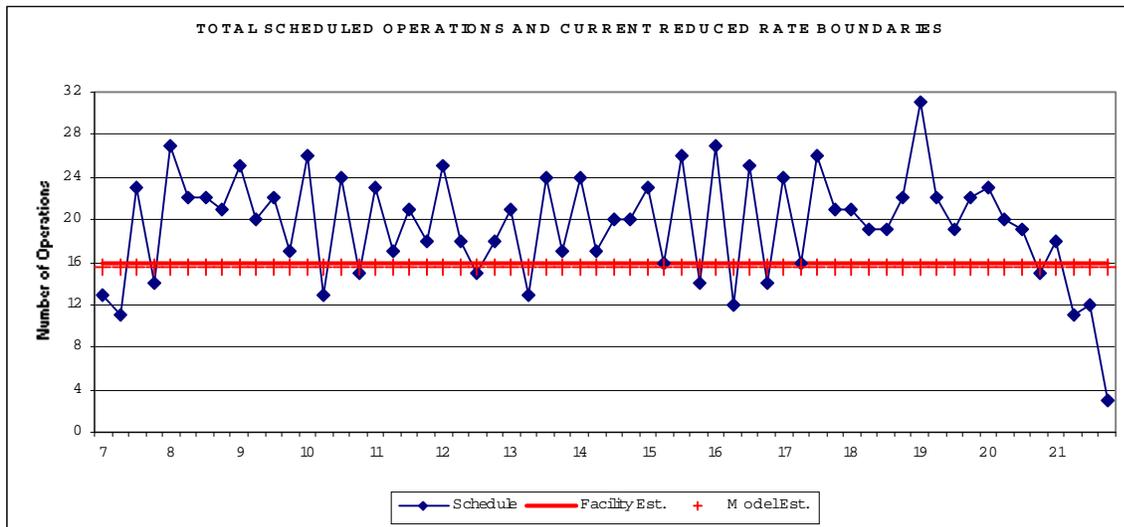


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima) – Runway 22/13
- Reduced Rate of (32, 32) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



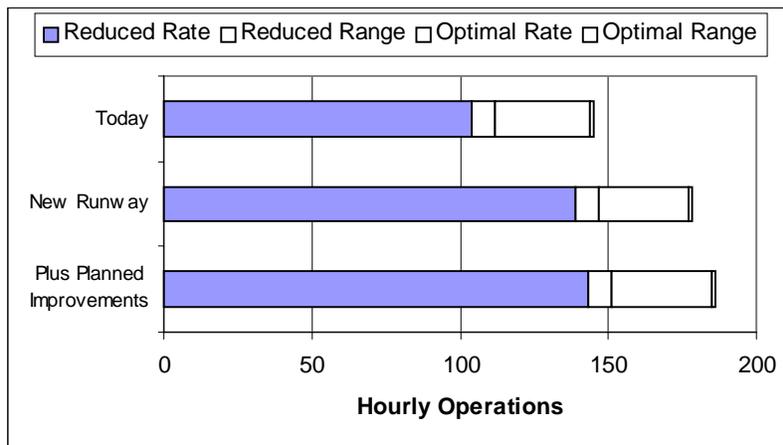
Orlando International Airport Benchmarks

- The current capacity benchmark at Orlando is 144-145 flights per hour in good weather.
- Current capacity falls to 104-112 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- In good weather, Orlando's scheduled traffic is below capacity throughout the day.
- In adverse weather, scheduled operations rarely exceed capacity.
- Fewer than 1% of flights are delayed more than 15 minutes at Orlando.
- A new runway, scheduled to open in 2003, is expected to improve Orlando's capacity by 23% (to 177-178 flights per hour) in good weather and by 34% (to 139-147 flights per hour) in adverse weather.
- The planned new runway is expected to improve Orlando's capacity benchmark by 23% (177-178 flights per hour) in good weather and by 34% (139-147 flights per hour) in adverse weather.
- In addition, technology and procedural improvements, when combined with the new runway, are expected to increase Orlando's capacity benchmark by 28% (185-186 flights per hour over the next 10 years) while the adverse weather capacity benchmark will increase by 38% (143-151 flights per hour).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes, which allow a more consistent flow of aircraft to the runway.
 - Triple simultaneous instrument approaches with the new runway.
- Demand at Orlando is projected to grow by 42% over the next decade. Despite this high growth rate, Orlando's current ample capacity and planned improvements indicate that delays should not be a problem in the future.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	144-145	104-112
New Runway	177-178	139-147
Plus planned improvements	185-186	143-151



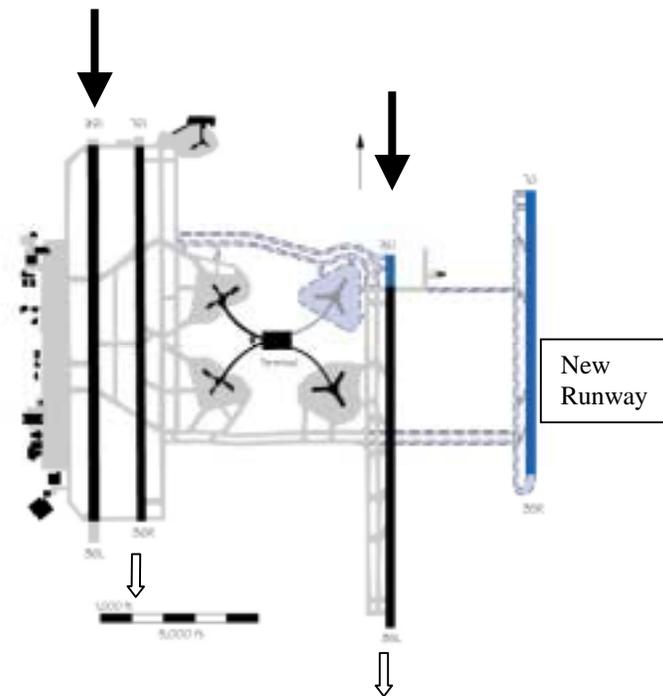
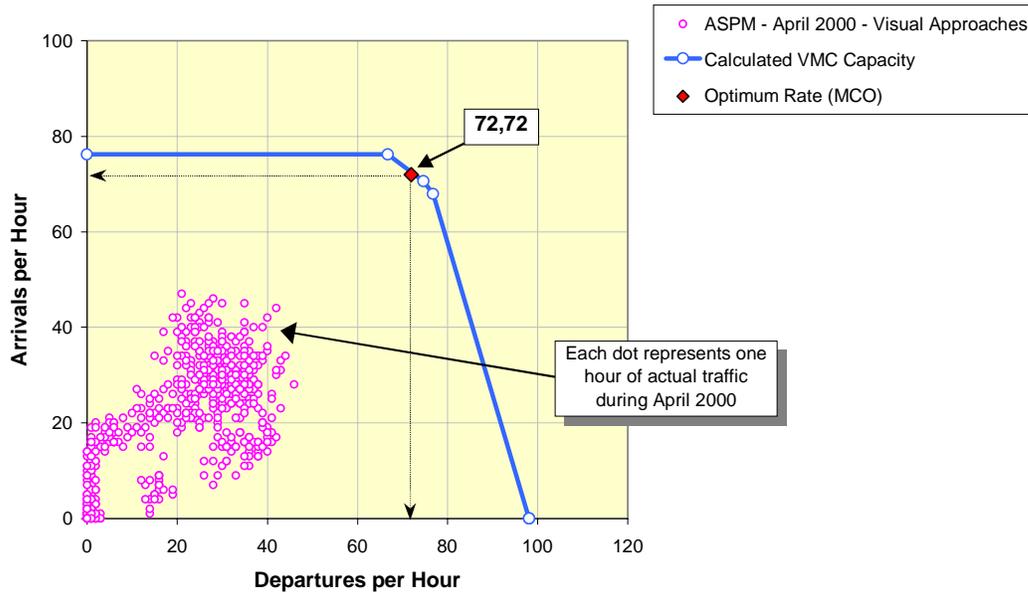
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
 - Triple simultaneous instrument approaches with the new runway.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

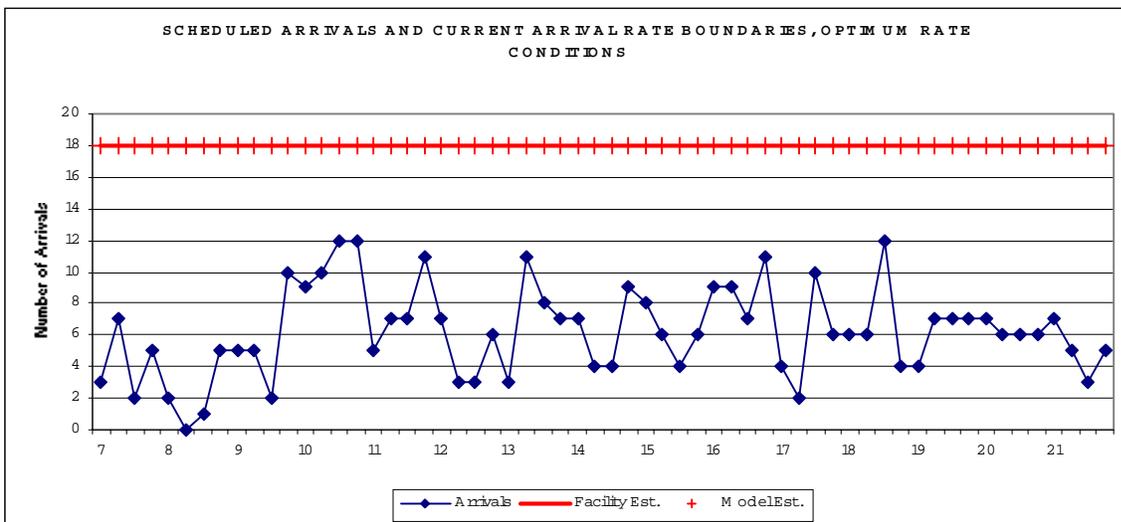
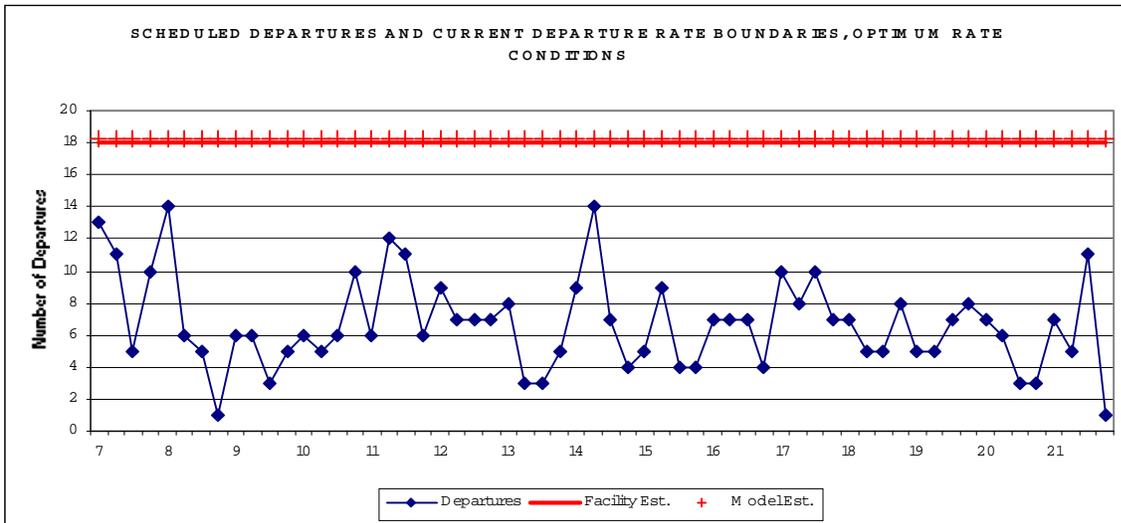
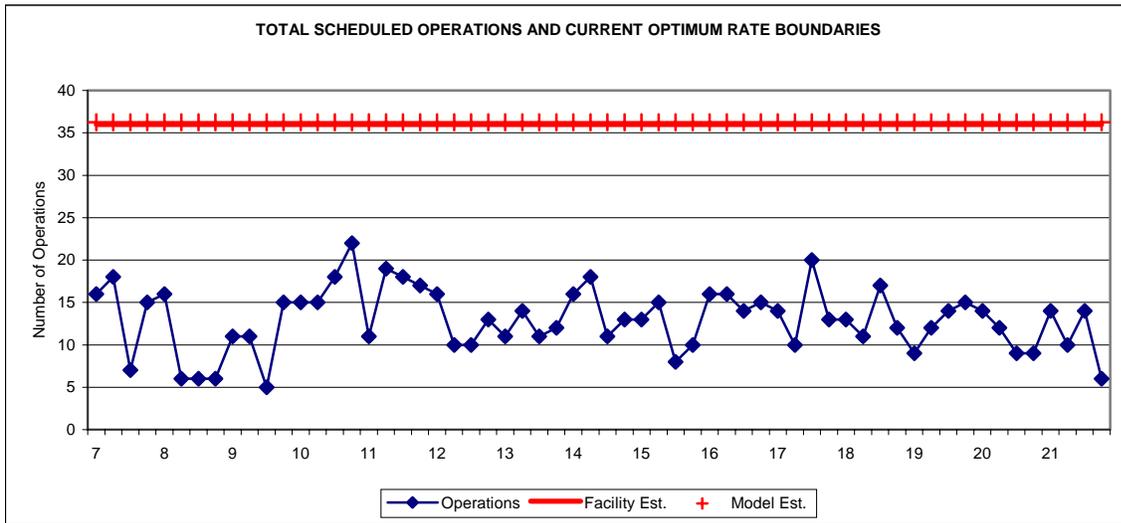
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation - Optimum rate of (72, 72) was reported by the facility
- ASPM data is actual hourly traffic counts
- Solid line represents the expected limit of hourly operations

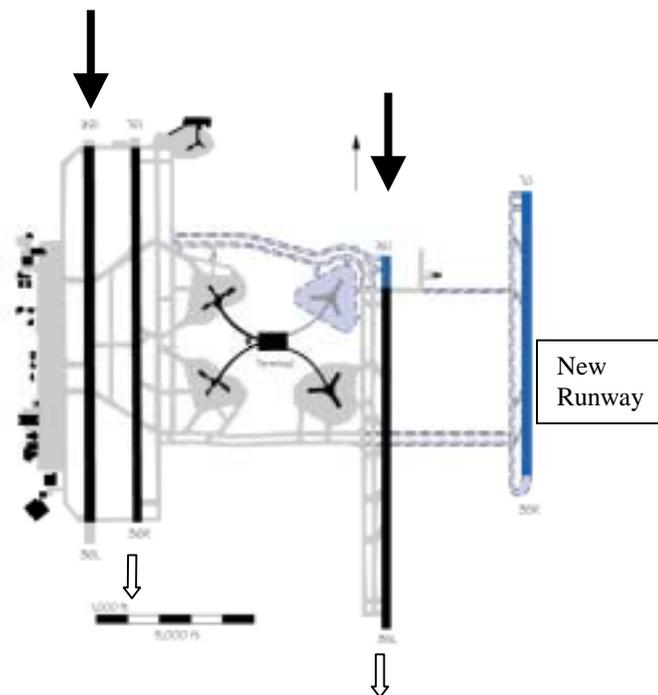
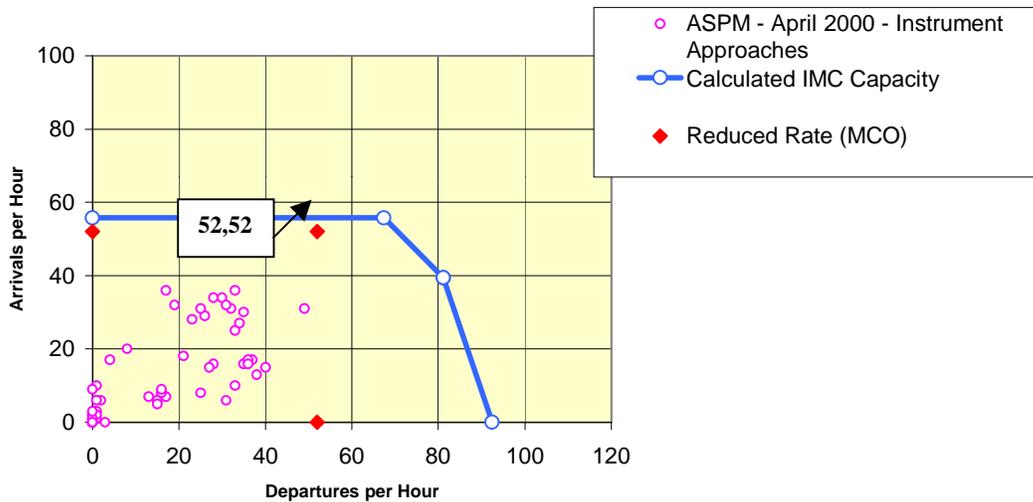


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

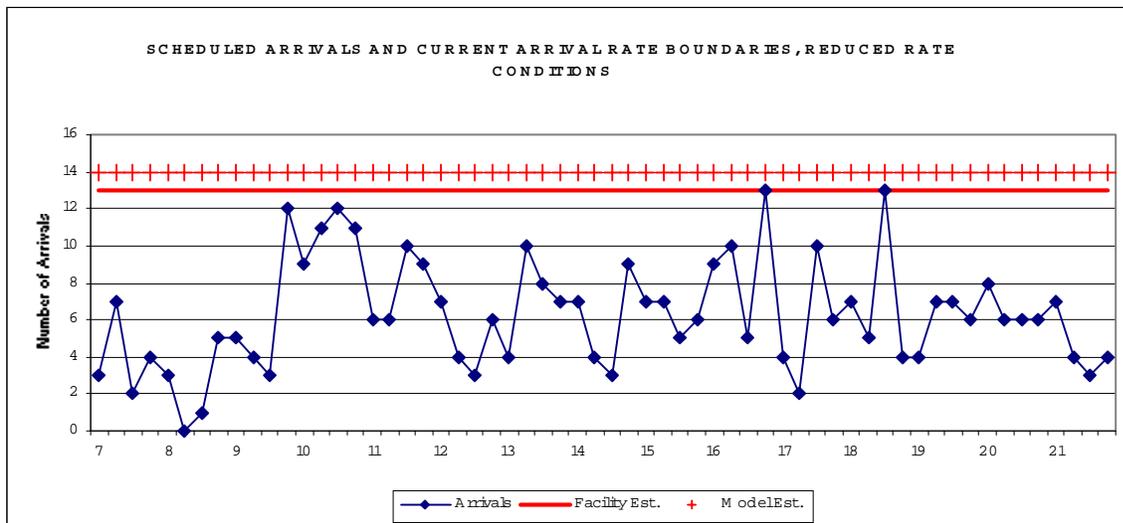
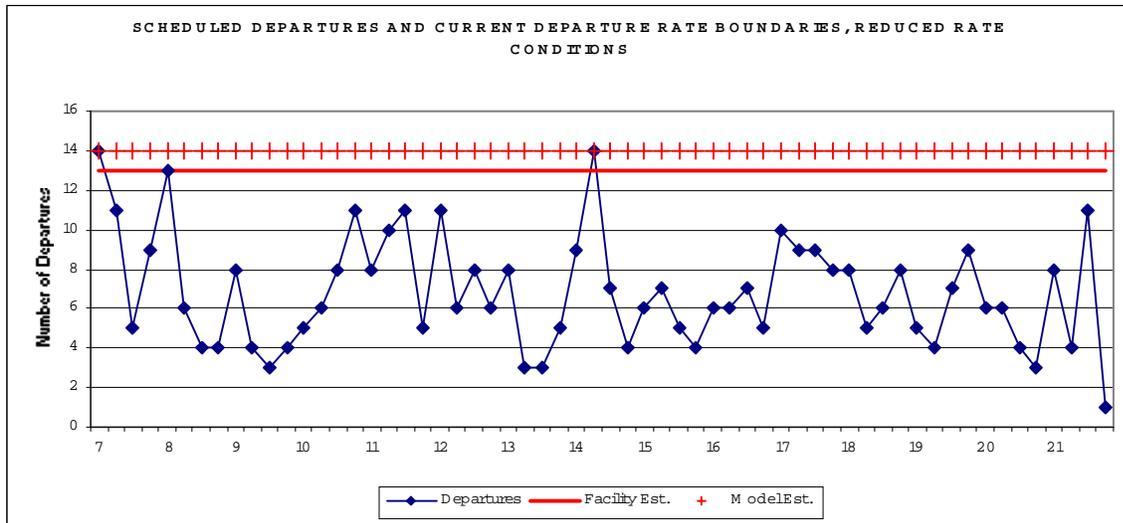
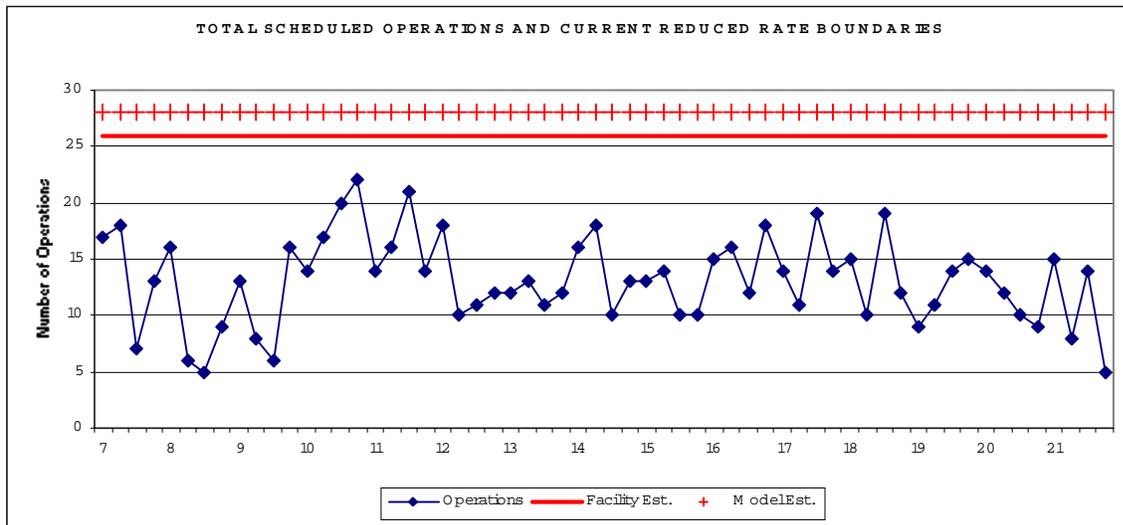


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Reduced rate of (52, 52) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed hourly traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



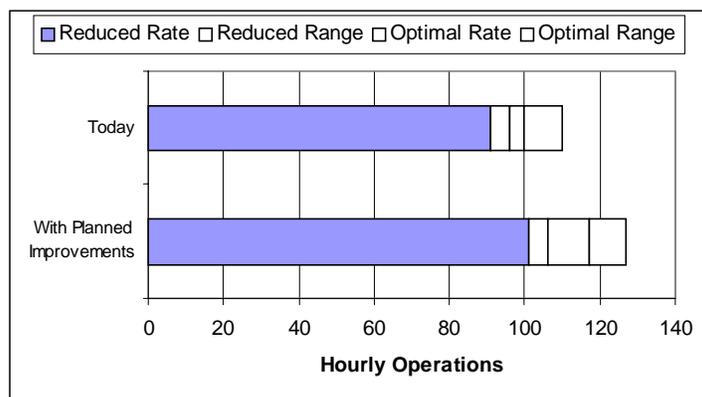
Philadelphia International Airport Benchmarks

- The current capacity benchmark at Philadelphia is 100-110 flights per hour in good weather.
- Current capacity falls to 91-96 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- In 2000, over 4% of all flights at Philadelphia experienced significant levels of delay (more than 15 minutes).
- In adverse weather, scheduled traffic exceeds capacity 3 1/2 hours of the day. As a result, about 14% of the flights are delayed significantly (more than 15 minutes).
- Technology and procedural improvements are expected to improve Philadelphia's capacity benchmark in good weather by 17% (to 117-127 flights per hour) over the next 10 years, while the adverse weather capacity benchmark will increase by 11% (to 101-106 flights per hour).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes, which allow a more consistent flow of aircraft to the runway.
 - LAHSO, which allows independent arrivals for specific aircraft types on intersecting runways.
 - PRM (although no effect in reduced rate configuration).
- Demand at Philadelphia is expected to grow by 23% over the next decade. This imbalance between capacity and demand growth is expected to significantly increase delays.
- These results consider the new runway 8/26 that was recently commissioned at Philadelphia. The benchmarks assume that 25% of airport traffic can use the short runways 17/35 and 8/26. If this percentage declines, the capacity of the airport will also decrease.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	100-110	91-96
New Runway	N/A	N/A
With planned improvements	117-127	101-106



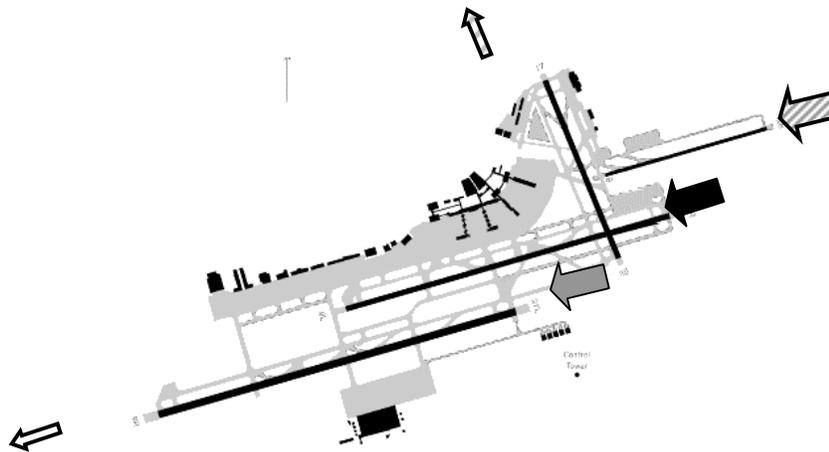
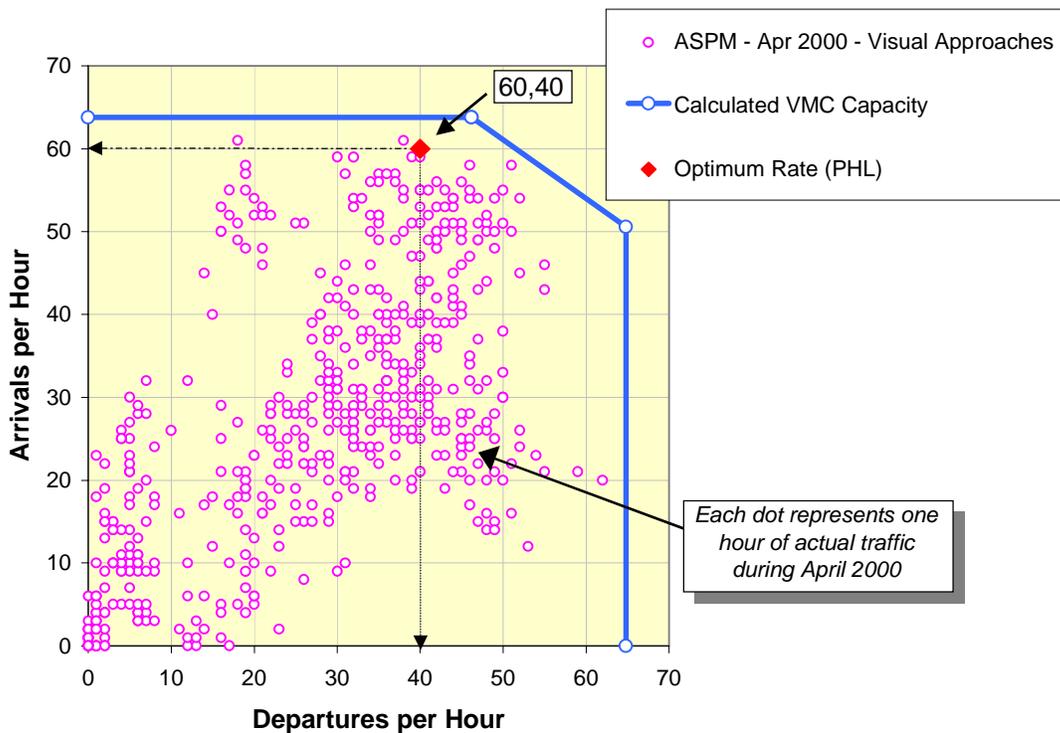
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
 - LAHSO
 - PRM (although no effect in reduced rate configuration)
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

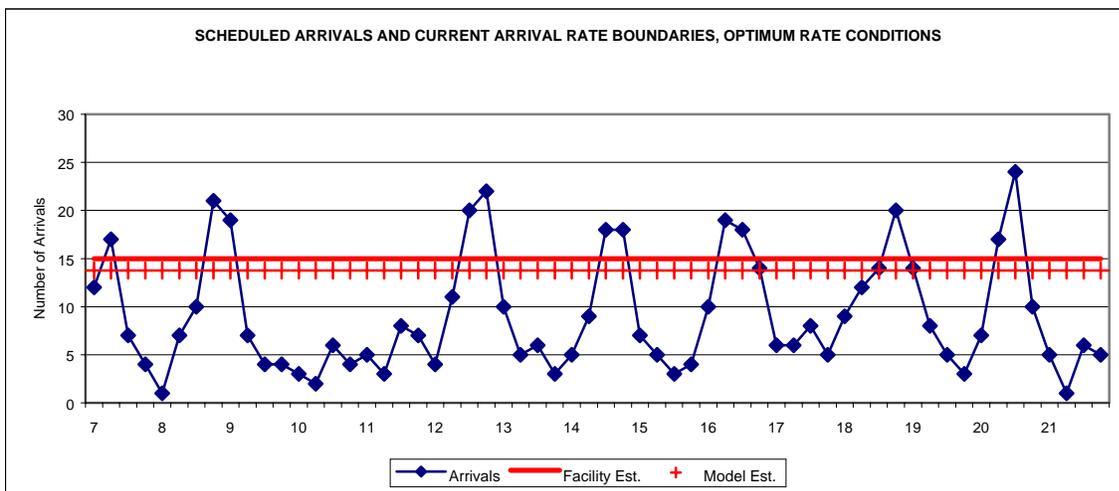
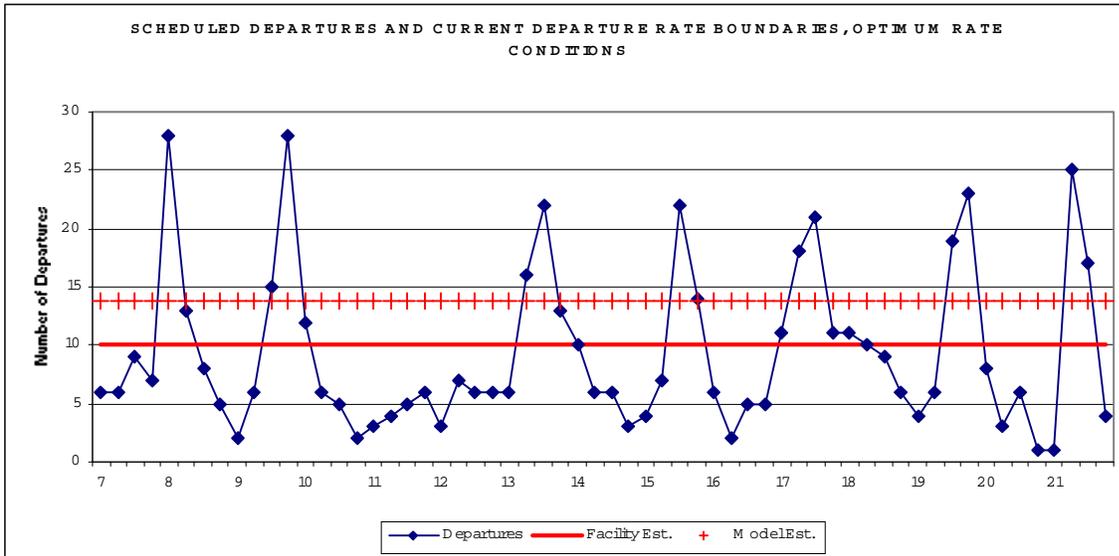
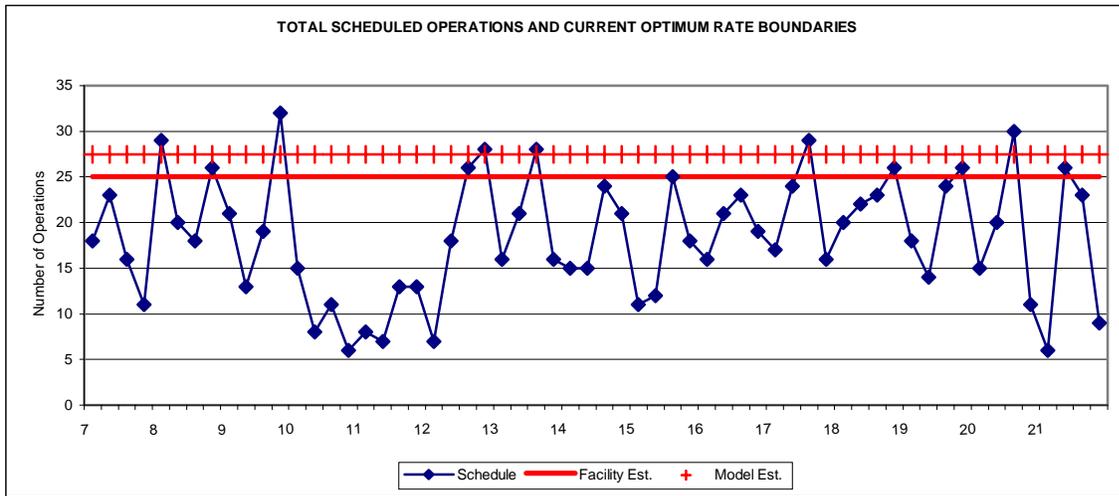
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – Optimum Rate of (60,40) was reported by the facility
 - Arrive 27R/35/26, Depart 27L until turboprop demand is exhausted
 - Then, Arrive 27R/L, Depart 27L/35
- Assumed 25% of traffic can use Runways 17/35 and 8/26. If fewer aircraft can use these runways, the capacity of the airport decreases.
- ASPM data is actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- Solid line represents the calculated airport capacity during a busy hour, and the tradeoff between arrivals and departure rates
- The capacity model can only approximate the complex operations at PHL

