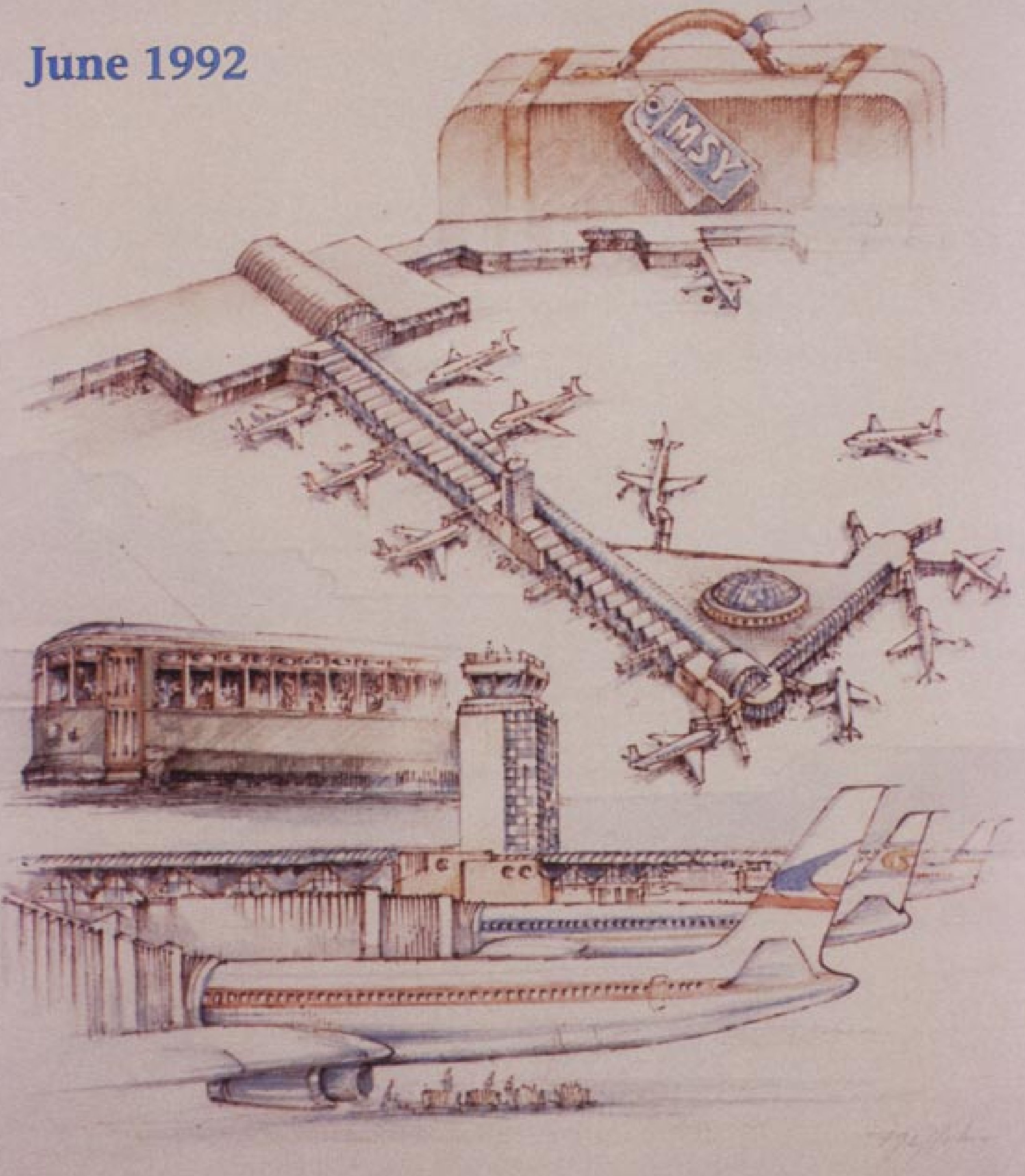
New Orleans International Airport

Capacity Enhancement Plan

June 1992



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Airport Capacity Enhancement Plan

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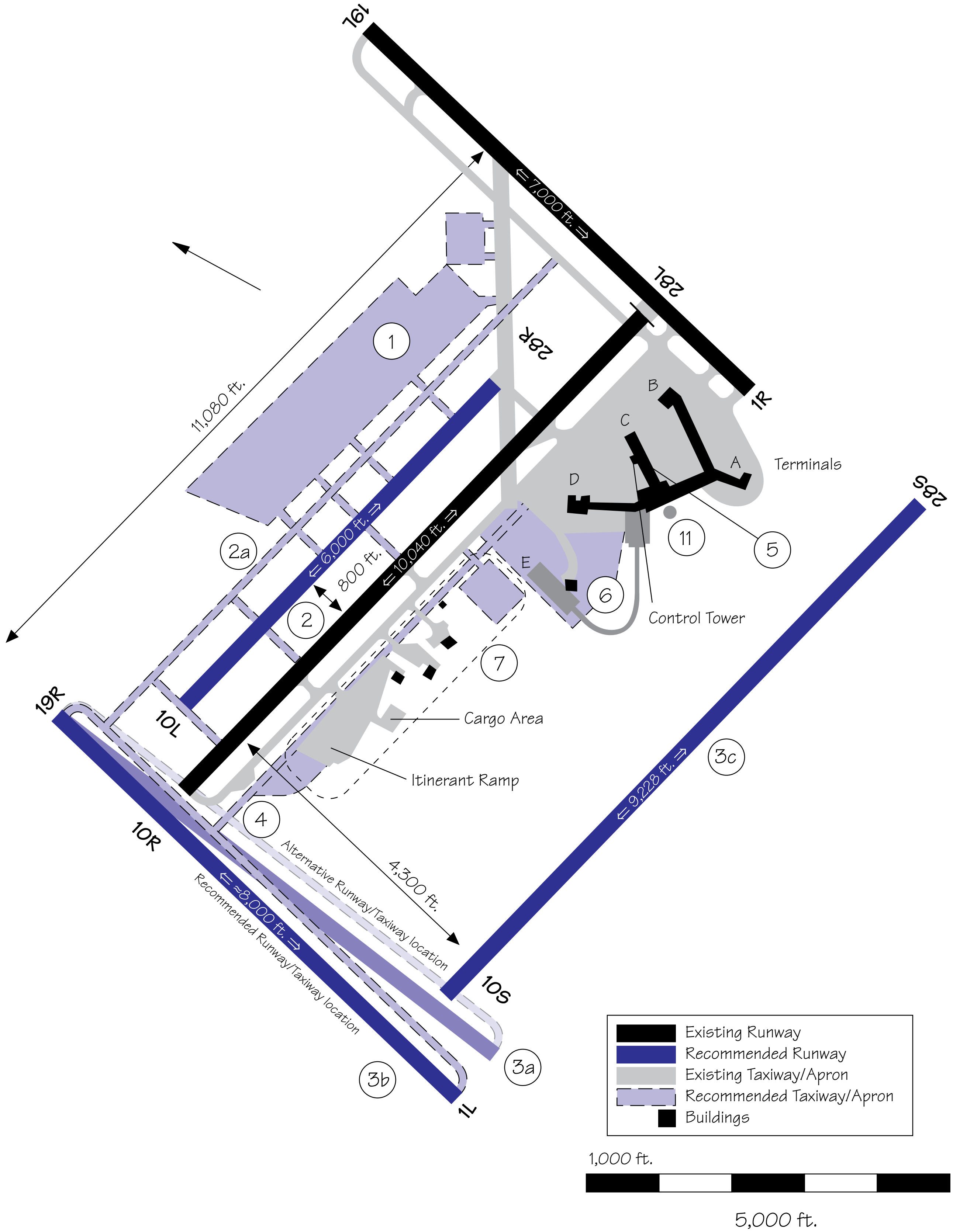
Prepared jointly by the U.S. Department of Transportation, Federal Aviation Administration, the City of New Orleans, Aviation Board, and the airlines and general aviation serving New Orleans.

