

CHAPTER 4

FACILITIES ANALYSIS

An airport's runways, taxiways, aprons, and terminal facilities are planned to meet current and forecasted demand. Since airport demand is a market driven condition based on the wants and needs of airport users, a key objective of this study is to develop a plan that addresses both the transportation and economic needs of the aviation community and local population. The recommended improvements are based upon a review of the airport's existing facilities, conformance of these facilities to current Federal Aviation Administration (FAA) design and safety standards, and the capacity of the airport's facilities to meet the current and forecasted demand. The recommended improvements will be used to develop the Airport Layout Plan (ALP), presented in Chapter 5, as well as the Airport's Capital Improvement Program (CIP) presented in Chapter 6. Both the ALP and CIP will be submitted to the Massachusetts Aeronautics Commission (MAC) and the FAA for approval.

4.1 AIRPORT DESIGN STANDARDS

In AC 150/5300-13 *Airport Design*, the FAA establishes certain design and safety standards for all airports in the United States receiving federal grants. The purpose of these design standards is to enhance aviation safety and to improve the capacity of the national airport system. Airports are required to conform to these standards as best as possible. Facilities that are not in compliance with current standards must be improved as soon as possible, provided it is economically feasible to do so and all environmental or public concerns are adequately addressed.

4.1.1 Design Aircraft

Single and multi-engine piston aircraft accounted for approximately 99.5-percent of the annual operations at Mansfield Municipal Airport in 1999. These aircraft have wingspans of less than 49-feet and approach speeds less than 121 knots and are members of design group B-I as defined in AC 150/5300-13. The remaining 0.5-percent of the aircraft are larger twin-engine aircraft that are defined as design group B-II in AC 150/5300-13. B-II aircraft are typified by having wingspans of less than 79-feet and approach speeds less than 121 knots.

The forecast of future activity included in Chapter 3 estimated that the larger B-II aircraft will begin using the airport as facilities are improved and economic conditions continue to grow. It is forecasted B-II aircraft will account for more than 500 annual operations somewhere in the 2007 timeframe that, if realized, would necessitate a change in the ARC and the corresponding design standards. The design standards for both B-I and B-II aircraft will be presented in this Facility Analysis section.

4.1.2 Runway Classification and Approaches

The two runways at Mansfield Municipal Airport are currently considered **utility** runways. A utility runway is a runway constructed for and intended to be used by propeller driven aircraft of

12,500 pounds maximum gross weight. Runway 14-32 has two published non-precision instrument approaches: a non-directional beacon (NDB) approach and a geographic positioning system (GPS) approach.

The minimums for both of these approaches vary depending on the type of approach. Both the straight-in NDB approach and circling NDB approach to Runway 32 have visibility minimums equal to or greater than a mile with minimum decent altitudes of 720-feet above mean sea level. The straight-in GPS approach to Runway 32 has a visibility minimum greater than or equal to one mile and a minimum decent altitude of 520-feet above mean sea level (MSL) or higher. The circling GPS approach to Runway 32 has a visibility minimum of greater than or equal to one mile and a minimum decent altitude of 600-feet above mean sea level (see Figures 4.1 and 4.2).

It is not likely that the airport’s instrument approaches will improve to a point that it will affect the design standards. In order for this to occur, either a precision instrument approach would have to be established or the approach minimums would have to be lowered to less than 3/4 of a mile. The likelihood of either happening is minimal due to the physical limitations of the airport and the types of aircraft using it.

It was discussed previously that the Design Aircraft is anticipated to change from B-I to B-II within the next 10-years. Due to the limiting factor of usable runway length, the B-II aircraft that are forecasted to use the airport on enough frequency to be deemed “critical” (at least 500 annual operations), will continue to be utility aircraft. Therefore, the airport will continue to be a “utility” category airport according to FAR Part 77 criteria (see Table 4-1).

TABLE 4-1

RUNWAY CLASSIFICATION AND APPROACH CAPABILITIES

<u>Runway</u>	<u>Existing</u>	<u>Ultimate</u>
Runway 14-32	Utility	Utility
Runway 4-22	Utility	Utility
Runway 14 Approach	Visual	Visual
Runway 32 Approach	Non-Precision (visibility >1 mi)	Non-Precision (visibility >1 mi)
Runway 4 Approach	Visual	Visual
Runway 22 Approach	Visual	Visual

Source: Campbell and Paris Engineers, P.C. 2001

4.1.3 Separation Standards

An important element to the safe movement of aircraft while on the ground is the proper separation of aircraft to each other and to fixed or moveable objects. The FAA standards concerning the separation of aircraft are based on the design aircraft and the visibility minimums of a runway. Table 4-2 presents key separation standards for both B-I and B-II design groups with visibility minimums greater than three-quarters of a mile.