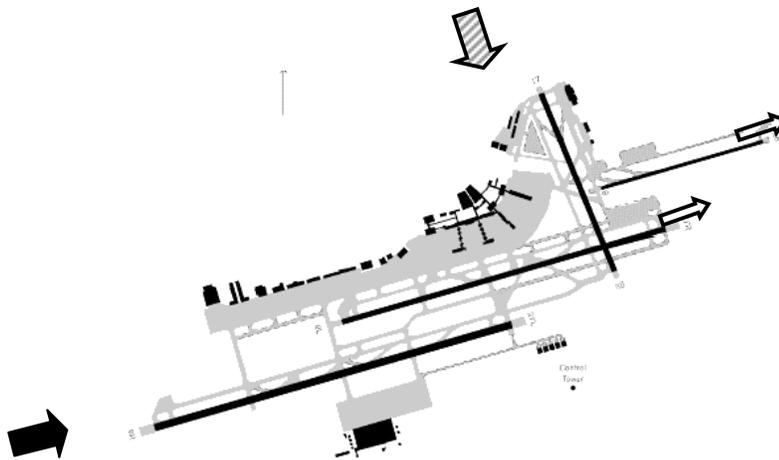
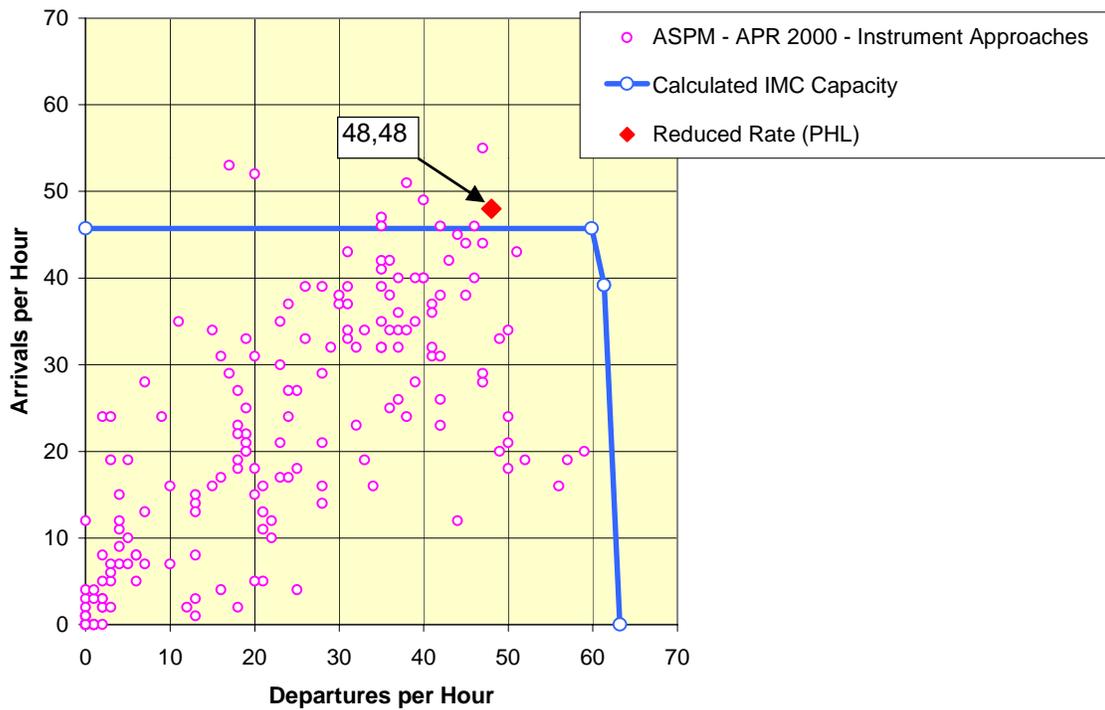


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

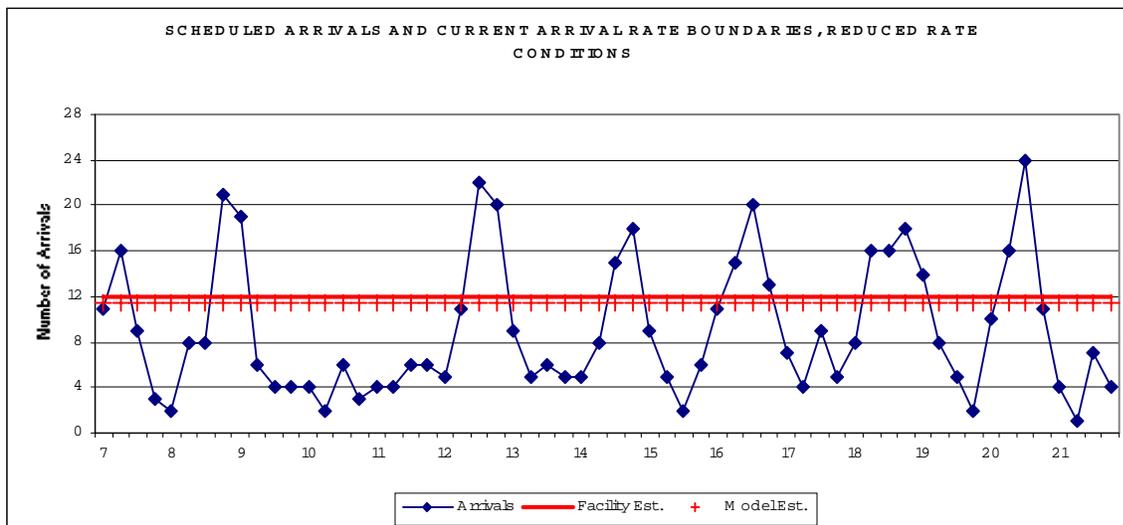
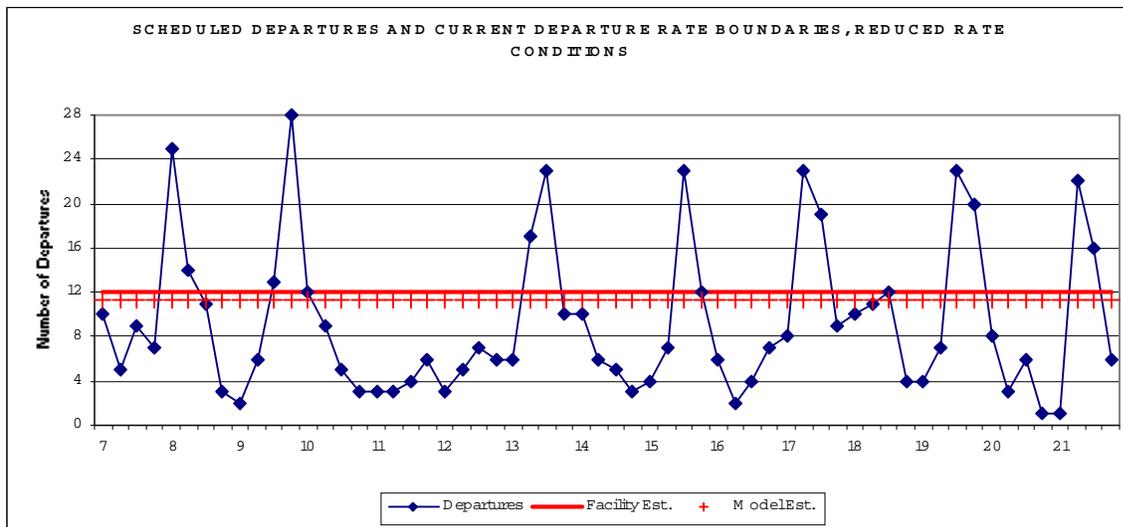
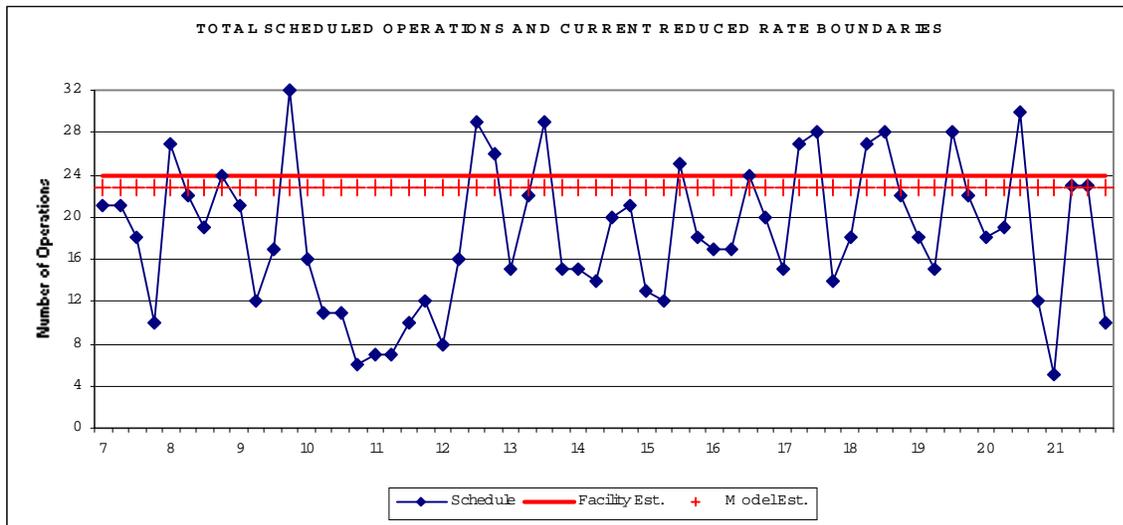


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Arrive 9R/17, Depart 9L/8 (turboprops operate independently)
- Assumed 25% of traffic can use Runways 17/35 and 8/26. If fewer aircraft can use these runways, the capacity of the airport decreases.
- Reduced Rate of (48,48) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



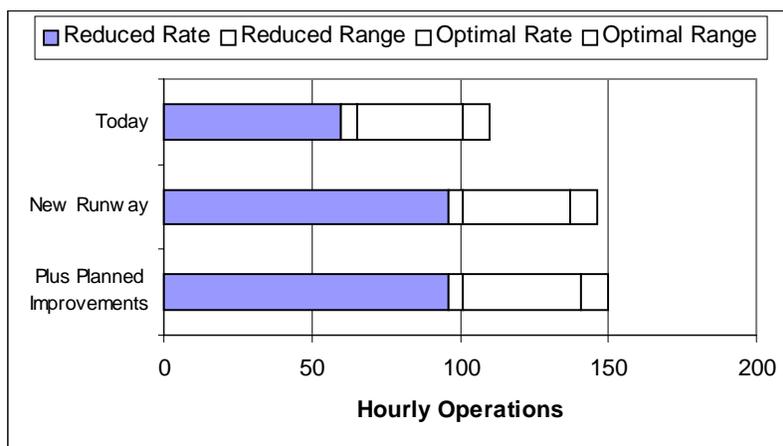
Phoenix Sky Harbor International Airport Benchmarks

- The current capacity benchmark at Phoenix Sky Harbor today is 101-110 flights per hour in good weather.
- Current capacity falls to 60-65 flights (or fewer) per hour today in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy participation.
- This year Phoenix opened a new third runway which raises the good weather capacity to 137-146 flights per hour (a 36% increase), and to 96-101 flights per hour (a 60% increase) in adverse weather conditions.
- As a result of the addition of the new third runway, Phoenix now operates below its good weather and reduced rate capacity throughout the day.
- Overall, about 2% of the flights at Phoenix were delayed significantly (more than 15 minutes) prior to the operation of the third new runway.
- In addition to the new runway, technology and procedural improvements are expected to improve the Phoenix capacity benchmark by a total of 40% (to 141-150 flights per hour) over the next 10 years. Technological and procedural improvements will not increase the adverse weather capacity benchmarks.
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes, which allow a more consistent flow of aircraft to the runway.
- The capacity at Phoenix with the new runway is adequate to accommodate the projected increase in demand of 31% over the next decade.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	101-110	60-65
New Runway	137-146	96-101
Plus planned improvements	141-150	96-101



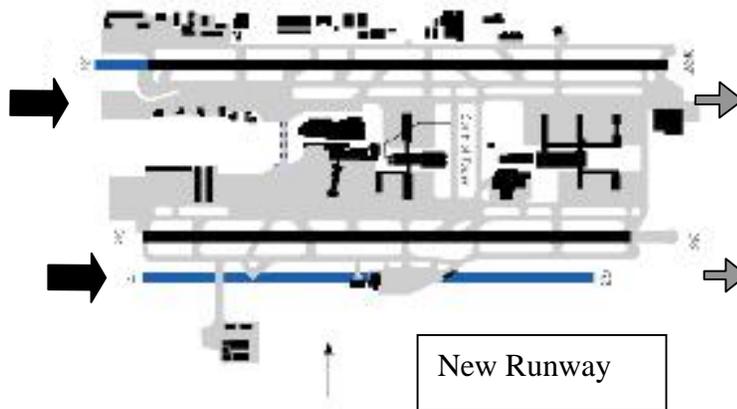
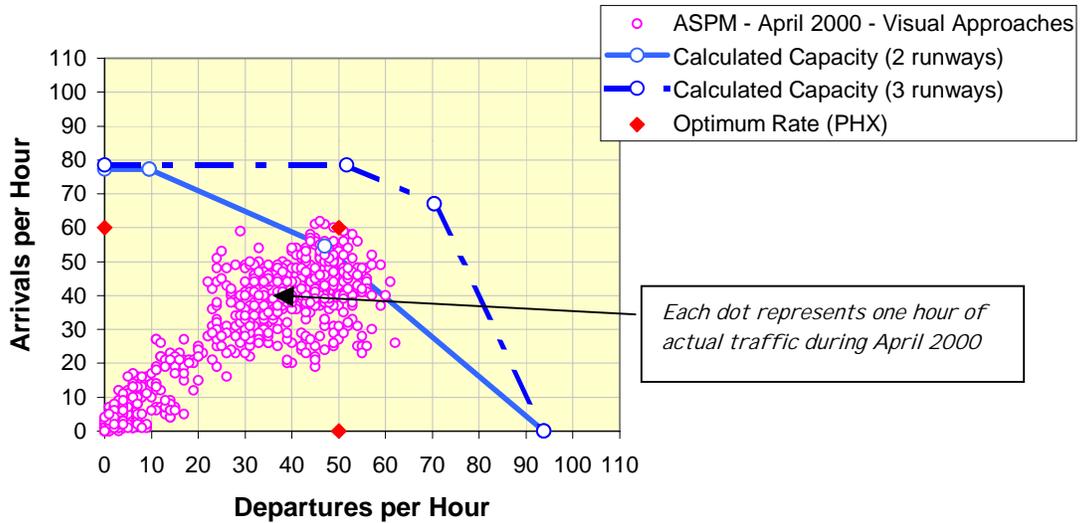
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

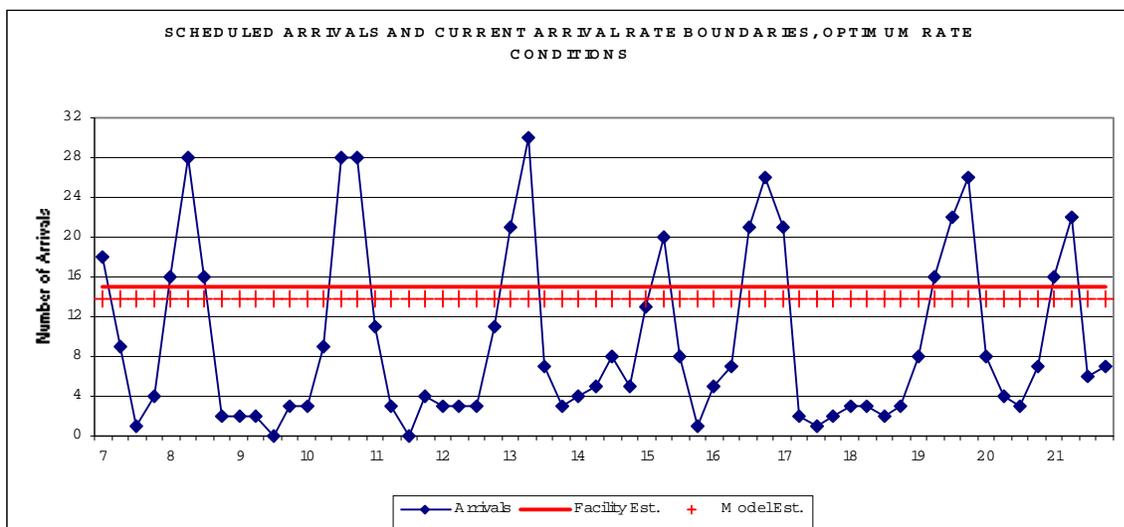
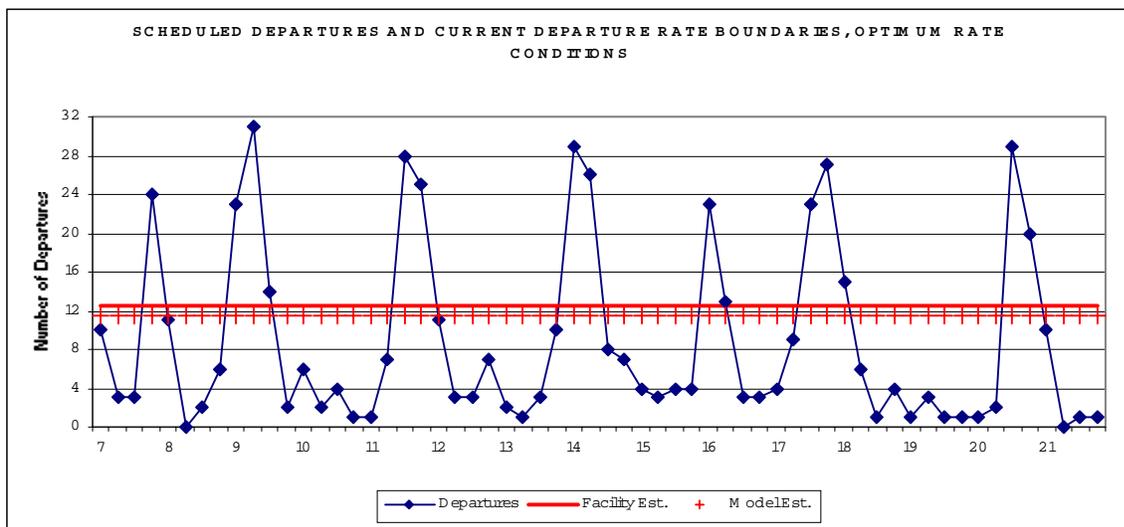
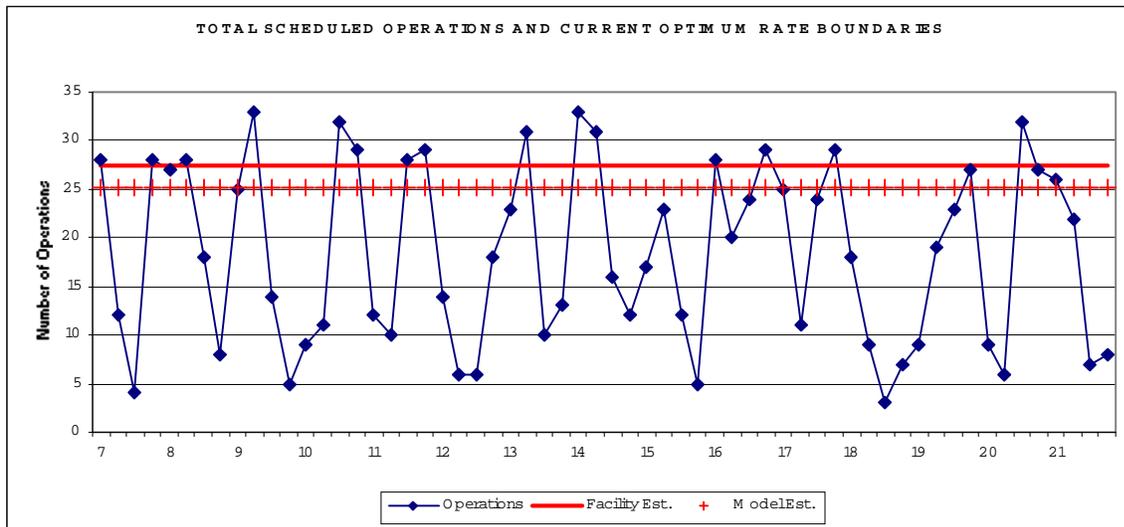
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – Optimum Rate of (60,50) was reported by the facility
 - Arrive from West
- ASPM data is actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- Chart below represents observed traffic and expected rates in terms of operations per hour

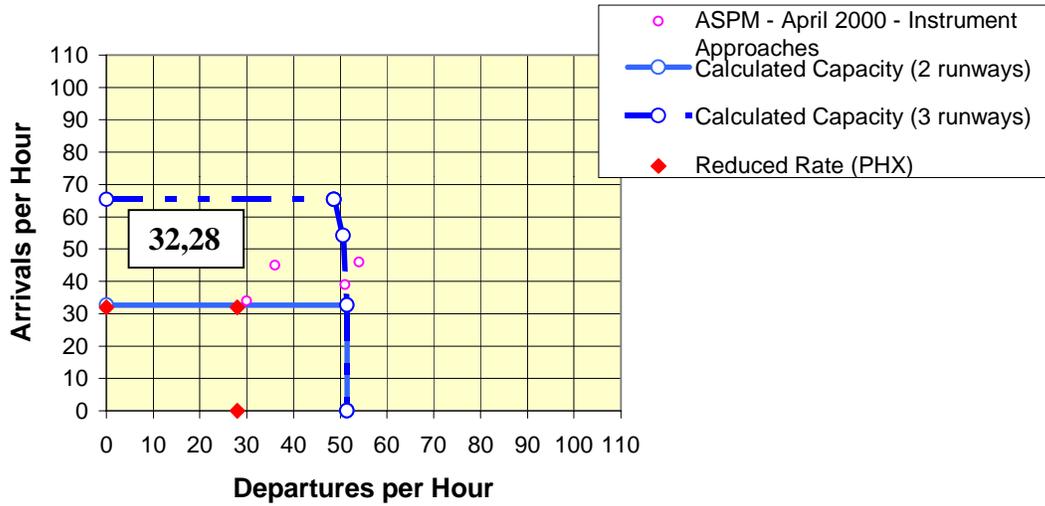


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions



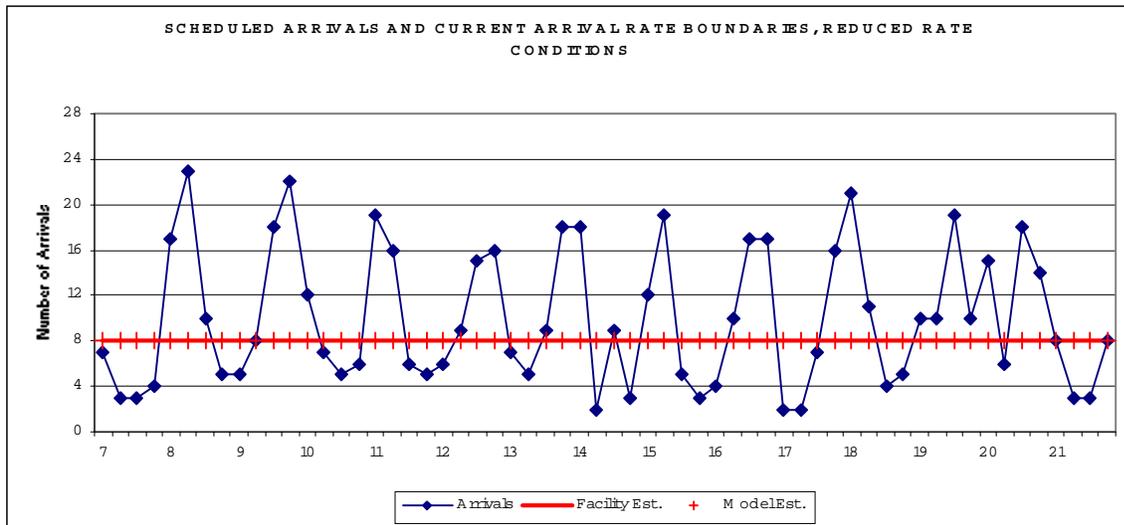
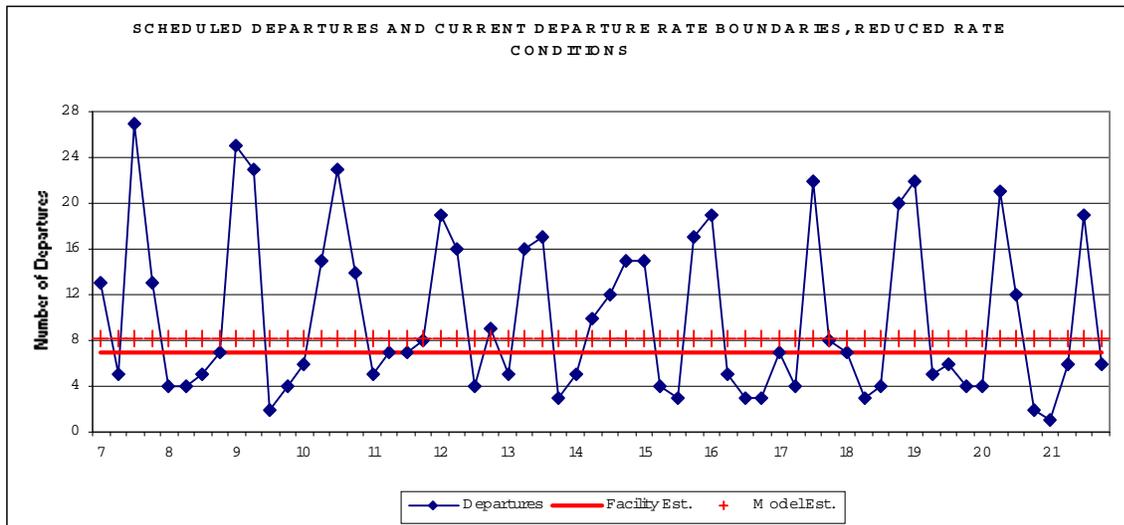
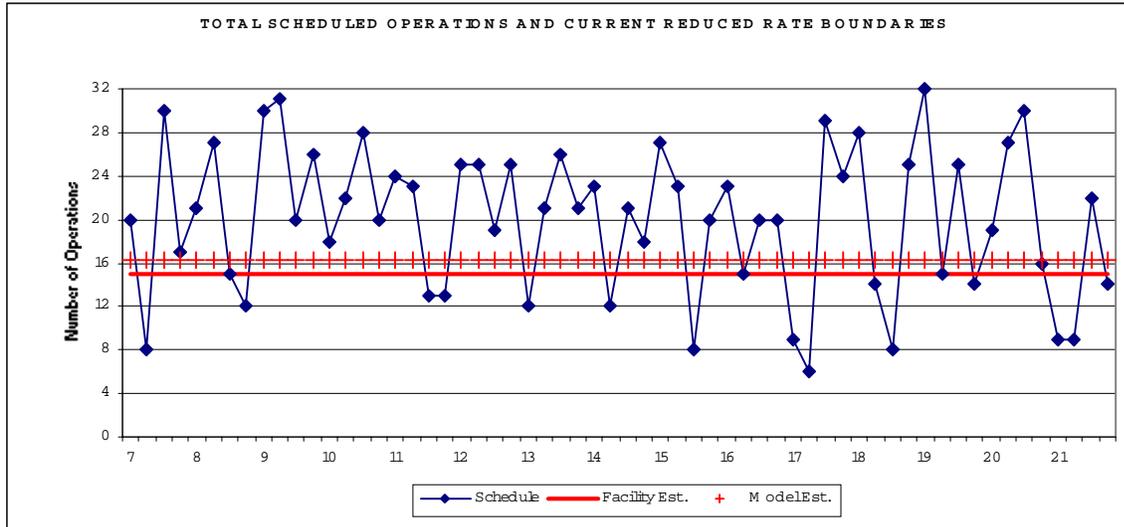
Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima) - Reduced Rate of (32,28) was reported by the facility
 - Arrive from East
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour



PHX – Phoenix Sky Harbor International Airport

Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



Pittsburgh International Airport Benchmarks

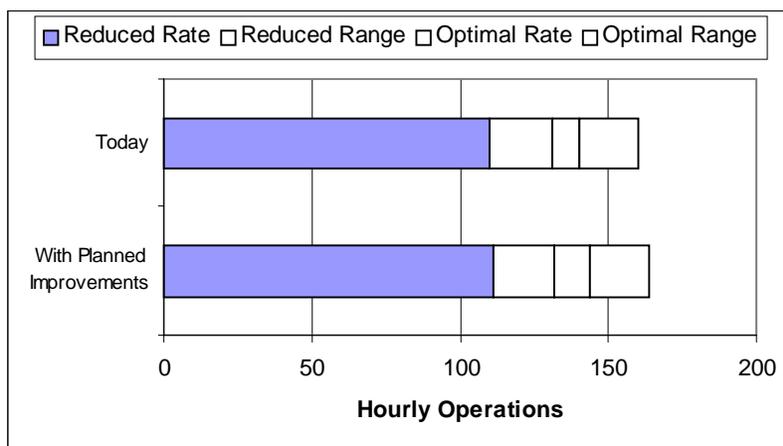
- The current capacity benchmark at Pittsburgh International is 140-160 flights per hour in good weather.
- Current capacity falls to 110-131 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- Although Pittsburgh has periods when scheduled operations exceed its good-weather capacity, the demand drops to very low levels in between the peaks, allowing the airport time to recover.
- Overall, less than 0.5% of the flights are delayed significantly (more than 15 minutes).
- Technology and procedural improvements are expected to improve Pittsburgh's capacity benchmark by 3% (to 144-164 flights per hour) over the next 10 years, while the adverse weather capacity will increase by 1% (to 111-132 flights per hour).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes, which allow a more consistent flow of aircraft to the runway.
- Demand is expected to grow by 15% over the next decade. Because capacity is not expected to keep pace with growth in demand, a modest increase in delay is likely.