Figure 1 New Orleans International Airport

Figure 2 Capacity Enhancement Alternatives and Annual Delay Savings

Figure 1 New Orleans International Airport



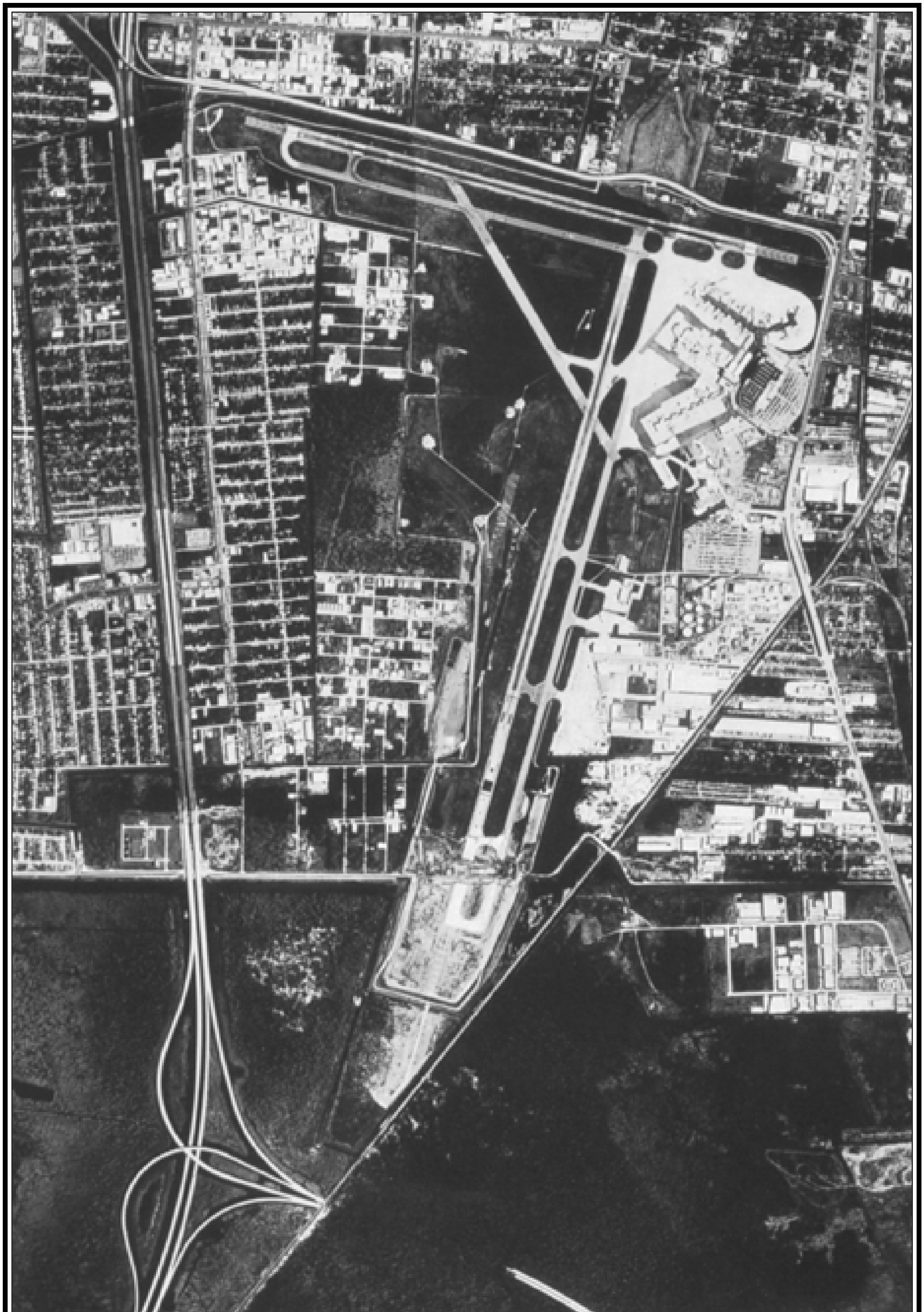


Figure 2 Capacity Enhancement Alternatives and Annual Delay Savings

Alternatives	Estimated Annual Delay Savings* (hours / millions of 1991 $) Baseline (151,000)	Future 1 (213,000)	Future 2 (265,000)	Future 3 ** (312,000)	Future 4** (395,000)
Airfield Improvements					
1. Construct new general aviation (GA) complex and east/west taxiway on north side	***	***	28/$.03	—	—
2. Convert north parallel east/west taxiway into new commuter/GA Runway 10L/28R	***	264/$0.27	825/$0.83	4,627/$4.66	26,948/$27.12
2a. Construct parallel taxiway north of new Runway 10L/28R			†		
3. Construct new air carrier runway					
3a. Construct dependent non-parallel Runway 1L/19R	***	***	1,665/$1.68	14,164/$14.25	91,168/$91.73
3b. Construct independent parallel Runway 1L/19R	***	385/$0.39	2,658/$2.67	17,656/$17.77	124,934/$125.71
3c. Construct independent parallel Runway 10S/28S	***	5,523/$5.56	9,895/$9.96	27,340/$27.51	143,133/$144.02
4. Construct east/west dual taxiway south of Runway 10R/28L	—	—	3,180/$3.20	10,010/$10.07	32,428/$32.63
5. Construct new international and domestic gates and renovate one gate on Concourse C		†			
6. Construct new Concourse E (20 gates) for air carrier operations		†			
7. Develop air cargo complex		†			
8. Construct perimeter road		†			
9. Study requirement for new airport		†			
Facilities and Equipment Improvements					
10a. Move VORTAC from current location in lake, possibly to MSY		†			
10b. Install additional VOR		†			
11. Construct new airport traffic control tower		†			
Operational Improvements					
12. Effects of noise constraints	36/$0.04	174/$0.18	570/$0.57	—	—
13. Develop and implement converging instrument approaches					
13a. "TERPS plus 3" approach procedures to Runways 10R and 19L and Runways 10R and 1R	***	11/$0.01	65/$0.07	—	—
13b. Dependent IFR approaches to Runways 10R and 19L and Runways 10R and 1R	—	85/$0.09	415/$0.42	—	—
14. Use 2.5 NM spacing between similar class, non-heavy aircraft	35/$0.04	149/$0.15	525/$0.53	—	—
15. Conduct airspace capacity design project; restructure terminal airspace		†			
16. Study effects of existing heliport		†			
17. Enhance GA reliever airports	—	—	—	—	—
17a. Reduce GA traffic by 25 %	59/$0.06	271/$0.27	766/$0.77	—	—
17b. Reduce GA traffic by 50 %	126/$0.13	503/$0.51	1,675/$1.69	—	—
17c. Reduce GA traffic by 75 %	193/$0.19	637/$0.64	2,520/$2.54	—	—

* The annual delay savings benefits of these alternatives are not necessarily additive.
** Delay savings for Future 3 and 4 activity levels were calculated only for alternatives 2, 3, and 4.
*** The delay savings benefits for these activity levels are nominal
† These improvements were not simulated. Therefore, no dollar figures are available. There is a description of each of these items in Section 2 — Capacity Enhancement Alternatives.

Summary

The Federal Aviation Administration (FAA), airport operators, and aviation industry groups have initiated joint Airport Capacity Design Teams at various major air carrier airports throughout the U.S. These Capacity Teams identify and evaluate alternative means to enhance existing airport and airspace capacity to handle future demand. A Capacity Team for New Orleans International Airport (MSY) was formed in 1991.

MSY has remained one of the busiest airports in the country. Activity has increased from 3,063,000 passenger enplanements in 1983 to 3,240,000 in 1989. In 1990, the Airport handled 151,000 aircraft operations (either takeoffs or landings).

The MSY Capacity Team identified and assessed various actions which, if implemented, would increase MSY's capacity, improve operational efficiency, and reduce aircraft delays. The purpose of the process was to determine the technical merits of each alternative action and its impact on capacity. Additional studies may be needed to assess environmental, socioeconomic, financial, or political issues associated with the implementation of these alternatives.

Selected alternatives identified by the Capacity Team were tested using computer models developed by the FAA to quantify the benefits provided. Different levels of activity were chosen to represent growth in aircraft operations in order to compare the merits of each action. These annual activity levels are referred to throughout this report as:

Baseline — 151,000 operations;
Future 1 — 213,000 operations;
Future 2 — 265,000 operations;
Future 3 — 312,000 operations; and
Future 4 — 395,000 operations.

If no improvements are made at MSY (the "Do Nothing" scenario), the annual delay cost will increase from 1,960 hours or $1.97 million at the Baseline level of operations to 11,240 hours or $11.24 million by Future 2 and 156,007 hours or $156.97 million by Future 4.

The major alternatives resulting from the New Orleans Capacity Design Team study include:

	Annual Delay Savings			
	Future 2		Future 4	
	Hours	Millions of 1991 $	Hours	Millions of 1991 $
• Construct new independent parallel Runway 1L/19R	2,658	$2.67	124,934	$125.71
or				
• Construct new independent parallel Runway 10S/28S	9,895	$9.96	143,133	$144.02
• Convert north parallel E/W taxiway into new Runway 10L/28R	825	$0.83	26,948	$27.12

Figure 3 Hourly Flow Rate Versus Average Delay (IFR Conditions)