Figure 4.1

Figure 4.2

TABLE 4-2

RUNWAY/TAXIWAY GROUP B-I AND B-II DESIGN STANDARDS		
<u>Component</u>	<u>Design Group B-I</u>	<u>Design Group B-II</u>
Runway Centerline to Parallel Taxiway Centerline	150'	240'
Runway Centerline to Terminal Taxiway Centerline	150'	240'
Runway Centerline to Aircraft Parking Area	125'	250'
Taxiway Centerline to Parallel Taxiway/Taxilane	69'	105'
Taxilane Centerline to Parallel Taxiway	64'	97'
Taxiway Centerline to Fixed or Movable Object	44.5'	65.5'
Taxilane Centerline to Fixed or Movable Object	39.5'	57.5'

Source: Campbell and Paris Engineers, P.C., 2001

4.2 RUNWAY 14-32

A review of the FAA design standards applicable to this runway revealed that the runway meets many of the standards for the current design group, with the exception of the runway safety areas and some obstructions within the transitional and approach surfaces (see Table 4-5). Specific recommendations concerning improvements required to meet all of the standards are discussed in later sections of this chapter. Vegetation on and around the airport that may be considered obstructions to air navigation are being addressed as part of an independent Vegetation Management Plan study currently underway.

4.2.1 FAA Design Standards

Runway Width: Runway 14-32 is currently 75-feet wide. The minimum runway width for the current design group B-I aircraft is 60-feet. The standard runway width for design group B-II aircraft is 75-feet. The runway meets the required standard for the both the existing and future design aircraft.

Runway and Taxiway Separation: The current distance between the centerline of Runway 14-32 and the centerline of the parallel taxiway is 200-feet. The standard runway centerline to taxiway centerline for design group B-I is 150-feet (for small aircraft exclusively), 225-feet for design group B-I (with large aircraft included) and for design group B-II is 240-feet. The existing runway/taxiway centerline separation meets this standard for design group B-I (small aircraft exclusively). The taxiway would have to be relocated 25-feet to the northeast to meet the design requirements for design group B-I (with large aircraft), or 40-feet to the northeast to meet design requirements for design group B-II.

Runway and Apron Separation: The current separation between the centerline of Runway 14-32 and the edge of the main apron is 295-feet. The standard minimum

separation for design group B-I (small aircraft exclusively) is 125-feet, for design group B-I (with large aircraft included) is 200-feet and for design group B-II, 250-feet. The runway meets the required standard for the both the existing and future design aircraft.

Runway Safety Areas: Runway safety areas are prepared turf surfaces that surround a runway end and are required to be “clear and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations.” The current safety area off the approach end to Runway 14 is approximately 200-feet long by 120-feet wide. The current safety area off the approach end to Runway 32 is 220-feet long by 120-feet wide. The minimum safety area for design group B-I is 240-feet long by 120-feet wide and 300-feet long by 150-feet wide for design group B-II. The runway does not meet the Runway Safety Area requirements for either the existing or future design aircraft. An additional forty-feet (40) of safety area is necessary on the approach end to Runway 14 while an additional twenty (20) feet of safety area is necessary on the approach end to Runway 32 to meet current standards. To the satisfy design group B-II standards, an additional 100-feet of safety area is necessary on the approach end to Runway 14 and an additional 80-feet of safety area is necessary on the approach end to Runway 32 and the safety area would have to be widened by 30-feet for the entire length of Runway 14-32 (see Table 4-3).

TABLE 4-3

RUNWAY SAFETY AREA IMPROVEMENTS REQUIRED TO MEET VARIOUS FAA DESIGN GROUP STANDARDS

Existing Conditions			
Runway 14 Length Beyond RE		200	
Runway 14 Width		120	
Runway 32 Length Beyond RE		220	
Runway 32 Width		120	
FAA Standard			
Measurement	Design Group B-I - SAE	Design Group B-I	Design Group B-II
Length Beyond Runway End	240	240	300
Width	120	120	150
Required Improvement			
Runway 14 Length Beyond RE	40	40	100
Runway 14 Width	0	0	30
Runway 32 Length Beyond RE	20	20	80
Runway 32 Width	0	0	30