PIT – Pittsburgh International Airport

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	140-160	110-131
New Runway	N/A	N/A
With planned improvements	144-164	111-132



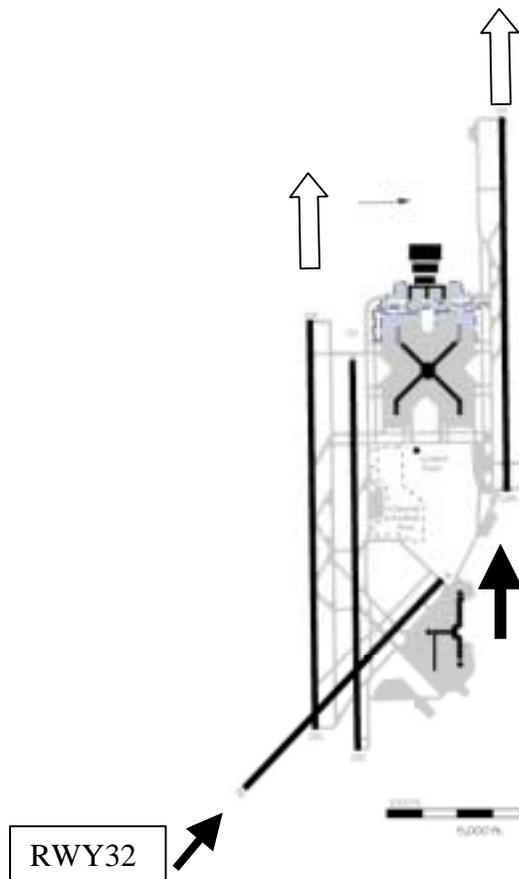
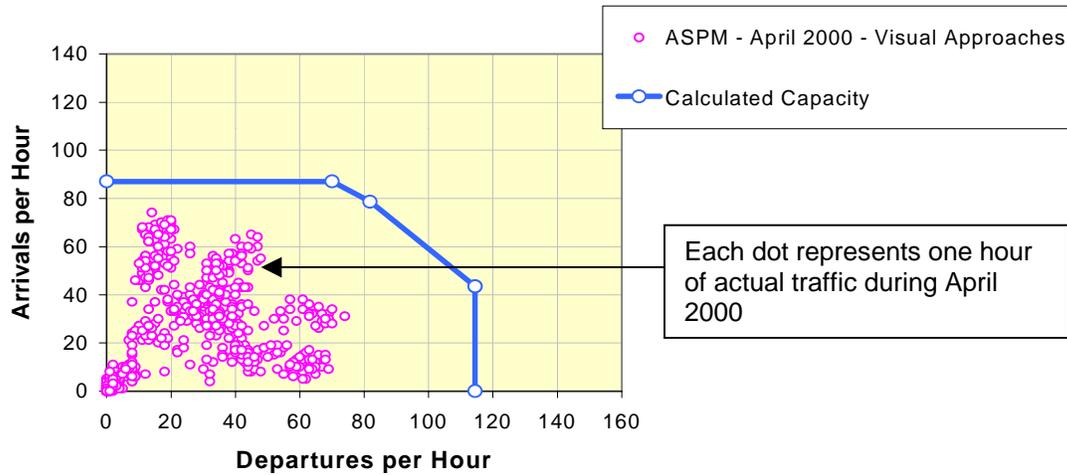
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

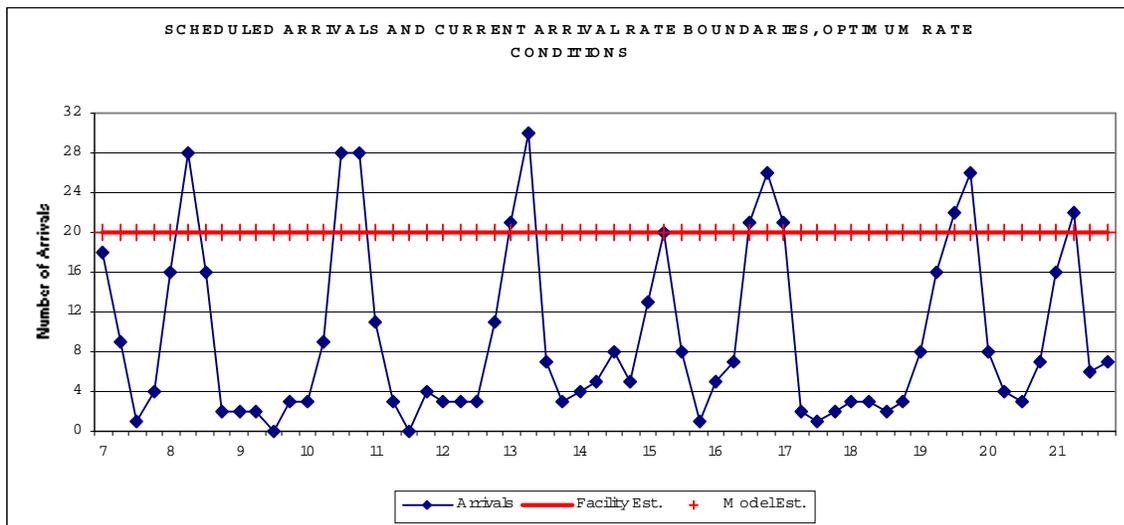
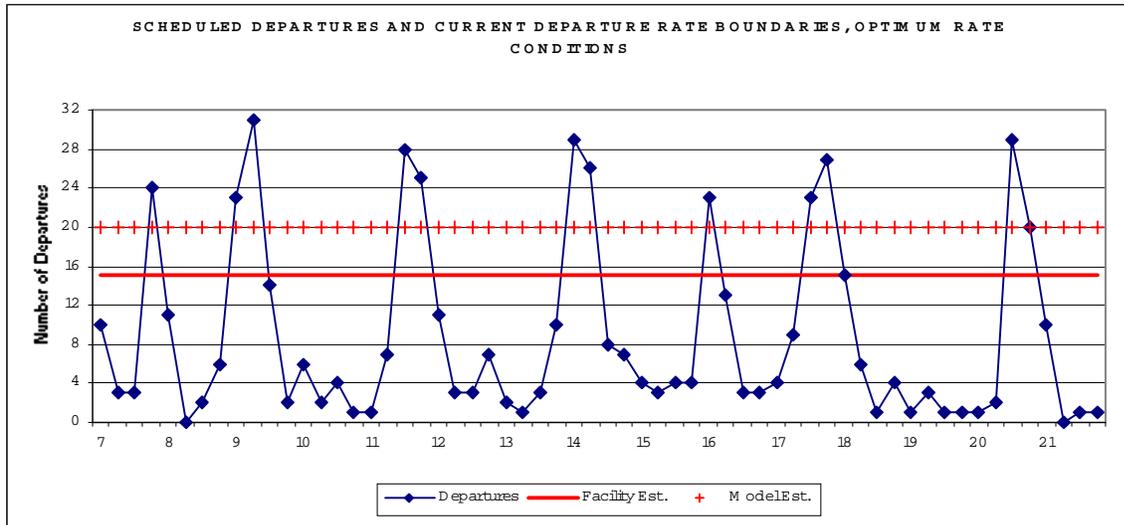
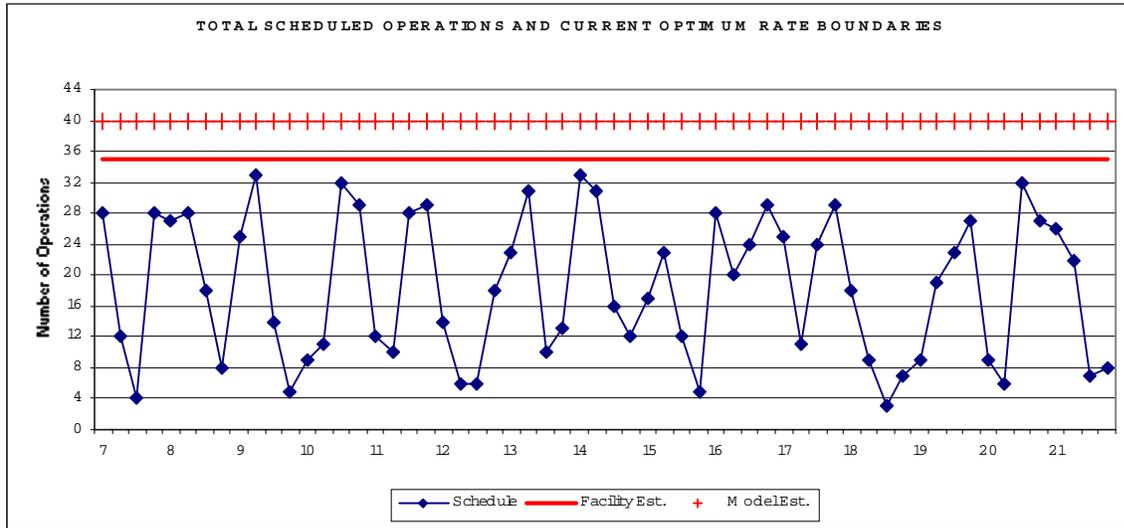
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation
 - Facility reported 80 max AAR, 100 max ADR, with a maximum of 140 total ops.
 - RW32/28LR is RWY configuration reported by facility.
- ASPM data is actual hourly traffic counts for April 2000
- Chart below represents observed hourly traffic and expected rates in terms of operations per hour. Solid line represents the expected limit of hourly operations. Per facility reported optimal operations, arrivals were modeled on RWY32 & 28R, departures on RW28LR.

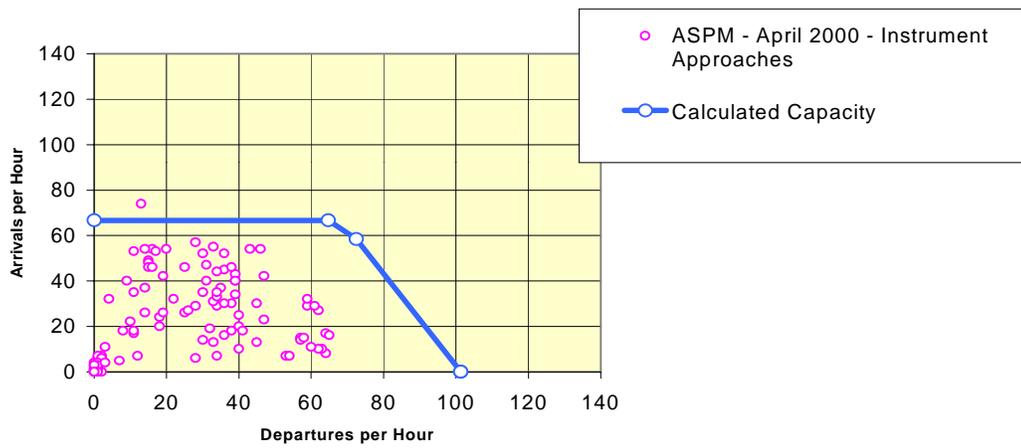


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

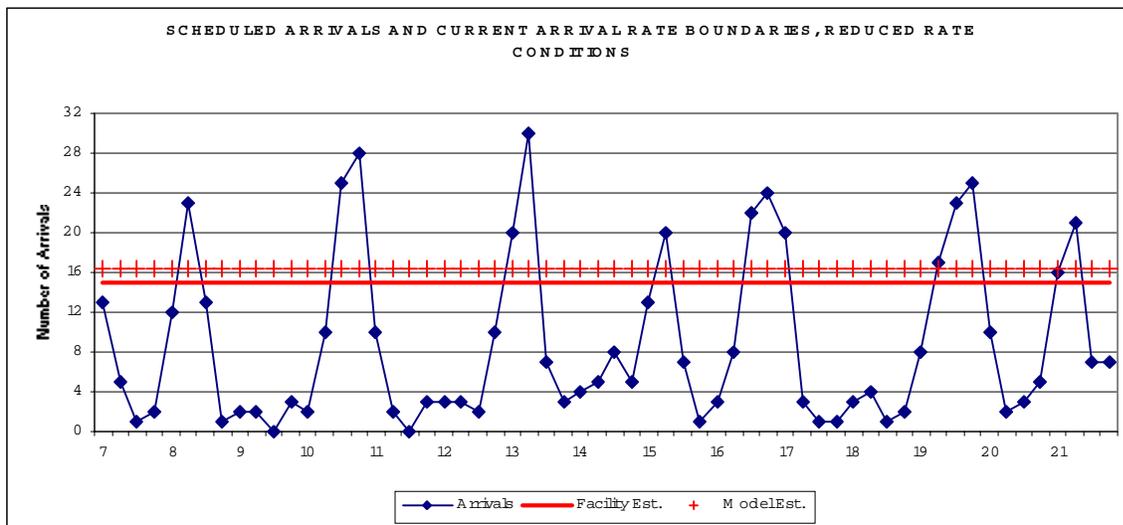
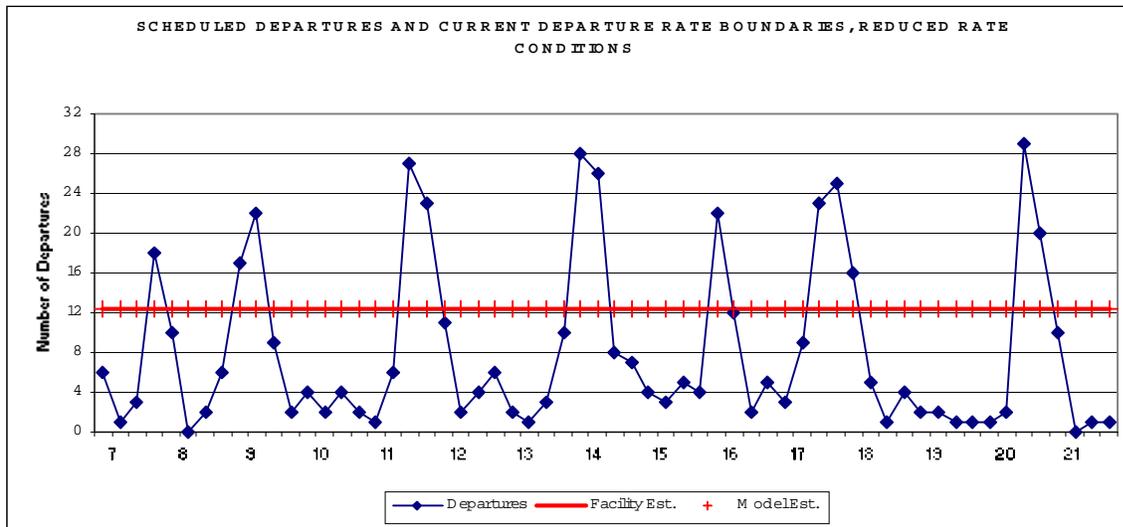
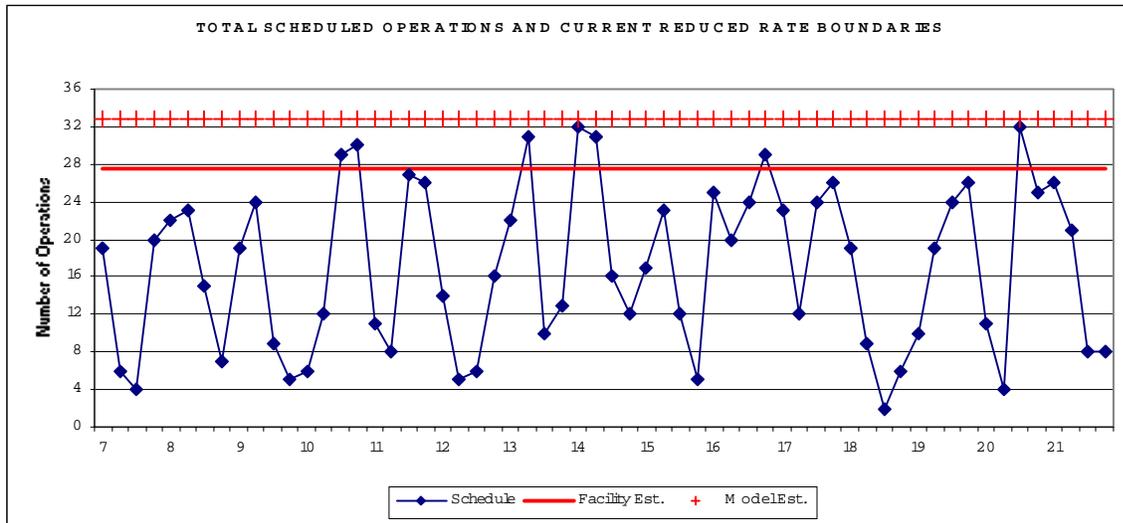


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Facility reported 65 max AAR, 90 max ADR, with a maximum of 110 total ops.
 - RW28LCR is RWY configuration reported by facility.
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed hourly traffic and expected rates in terms of operations per hour. The three parallel runways 28LCR have been modeled.



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



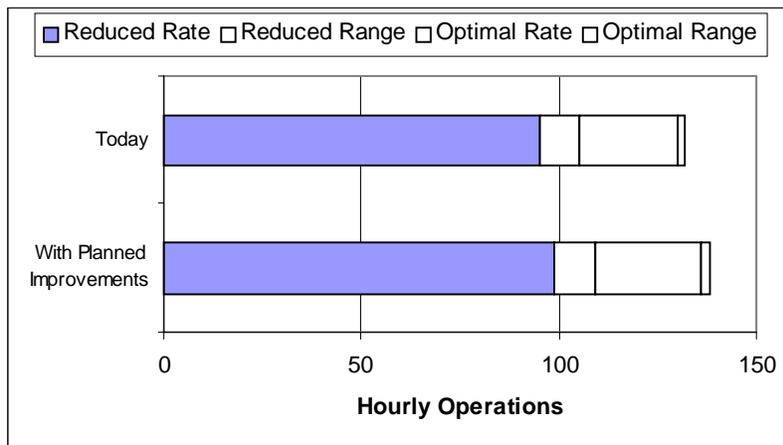
Salt Lake City International Airport Benchmarks

- The current capacity benchmark at Salt Lake City International is 130-132 flights per hour in good weather.
- Current capacity falls to 95-105 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- Scheduled traffic at Salt Lake City rarely exceeds its good weather and adverse weather capacities.
- Overall, roughly 0.2% of all flights at Salt Lake City are significantly delayed (more than 15 minutes).
- Technology and procedural improvements are expected to improve Salt Lake City's capacity benchmark for good weather by 5% (to 136-138 flights per hour) over the next 10 years.
- The adverse weather capacity benchmark will increase by 4% (to 99-109 flights per hour).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- Demand at Salt Lake City is expected to grow by 34% over the next decade. While capacity improvements will not keep pace with the growth in demand, Salt Lake City should have ample capacity to accommodate the future growth in good weather conditions. When operating in adverse weather conditions, the airport will be operating near or above its capacity benchmark, resulting in an increase in delays. The airport operator has long-term plans for runway realignment to increase capacity and relieve delay.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	130-132	95-105
New Runway	N/A	N/A
With planned improvements	136-138	99-109



The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.

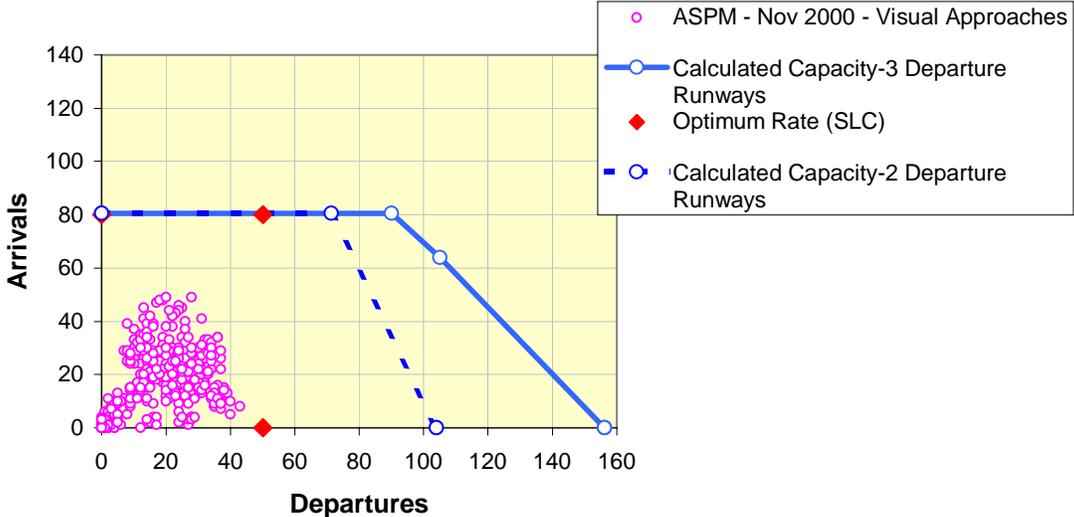
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

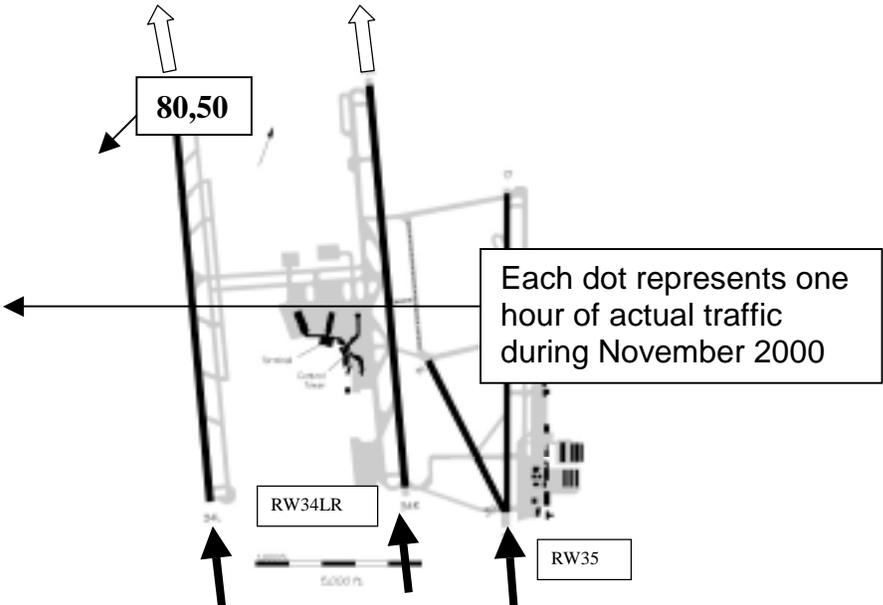
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

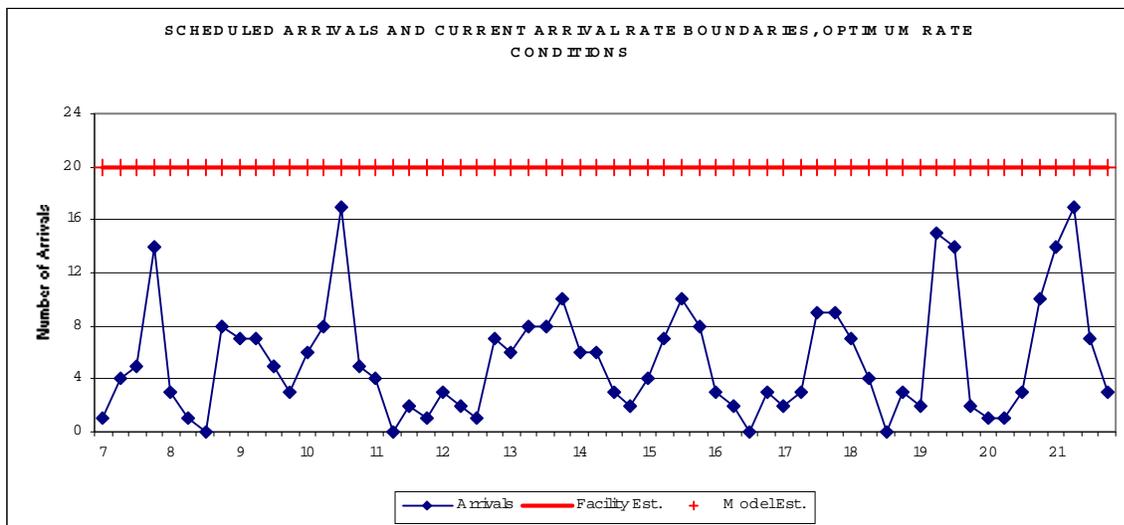
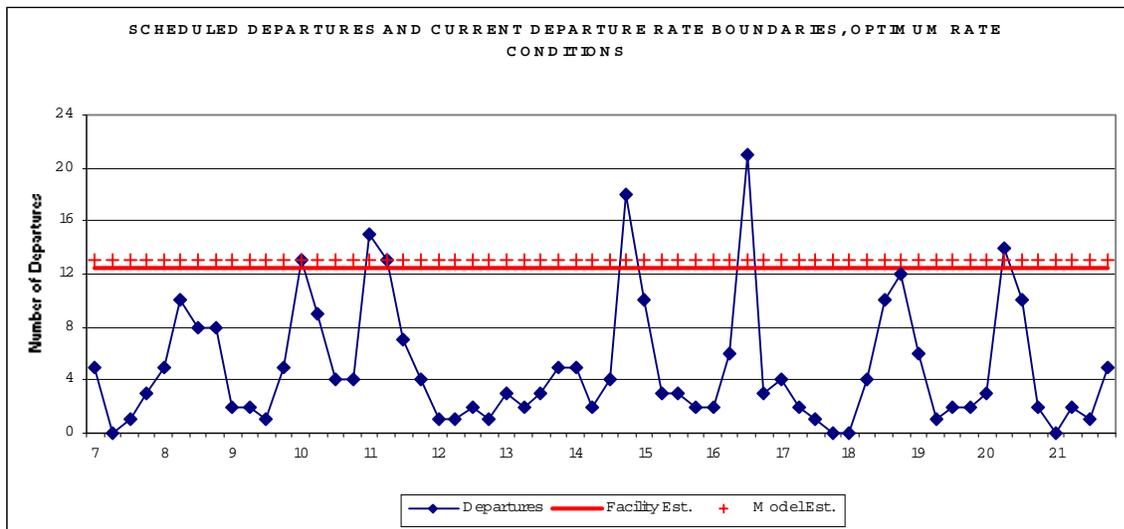
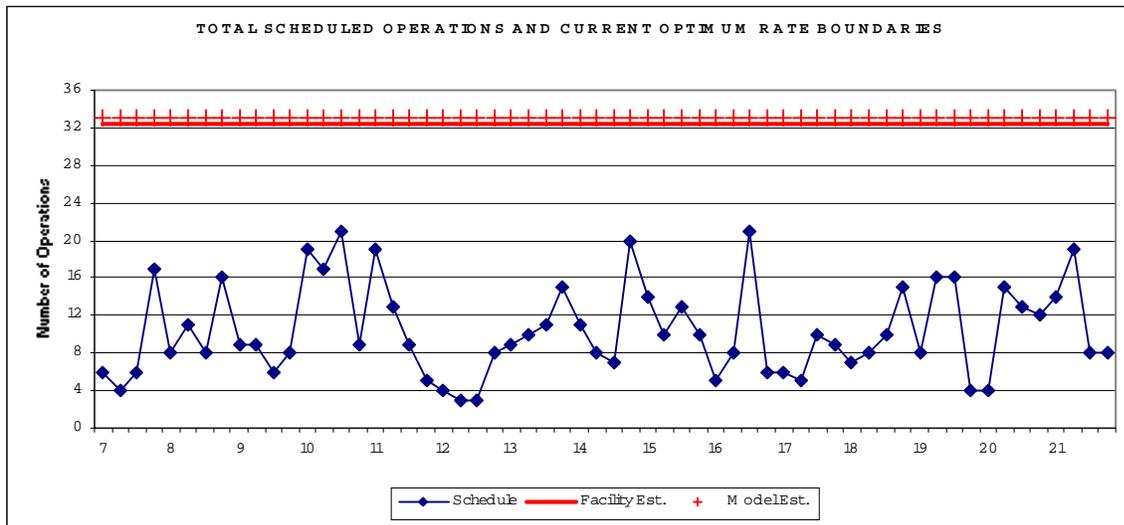
- Visual approaches, visual separation
 - Optimum rate of (80,50) was reported by the facility.
 - Configuration shown is configuration modeled.
 - Facility reported configuration RW16LR/17 or 34LR/35.
- ASPM data is actual hourly traffic counts
- Chart below represents observed hourly traffic and expected rates in terms of operations per hour. Solid line represents the expected limit of hourly operations.



- Departure routes are limited due to terrain to the east.