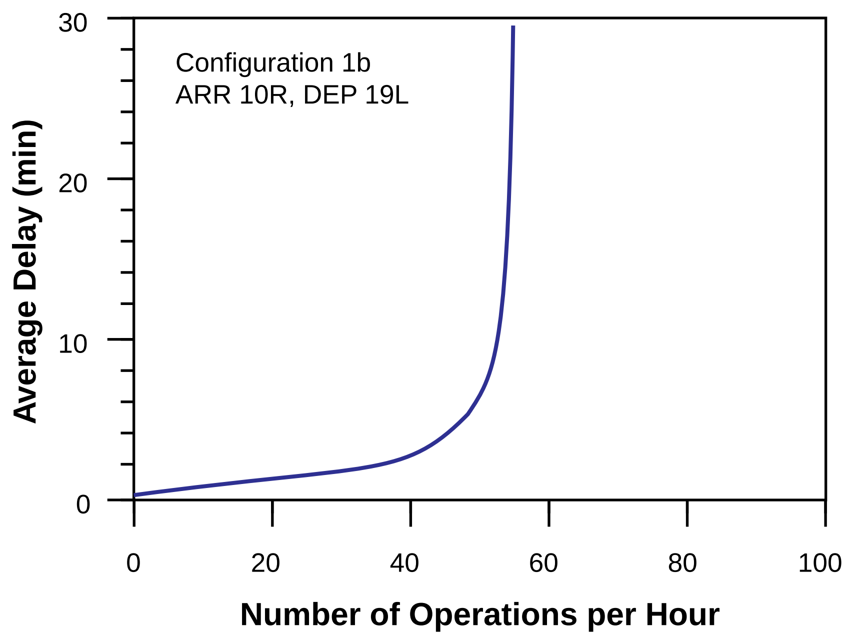


Figure 4 Profile of Daily Demand — Hourly Distribution

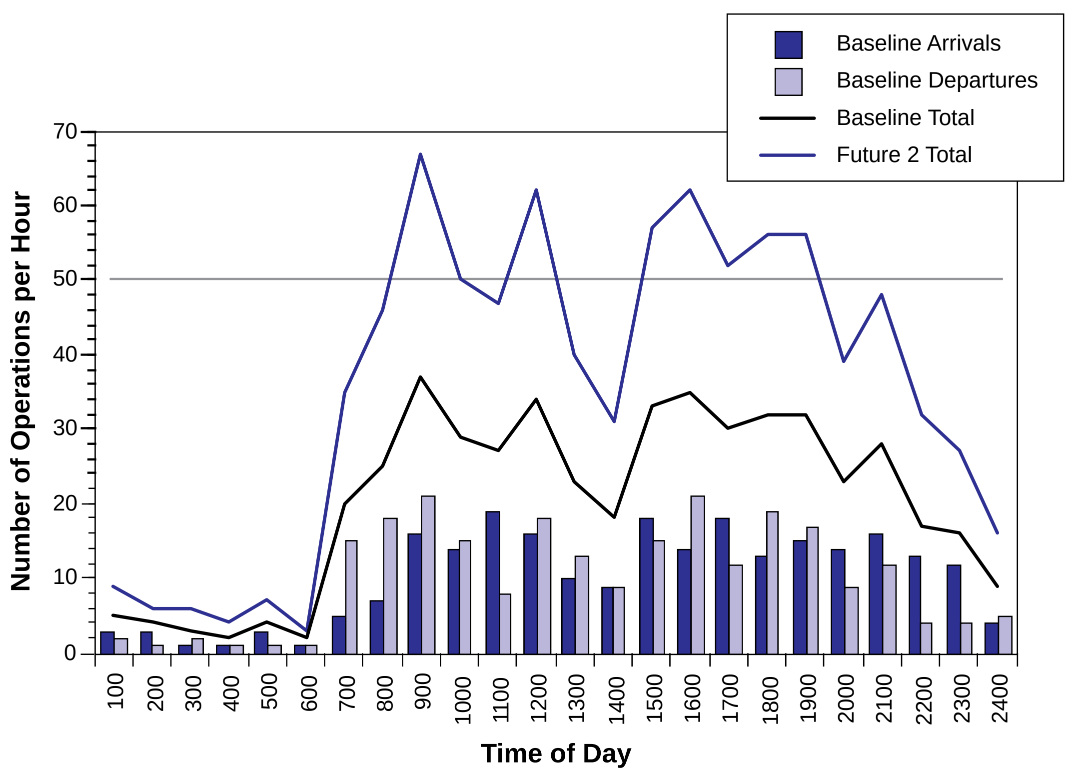
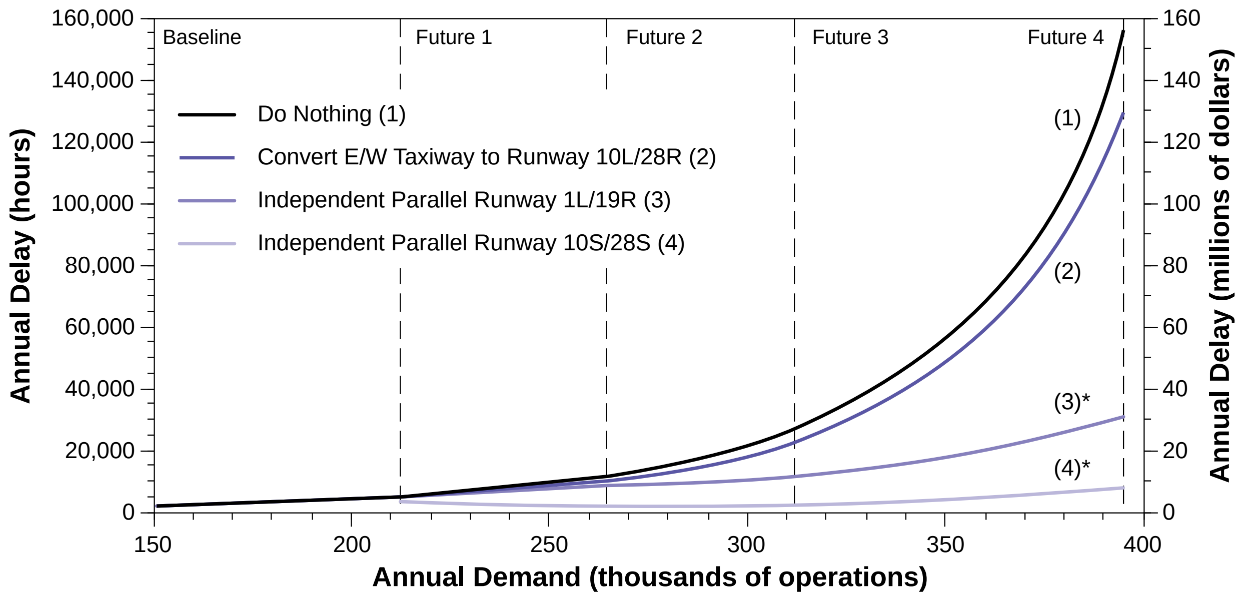


Figure 5 Annual Delay Costs — Capacity Enhancement Alternatives



** The major difference in the benefits of projects 3 and 4 is aircraft taxi time.*

Figure 3 illustrates the capacity and delay curve for the current airfield configuration at MSY under instrument flight rules (IFR) conditions. It shows that aircraft delays will begin to escalate rapidly as hourly demand exceeds 50 operations per hour. Figure 4 shows that, while hourly demand doesn't exceed 50 operations at Baseline demand levels, 50 operations per hour is frequently exceeded at the demand levels forecast for Future 2.

Figure 5 shows how delay could continue to grow at a substantial rate as demand increases if there are no improvements in airfield capacity, i.e., the "Do Nothing" scenario. Annual delay costs would increase from $1.97 million at the Baseline level of operations to $11.31 million by Future 2 and $156.97 million by Future 4. The chart also illustrates that the greatest savings in delay costs would be provided by:

- Constructing a new independent parallel Runway 1L/19R or
- Runway 10S/28S
- Converting north parallel east/west taxiway into a new Runway 10L/28R.

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Section 1 — Introduction

Background

The challenge for the air transportation industry in the nineties is to enhance existing airport and airspace capacity and to develop new facilities to handle future demand. As environmental, financial, and other constraints continue to restrict the development of new airport facilities in the U.S., an increased emphasis has been placed on the redevelopment and expansion of existing airport facilities.

To begin to meet this challenge, the FAA, along with airport operators and aviation industry groups throughout the country, have initiated joint Airport Capacity Design Teams to study airport capacity enhancement at the major air carrier airports in the U.S. The objectives of these studies are to identify various alternatives for increasing capacity and to evaluate their potential for reducing delays.

Over the past decade, New Orleans International Airport (MSY) has remained one of the nation's busiest airports. Passenger enplanements rose from 3,063,000 in 1983 to 3,240,000 in 1989. MSY's total aircraft operations reached 151,000 in 1990. Because of the strong lure of New Orleans as a travel and convention destination, MSY ranks in the top ten airports nationally in origin and destination traffic. In addition, with the continued expansion of the city's convention facilities, the advent of riverboat gambling in 1993, and the likely introduction of landbased casino gambling, air traffic at MSY is expected to increase significantly as tourists, conventioneers, and gamblers come to New Orleans in greater numbers than ever before.

This report has established benchmarks for development based upon traffic levels and not upon any definitive time schedule, since actual growth can vary year to year from projections. As a result, the report should retain its validity until the highest traffic level is attained, regardless of the actual dates paralleling the development.

A Baseline benchmark of 151,000 aircraft operations (either takeoffs or landings) was established based on the current annual traffic level when the study began. Four future traffic levels, Future 1, Future 2, Future 3, and Future 4, were established at 213,000, 265,000, 312,000, and 395,000 annual aircraft operations respectively, based on Capacity Team consensus of potential traffic growth at New Orleans. If no improvements are made at MSY, annual delay levels and delay costs are expected to increase from an estimated 1,960 hours and

$1.97 million at the Baseline activity level to 11,240 hours and $11.31 million by the Future 2 demand level and to 156,007 and $156.97 million by the Future 4 demand level.

The Capacity Team studied various proposals with the potential for increasing capacity and reducing delays at MSY. The improvements evaluated as a part of the Capacity Team's efforts are delineated in Figure 2 and described in detail in Section 2 — Capacity Enhancement Alternatives.

Objectives

The major goal of the Capacity Team at MSY was to develop an action plan of options to increase airport capacity, improve airport efficiency, and reduce aircraft delays. In achieving this objective, the Capacity Team:

- Assessed the current airport capacity and the causes of delay associated with the airfield, the immediate airspace, and the apron and gate-area operations.
- Evaluated capacity and delay benefits of alternative air traffic control (ATC) procedures, navigational improvements, airfield development, and operational improvements.

Methodology

The Capacity Team met periodically for review and coordination. The FAA Technical Center's Aviation Capacity Branch provided expertise in airport simulation modeling. Other Capacity Team members contributed suggested improvement options, data, text, and capital cost estimates.

Initial work consisted of gathering data and formulating assumptions required for the capacity and delay analysis and modeling. Where possible, assumptions were based on actual field observations at MSY. Proposed improvements were analyzed in relation to current and future demands with the help of two computer models, the Airfield Delay Simulation Model (ADSIM) and the Runway Delay Simulation Model (RDSIM). Appendix B briefly describes the two models.

The simulation models considered air traffic control procedures, airfield improvements, and traffic demands. Alternative airfield configurations were prepared from present and proposed airport layout plans. Various configurations were evaluated to assess the benefits of projected improvements. Air traffic control procedures and system improvements determined the aircraft separations to be used for the simulations under both VFR and IFR conditions.