Source: Campbell & Paris Engineers, P.C. 2001

Runway Object Free Area: The object free area is a prepared turf surface surrounding a runway that is to be kept free of objects, except those needed for navigation or other aviation uses. The object free area off the approach end to Runway 14 is 200-feet long by 250-feet wide. The object free area off the approach end to Runway 32 is 220-feet long by 250-feet wide. The standard object free area for design group B-I (small aircraft

exclusively) is 240-feet in length and 250-feet in width, design group B-I (large aircraft included) is 240-feet in length and 400-feet in width, and for design group B-II is 300-feet in length and 500-feet in width. The runway does not meet the Runway Object Free Area requirements for either the existing or future design aircraft. An additional forty-foot (40) of object free area is necessary on the approach end to Runway 14 and an additional twenty-foot (20) is necessary on the approach end to Runway 32 to meet current standards. An additional 40-foot in length and an additional 150-foot in width is necessary on the approach end to Runway 14 to meet design group B-I (with large aircraft included) standards. To satisfy design group B-II standards, an additional 100-foot of object free area is necessary on the approach end to Runway 14 and an additional 80-foot is necessary on the approach end to Runway 32 and the object free area would have to be widened by 250-foot for the entire length of Runway 14-32 (see Table 4-4).

TABLE 4-4

RUNWAY OBJECT FREE AREA IMPROVEMENTS REQUIRED TO MEET VARIOUS FAA DESIGN GROUP STANDARDS

Existing Conditions			
Runway 14 Length Beyond RE			200
Runway 14 Width			250
Runway 32 Length Beyond RE			220
Runway 32 Width			250
FAA Standard			
Measurement	Design Group B-I - SAE	Design Group B-I	Design Group B-II
Length Beyond Runway End	240	240	300
Width	250	400	500
Required Improvement			
Runway 14 Length Beyond RE	40	40	100
Runway 14 Width	0	150	250
Runway 32 Length Beyond RE	20	20	80
Runway 32 Width	0	150	250

Source: Campbell & Paris Engineers, P.C. 2001

Runway Protection Zone: The runway protection zone is a trapezoidal-shaped area that is longitudinally centered on the extended runway centerline and has a predetermined inner and outer width and a predetermined length. The length and width of the runway protection zone is predicated upon the visibility minimums and the aircraft approach category of the critical aircraft. For existing conditions of design group B-I (small aircraft exclusively), the runway protection zone has an inner width of 250-foot, and outer width of 450-foot, and a horizontal length of 1,000-foot. For design group B-I (large aircraft included), the runway protection zone has an inner width of 500-foot, an outer width of 700-foot and a horizontal length of 1,000-foot.

The Federal Aviation Administration recommends that the airport sponsor have “sufficient property interest” on the land included in the runway protection zone. In

1999, the airport does not have sufficient property interest over the land included in the runway protection zone to Runway 32. The entire existing runway protection zone off of the approach end to Runway 14 is located on airport property (approximately 8.03-acres). Approximately 7.3-acres of the existing runway protection zone off of the approach end to Runway 32 is located on airport property with the remainder of the existing runway protection zone located over the right-of-way to Interstate-495. To the dimensions discussed above for a design group B-I Runway Protection Zone, it is recommended that the Town of Mansfield purchase in fee simple, as land becomes available on the real estate market, the portion of land located in the runway protection zone that is located off airport property. Until such time as land is available for purchase in fee simple, it is recommended that the airport purchase avigation easements over the portions of the Runway Protection Zone that extend off-airport property. The cost of purchasing the land in fee simple or avigation easements is eligible for federal AIP grants and state matching funds.

4.2.2 CFR 14 Part 77 Surfaces

Primary Surface: is a rectangular surface that is longitudinally centered on the runway centerline. The elevation of any point of the primary surface is equal to the elevation of the nearest point on the runway centerline. The width of the primary surface is dependent upon the type of approach existing and planned for the runway and the visibility minimums. For runways with a specially prepared hard surface, the primary surface extends 200-feet beyond the physical end of the runway. For runways that do not have a specially prepared hard surface, the primary surface does not extend beyond the physical end of the runway.

Even though the runway is classified as a utility runway, Runway 32 has a published non-precision instrument approach resulting in a primary surface 500-feet wide and extending 200-feet beyond each runway end. The width of the primary surface includes vegetation thus creating obstructions to the primary surface. The airport does not meet the requirement of maintaining the primary surface clear of obstructions. The obstructions have not been formally evaluated by the FAA to determine if any of the obstructions are “hazards to air navigation.”

Transitional Surface: This surface rises at a slope of one-foot vertical for every seven-feet of horizontal distance (7:1) as measured at 90-degree angles from the runway and extended runway centerline. The transitional surface starts at the edge of the primary surface and approach surface and terminates when intersecting the horizontal surface 150-feet above the established airport elevation. The width of the primary surface at Mansfield Municipal will bring vegetation into the transitional surface thus creating obstructions to the transitional surface. The airport does not meet the requirement of maintaining the transitional surface clear of obstructions. The obstructions have not

been formally evaluated by the FAA to determine if any of the obstructions are “hazards to air navigation.”