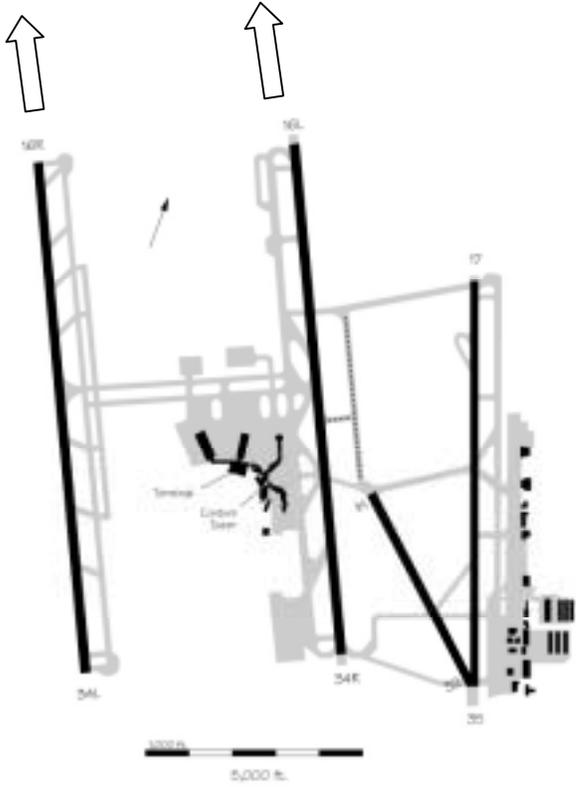
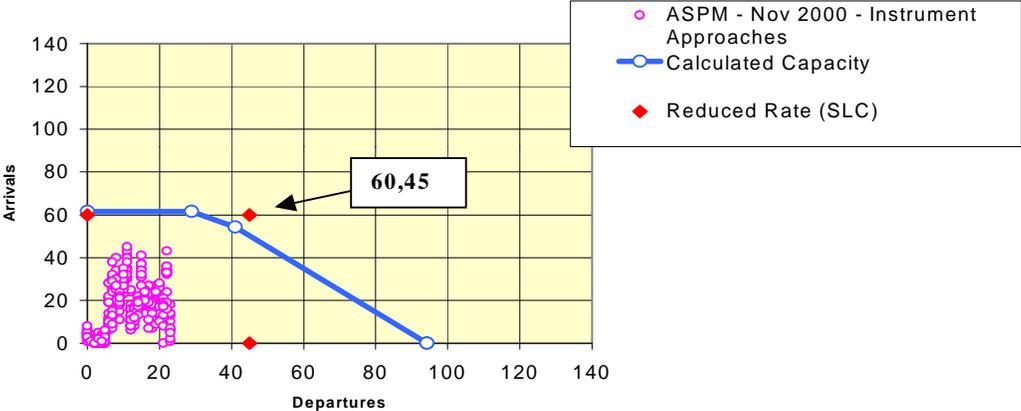


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

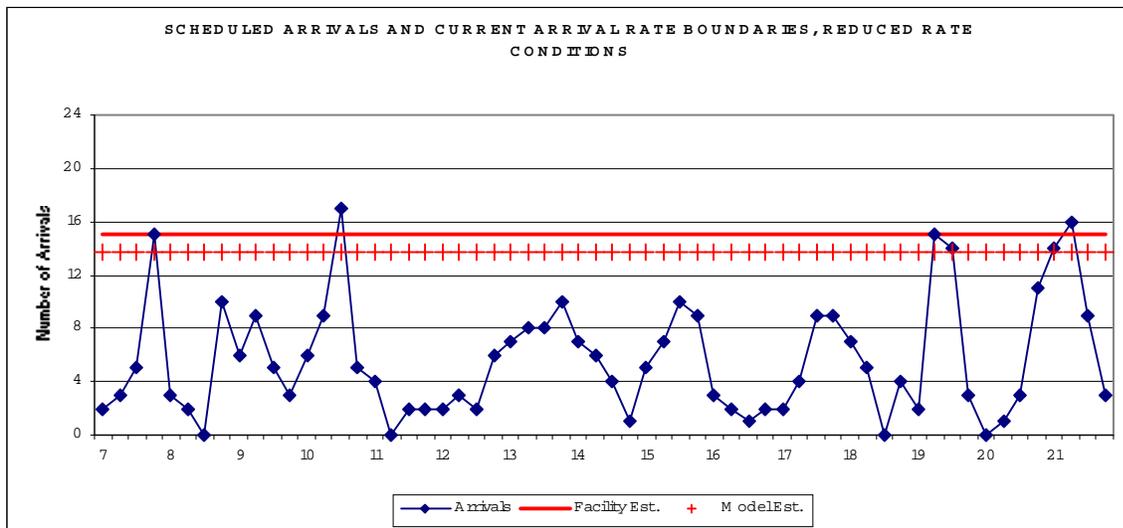
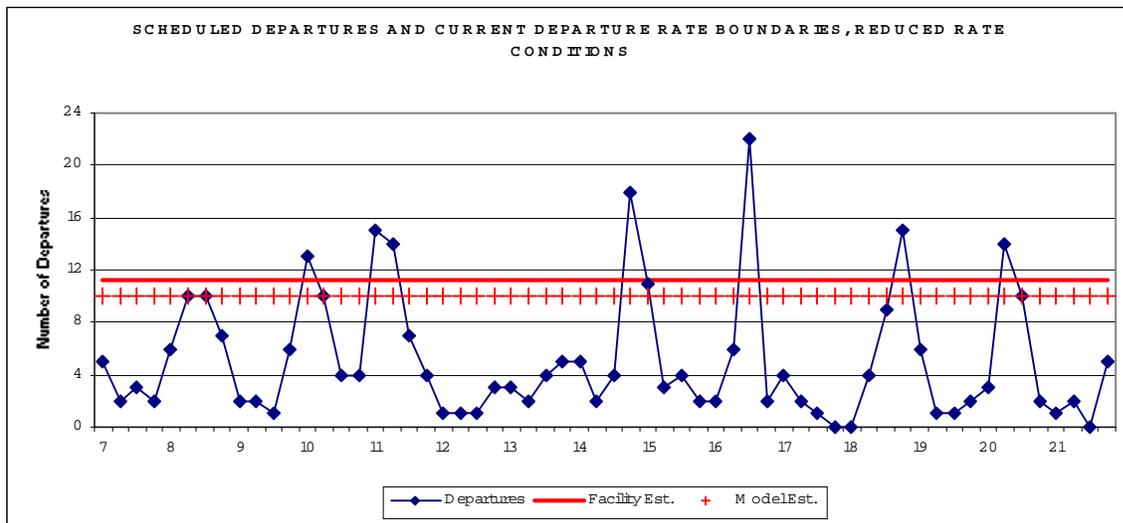
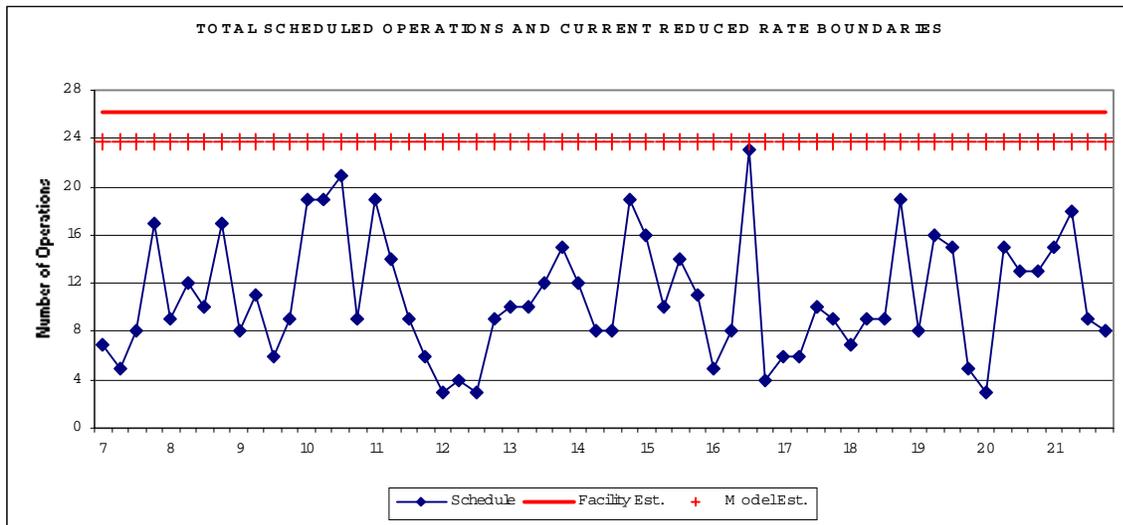


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Reduced rate of (60,45) was reported by the facility.
 - Configuration shown is configuration modeled.
 - Facility reported configuration RW16LR/17 or 34LR/35.
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed hourly traffic and expected rates in terms of operations per hour.



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



San Diego International Airport Benchmarks

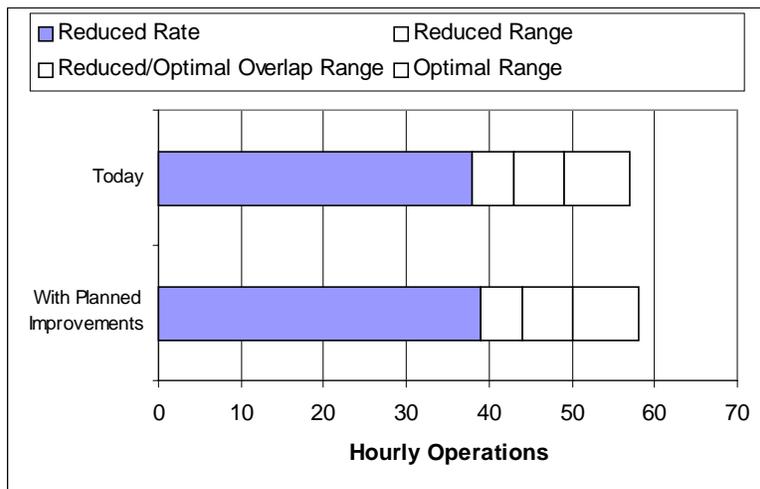
- The current capacity benchmark at San Diego is 43-57 flights per hour in good weather.
- Current capacity falls to 38-49 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- San Diego operates below its good-weather capacity for all but 2 ½ hours of the day, and during bad weather, demand is accommodated with few delays.
- Overall, less than 1% of the flights are delayed significantly (more than 15 minutes).
- Technology and procedural improvements are expected to improve San Diego's capacity benchmark by 2% (to 44-58 flights per hour) over the next 10 years.
- The adverse weather capacity benchmark will increase by 3% (to 39-50 flights per hour).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- Demand at San Diego is expected to grow by 33% over the next decade. Although current traffic demand is below capacity, this growth in demand can be expected to cause some increase in delays.

SAN – San Diego International Airport

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	43-57	38-49
New Runway	N/A	N/A
With planned improvements	44-58	39-50



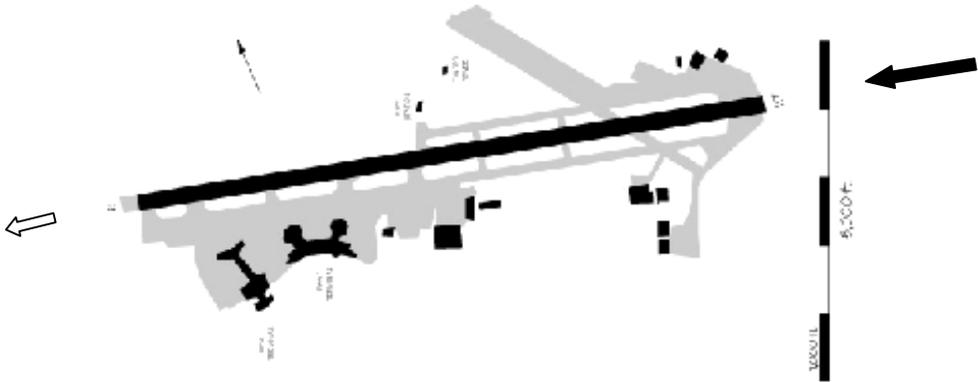
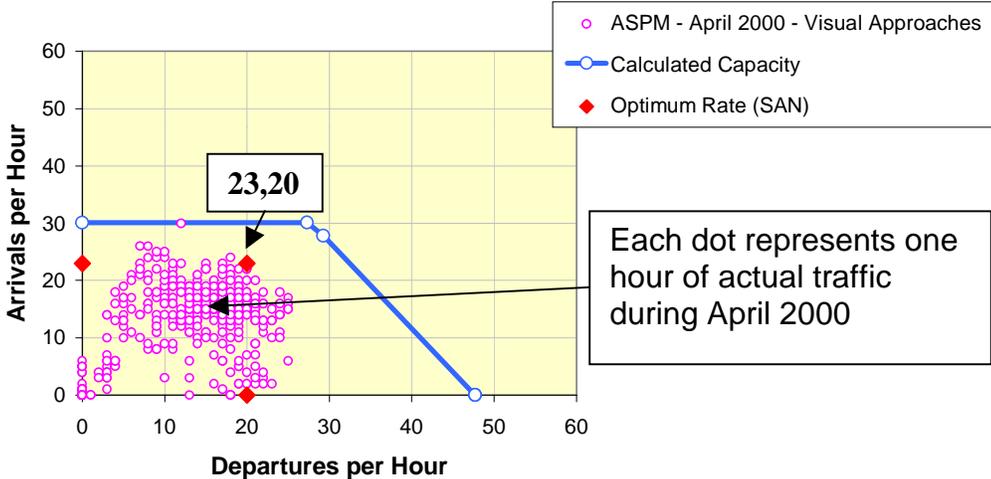
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

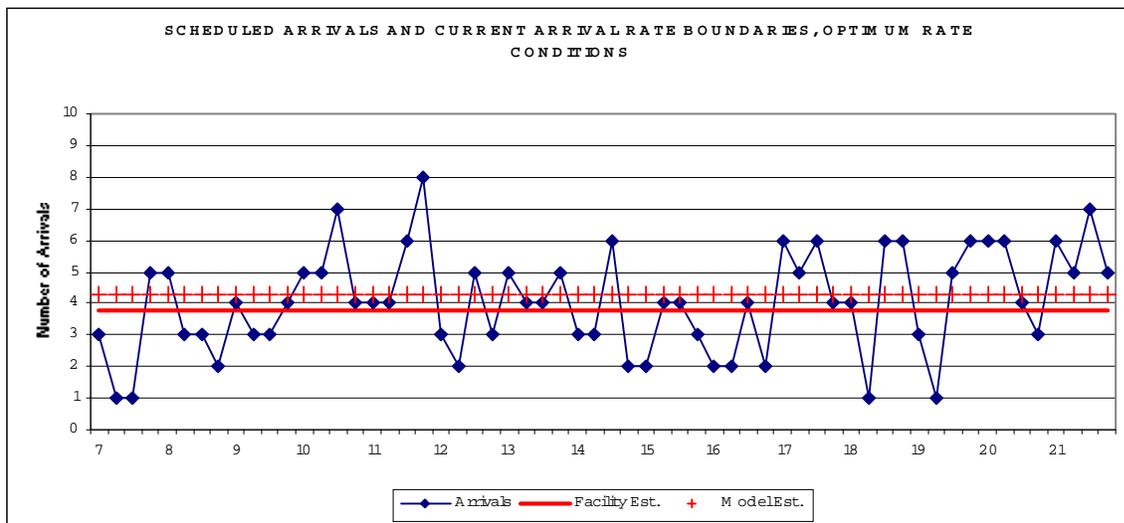
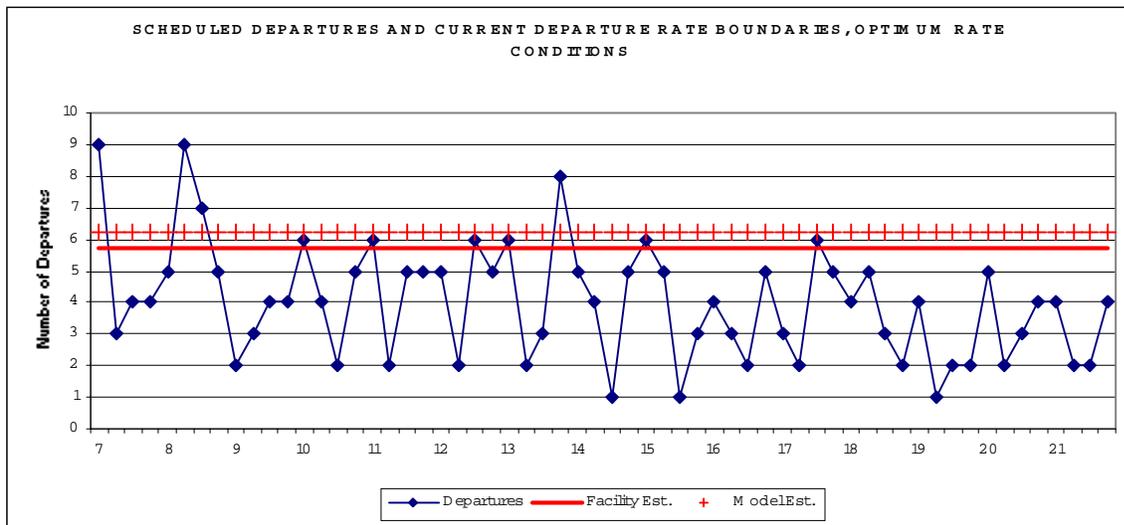
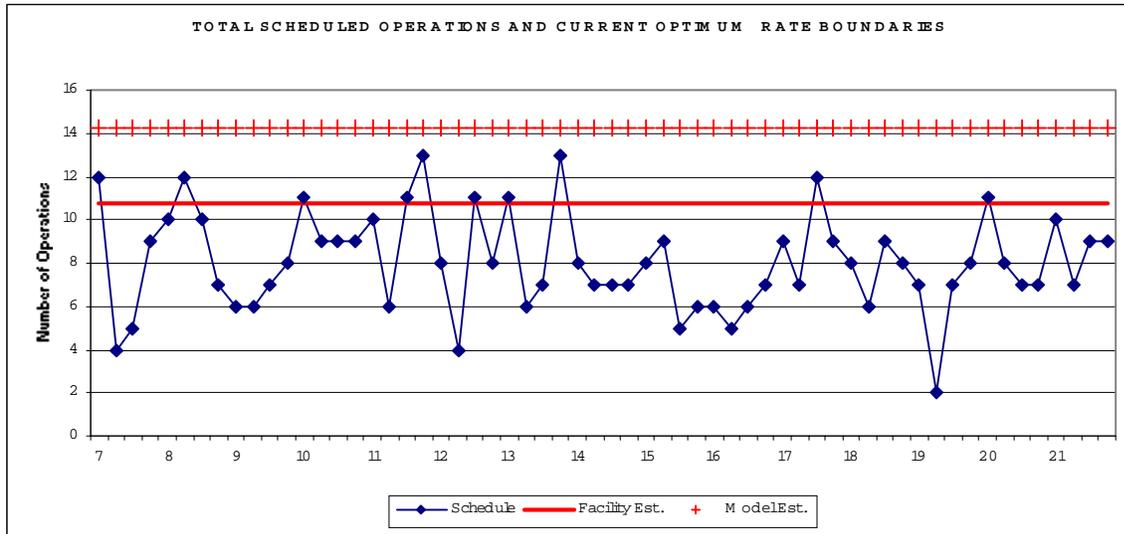
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – westward arrivals and departures
 - Optimum rate of (23,20) was reported by the facility
- ASPM data is actual hourly traffic counts
- Solid line represents the expected limit of hourly operations

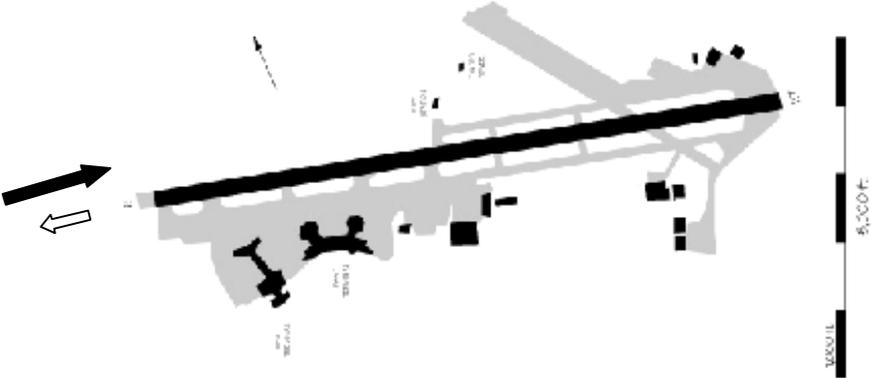
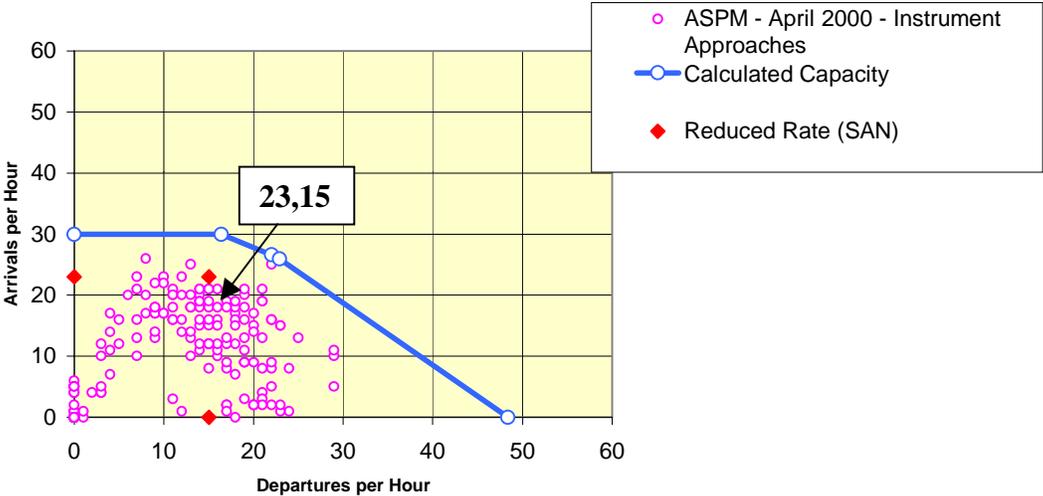


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

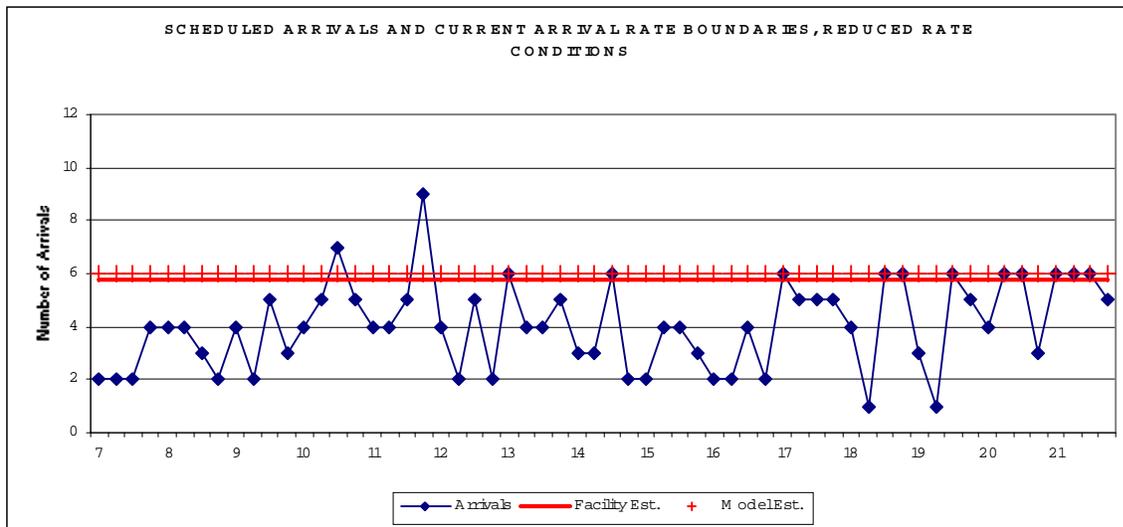
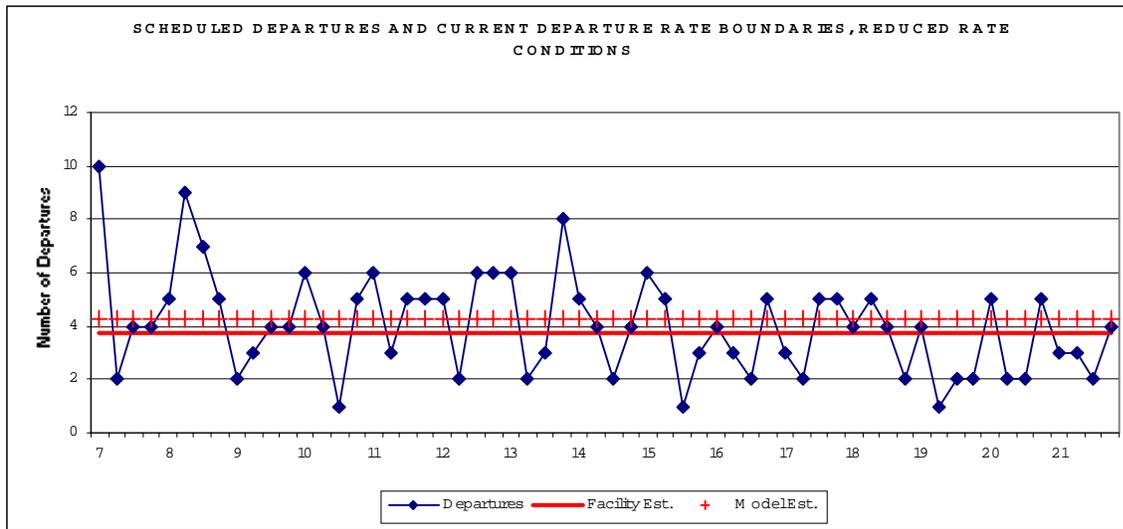
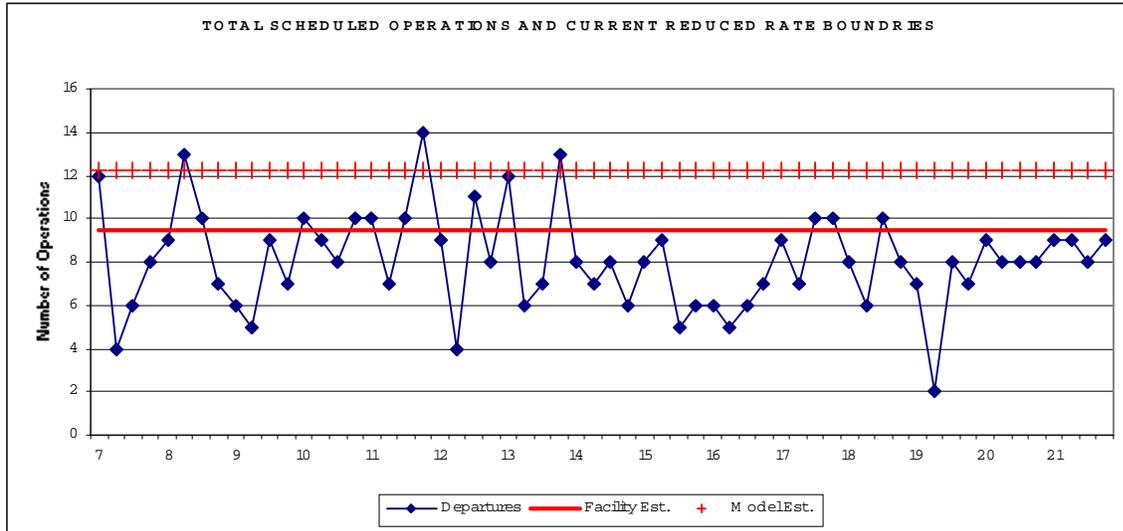


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima) – eastward arrivals, westward departures
 - Reduced rate of (23,15) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed hourly traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



San Francisco International Airport Benchmarks

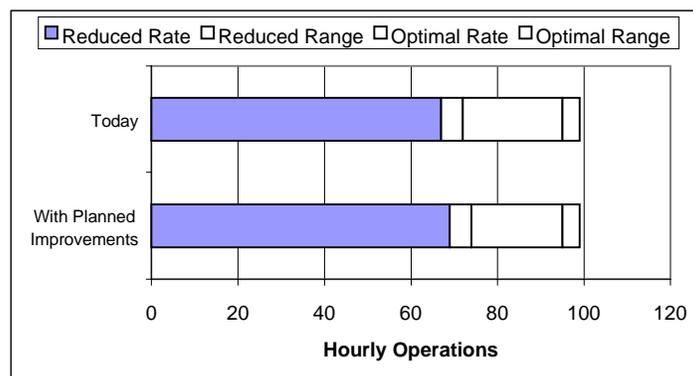
- The current capacity benchmark at San Francisco is 95-99 flights per hour in good weather. The runway geometry at San Francisco makes fleet mix a key determinant of capacity.
- Current capacity falls to 67-72 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- San Francisco ranks fourth in the number of flights delayed in excess of 15 minutes in calendar year 2000 (over 5% of the flights). During the same period, it ranked second, behind LaGuardia, in total arrival delay.
- Technology and procedural improvements are not expected to improve San Francisco's capacity benchmark for good weather over the next 10 years.
- These improvements are expected to increase the adverse weather capacity benchmark by 3% (to 69-74 flights per hour).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes, which allow a more consistent flow of aircraft to the runway.
 - SOIA (with PRM) may provide additional capacity during certain weather conditions. These benefits are not reflected in the benchmark value, however, which is based on weather condition below the minima for SOIA operations.
- The airport operator was considering runway reconfiguration at the time the study was prepared. However, no locally preferred alternative had been selected so no attempt was made to estimate the benefit of such an improvement.
- Demand is expected to grow by 18% over the same period.
- San Francisco frequently experiences adverse weather conditions that significantly reduce capacity below demand. San Francisco is one of the most delayed airports in America and demand will grow faster than capacity over the next ten years. This will cause greater delays, especially in adverse weather.