Air traffic demand levels were derived from *Official Airline Guide* data, historical data, and Capacity Team and other forecasts. Aircraft volume, mix, and peaking characteristics were considered for each of the five different demand forecast levels (Baseline, Future 1, Future 2, Future 3, and Future 4). From this, annual delay estimates were determined based on implementing various improvements. These estimates took into account historic variations in runway configuration, weather, and demand. The annual delay estimates for each configuration were then compared to identify delay reductions resulting from the improvements.

Following the evaluation, the Capacity Team developed a plan of "Recommended Alternatives" for consideration, which is included in Figure 6.

Figure 6 Capacity Enhancement Alternatives and Recommended Actions

Alternatives	Action	Time Frame
Airfield Improvements		
1. Construct new general aviation (GA) complex and east/west taxiway on north side	Recommended	Baseline
2. Convert north parallel east/west taxiway into new commuter/GA Runway 10L/28R	Recommended	Baseline–Future 2
2a. Construct parallel taxiway north of Runway 10L/28R	Recommended	Baseline–Future 2
3. Construct new air carrier runway	Under Study*	
3a. Construct dependent non-parallel Runway 1L/19R		
3b. Construct independent parallel Runway 1L/19R		
3c. Construct independent parallel Runway 10S/28S		
4. Construct east/west dual taxiway south of Runway 10R/28L	Recommended	Future 2–Future 3
5. Construct new international and domestic gates and renovate one gate on Concourse C	Under Construction	
6. Construct new Concourse E (20 gates) for air carrier operations	Recommended	—
7. Develop air cargo complex and associated aprons	Recommended	—
7a. Develop Area 1 — Stage I east air cargo apron		
7b. Develop Area 2 — existing and south-of-existing GA areas		
7c. Develop Area 3 — Stage II east air cargo apron		
7d. Develop Area 4 — west air cargo apron		
8. Construct perimeter road	Recommended	—
9. Study requirement for new airport	Under Study**	—
Facilities and Equipment Improvements		
10a. Move VORTAC from current location in lake, possibly to New Orleans International Airport	Recommended	Baseline
10b. Install additional VOR	Study**	Baseline
11. Construct new airport traffic control tower (ATCT)	Under Construction	Baseline
Operational Improvements		
12. Effects of noise constraints	Study**	Baseline
13. Develop and implement converging instrument approaches		
13a. "TERPS plus 3" approach procedures to Runways 10R and 19L and Runways 10R and 1R	Recommended	Baseline
13b. Dependent IFR approaches to Runways 10R and 19L and Runways 10R and 1R	Study**	
14. Use 2.5 NM spacing between similar class, non-heavy aircraft	Recommended	Baseline
15. Conduct an airspace capacity design project and restructure terminal airspace	Recommended	Baseline
16. Study effects of existing public-use heliport	Study**	
17. Enhance GA reliever airports	Study**	Baseline
17a. Reduce GA traffic by 25 percent		
17b. Reduce GA traffic by 50 percent		
17c. Reduce GA traffic by 75 percent		

* The airport has proposed an additional air carrier runway, which is currently the subject of an environmental impact study.

** The term "Study" or "Under Study" suggests that a specific study be conducted or that it become part of a larger planning effort, such as a Master Plan update or a FAR Part 150 Airport Noise Compatibility Study. These individual proposals require further investigation at a level of detail that is beyond the scope of this effort.

Section 2 — Capacity Enhancement Alternatives

Figure 1 shows the current layout of the Airport, plus the recommended airfield improvements considered by the MSY Capacity Team.

Figure 2 lists the capacity enhancement alternatives evaluated by the Capacity Team and presents the estimated annual delay savings benefits for selected improvements. The annual savings are given for the activity levels Baseline, Future 1, Future 2, Future 3, and Future 4, which correspond to annual aircraft operations of 151,000, 213,000, 265,000, 312,000, and 395,000 respectively. The delay savings benefits of the improvements are not necessarily additive.

Figure 6 presents the recommended action and suggested time frame for each capacity enhancement alternative considered by the Capacity Team.

The New Orleans International Airport Capacity Team limited its analyses to aircraft activity within the terminal area airspace and on the airfield. They considered the technical and operational feasibility of the proposed improvements, but did not address environmental, socioeconomic, financial, or political issues regarding airport development. These issues need to be addressed in future airport system planning studies by the New Orleans Aviation Board, and the data generated by the Capacity Team can be used in such studies.

These capacity enhancement alternatives are categorized and discussed under the following headings:

- Airfield Improvements.
- Facilities and Equipment Improvements.
- Operational Improvements.

Airfield Improvements

1. Construct new general aviation (GA) complex and new east/west taxiway on north side.

General aviation and air cargo now share the same small apron on the south side of existing Runway 10/28, an apron that provides less than 750,000 square feet of parking space. This shared apron has periodic difficulty accommodating GA traffic and is far too small to handle the large charter planes transporting passengers to major conventions or events in New Orleans. Also, during major events in the past, there have been as many as 175 GA aircraft requesting to park on the existing apron, which has the capacity to park 45 aircraft.

The Airport is planning to construct a new GA complex on the north side of the Airport and transfer GA operations to this new complex. The Airport will then be able to develop and expand the cargo facilities in the limited space available on the south side of the Airport, provide GA a great deal more parking space, and reduce operational conflicts among GA, air carrier, and cargo uses. The construction of this GA multi-use apron, with four connector taxiways and an access road to the north, would be completed in four phases.

Site preparation has begun for a new east/west parallel taxiway on the north side, about 7,000 feet in length, that would serve as a direct conduit to and from the new GA apron. Use of this new taxiway would allow for complete separation of GA from cargo and air-carrier activity and would help to keep ground delays to a minimum. Built initially as a taxiway, it may later be converted into a runway (alternative 2) subject to environmental approval. If it is converted into a runway, a new parallel taxiway (alternative 2a) will be built to the north of the runway to serve the runway and the GA area.

The estimated cost in 1991 dollars is $44 million for the north-side GA aprons and the connector taxiways and $14–16.8 million for the east/west parallel taxiway.

Annual savings at the Future 2 activity level would be 28 hours or $.03 million.

2. Convert north parallel east/west taxiway into new commuter/general aviation (GA) Runway 10L/28R.

The purpose of this project is to convert the north parallel east/west taxiway (alternative 1), built initially to serve the new north GA apron area, into Runway 10L/28R. Separated from Runway 10R/28L by 800 feet, it would permit dual arrival streams under visual flight rules (VFR) conditions. The site preparation phase of this taxiway/runway project has already begun.

The estimated project cost in 1991 dollars is $0.5 million for lights and marking.

Annual savings at the Future 2 activity level would be 825 hours or $0.83 million, and, at Future 4 activity levels, 26,948 hours or $27.12 million.

2a. Construct parallel east/west taxiway north of new Runway 10L/28R.

This new east/west taxiway would be built immediately north of the prospectively converted Runway 10L/28R (alternative 2) and to the south of the new GA apron on the north side (alternative 1) if the runway conversion is approved. This new, 75 foot wide, parallel taxiway would serve the runway and the development on the north side of the Airport.

The estimated project cost in 1991 dollars is $8–10 million.

3. Construct new air carrier runway.

Preliminary cost estimates for a new air carrier runway range from $170 to $350 million depending on the runway's final location and configuration as well as on the method of construction. These construction cost estimates include all related costs, such as fees, property acquisition, relocation costs, and reconstruction of all related infrastructure, including levees and roadways. The only costs not included in the estimates are those of relocating the Illinois Central Railroad, which passes through each of the proposed alignments of the runway, alternatives 3a, 3b, and 3c. This cost of the railroad relocation has not been determined yet. The Airport's ongoing environmental impact study for the independent parallel runway will present recommendations for alignment and construction method for both the runway and the relocation of the railroad.

3a. Construct dependent non-parallel Runway 1L/19R.

Construction of Runway 1L/19R as a non-parallel runway would require the use of more restrictive air traffic control procedures under IFR conditions than a parallel runway.

Delay reduction benefits were calculated by assuming the availability of two VFR arrival streams, both southbound (Runways 19R and 19L) and northbound (Runways 1L and 1R), and two IFR arrival streams southbound, but only one IFR arrival stream northbound. The estimated benefit should be considered a maximum, since other complexities of a non-parallel operation, including minimum descent altitudes, are involved.

Annual savings at the Future 2 activity level would be 1,665 hours or $1.68 million, and, at Future 4 activity levels, 91,168 hours or $91.73 million.

Under this project, a new parallel north/south Runway

3b. Construct independent parallel Runway 1L/19R.

1L/19R and associated parallel taxiway would be constructed about 8,000 feet in length west of the Airport in St. Charles Parish. With a separation of more than 10,000 feet from the existing Runway 1R/19L, it would allow for two independent simultaneous arrival streams under all weather conditions. Construction of this new runway would provide the additional capacity needed to handle the increased traffic that would accompany a hub operation.

Annual savings at the Future 2 activity level would be 2,658 hours or $2.67 million, at Future 4 activity levels, 124,934 hours or $125.71 million.

3c. Construct independent parallel Runway 10S/28S.

As an option for the proposed Runway 1L/19R (alternatives 3a and 3b), the Airport is considering the construction of an east/west parallel runway and taxiway complex south of the existing runways and terminal, off of present Airport property. If, for some reason, the Airport is unable to build Runway 1L/19R, the only remaining reasonable location for a new parallel runway for instrument approaches is to the south, between the Airport and the Mississippi River.