SFO – San Francisco International Airport

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	95-99	67-72
New Runway	N/A	N/A
With planned improvements	95-99	69-74



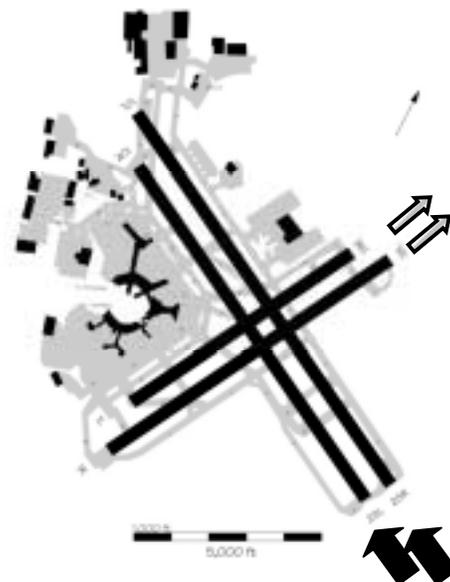
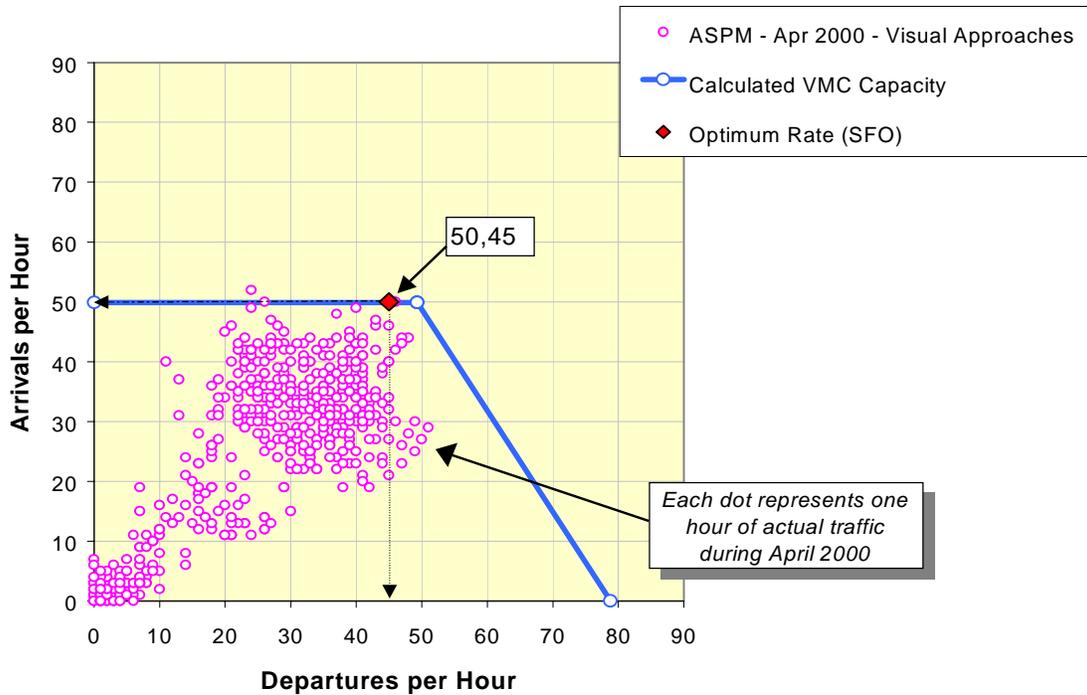
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
 - SOIA (with PRM) may provide additional capacity during certain weather conditions. These benefits are not reflected in the benchmark value, however, which is based on weather condition below the minima for SOIA operations
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

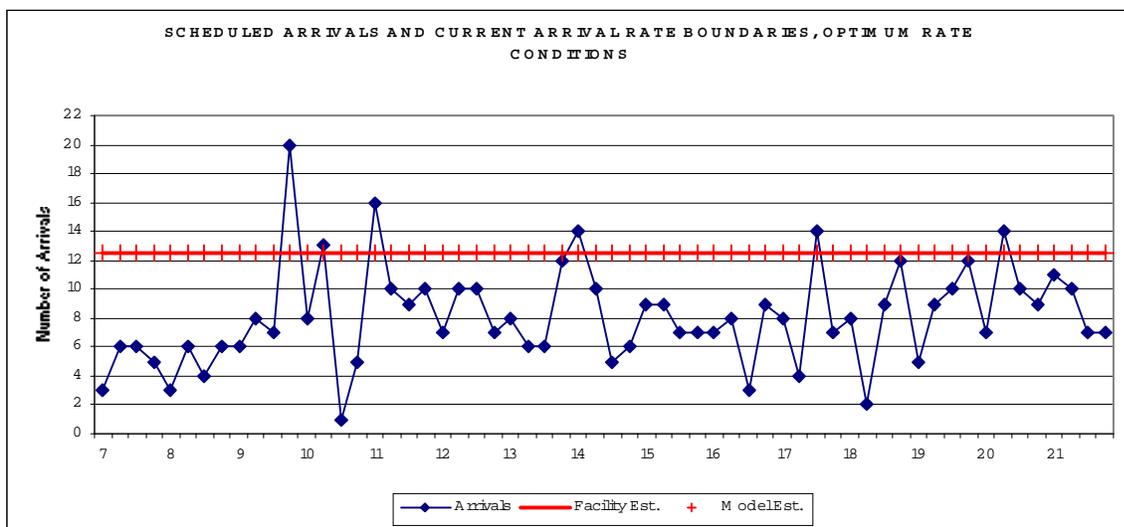
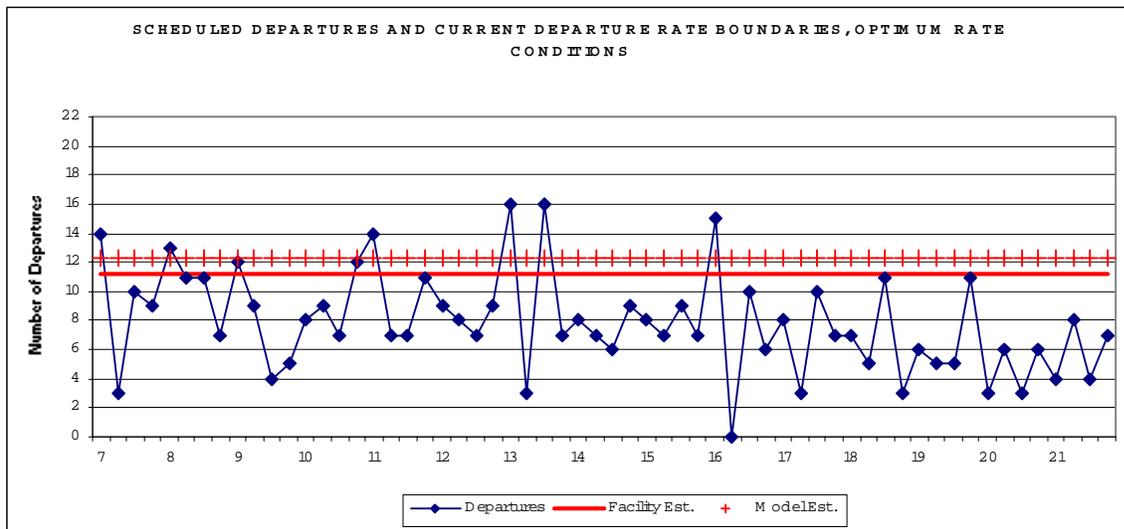
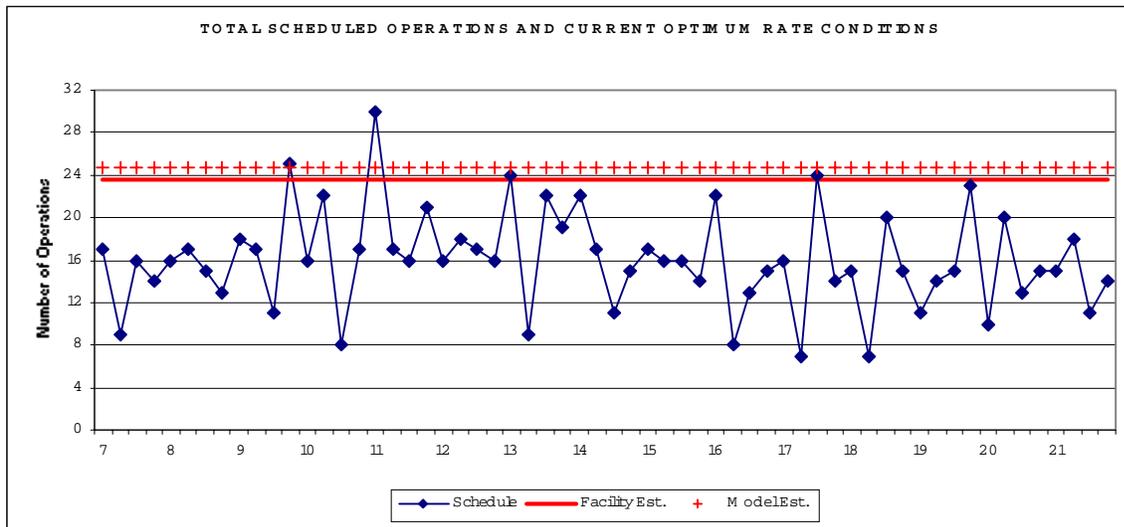
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation
 - Optimum Rate of (50, 45) was reported by the facility
 - Arrive Runways 28L/R, Depart Runways 01L/R
- ASPM data is actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- Solid line represents the calculated airport capacity during a busy hour, and the tradeoff between arrivals and departure rates

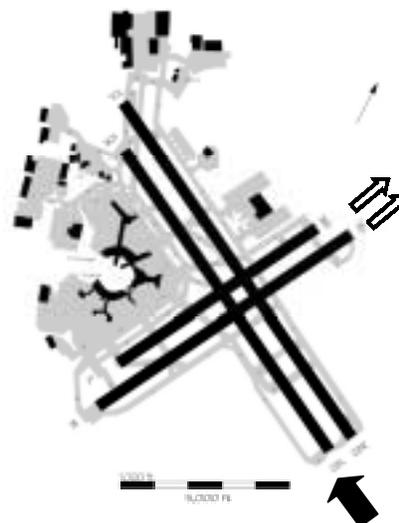
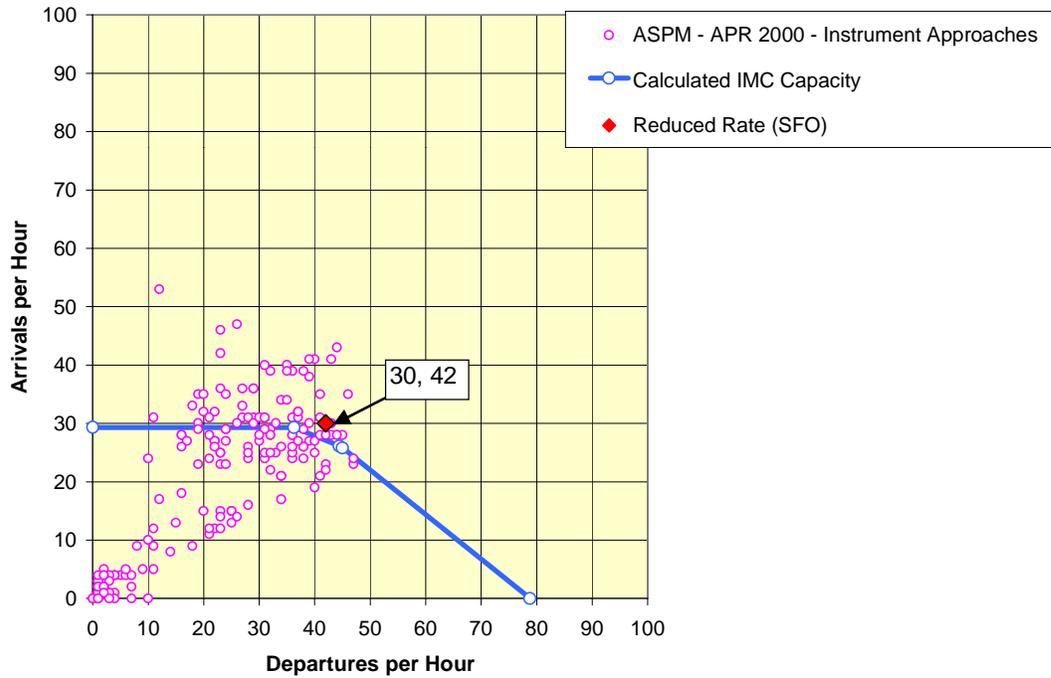


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

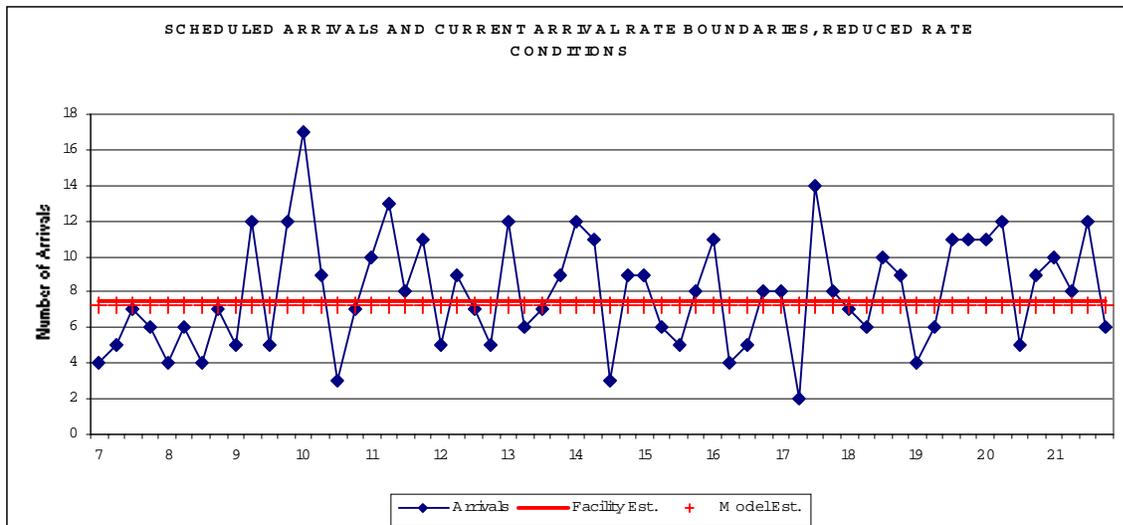
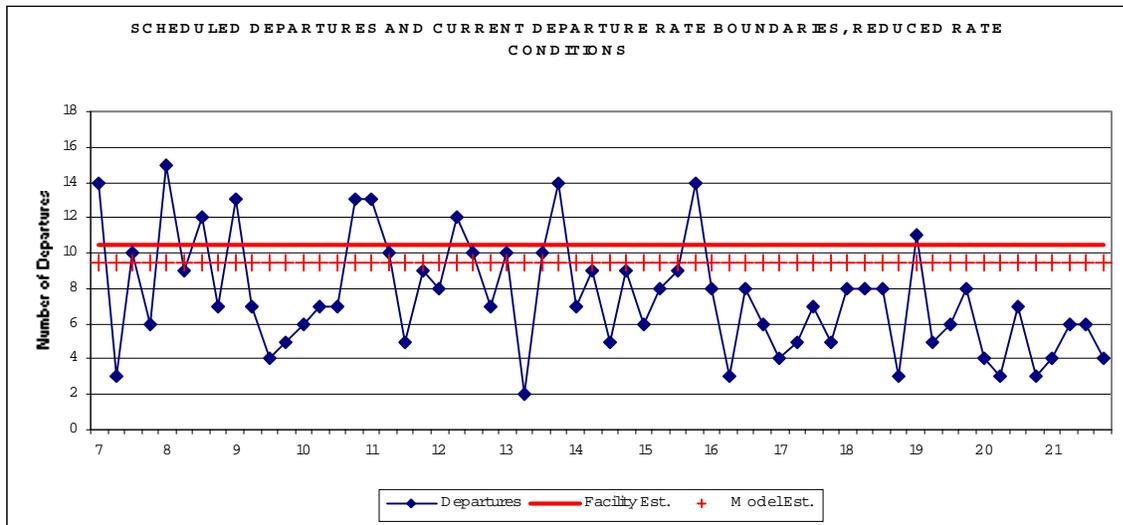
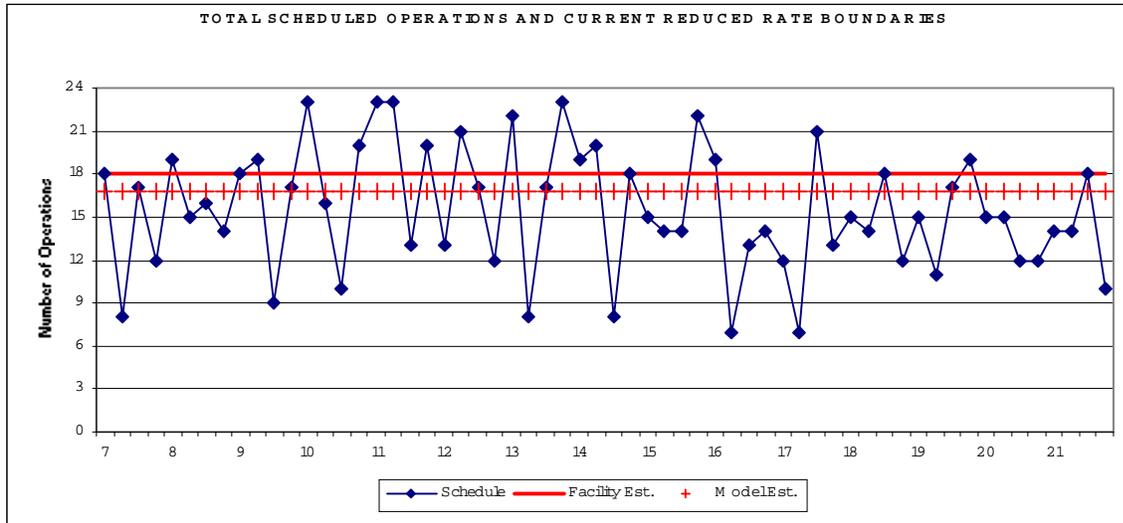


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Arrive Runway 28L/R, Depart 01L/R
- Reduced Rate of (30,42) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departures and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



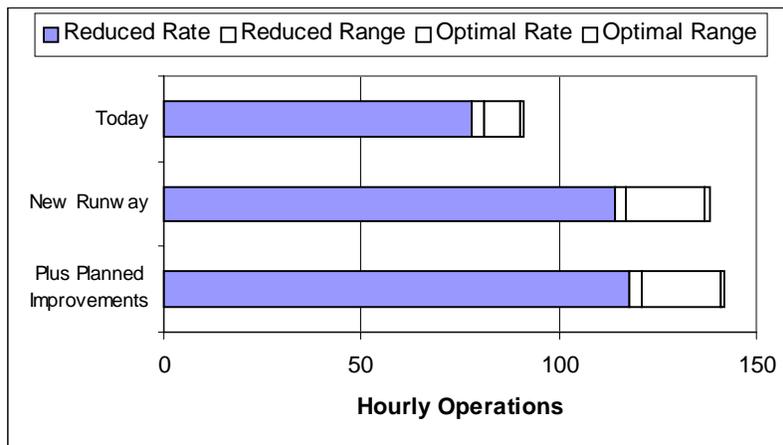
Seattle-Tacoma International Airport Benchmarks

- The current capacity benchmark at Seattle-Tacoma International is 90-91 flights per hour in good weather.
- Current capacity falls to 78-81 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- While only about 1% of all flights at Seattle are delayed more than 15 minutes from their estimated flight plan arrival time, the airport operator emphasizes that almost a third of airline flights arrive more than 15 minutes later than scheduled.
- A new runway, planned for completion in 2006, is expected to improve Seattle's capacity benchmark by 52% (to 137-138 flights per hour) in good weather and by 46% (to 114-117 flights per hour) in adverse weather. This assumes that airspace, ground infrastructure and environmental constraints allow full use of the new runway.
- In addition to the new runway, technology and procedural improvements are expected to improve Seattle's capacity benchmark for good weather by a total of 57% (to 141-142 flights per hour) over the next 10 years. Similarly, the adverse weather capacity benchmark will increase by a total of 51% (to 118-121 flights per hour).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- Demand at Seattle is expected to grow by 17% over the next decade. Capacity is expected to meet or exceed the growth in demand, primarily due to the new runway. Thus, there should be fewer delays in the future.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	90-91	78-81
New Runway	137-138	114-117
Plus planned improvements	141-142	118-121



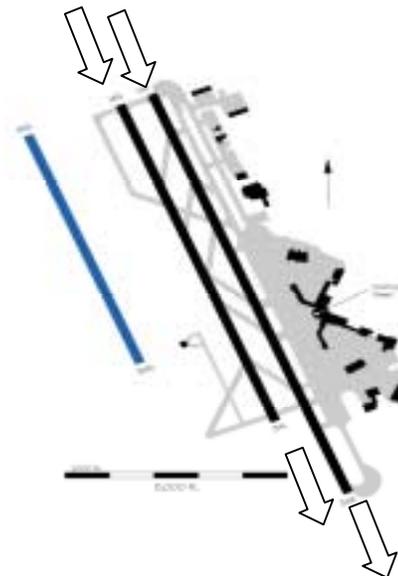
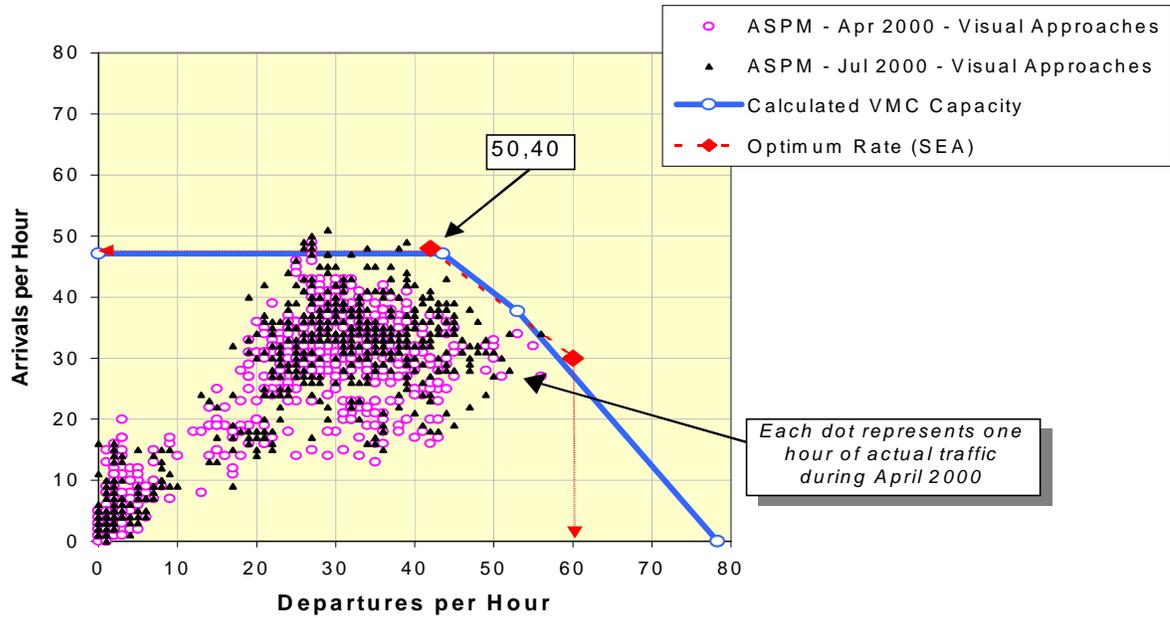
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

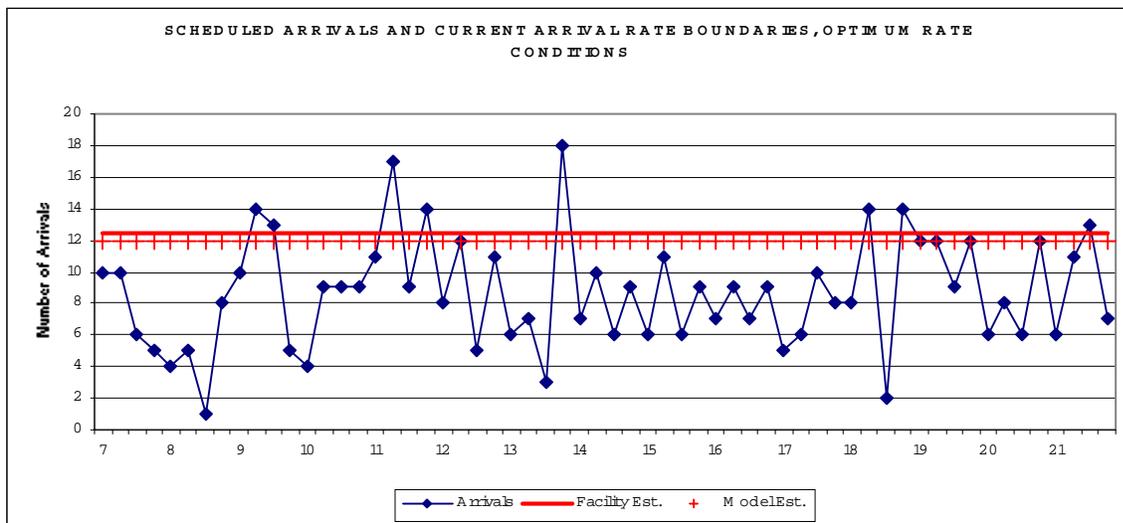
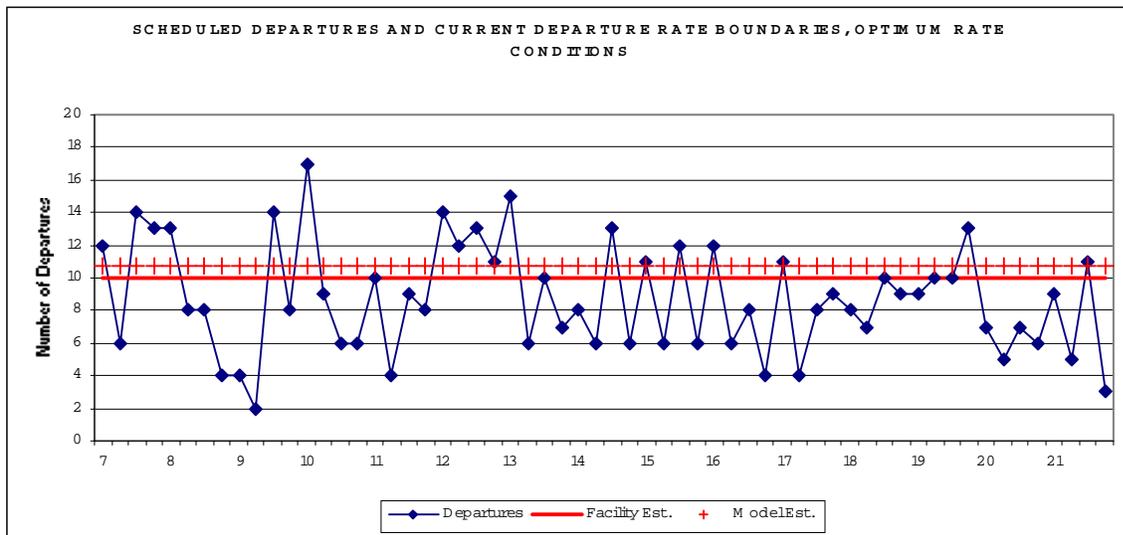
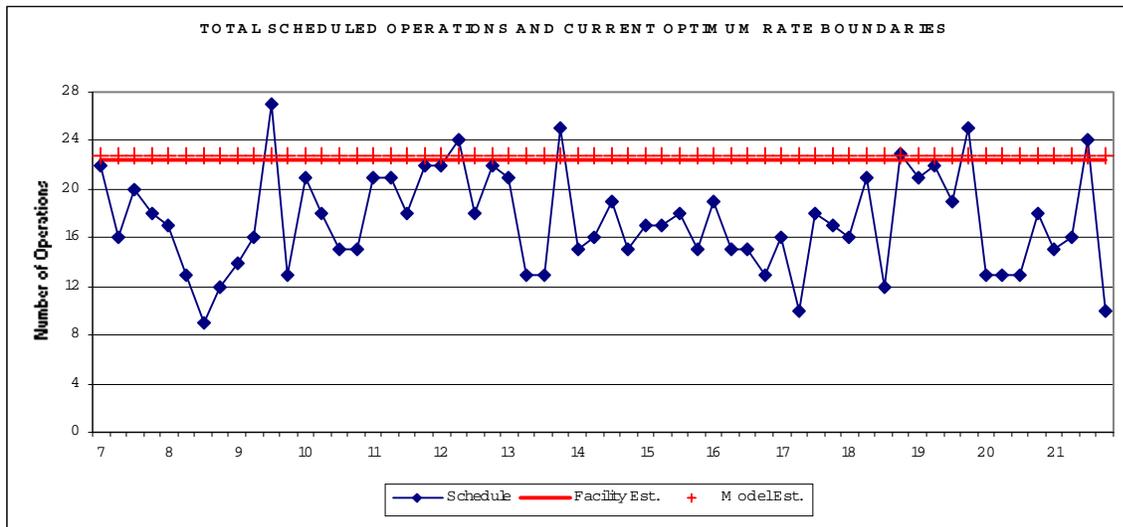
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – Optimum Rate of (50,40) was reported by the facility
- ASPM data is actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- Solid line represents the calculated airport capacity during a busy hour, and the tradeoff between arrivals and departure rates
- The capacity model can only approximate the complex operations at SEA

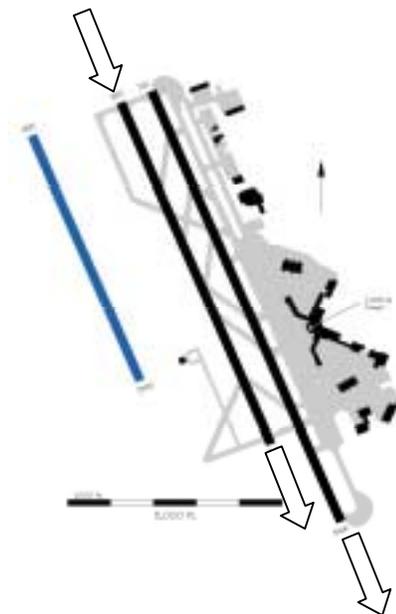
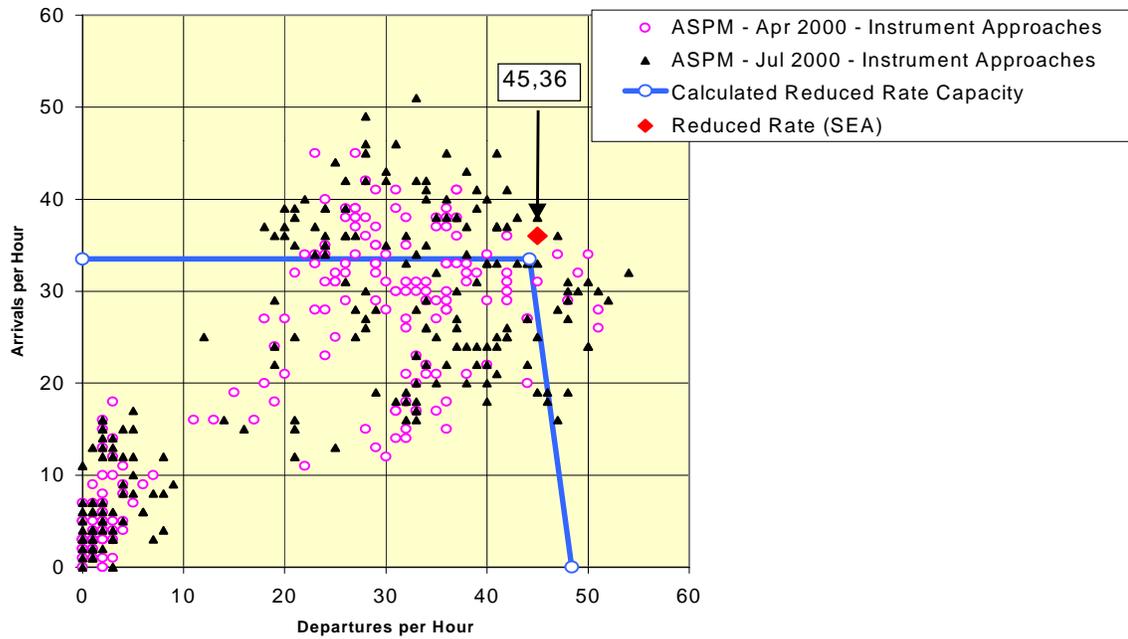


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

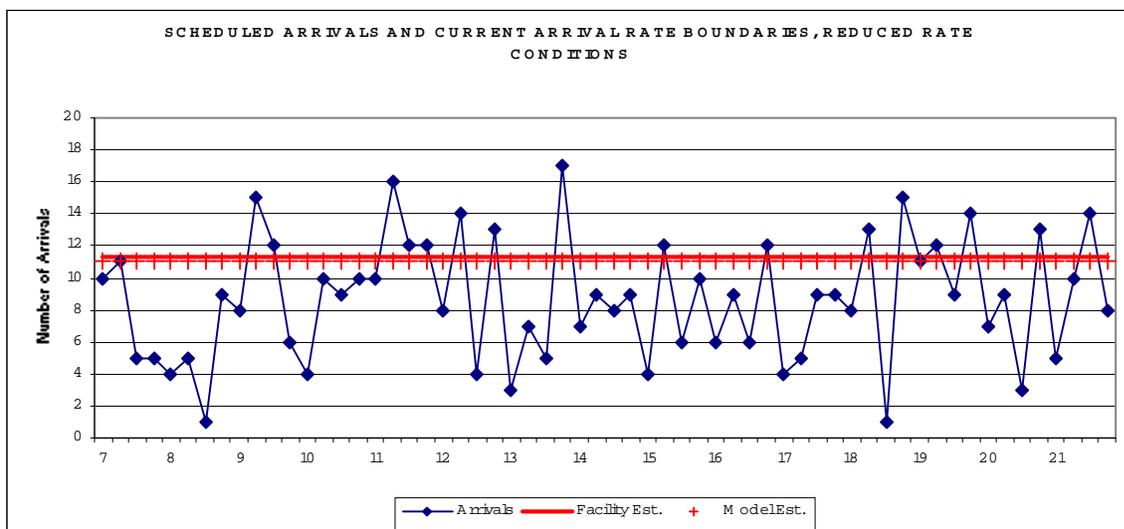
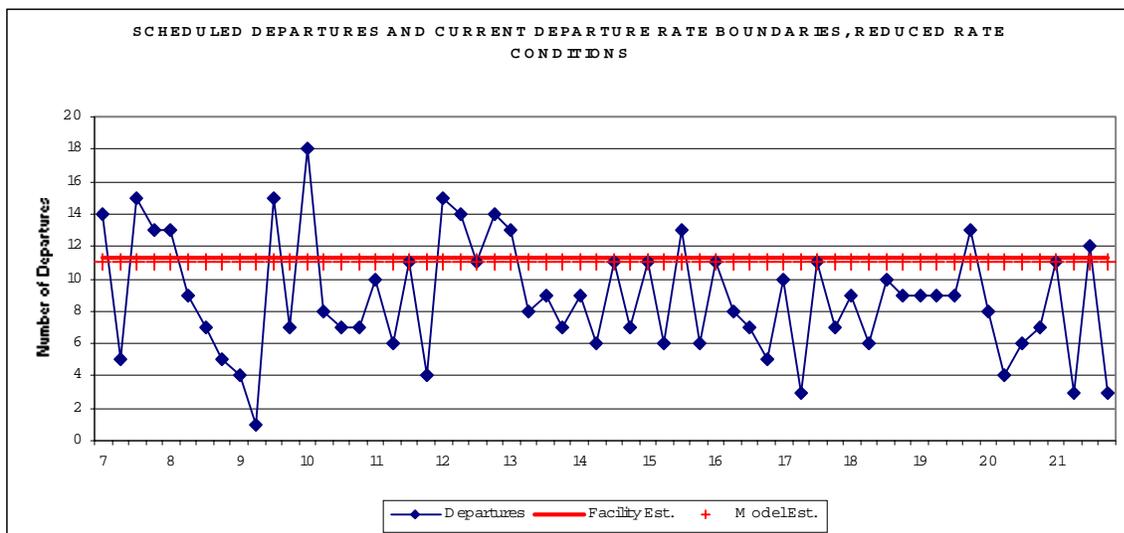
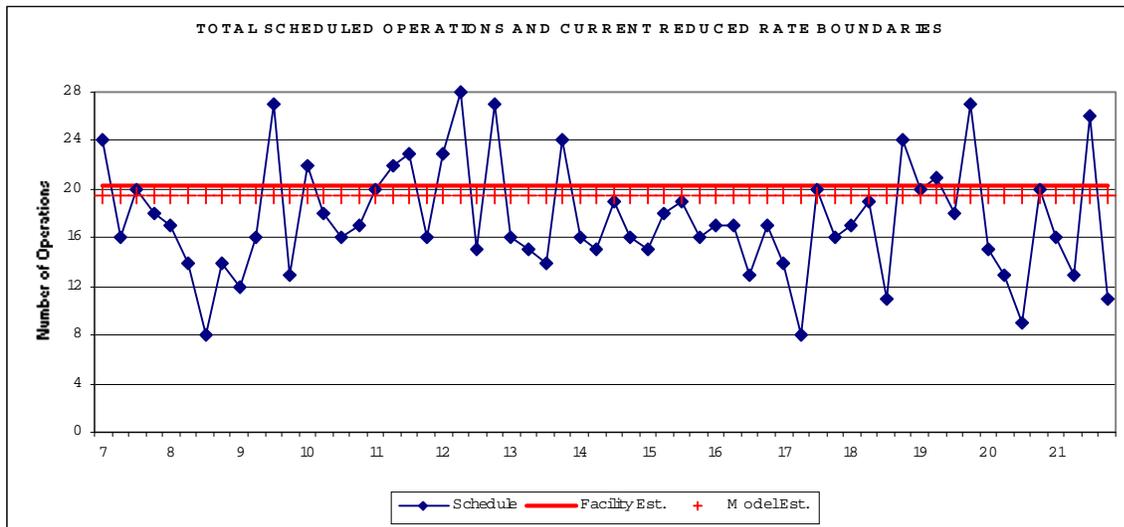


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
- Reduced Rate of (36,45) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



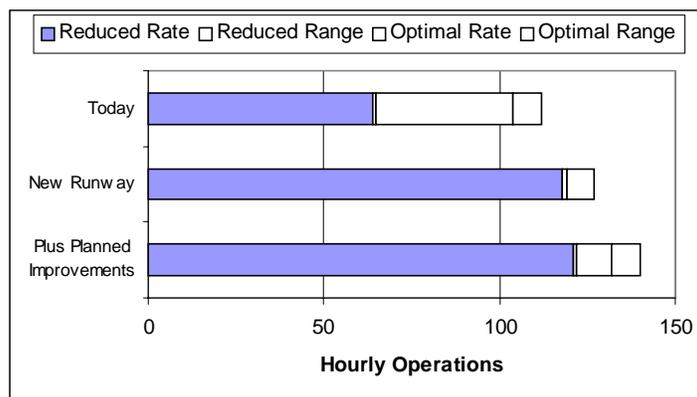
Lambert St. Louis International Airport Benchmarks

- The current capacity benchmark at Lambert St. Louis International is 104-112 flights per hour in good weather.
- Current capacity falls to 64-65 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- Scheduled operations at Lambert-St. Louis are at or above good weather capacity 5 1/2 hours per day. In adverse weather conditions scheduled operations meet or exceed capacity for 10 hours per day.
- In 2000, almost 2% of all flights at St. Louis experienced significant levels of delay (more than 15 minutes).
- A new runway, planned for completion in 2006, is expected to improve St. Louis's capacity benchmark by 14% (to 119-127 flights per hour) in good weather and by 84% (118-119 flights per hour) in adverse weather. This assumes that airspace, ground infrastructure, and environmental constraints allow planned use of the new runway.
- In addition to the new runway, technology and procedural improvements are expected to increase St. Louis's capacity benchmark by a total of 27% (to 132-140 flights per hour) in good weather over the next 10 years.
- Similarly, the adverse weather capacity benchmark will increase by a total of 89% (to 121-122 flights per hour).
- These capacity increases could be brought about as a result of:
 - pFAST, which assists the controller with sequencing aircraft, for a better flow of traffic into the terminal area.
 - PRM (dual simultaneous operations - 4100 feet runway spacing with the new runway).
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- Demand at St. Louis is expected to grow by 30% over the next decade. Capacity is expected to meet or exceed the expected growth in demand, primarily due to the new runway. Thus delays are expected to be reduced in the future, especially in adverse weather.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	104-112	64-65
New Runway	119-127	118-119
Plus planned improvements	132-140	121-122



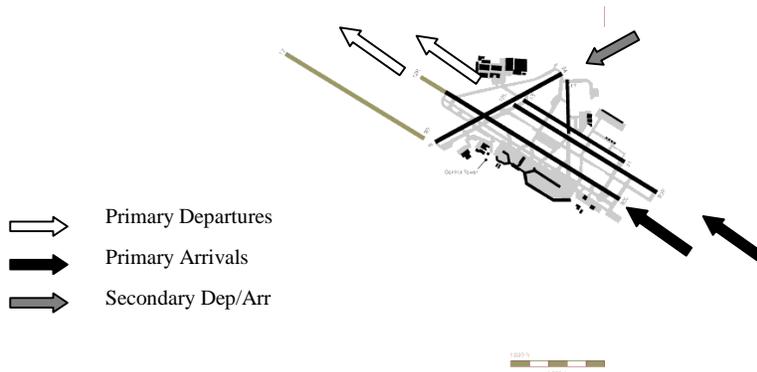
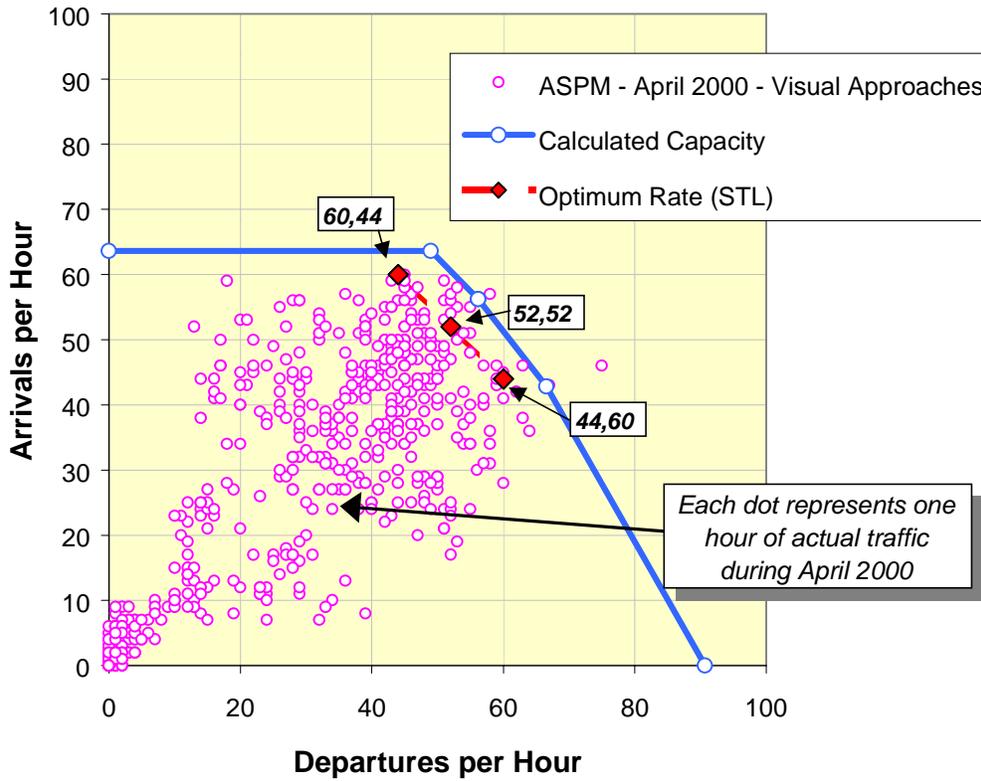
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - pFAST, which assists the controller with sequencing aircraft, for a better flow of traffic into the terminal area
 - PRM (dual simultaneous operations - 4100 feet runway spacing with the new runway)
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

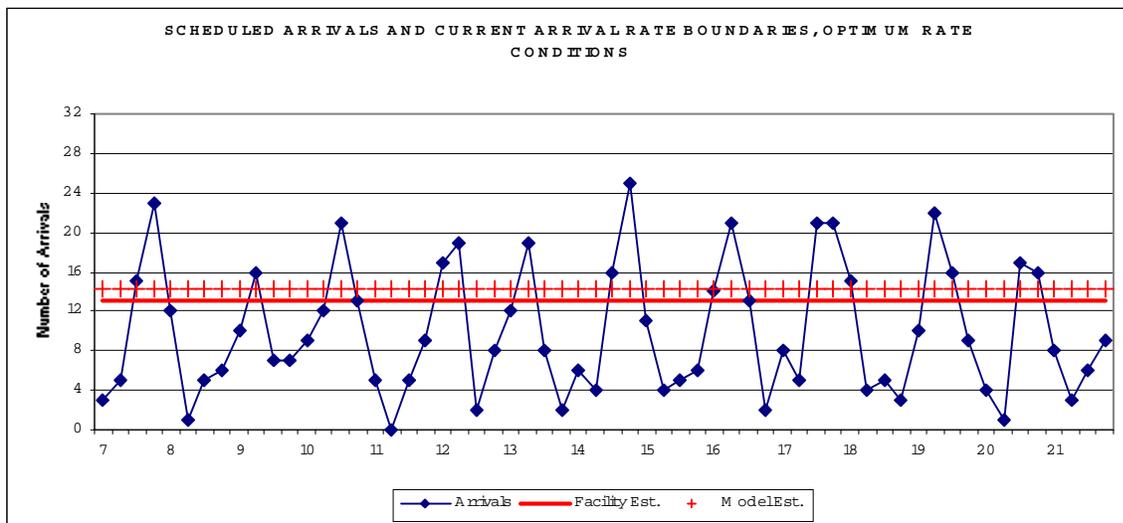
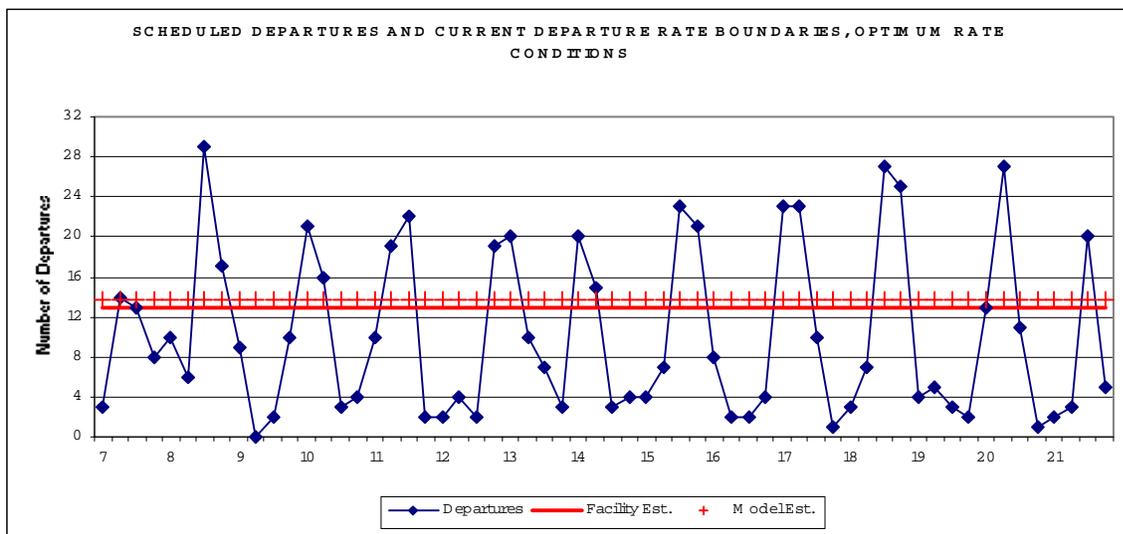
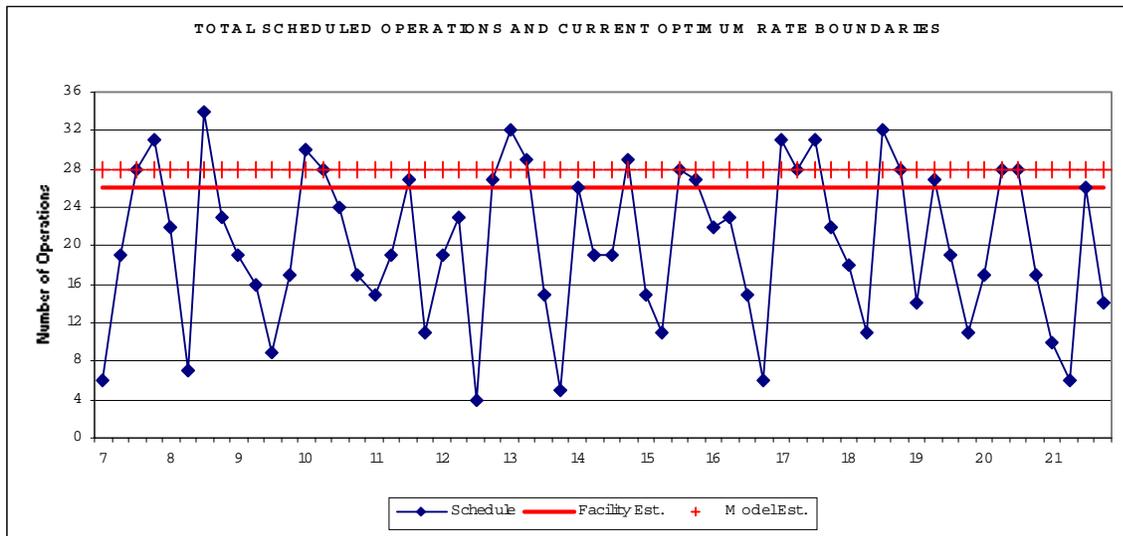
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – Optimum Rate of (52,52) was reported by the facility
 - Arrive Runways 30L/R, Depart Runways 30L/R
 - Some arrivals may use Runway 24
 - Simultaneous departures from two runways
- ASPM data is actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- Solid line represents the calculated airport capacity during a busy hour, and the tradeoff between arrivals and departure rates

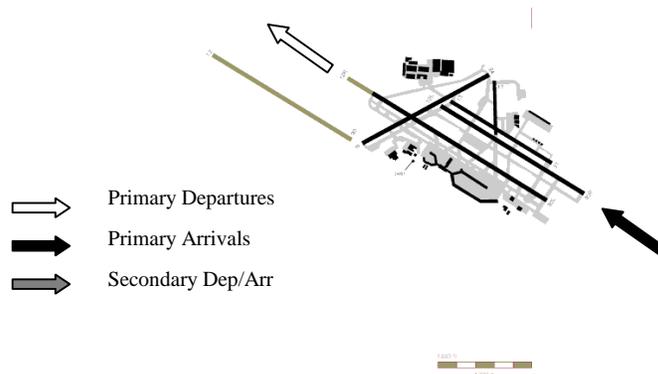
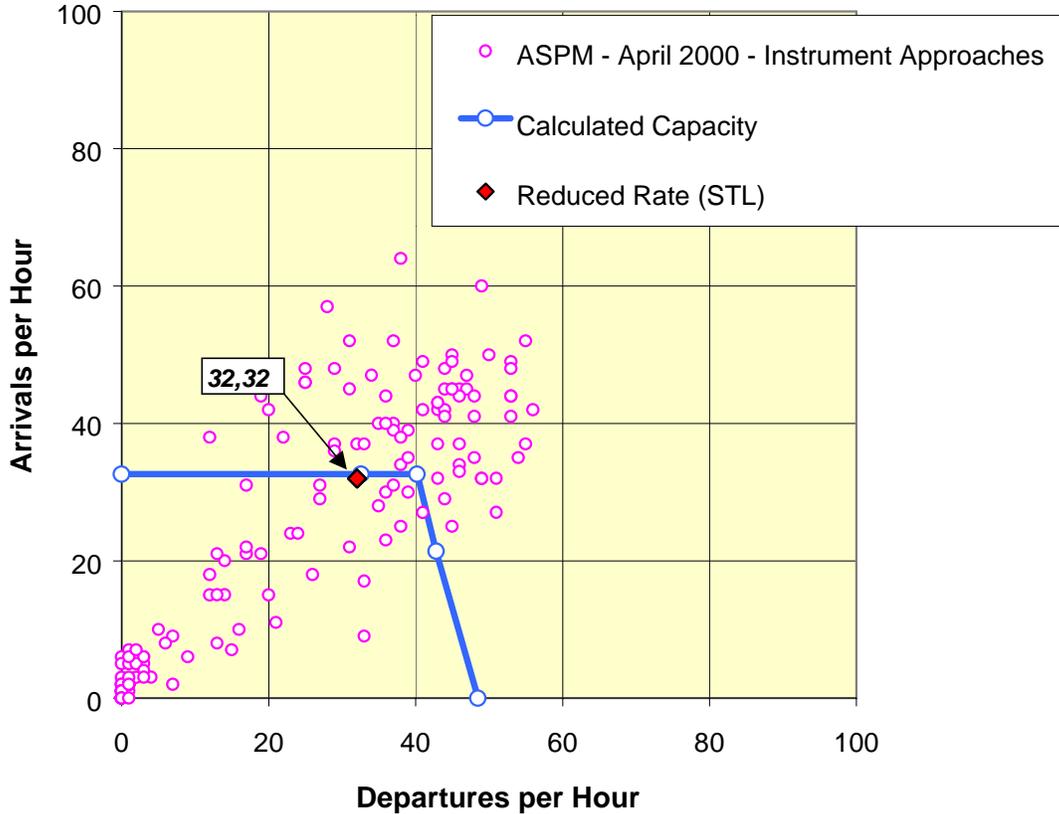


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

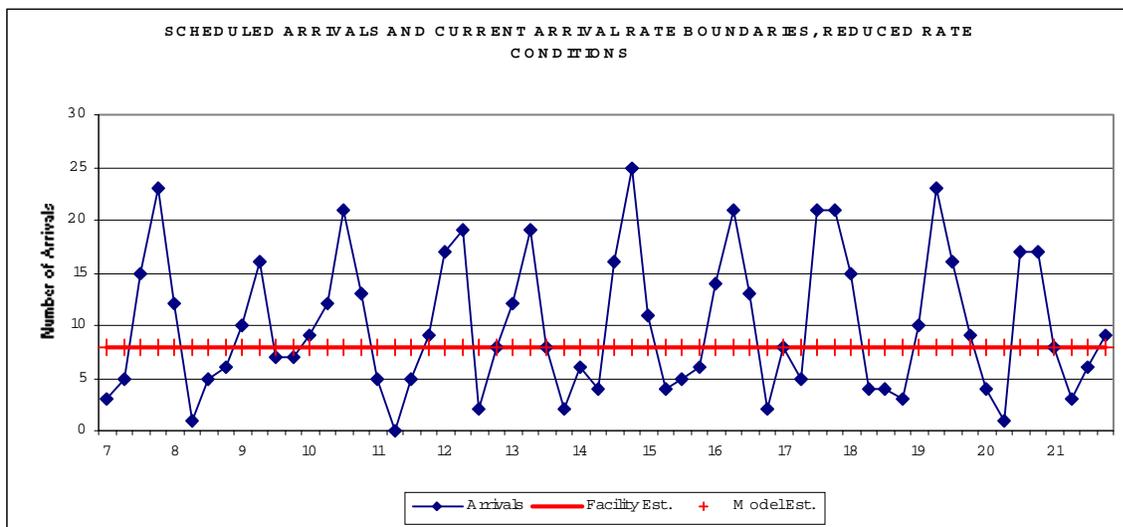
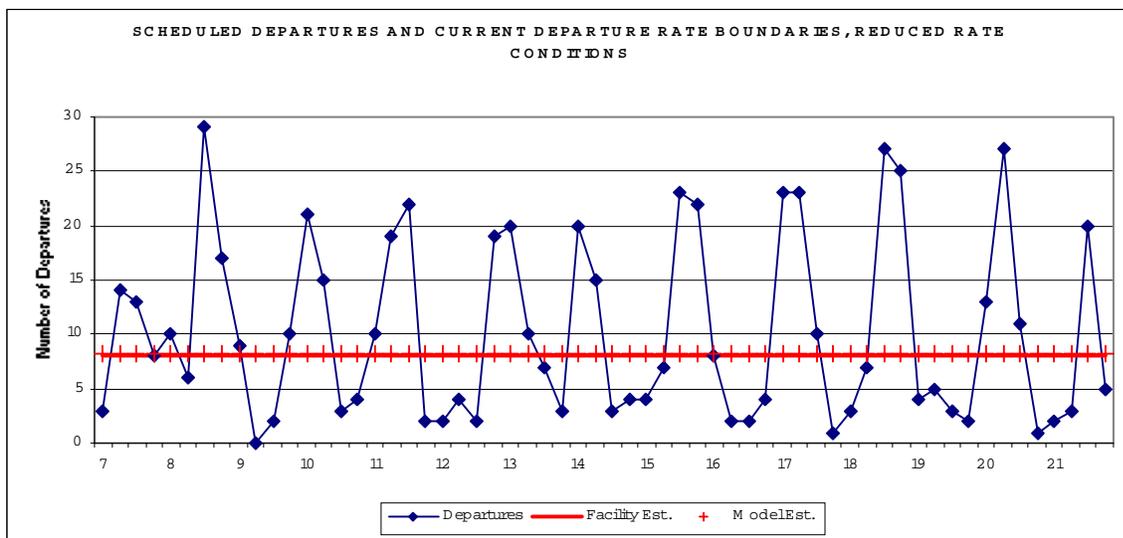
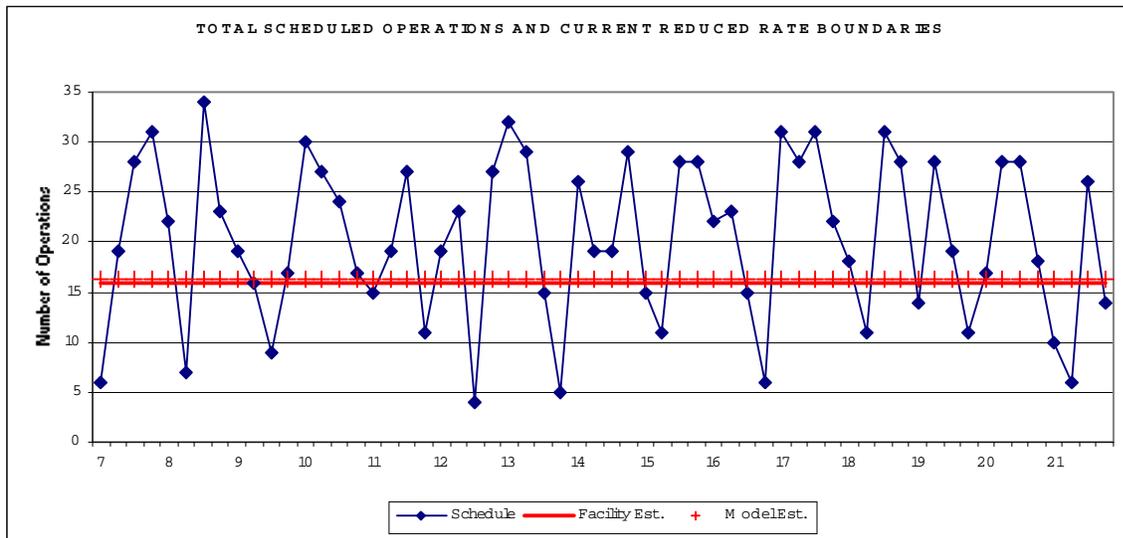


Current Operations – Reduced Rate

- Instrument approaches (below minima for LDA, CRDA approaches)
 - Arrivals to one parallel runway, departures from the other parallel
- Reduced Rate of (32,32) was reported by the facility
- Calculated capacities are close to reported AAR and ADR
- ASPM data for “Instrument Approaches” can include marginal VFR, CRDA, or LDA approaches, with higher acceptance rates.
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



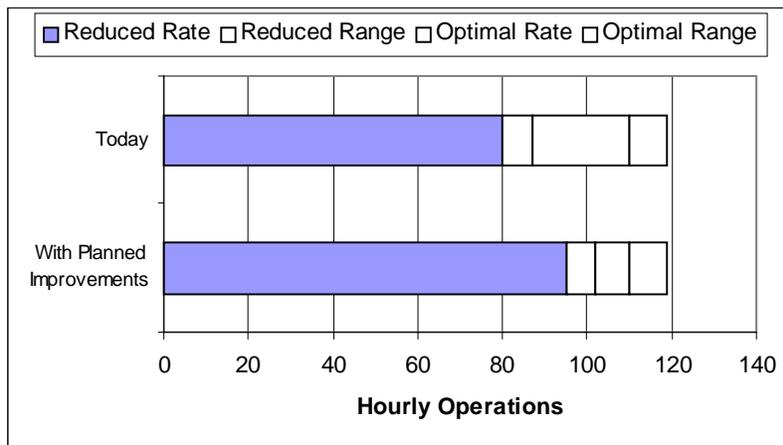
Tampa International Airport Benchmarks

- The current capacity benchmark at Tampa International is 110-119 flights per hour in good weather.
- Current capacity falls to 80-87 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- On good weather days, scheduled traffic at Tampa is at or below the capacity benchmark for the entire day. In adverse weather conditions, scheduled operations meet or exceed capacity for less than one hour per day.
- Less than 1% of the Tampa traffic is significantly delayed (i.e., more than 15 minutes).
- Technology and procedural improvements are not expected to increase Tampa's capacity benchmark in good weather. However, the adverse weather capacity is increased by 19% (to 95-102 flights per hour), primarily by conducting dual simultaneous approaches (rather than dependent staggered approaches).
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
 - Dual simultaneous approaches.
- Demand at Tampa is expected to grow by 18% over the next decade. This growth should easily be accommodated without causing a significant increase in delays.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	110-119	80-87
New Runway	N/A	N/A
With planned improvements	110-119	95-102



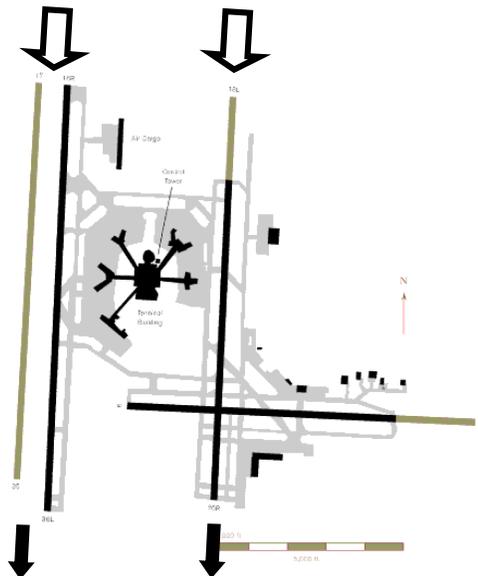
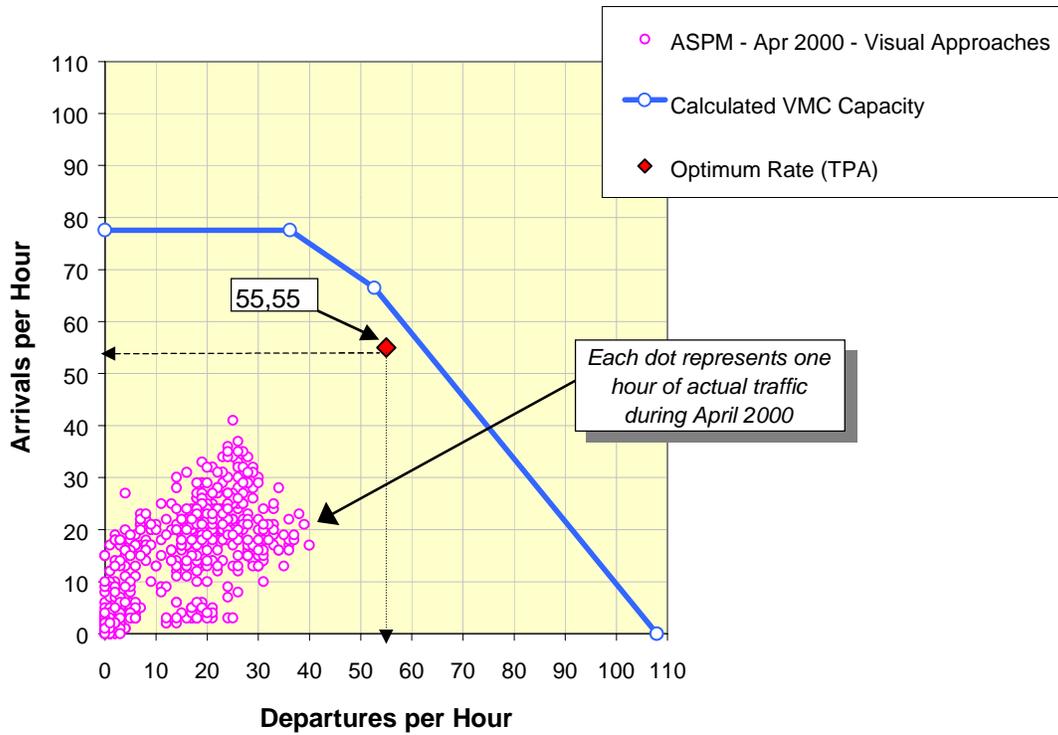
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
 - Dual simultaneous approaches
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