The viability of Runway 10S/28S as an alternative to Runway 1L/19R is dependent upon the removal of the noise restrictions on operations on the existing Runway 10/28. In addition, noise mitigation measures would be needed to reduce the effects of noise exposure on the communities east of the Airport.

Annual savings at the Future 2 activity level would be 9,895 hours or $9.96 million, and, at Future 4 activity levels, 143,133 hours or $144.02 million.

4. Construct east/west dual taxiway south of Runway 10R/28L.

When the new Runway 1L/19R is constructed, a new 6,735-foot long, 75-foot wide east/west parallel taxiway would be built south of the existing Taxiway E and north of the cargo area proposed in alternative 7. Two taxiways would allow one-way traffic on each taxiway, making operations on the new Runway 1L/19R more efficient.

The estimated cost in 1991 dollars is $4.75–5.75 million.

The additional annual savings at the Future 2 activity level would be 3,180 hours or $3.20 million and, at Future 4 activity levels, 32,428 hours or $32.63 million.

5. Construct new international and domestic gates and renovate one gate on Concourse C.

Concourse C is one of the original Airport buildings built in the 1950's. Stage I of the reconstruction will provide five new international gates and one new domestic gate and renovate one additional gate (for a total of fifteen gates). The international gates will handle the increasing South and Central American traffic through New Orleans and the prospective direct service between New Orleans and Europe. In conjunction with the renovation, the Airport is also rebuilding its Federal Inspection Services Facility to further expedite international traffic through MSY.

The estimated cost in 1991 dollars for Stage I construction, which is underway, is $12–14 million.

Stage II and III will complete the reconstruction project and provide an additional five gates to accommodate the near-term expected growth in air traffic at MSY.

The estimated cost for Stage II and III construction in 1991 dollars is $14–16 million.

6. Construct new Concourse E (20 gates) for air carrier operations.

This project would provide additional gates to accommodate the anticipated long-term growth in air traffic at MSY. The new satellite Concourse E, a 135,000 square foot, two-level structure, would be located to the west of the existing terminal and would be connected to the main terminal via a people mover.

The estimated cost in 1991 dollars is $35 million. However, this does not include the cost of a people mover to connect the new concourse with the main terminal facilities.

7. Develop air cargo complex and associated aprons.

- **7a. Develop Area 1 — Stage I east air cargo apron.**
- **7b. Develop Area 2 — existing GA area and south of existing GA area.**
- **7c. Develop Area 3 — Stage II east air cargo apron.**
- **7d. Develop Area 4 — west air cargo apron.**

Presently, cargo and general aviation (GA) operations share the same apron facilities on the southwest side of the Airport. This apron supports just under 750,000 square feet of usable parking area and must provide space for both cargo and GA aircraft. To alleviate the operational and space conflicts that result from overcrowding on this shared apron, the Airport is planning to relocate GA to the north side of the airfield to a newly constructed GA complex (see alternative 1). Cargo operations will remain on the south side of the airfield because of its proximity to the air carrier airlines, which carry much of the Airport's cargo. Separating cargo and GA operations will eliminate conflicts between the two and create a great deal more aircraft parking spaces for both. This plan, which includes the addition of parking aprons and the improvement of the access road network, is an effort by the Airport to create a cohesive cargo area to serve the rapidly increasing air cargo market.

The Airport is planning to build two new aprons south of the east/west runway (Runway 10R/28L) and immediately to the west of the terminal area (alternatives 7a and 7c). A third-party developer will build a series of air cargo service buildings to serve these new aprons. In addition, the roads and utilities serving the cargo area will be improved.

At the present time, the only cargo facilities serving the Airport are in LaFon Airpark, located south of the existing cargo/GA apron, outside the Airport property boundaries. All cargo must be carried through the security fences to the apron, creating a serious security problem. The Airport is in the process of acquiring LaFon Airpark. Once it is incorporated into Airport boundaries, the Airport is planning to improve the access road network within the facility and extend portions of the apron toward the existing buildings to create a better linkage between the landside and the airfield (alternative 7b).

Additionally, the Airport is planning to construct another parking apron to the west of the cargo area to provide more aircraft parking space (alternative 7d).

8. Construct perimeter road.

This three-phased project would build new roads in appropriate locations and upgrade the existing roadway to provide an all-weather surface for aircraft rescue and firefighting (ARFF) vehicles. The combination of heavy vehicles and extremely soft, moist soil will cause an ARFF vehicle to sink almost immediately after it leaves the pavement. An extensive perimeter road system is essential to the safe operation of the Airport.

The estimated cost in 1991 dollars is $20.5–24.6 million. This does not include the cost of enclosing Duncan Canal, the drainage canal on the east side of the Airport adjacent to a portion of the roadway.

9. Study requirement for new airport.

The Airport is currently undertaking a multi-phase site selection study for a new air-carrier airport in the New Orleans area. In 20 years, assuming a 3 percent or greater annual rate of growth, the number of operations at the Airport will approach Future 3 or Future 4 levels. Even if the capacity improvements recommended in this plan are completed, the annual delay costs approximate $30 million at a Future 4 level of operations. In fact, current annual growth in the New Orleans area is already well above 3 percent. If the Airport is selected to provide hubbing operations, existing and anticipated capacity will evaporate even more quickly. The new state of the art in airfield design will allow for three all-weather flight arrival streams and multiple departure streams. That capability does not appear possible at the current airport site.

Facilities and Equipment Improvements

10a. Move VORTAC from current location in lake, possibly to New Orleans International Airport.

Moving the existing VORTAC closer to or on the Airport would result in improved guidance for arrivals and departures. It would also support restructuring the terminal area airspace to use a two corner post system with the existing Picayune VORTAC to the northeast and the Tibby VORTAC to the southwest (see alternative 15).

Preliminary costs for this project in 1991 dollars range from $0.5 to $1.5 million.

10b. Install additional VOR (or re-route high-altitude traffic away from MSY VORTAC).

The New Orleans VORTAC serves several busy high-altitude jet routes. Eventually, with the expansion of traffic, MSY departures may occasionally be held on the ground until a hole is available in the stream of aircraft using these jet routes. These departures could be released without delay if the jet routes were re-routed away from the MSY VORTAC.

The VOR is primarily an en route navigational aid. Installing a new VOR away from MSY could assist in defining air routes to more efficiently overfly MSY terminal airspace. However, other navigational alternatives, such as restructuring area airspace to use the existing Picayune or Tibby VORTACs, may permit circumnavigation of the critical portion of MSY terminal airspace without requiring a new VOR (see alternative 15).

Preliminary costs for the project in 1991 dollars are $0.5 million.

11. Construct new airport traffic control tower (ATCT).

Constructing a new runway will require a new tower location and a higher tower cab to provide controllers with a view of future aircraft movement areas and facilitate proper traffic control. Construction began in late 1991.

Operational Improvements

12. Effects of noise abatement procedures.

The noise abatement procedures in place at the Airport restrict the use of Runway 10 for departure and Runway 28 for arrival to periods when weather conditions require their use. If aircraft operations at MSY were conducted without these procedures, there would be a reduction in annual delays. Annual costs associated with noise abatement at the Future 1 activity level would be 174 hours or $0.18 million, and, at Future 2 activity levels, 570 hours or $0.57 million.

13. Develop and implement converging instrument approaches.

13a. Implement "TERPS plus 3" approach procedures to Runways 10R and 19L and Runways 10R and 1R.

Simultaneous converging approaches are designed using the "TERPS plus 3" criteria. This refers to the need for missed approach points to be separated by at least 3 nautical miles (NM) and for missed approach obstacle-free surfaces not to overlap.

Annual savings at the Future 1 activity level would be 11 hours or $0.01 million, and, at Future 2 activity levels, 65 hours or $0.07 million.

13b. Conduct dependent IFR approaches to Runways 10 R and 19L and Runways 10R and 1R.

Under visual flight rules (VFR) conditions, it is common to use non-intersecting, non-parallel runways for independent streams of arriving aircraft. Because of the reduced visibility and ceilings associated with instrument flight rules (IFR) conditions, simultaneous (independent) use of runways is currently permitted for aircraft arrivals only during relatively high weather minimums ("TERPS plus 3"). However, a program is under development that would support dependent (alternating) arrivals on non-parallel runways using a new display aid for air traffic controllers.

Minimum in-trail spacing between similar aircraft in an approach stream to a single runway during IFR conditions is 3 NM (2.5 NM in some cases). Dependent non-parallel approaches would allow two arrival streams during IFR, but the minimum in-trail spacing between similar aircraft in the same arrival stream would be 4 to 5 NM to allow for a stagger in arrivals. This stagger provides a buffer in case of missed approaches. For modeling purposes, a spacing of 4 NM was used to estimate delay reduction benefits.

Annual savings at the Future 1 activity level would be 85 hours or $0.09 million, and, at Future 2 activity levels, 415 hours or $0.42 million.

14. Implement 2.5 NM spacing between similar class, non-heavy aircraft.

Existing procedures under instrument meteorological conditions (IMC) require that arriving aircraft be separated by 3 nautical miles (NM) or more. Improving separation minimums to 2.5 NM would increase runway capacity. Most of the savings occur at the highest demand levels during IFR conditions, but, if the runway exits are not visible from the tower, the 2.5 NM separation cannot be applied.

Annual savings at the Future 1 activity level would be 149 hours or $0.15 million, and, at Future 2 activity levels, 525 hours or $0.53 million.

15. Conduct an airspace capacity design project and re-structure terminal airspace.

The Capacity Team highly recommends a complete analysis of all of the en route airspace that interconnects with MSY. This analysis should include concepts of airspace restructuring that offer the potential for improving arrival and departure air route capacity in conjunction with airport improvements. New technology and operating concepts need to be reviewed in an effort to improve flow-control procedures and reduce or eliminate miles-in-trail restrictions that exceed optimum aircraft spacing. The end result should be airspace capacity that takes advantage of the Airport's surface capacity.

MSY was awarded a second Airport Improvement Plan (AIP) grant to conduct a site-selection study for a replacement, supplemental, or additional airport in the event that MSY is unable to meet future aviation demand.

Phase 1 of the study identified a number of sites where a potential air carrier airport, with four parallel runways capable of handling triple IFR approaches, could be located within areas of sparse existing development.

Phase 2 of the study will rank the proposed sites for the best location, first from an airspace standpoint using the FAA's Airport and Airspace Simulation Model (SIMMOD), and then from the standpoint of cost and political, environmental, and other factors, and select a recommended site. The first round of feasibility studies is completed. A few additional studies evaluating different operational scenarios are underway to supplement the ranking process.

If a follow-on airspace capacity design project is required for restructuring the terminal airspace, this data would serve as a basis for that study.

16. Study effects of existing public-use heliport.

With the technological improvements in larger passenger helicopter, tilt-wing, and tilt-rotor aircraft, city center to city center travel is a possibility for the short-haul market. There is the potential to capture a portion this market.

17. Enhance general aviation (GA) reliever airports (reduce GA traffic by 25, 50, and 75 percent).

If general aviation aircraft were encouraged to use other airports to serve the New Orleans metropolitan area, airfield capacity at MSY would become available for additional commercial aircraft. Safe and reliable airside facilities and attractive service facilities would be needed at other reliever airports. Ground transportation connections may be necessary. To determine the benefits of enhancing reliever airports, the Capacity Team evaluated the effects of reducing the number of small, slow aircraft by 25, 50, and 75 percent.

With a 25 percent reduction in GA traffic, annual savings at the Future 1 activity level would be 271 hours or $0.27 million, and, at Future 2 activity levels, 766 hours or $0.77 million.

With a 50 percent reduction in GA traffic, annual savings at the Future 1 activity level would be 503 hours or $0.51 million, and, at Future 2 activity levels, 1,675 hours or $1.69 million.

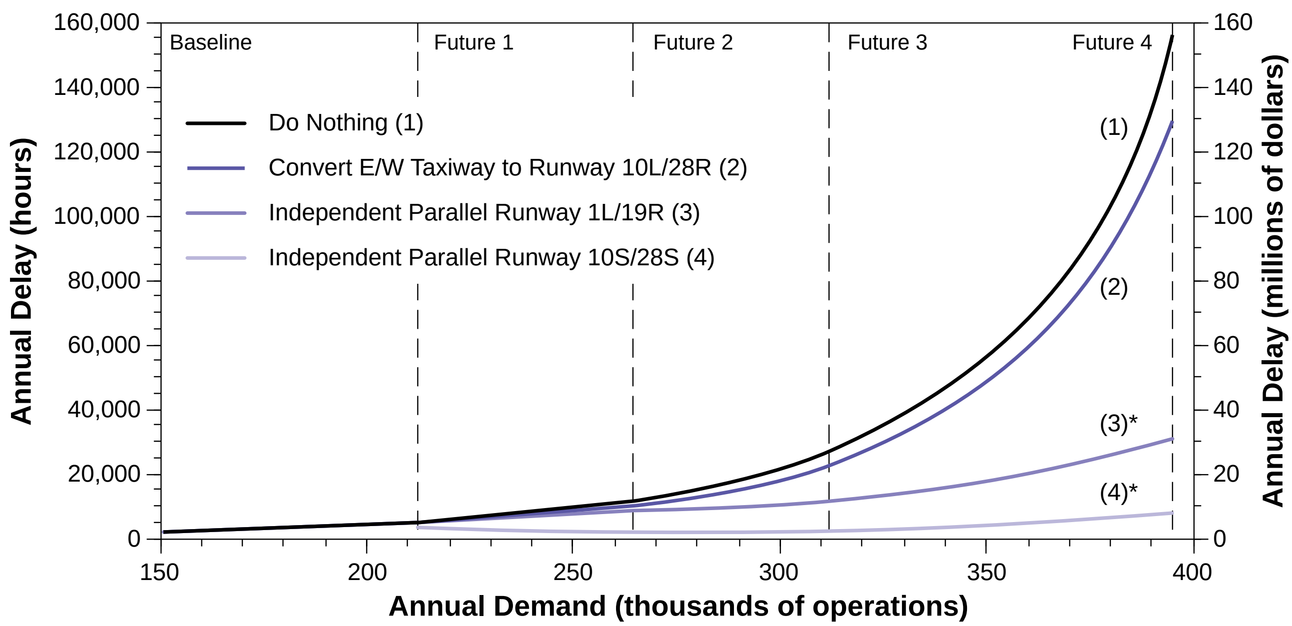
With a 75 percent reduction in GA traffic, annual savings at the Future 1 activity level would be 637 hours or $0.64 million, and, at Future 2 activity levels, 2,520 hours or $2.54 million.

Section 3 — Conclusions

Figure 7 demonstrates the impact of delays at New Orleans International Airport. The chart shows how delay will continue to grow at a substantial rate as demand increases if there are no improvements made in airfield capacity, i.e., the Do Nothing scenario. The chart also shows that the greatest savings in delay costs would be provided by:

- Constructing a new independent parallel Runway 1L/19R or
- Runway 10S/28S
- Converting north parallel east/west taxiway into a new Runway 10L/28R.

Figure 7 Annual Delay Costs — Capacity Enhancement Alternatives



** The major difference in the benefits of projects 3 and 4 is aircraft taxi time.*

Section 4 — Summary of Technical Studies

Overview

The New Orleans International Airport Capacity Team evaluated the efficiency of the existing airfield and the proposed future configuration. Figure 8 illustrates airfield weather conditions, and Figure 9, runway utilization. The potential benefits of various improvements were determined by examining airfield capacity, airfield demand, and average aircraft delays.

The Capacity Team used the Runway Delay Simulation Model (RDSIM) to determine aircraft delays during peak periods. The Airfield Delay Simulation Model (ADSIM) was used to determine taxi times associated with the parallel air carrier runway alternatives. Delays were calculated for current and future conditions.

Daily operations corresponding to an average day in the peak month were used for each of the forecast periods. Daily delays were annualized to measure the potential economic benefits of the proposed improvements. The annualized delays provide a basis for comparing the benefits of the proposed changes. The benefits associated with various runway use strategies were also identified.

The fleet mix at New Orleans International Airport (MSY) is estimated to have an average direct operating cost of $1,006 per hour. This figure represents the costs for operating the aircraft and includes such items as fuel, maintenance, and crew costs, but it does not consider lost passenger time, disruption to airline schedules, or any other intangible factors.

The cost of a particular improvement is measured against its annual delay savings. This comparison indicates which improvement will be the most effective.

For expected increases in demand, a combination of improvements can be implemented to allow airfield capacity to increase while aircraft delays are minimized.

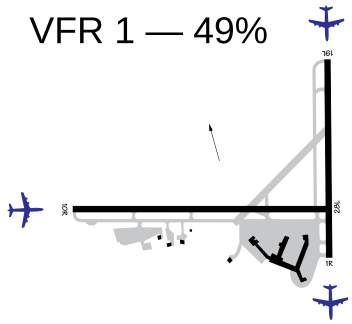
Figure 8 Airfield Weather

	Ceiling/Visibility	Occurrence (%)
VFR	3,000 feet / 5 MI or above	80
IFR	Below 3,000 / 5 MI	20
	Total	100

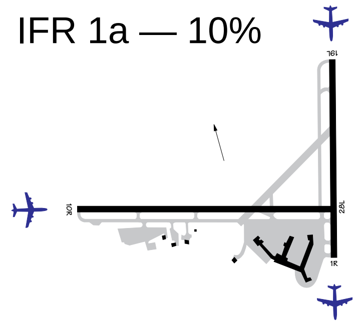
VFR - Visual Flight Rules IFR - Instrument Flight Rules MI - Miles