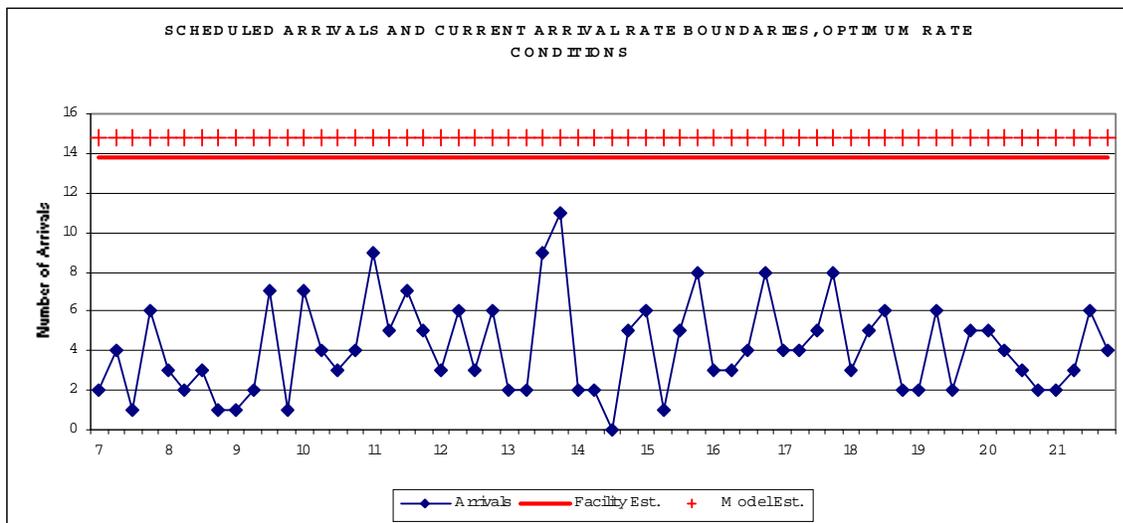
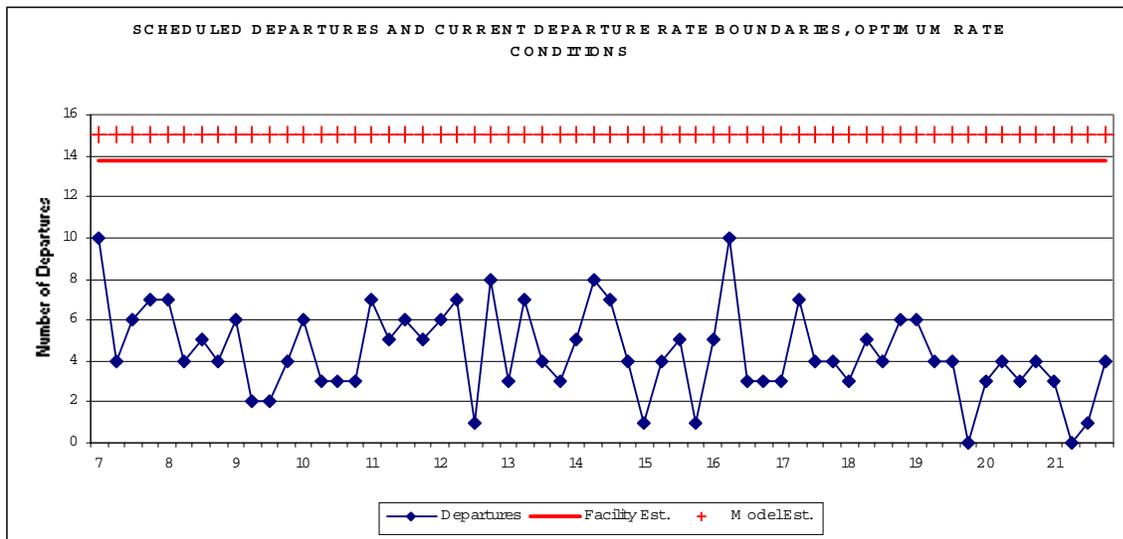
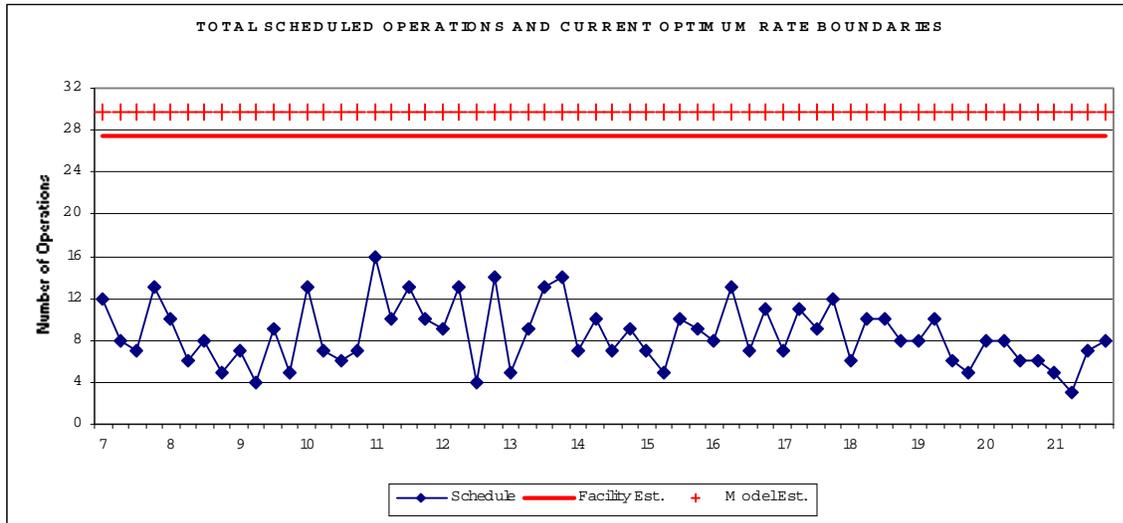
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation – Optimum Rate of (55, 55) was reported by the facility
 - Arrive Runways 18L/R, Depart Runways 18L/R
- ASPM data is actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- Solid line represents the calculated airport capacity during a busy hour, and the tradeoff between arrivals and departure rates

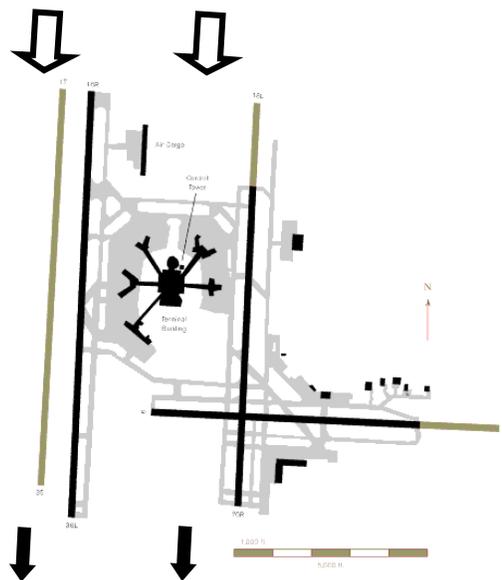
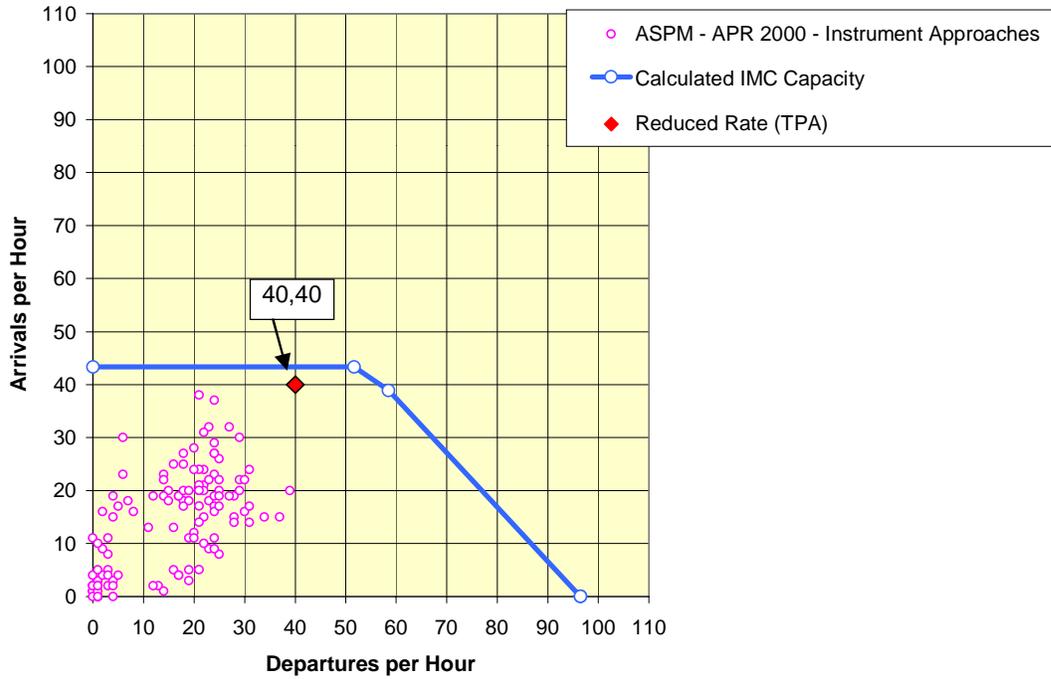


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

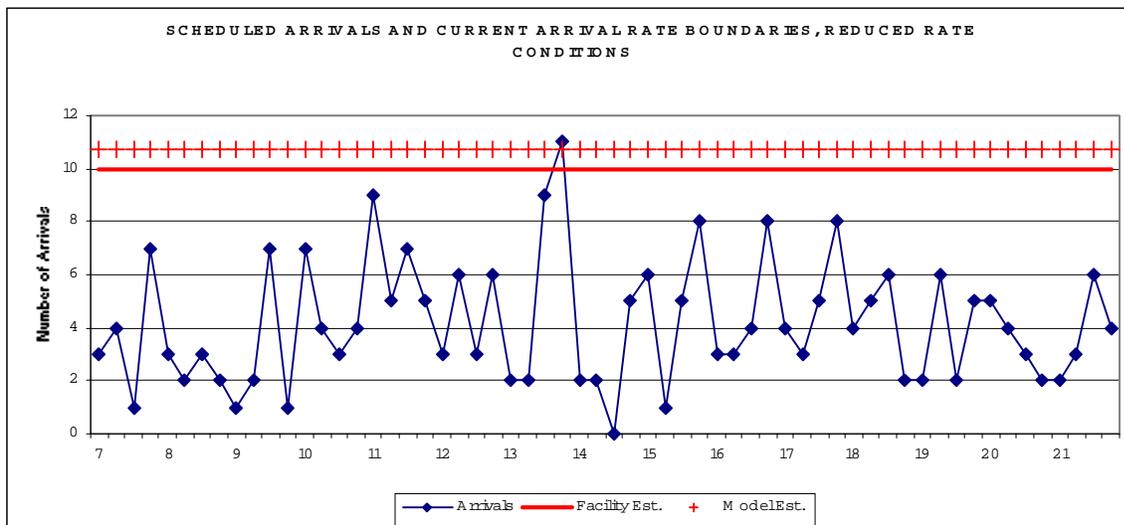
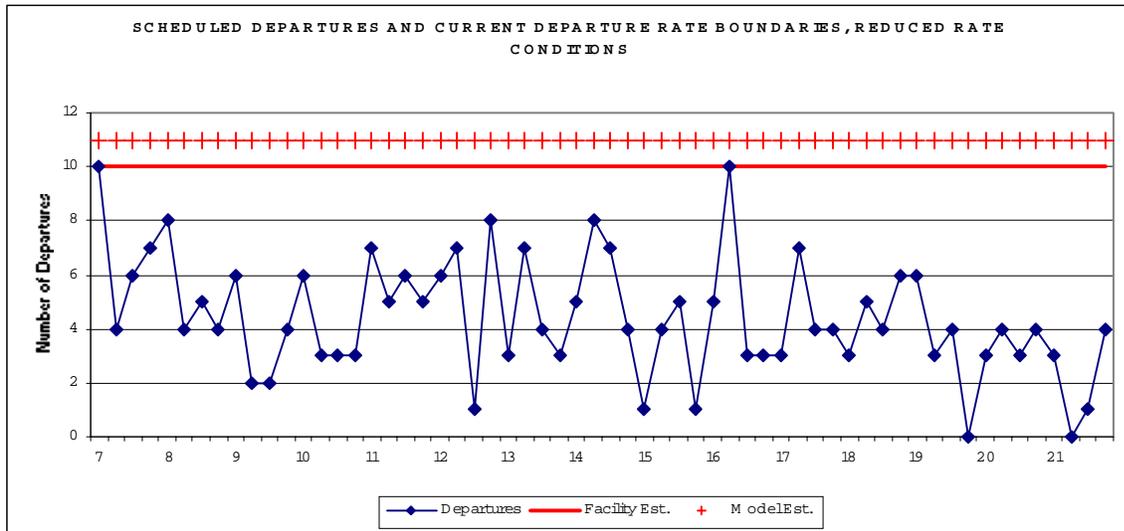
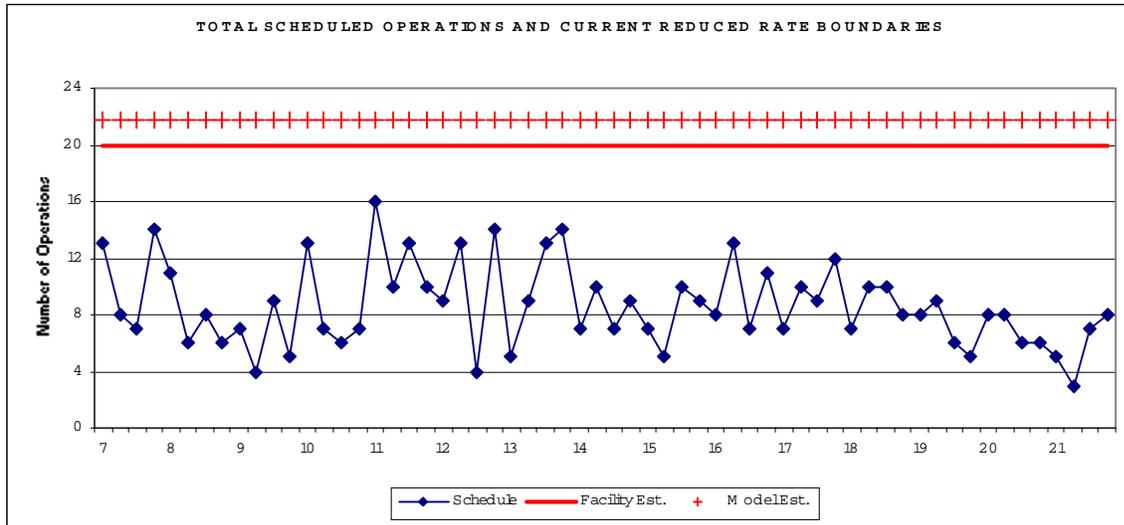


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Arrive and Depart Runways 18L/R
 - Staggered approaches
- Reduced Rate of (40, 40) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



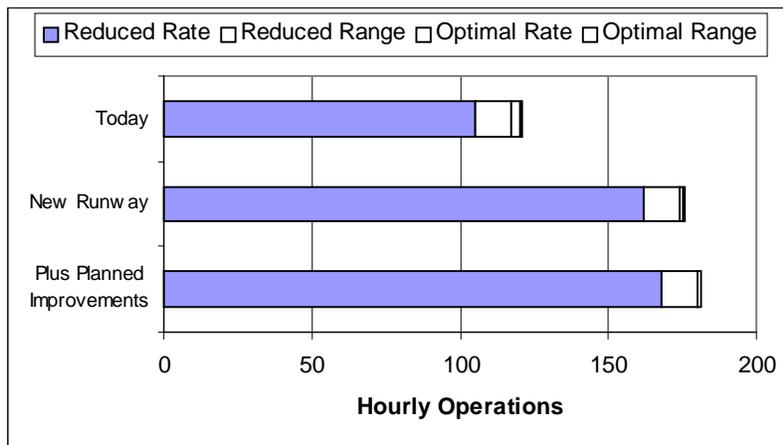
Washington Dulles International Airport Benchmarks

- The current capacity benchmark at Washington Dulles International is 120-121 flights per hour in good weather.
- Current capacity falls to 105-117 flights (or fewer) per hour in adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.
- Periods of excess arrival and departure demand occur about 1 hour of the day in both good and adverse weather conditions, and can be handled efficiently in off-peak periods.
- Overall, about 2% of the flights at Dulles are delayed longer than 15 minutes.
- A new runway, planned for completion in 2004, is expected to improve Dulles's capacity benchmark by 46% (to 175-176 flights per hour) in good weather and 54% (to 162-174 operations per hour) in adverse weather conditions.
- In addition to the new runway, technology and procedural improvements are expected to improve the capacity at Dulles for good weather by a total of 49% (to 179-180 flights per hour) and a total of 60% (to 168-180) in adverse weather conditions.
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV routes, which allow a more consistent flow of aircraft to the runway.
- Demand is projected to grow by 20% in the next decade. Over the same period capacity is expected to meet or exceed the expected growth in demand, primarily due to the new runway. Thus delays are expected to decline in the future.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	120-121	105-117
New Runway	175-176	162-174
Plus planned improvements	179-180	168-170



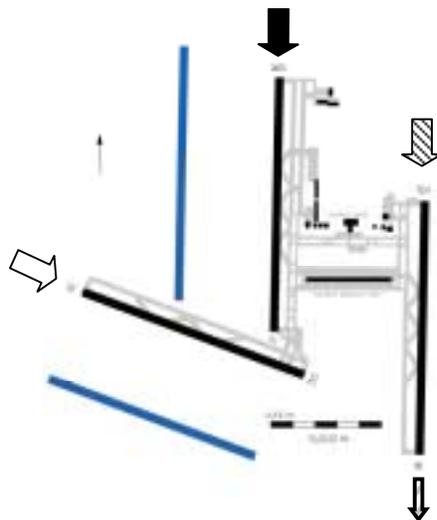
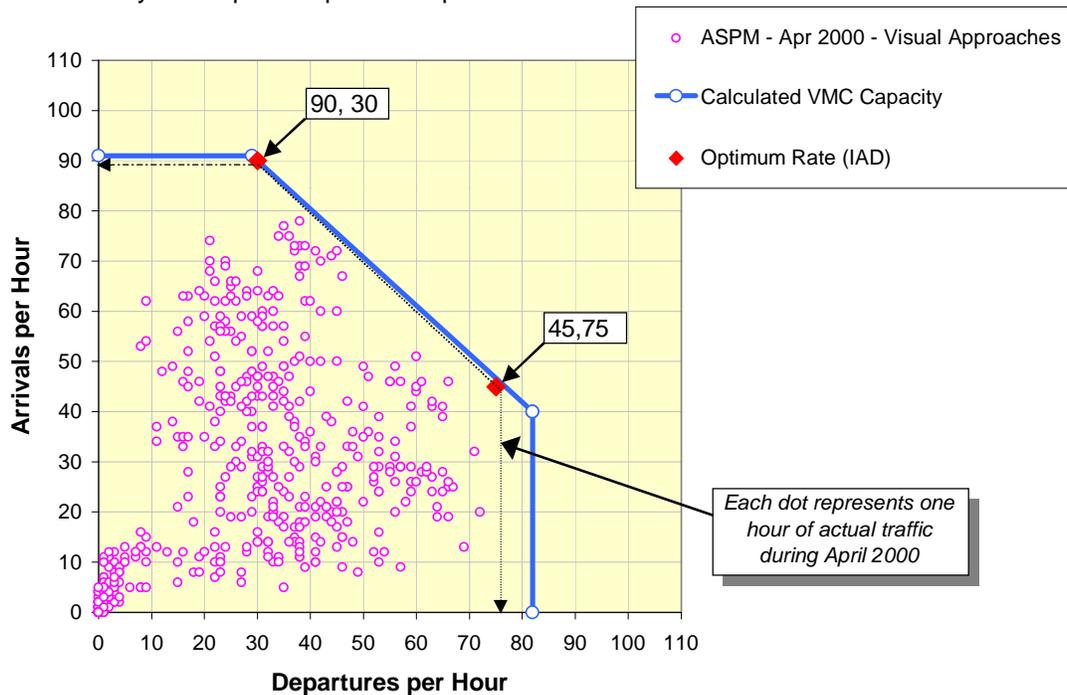
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

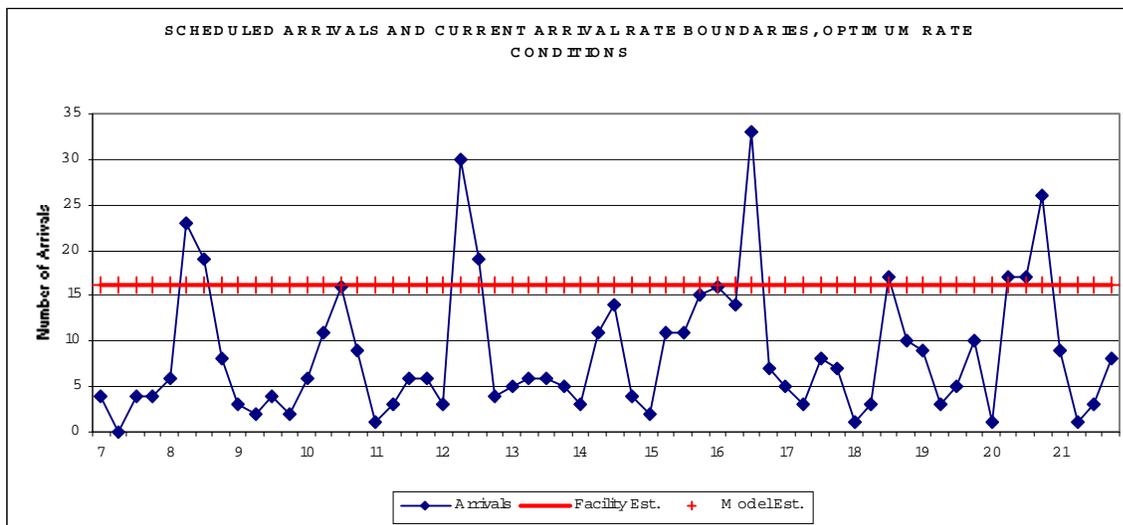
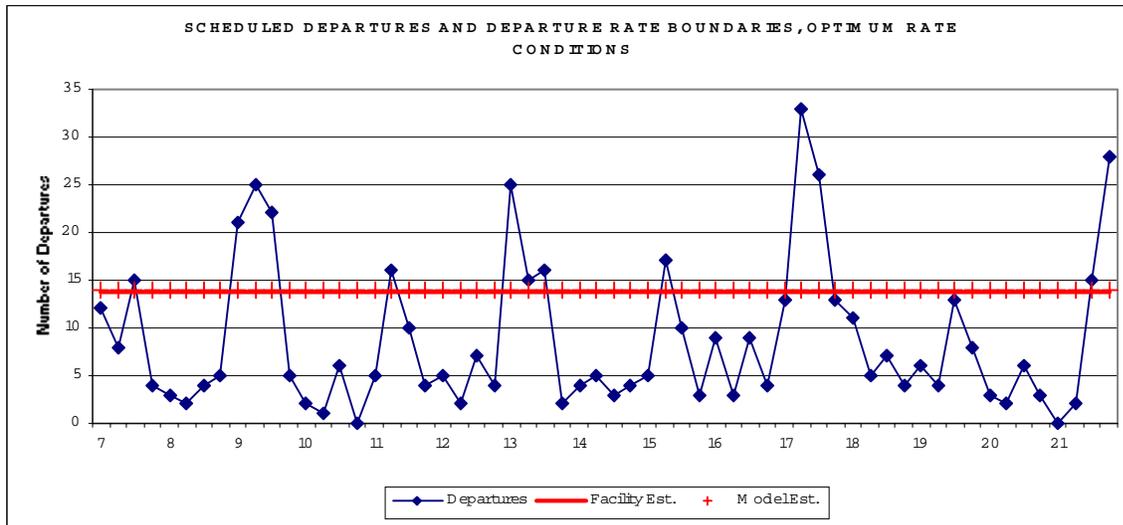
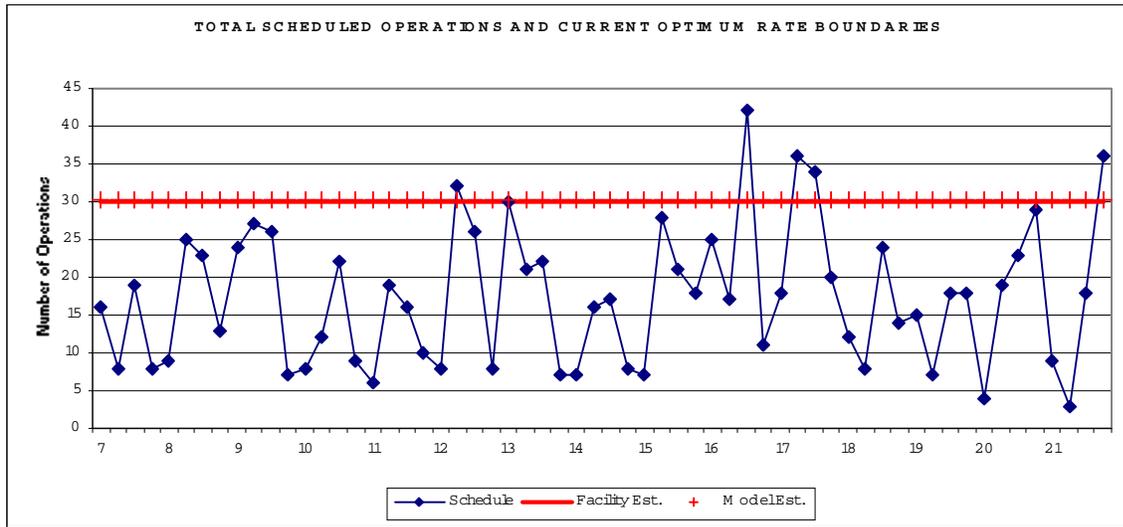
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation
 - Optimum Rate of (90, 75 - 120 maximum) was reported by the facility
 - Arrive Runways 19L/R & 12, Depart Runways 19L/R (90, 30 arrival priority shown below)
 - Arrive Runway 19R, Depart Runways 19L/30 (45, 75 departure priority not shown)
- ASPM data is actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. This data includes other runway configurations and off-peak periods.
- Solid line represents the calculated airport capacity during a busy hour, and the tradeoff between arrivals and departure rates
- The capacity model can only approximate the operations at IAD. Future scenarios used the third N/S runway with triple independent operations

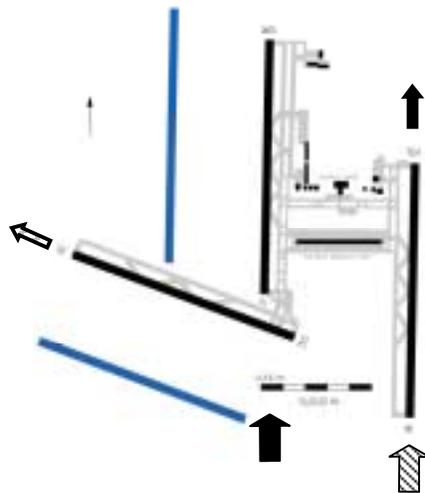
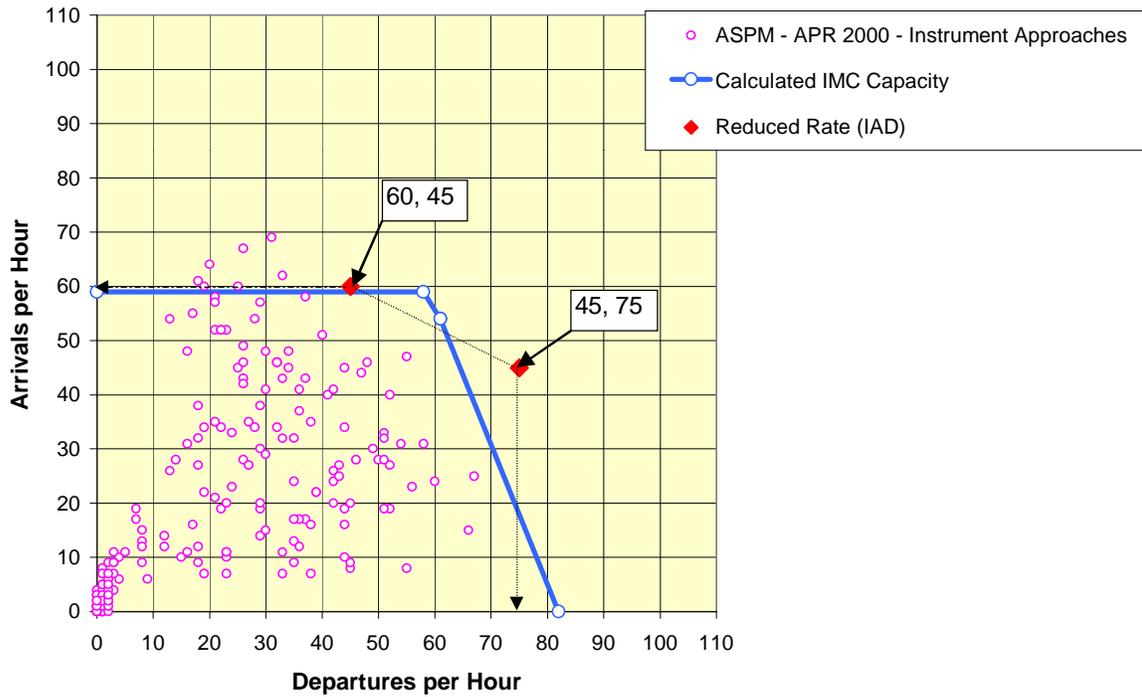