Figure 9 Runway Utilization — Present

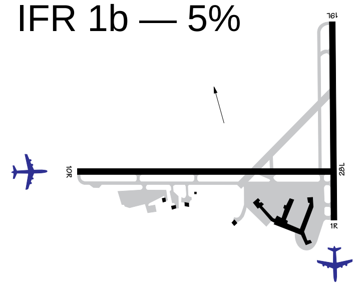
VFR 1 — 49%



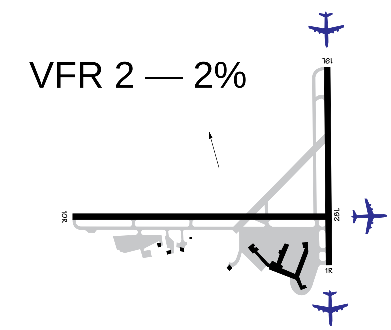
IFR 1a — 10%



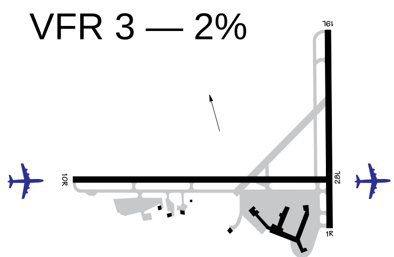
IFR 1b — 5%



VFR 2 — 2%



VFR 3 — 2%



IFR 3 — 1%

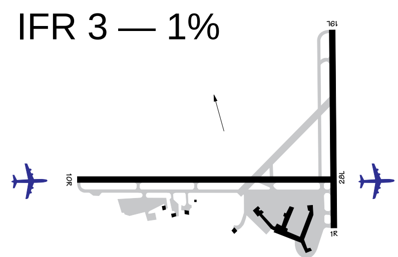
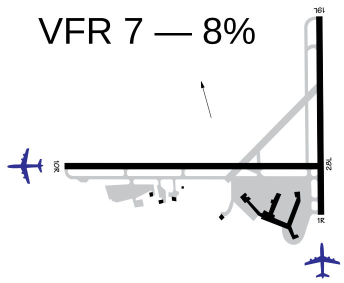
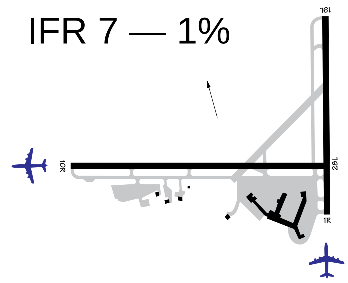
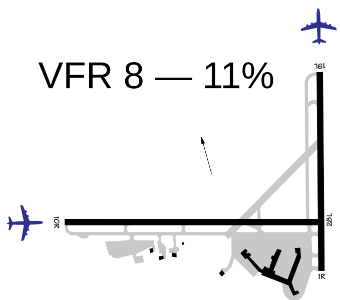
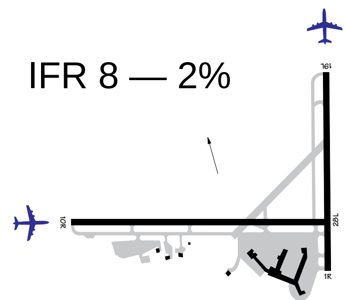


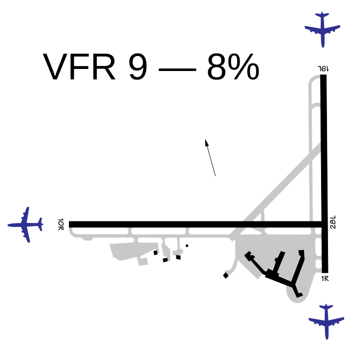
Figure 9 Runway Utilization (continued) — Present


VFR 7 — 8%


IFR 7 — 1%


VFR 8 — 11%


IFR 8 — 2%


VFR 9 — 8%

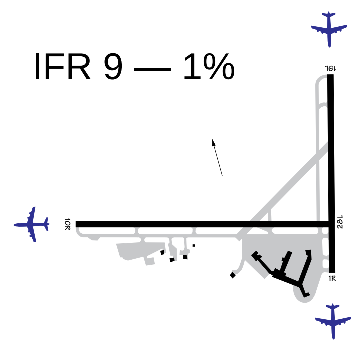

IFR 9 — 1%

Figure 9 Runway Utilization (continued) — Future

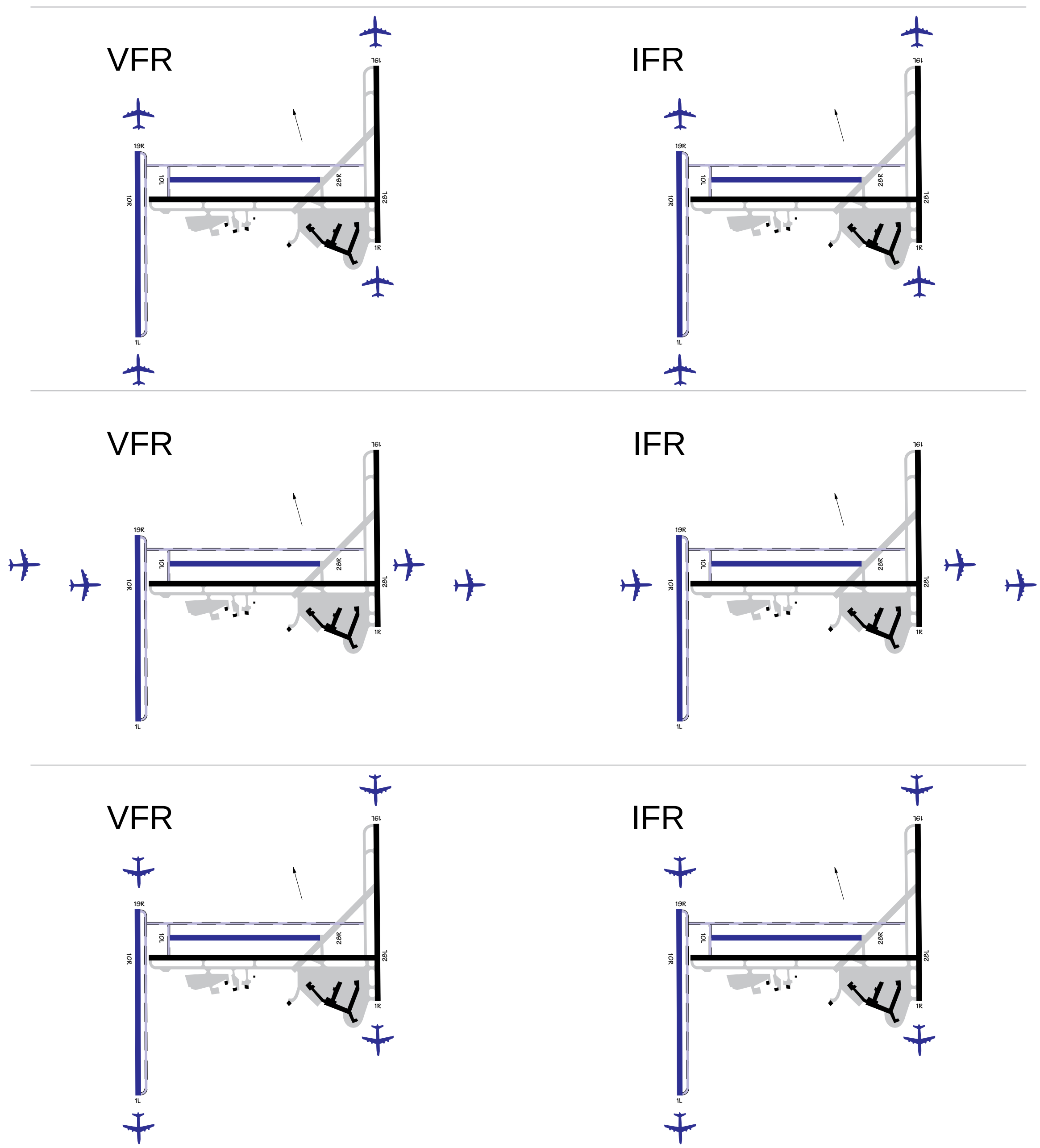
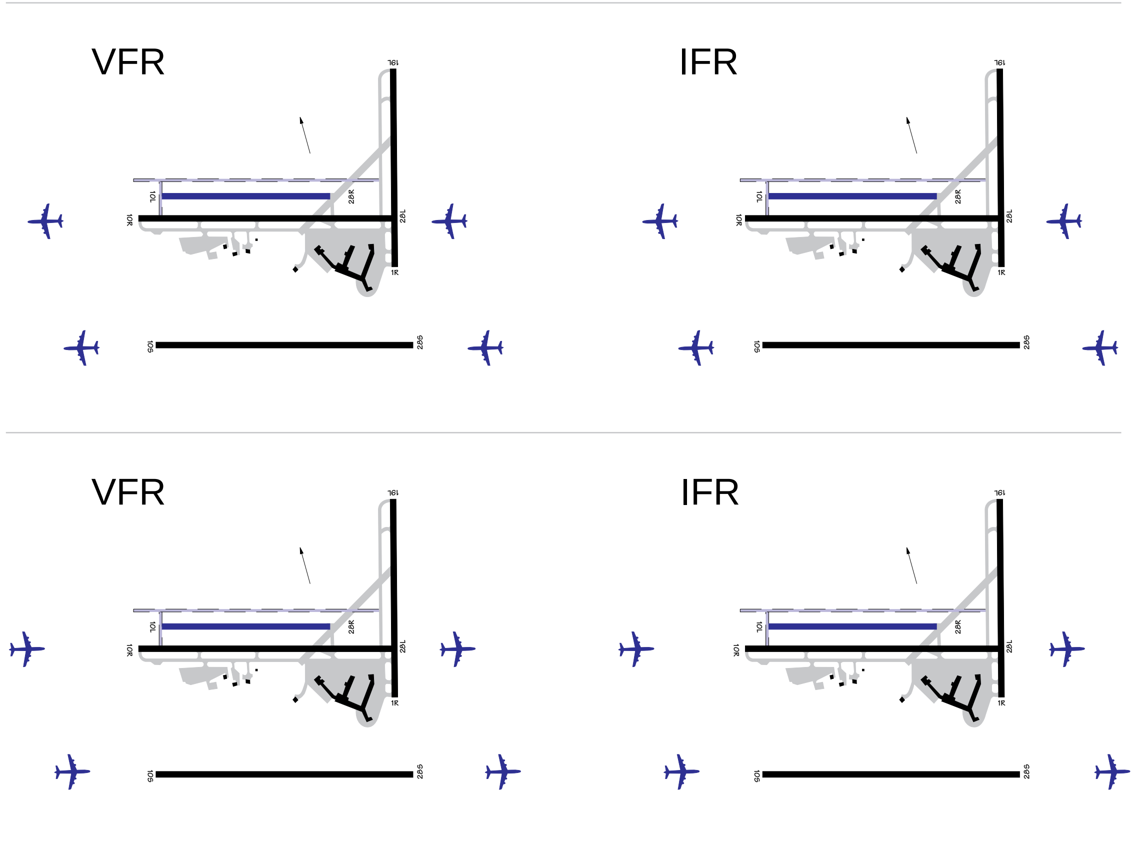


Figure 9 Runway Utilization (continued) — Future



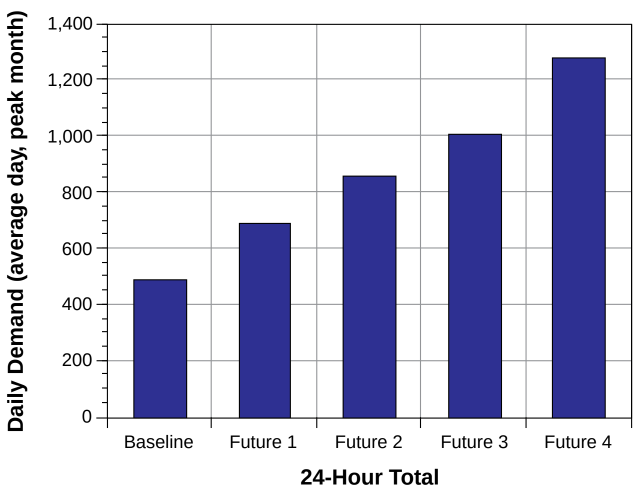
Airfield Capacity

The MSY Capacity Team defined airfield capacity to be the maximum number of aircraft operations (landings or takeoffs) that can take place in a given time. The following conditions were considered.

- Level of delay
- Airspace constraints
- Ceiling and visibility conditions
- Runway layout and use
- Aircraft mix
- Percent arrival demand

Figure 10 illustrates the average-day, peak-month arrival and departure demand levels for MSY for each of the five annual activity levels used in the study, Baseline, Future 1, Future 2, Future 3, and Future 4.

Figure 10 Airfield Demand Levels — Daily Aircraft Operations and Average Day of Peak Month



	Annual	24-Hour Day (Average Day, Peak Month)	Peak Hour
Baseline	151,000	488	37
Future 1	213,000	689	53
Future 2	265,000	858	67
Future 3	312,000	1,010	79
Future 4	395,000	1,278	100

Figure 11 presents the airport delay curve for MSY. The curve was developed for instrument flight rules (IFR) conditions, with a 50/50 split of arrivals and departures, with arrivals on Runway 10R and departures from Runway 19L. This curve is based on the assumption that arrival and departure demand is randomly distributed within the hour. Other patterns of demand can alter the demand/delay relationship.

The curve in Figure 11 illustrates the relationship between airfield capacity, stated in the number of operations per hour, and the average delay per aircraft. It shows that, as the number of aircraft operations per hour increases, the average delay per operation increases exponentially.

Figure 12 illustrates the hourly profile of daily demand for the Baseline activity level of 151,000 aircraft operations per year. It also includes a curve that depicts the profile of daily operations for the Future 2 activity level of 265,000 aircraft operations per year.

Comparing in Figures 11 and 12 shows that

- aircraft delays begin to escalate rapidly as hourly demand exceeds 50 operations per hour, and,
- while hourly demand doesn't exceed 50 operations at Baseline demand levels, 50 operations per hour is frequently exceeded at the demand levels forecast for Future 2.

Figure 11 Hourly Flow Rate Versus Average Delay — IFR Conditions

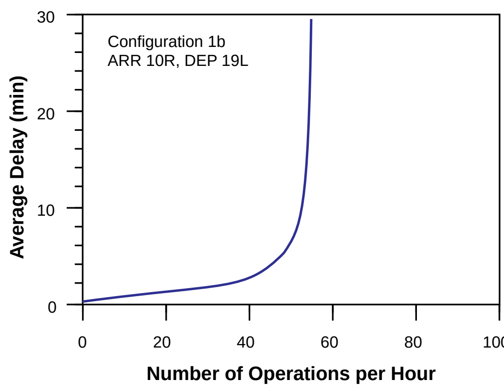
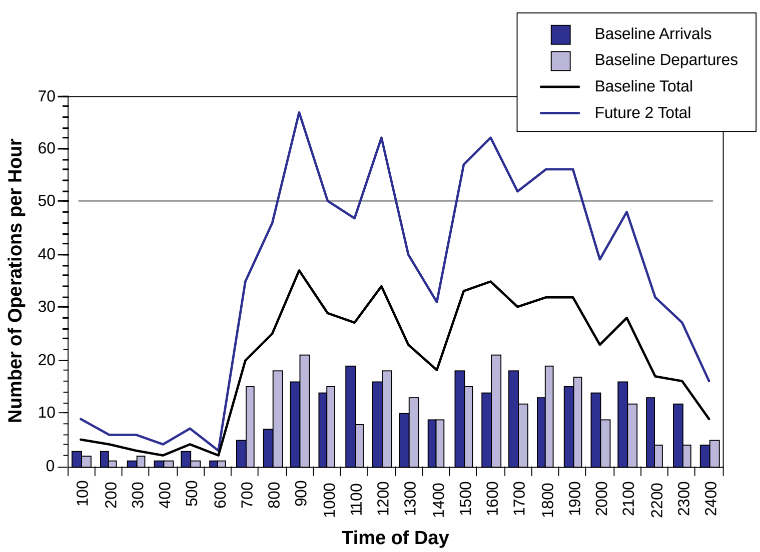


Figure 12 Profile of Daily Demand — Hourly Distribution



Aircraft Delays

Aircraft delay is defined as the time above the unimpeded travel time for an aircraft to move from its origin to its destination. Aircraft delay results from interference from other aircraft competing for the use of the same facilities.

The major factors influencing aircraft delays are:

- Weather
- Airfield and ATC System Demand
- Airfield physical characteristics
- Air traffic control procedures
- Aircraft operational characteristics

Average delay (in minutes per operation) was generated by the Runway Delay Simulation Model (RDSIM). A description of this model is included in Appendix B. If no improvements are made in airport capacity, the average delay per operation of 0.8 minutes in Baseline will increase to 2.5 minutes per operation by Future 2 and 23.7 minutes per operation by Future 4.

Under the "Do Nothing" situation, if there are no improvements in airfield capacity, the annual delay cost could increase as follows:

	Annual Operations	Annual Delay Costs Hours	Annual Delay Costs Millions of '91 $
Baseline	151,000	1,960	$1.97
Future 2	265,000	11,240	$11.31
Future 4	395,000	156,007	$156.97

Appendix A — Participants

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Appendix B
Computer Models and Methodology

The MSY Capacity Team studied the effects of the various improvements proposed to reduce delay and enhance capacity. The options were evaluated considering the anticipated increase in demand. The analysis was performed using computer modeling techniques. A brief description of the model and the methodology employed follows.

Computer Models

Airfield Delay Simulation Model (ADSIM)

This is a fast-time, discrete event model that employs stochastic processes and Monte Carlo sampling techniques. It describes significant movements of aircraft on the airport and the effects of delay in the adjacent airspace. The model was validated in 1978 at Chicago O'Hare International Airport against actual flow rates and delay data. It was calibrated for this study against field data collected at MSY to insure that the model was site-specific.

Inputs for the simulation model were derived from empirical field data. The model repeated each experiment 10 times using Monte Carlo sampling techniques to introduce system variability, which occurs on a daily basis in actual airport operations. The results were averaged to produce output statistics. Total and hourly aircraft delays, travel times, and flow rates for the airport and for the individual runways were calculated.

Runway Delay Simulation Model (RDSIM)

RDSIM is a short version of the ADSIM model that simulates only the runways and runway exits. There are two versions of the model. The first version ignores the taxiway and gate complexes for a user-specified daily traffic demand and is used to calculate daily demand statistics. In this mode, the model replicated each experiment forty times, using Monte Carlo sampling techniques to introduce daily variability of results, which were averaged to produce output statistics. The second version also simulates the runway and runway exits only, but it creates its own demand using randomly assigned arrival and departure times. The demand created is based upon user-specified parameters. This form of the model is suitable for capacity analysis.

For a given demand, the model calculates the hourly flow rate and average delay per aircraft during the full period of airport operations. Using the same aircraft mix, computer specialists simulated different demand levels for each run to generate demand versus delay relationships.

Methodology

Model simulations included present and future air traffic control procedures, various airfield improvements, and traffic demands for different times. To assess the benefits of proposed airfield improvements, the FAA used different airfield configurations derived from present and projected airport layouts. The projected implementation time for air traffic control procedures and system improvements determined the aircraft separations used for IFR and VFR weather simulations.

For the delay analysis, agency specialists developed traffic demands based on the *Official Airline Guide*, historical data, and various forecasts. Aircraft volume, mix and peaking characteristics were developed for three demand periods (Baseline, Future 1 and Future 2). The estimated annual delays for the proposed improvement options were calculated from the experimental results. These estimates took into account the yearly variations in runway configurations, weather, and demand based on historical data.

The potential delay reductions for each improvement were assessed by comparing the annual delay estimates with the Do Nothing case.

The RDSIM model, in its capacity mode, was used to perform the capacity analysis for MSY.

Appendix C — Glossary

ADSIM	Airfield Delay Simulation Model
AIP	Airport Improvement Program
ARFF	Aircraft Rescue and Firefighting
ATC	Air Traffic Control
ATCT	Airport Traffic Control Tower
FAA	Federal Aviation Administration
GA	General Aviation
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
MI	Miles
MSY	New Orleans International Airport
NAVAID	Navigation Aid
NM	Nautical miles
RDSIM	Runway Delay Simulation Model
SIMMOD	Airport and Airspace Simulation Model
TACAN	Tactical Air Navigation — UHF omnidirectional course and distance information
TERPS	Terminal Instrument Procedures
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VOR	VHF Omnidirectional Range — course information only
VORTAC	Combined VOR and TACAN navigational facility

Credits:

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