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

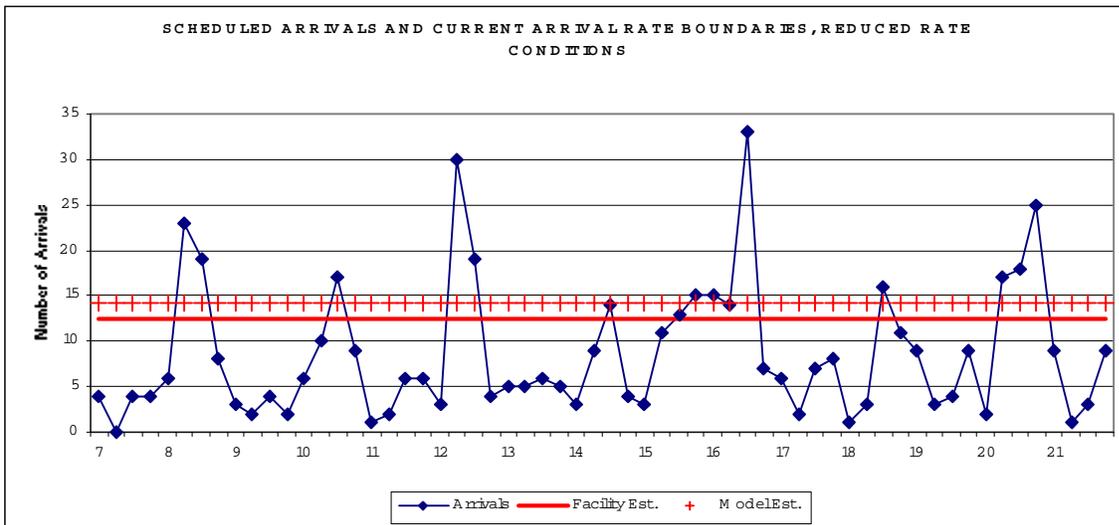
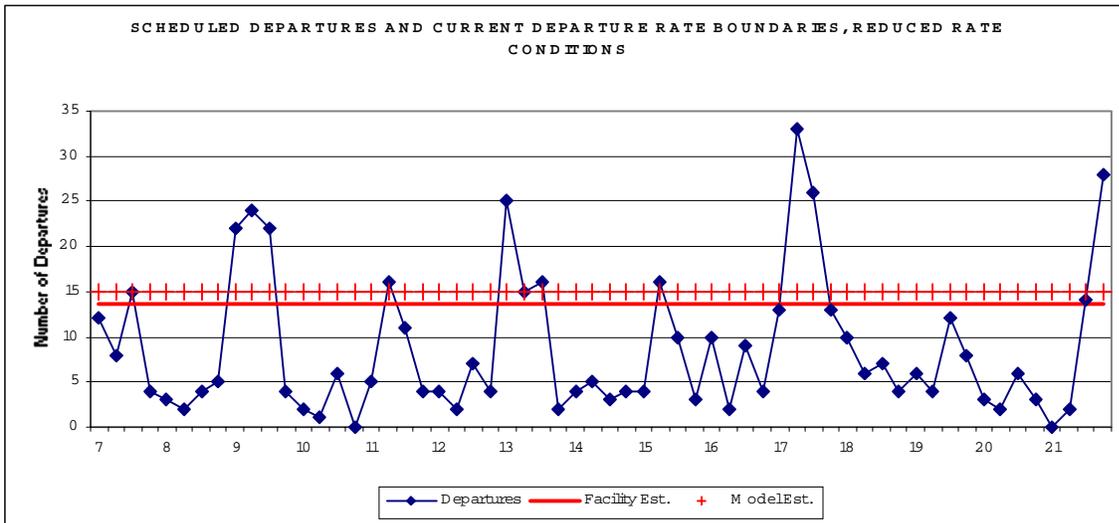
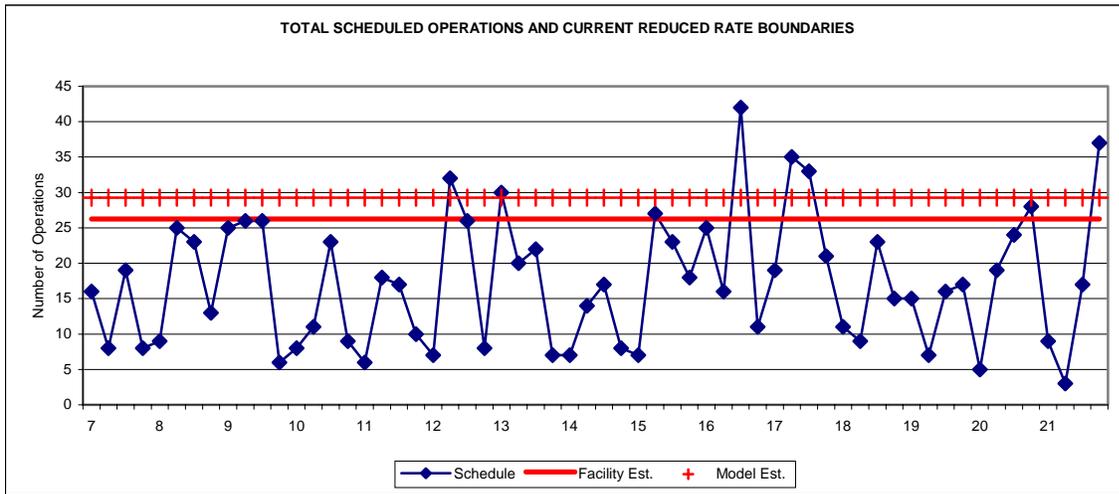


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Reduced rate of (60, 60 -120 maximum) was reported by the facility
 - Arrive Runways 01L/ Depart Runway 30 (60, 60 arrival priority shown below)
 - Arrive Runway 19L, Depart Runways 19R/30 (45, 75 departure priority not shown)
- Reduced Rate of 60, 45 was reported by the facility for arrival priority configuration shown below. Reduced Rate of 45, 75 was reported by the facility for departure priority configuration not shown.
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour Future scenarios used the third N/S runway with triple independent operations



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



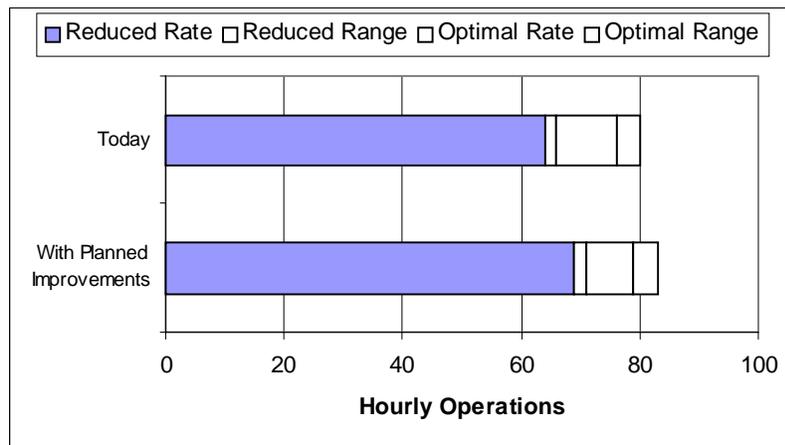
Washington-Ronald Reagan National Airport Benchmarks

- The current capacity benchmark at Reagan National today is 76-80 flights per hour in good weather.
- Current capacity falls to 62-66 flights (or fewer) per hour today in adverse weather conditions, which may include poor visibility, unfavorable winds or heavy precipitation.
- Half of the time during adverse weather, only the main runway can be used which reduces capacity to approximately 45 operations per hour.
- Scheduled traffic at Reagan National exceeds good weather capacity, for about 1 hour per day and in adverse weather capacity about 4 hours per day.
- Overall, about 1% of the flights at Reagan National is significantly delayed (more than 15 minutes).
- Technology and procedural improvements are expected to improve Reagan National's capacity benchmark by 4% (to 79-83 flights per hour) for good weather conditions, and by 8% (to 67-71 flights per hour) for adverse weather conditions over the next 10 years.
- These capacity increases could be brought about as a result of:
 - ADS-B/CDTI (with LAAS), which provides a cockpit display of the location of other aircraft and will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes, which allow a more consistent flow of aircraft to the runway.
- These improvements may be more than offset by reduced use of the shorter, crosswind runway as turboprop aircraft are replaced by regional jets, and growth in operations over the next 10 years.
- Demand is expected to grow by 4% over the same period. This growth should be at Reagan National without causing a significant increase in delays.
- The benchmark values assume continued use of Runways 04/22 and 15/33. Any change in the fleet mix that reduces the number of aircraft able to use these runways will reduce the overall capacity of the airports.

Airport Capacity Benchmarks – These values are for total operations achievable under specific conditions:

- **Optimum Rate** – Visual Approaches (VAPS), unlimited ceiling and visibility
- **Reduced Rate** – Most commonly used instrument configuration, below visual approach minima

Scenario	Optimum Rate	Reduced Rate
Today	76-80	62-66
New Runway	NA	N/A
With planned improvements	79-83	67-71



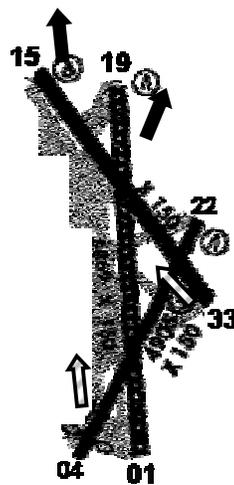
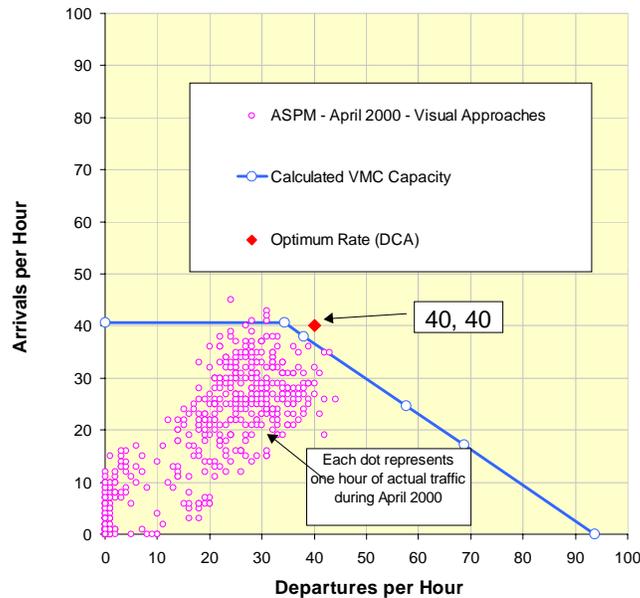
- The benchmarks describe an achievable level of performance for the given conditions, which can occasionally be exceeded. Lower rates can be expected under adverse conditions. Note: In some cases, facilities provided separate unbalanced maximum arrival and departure rates.
- Planned Improvements include:
 - ADS-B/CDTI (with LAAS) – provides a cockpit display of the location of other aircraft. This will help the pilot maintain the desired separation more precisely.
 - FMS/RNAV Routes – allows more consistent delivery of aircraft to the runway threshold.
- Benefits from Planned Improvements assume that all required infrastructure and regulatory approvals will be in place. This includes aircraft equipage, airspace design, environmental reviews, frequencies, training, etc. as needed.
- **Note:** These benchmarks do not consider any limitation on airport traffic flow that may be caused by non-runway constraints at the airport or elsewhere in the NAS. Such constraints may include:
 - Taxiway and gate congestion, runway crossings, slot controls, construction activity
 - Terminal airspace, especially limited departure headings
 - Traffic flow restrictions caused by en route miles-in-trail restrictions, weather or congestion problems at other airports

These values were calculated for the Capacity Benchmarking task and should not be used for other purposes, particularly if more detailed analyses have been performed for the individual programs.

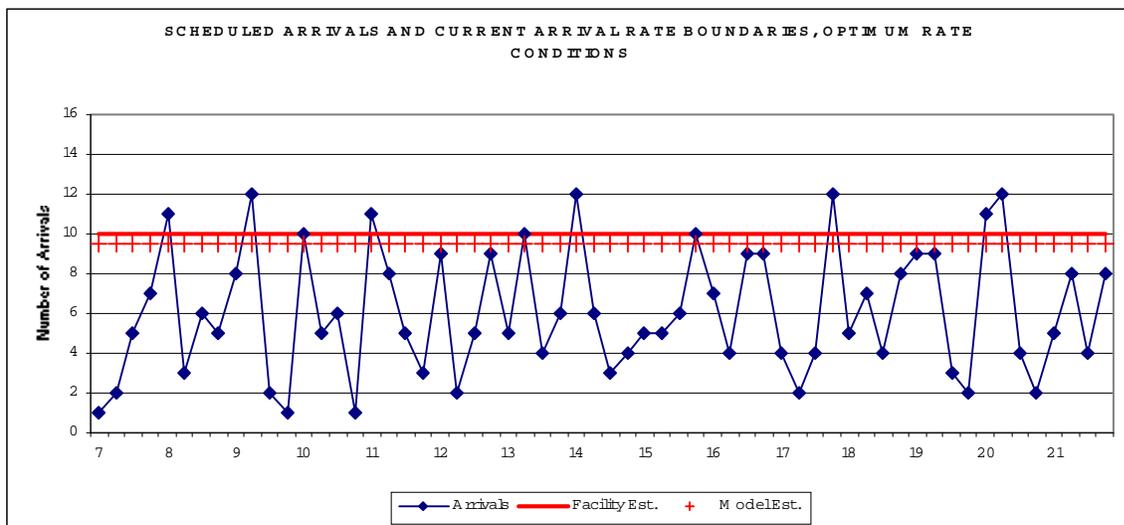
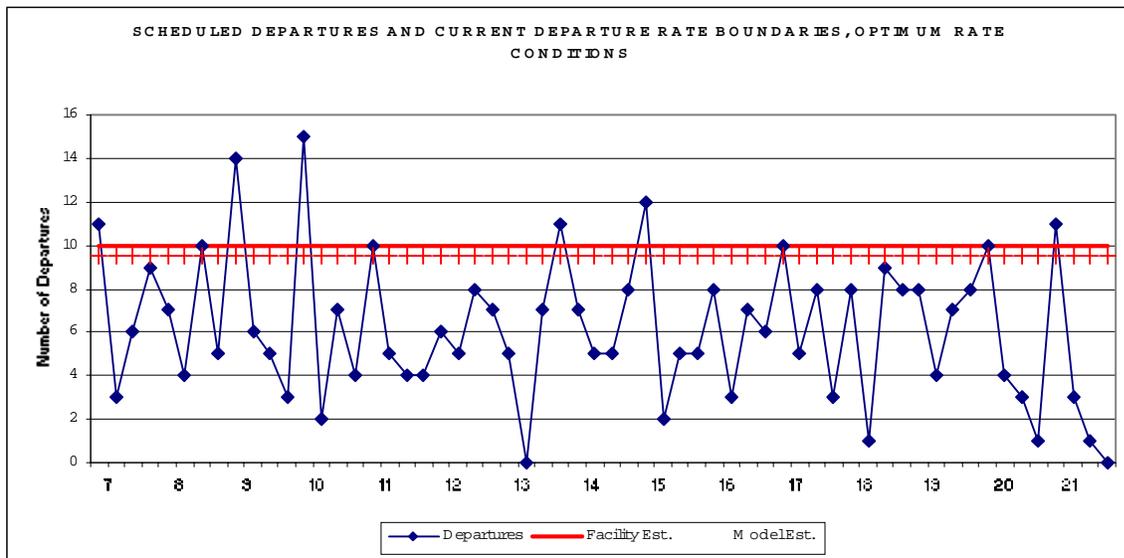
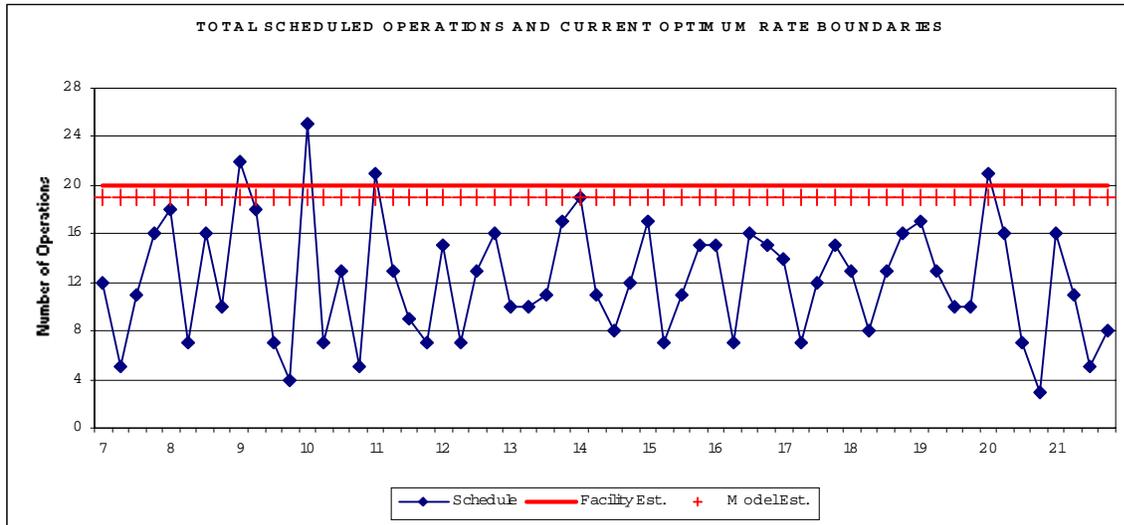
The list of Planned Improvements and their expected effects on capacity does not imply FAA commitment to or approval of any item on the list.

Current Operations – Optimum Rate

- Visual approaches, visual separation
 - Optimum Rate of (40,40) was reported by the facility
 - Arrive and Depart on 01, and as traffic permits, on 33 or 04
- DCA is a slot-controlled airport; consequently the number of operations remains relatively constant compared to airports where there are no slots.
- ASPM data are actual hourly traffic counts for the month of April 2000 for Visual Approach conditions. These data include other runway configurations and off-peak periods.
- Solid line represents the airport capacity during a busy hour calculated by the FAA Airport Capacity Model, showing the tradeoff between arrival and departure rates
- The capacity model can only approximate the complex operations at DCA

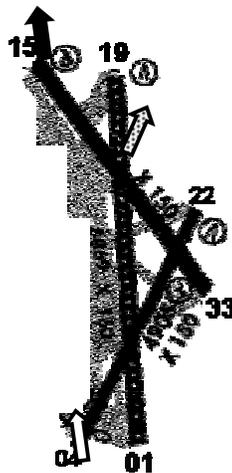
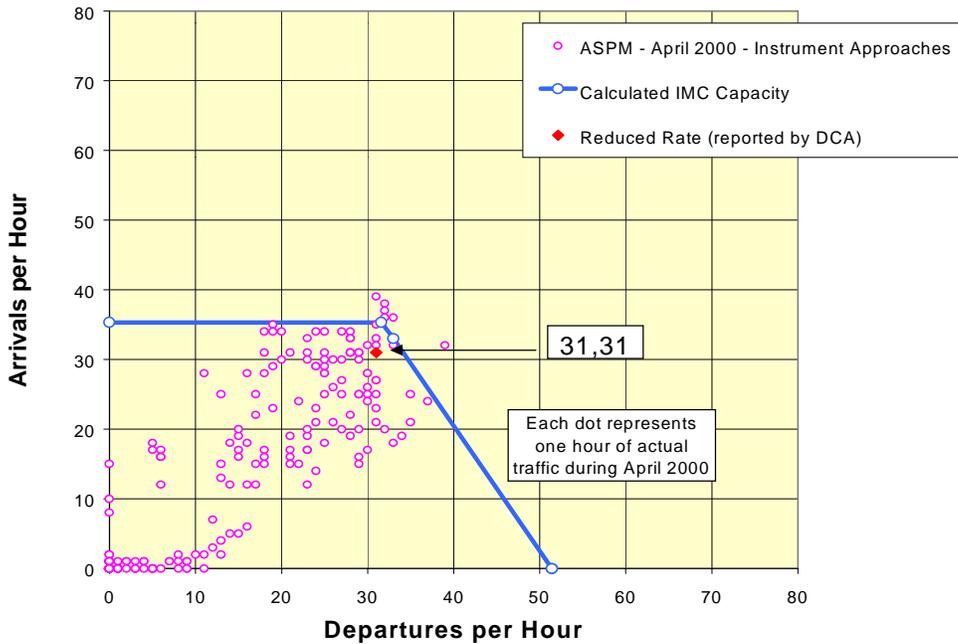


Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Optimum Rate Conditions

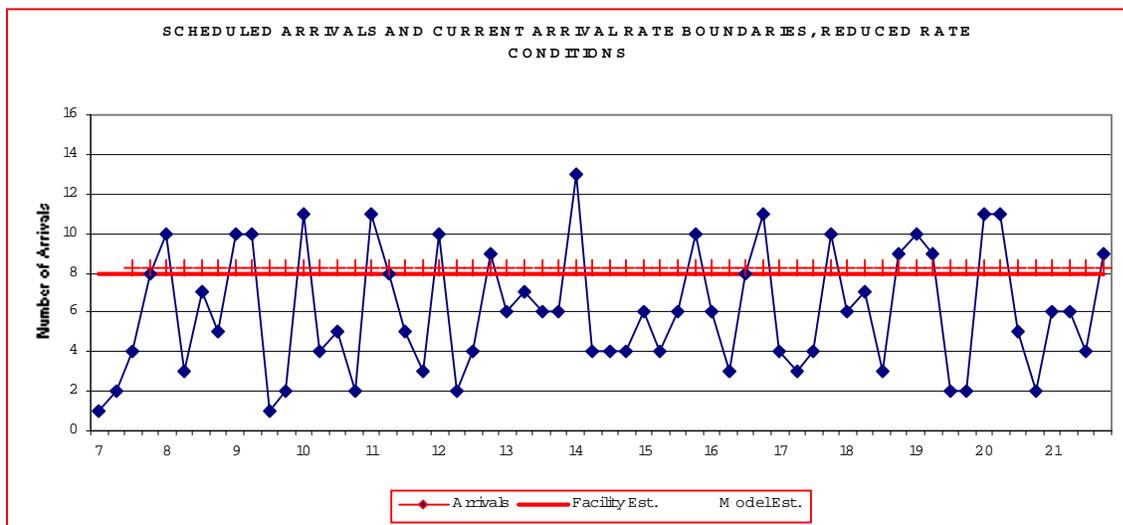
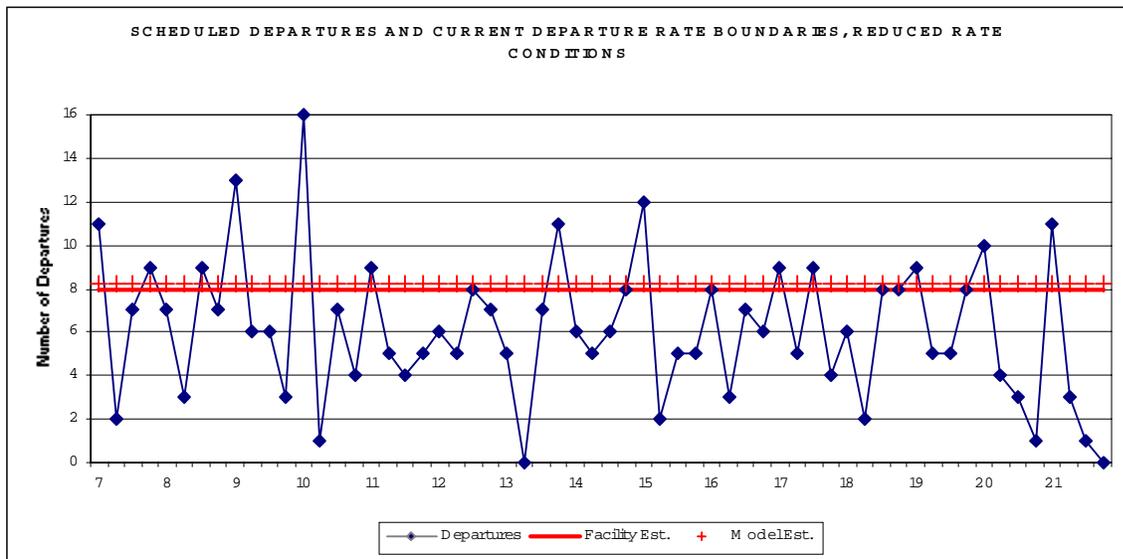
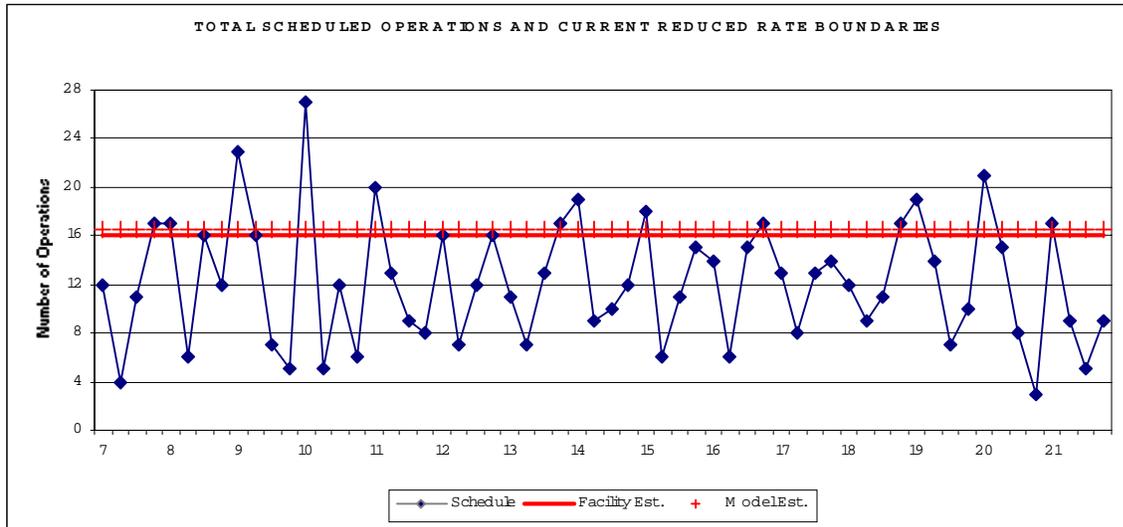


Current Operations – Reduced Rate

- Instrument approaches (below Visual Approach Minima)
 - Arrive 01, Depart 01
 - As Traffic permits, circle to land on 33 or 04
- DCA is a slot-controlled airport; consequently the number of operations remains relatively constant compared to airports where there are no slots.
- Reduced Rate of (32,32) was reported by the facility
- ASPM data for “Instrument Approaches” can include marginal VFR, with higher acceptance rates
- Chart below represents observed traffic and expected rates in terms of operations per hour



Scheduled Departures and Arrivals and Current Departure and Arrival Rate Boundaries (15-Minute Periods) Under Reduced Rate Conditions



Aviation Data Bases Dealing with Flight Scheduling, Flight Operations, and Delay

A. Database Description

Several data sources were used in developing and verifying the capacity benchmarks. Not all sources are equivalent or designed to measure the same thing. The basic use of each data set and general differences between them are described below.

1. Operations Network (OPSNET): This FAA data source is designed to measure the performance of the FAA flight control system. A flight is deemed under FAA control when it leaves the departure gate, and is released from FAA control when the flight arrives at the arrival gate. Elapsed flight times are compared to flight plans filed with the FAA, which may differ from published carrier schedules. Delays under OPSNET are counted when elapsed flight time exceeds flight plan times filed with the FAA by 15 minutes. OPSNET data was used for delay comparisons in this study.
2. Aviation System Performance Metrics (ASPM): This FAA data source was originally a cooperative venture between 10 air carriers and the FAA to supply detailed flight data for flights to and from 21 major airports. The ASPM database has been expanded to include flight data from the Enhanced Traffic Management System (ETMS) (computer records of all instrument flight rule flights), ground and flight movement times from Aeronautical Radio, Inc. (for those aircraft equipped with electronic sensors), and data reported in the Airline Service Quality Performance database. Flight times can be compared to carrier flight plans filed with the FAA or with air carrier schedules from the *Official Airline Guide* (OAG) and carrier reservation systems. With the exception of Honolulu, for which ASPM data are not available, flight data in this study is from the ASPM database.
3. Airline Service Quality Performance (ASQP): This DOT data source is designed to measure whether carrier flight performance meets published carrier schedules (from OAG or carrier reservation systems). Flight data are required to be reported for major carrier operations to and from the 31 large hubs. (The 31 required airports in ASQP differ from the benchmark study in that the large hubs include Chicago Midway and Portland, Oregon, and exclude Memphis and Honolulu.) In practice, the carriers report all scheduled service flight data. Flights are counted as delayed when they do not pull back from the departure gate within 15 minutes of scheduled departure time, or if they do not arrive at the arrival gate within 15 minutes of the scheduled arrival time. February 2001 data in the following table are taken from the April edition of the *Air Travel Consumer Report*.

B. Database Delay Comparison

The following table lists and ranks the 31 airports by OPSNET delays per 1,000 operations. Again using OPSNET data, the airports are additionally ranked by the number of delays. However, both the rate of delay and the total number of delays do not give the duration of delay. Using ASPM data for arriving flights, the 31 airports are ranked by average arrival delay. Finally, using ASQP data, the 31 airports are again ranked (inversely) by arrivals, showing the percentage of flight arrivals that are on time.

Operations, Enplaned Passengers, and Selected Delay Rankings Using Selected Databases and Criteria

<u>Airport</u>	OPSNET Delays per 1,000				ASPM Avg. Arrival Delay		ASQP			Enplaned Passengers		OPSNET Total	
	<u>Operations</u>	<u>Rank</u>	<u>Total Delays</u>	<u>Rank</u>	<u>(Minutes)</u>	<u>Rank</u>	<u>Flight Arrivals</u>	<u>Percent On Time</u>	<u>Inverse Rank</u>	<u>(thousands)</u>	<u>Rank</u>	<u>Oper.</u>	<u>Rank</u>
LaGuardia	155.9	1	61,120	1	21.8	1	8,838	73.1	13	10,785	18	392,047	22
Newark	81.2	2	37,132	3	14.3	5	9,686	74.7	15	14,904	12	457,182	18
Chicago	63.3	3	57,545	2	15.8	4	22,365	69.0	7	31,483	2	908,977	2
San Francisco	56.9	4	24,478	5	17.4	2	10,042	60.3	2	16,431	8	430,554	21
Boston	47.5	5	24,120	6	16.6	3	8,647	72.8	12	11,066	17	508,283	11
Philadelphia	44.5	6	21,521	7	13.4	6	9,490	73.7	14	10,346	19	483,567	14
Kennedy	38.8	7	13,930	11	12.2	9	3,386	78.5	23	10,137	20	358,951	26
Atlanta	30.9	8	28,229	4	12.0	10	19,867	72.5	11	37,224	1	913,449	1
Houston	28.1	9	13,785	12	8.9	25	10,153	81.7	28	14,735	13	490,568	12
Dallas/Ft. Worth	23.8	10	20,638	8	9.2	23	18,799	72.5	10	27,581	3	865,777	3
Phoenix	22.0	11	14,024	10	11.0	14	14,818	66.8	5	16,083	9	638,757	5
Los Angeles	21.9	12	17,141	9	12.7	8	16,003	60.0	1	24,007	4	783,684	4
Dulles	19.5	13	9,339	14	11.5	12	4,175	80.5	25	6,830	29	479,931	15
St. Louis	18.2	14	8,837	15	11.1	13	12,726	70.3	9	14,923	11	484,224	13
Detroit	17.6	15	9,780	13	8.8	26	11,570	80.8	26	16,563	7	554,580	6
Cincinnati	15.4	16	7,360	16	10.7	17	5,115	82.0	30	7,610	26	477,654	16
Minn./St. Paul	12.7	17	6,658	17	8.4	29	10,982	75.7	16	18,944	5	522,253	8
Miami	11.3	18	5,849	18	11.9	11	5,237	77.9	21	12,721	15	516,545	10
Seattle	10.4	19	4,653	19	10.3	20	7,687	66.7	4	13,062	14	445,677	20
Las Vegas	8.0	20	4,178	20	10.6	18	10,605	68.1	6	15,311	10	521,300	9
Reagan National	8.0	21	2,727	22	9.1	24	7,084	78.0	22	6,657	30	342,790	28
Balt.-Wash. Intl	6.9	22	2,181	24	10.9	16	7,632	81.7	27	8,002	25	315,348	29
Orlando	6.3	23	2,297	23	11.0	15	7,827	77.1	20	12,529	16	366,278	25
Charlotte	6.0	24	2,748	21	7.9	30	10,113	82.8	31	9,442	21	460,370	17
Pittsburgh	3.8	25	1,695	25	8.6	27	8,146	82.0	29	8,014	24	448,181	19
San Diego	2.5	26	520	28	9.9	21	5,486	65.0	3	7,248	27	207,916	31
Denver	2.2	27	1,177	26	13.4	7	10,469	69.3	8	17,435	6	528,604	7
Salt Lake City	2.0	28	720	27	9.6	22	6,067	76.2	18	8,709	22	366,933	24
Tampa	1.6	29	435	29	10.6	19	5,506	75.8	17	6,912	28	278,632	30
Memphis	0.4	30	143	30	8.5	28	4,418	78.8	24	4,524	31	386,335	23
Honolulu	0.0	31	8	31	N/A	N/A	3,128	76.5	19	8,517	23	345,496	27

Sources: FAA OPSNET and ASPM data are for CY 2000. Honolulu is not included in the voluntarily reported ASPM database. ASQP data for February 2001 is from the April edition of DOT's *Air Travel Consumer Report*. Enplaned passengers are from the 1999 edition of DOT's *Airport Activity Statistics of Certificated Route Air Carriers*.