In addition to vegetative obstructions, the blimp tie-down area is located approximately 750-feet to the north of the Runway 14-32 centerline and 500-feet from the edge of the existing primary surface. The use of the tie down area is such that the nose of the blimp is tied down while the body of the ship is allowed to rotate into the wind, thus creating a circular tiedown area equal to the length of the ship. At no time is more than one ship tied down at Mansfield Municipal Airport. The most common blimp to use the airport is approximately 145-feet in length and approximately 65-feet in height (including the gondola, fins and landing gear). Given these dimensions, a tied down blimp would present a 65-foot object, approximately 355-feet from the edge of the existing primary surface. The height of the transition surface at this location is approximately 51-feet. The blimp tie-down area presents an obstruction to the transitional surface. The airport does not meet the requirement of maintaining the transitional surface clear of obstructions. The obstructions have not been formally evaluated by the FAA to determine if any of the obstructions are “hazards to air navigation.”

Approach Surfaces: This is a trapezoidal shaped plane, longitudinally centered on the extended runway centerline. It extends outward and upward from each end of the primary surface. The dimensions and slope of the approach surface are determined by the approach planned or available for the runway and visibility minimums. For all utility runways, the slope of the approach surface is one-foot vertically for every twenty-feet of horizontal distance (20:1) along the extended runway centerline.

The inner width of the approach surface is always the same width as the primary surface. At Mansfield Municipal Airport, the approach surface for Runway 14-32 is 500-feet in width at its inner surface and extends for a horizontal distance of 5,000-feet at a slope of one foot vertically for every twenty-feet of horizontal distance along the extended runway centerline (20:1). The ultimate approach to Runway 32 is a non-precision approach to a utility runway which has a slope of 20:1. There are trees currently obstructing the approaches to both Runway 14 and Runway 32, resulting in the need to displace the thresholds to both runway ends. The existing obstructions have not been formally evaluated by the FAA to determine if they are “hazards to air navigation.”

TABLE 4-5

RUNWAY COMPLIANCE WITH FAA DESIGN STANDARDS AND FAR PART 77 SURFACES

<u>Runway 14-32</u>	<u>Design Group B-I</u>	<u>Design Group B-II</u>
Runway Width	Yes	Yes
Runway and Taxiway Separation	Yes	No
Runway and Apron Separation	Yes	Yes
Runway Safety Areas	No	No
Runway Object Free Area	No	No
Runway Protection Zone Area*	No	No
Runway Primary Surface	No	No
Runway Transition Surfaces	No	No
Runway Approach Surfaces	No	No
<u>Runway 4-22</u>	<u>Design Group A-I</u>	
Runway Width	Yes	
Runway and Taxiway Separation	No	
Runway and Apron Separation	Yes	
Runway Safety Areas	Yes	
Runway Object Free Area	Yes	
Runway Protection Zone Area*	No	
Runway Primary Surface	Yes	
Runway Transition Surfaces	No	
Runway Approach Surfaces	Yes	

* Runway Protection Zones are judged on the basis of sufficient property interest over off-airport portions of the RPZ.
Source: Campbell and Paris Engineers, P.C., 2001

4.3 RUNWAY 4-22

A review of the FAA design standards applicable to this runway revealed that the runway meets most standards for the current types of aircraft using the airport, with the exception of the separation between the runway and the terminal taxiway (see Table 4-5). Specific recommendations concerning improvements needed to meet all of the standards are discussed in later sections of this chapter. Vegetation on and around the airport that may be considered obstructions to air navigation are being addressed as part of an independent Vegetation Management Plan study currently underway.

Runway 4-22 is planned to remain for small aircraft exclusively and is only required to meet the design standards for small aircraft exclusively as presented in AC 150/5300-13 *Airport Design*. Runway 4-22 is planned to remain a turf runway for several reasons. First, the additional benefit gained from a paved runway does not justify the expenditure of the funds to construct and maintain the runway. Second, the paving of the runway will require a change in the Part 77 surfaces for Runway 4-22 (see Section 4.3.2). Third, the nostalgia of landing on a turf runway is important to many pilots and Mansfield Municipal is one of only a few airports that boast the combination of a turf runway and aviation facilities and services at a level consistent with municipal airports (i.e., a FBO and t-hangar units that are simply not located a many small turf

airports). The existing and ultimate design group is design group A-I small being defined as aircraft having the characteristics of typical A-I aircraft (i.e., wing-span and approach speed), but having a weight below 12,500 pounds.

4.3.1 FAA Design Standards

Runway Width: Runway 4-22 is a turf runway and is 100-feet wide and is used exclusively by small aircraft under 12,500 pounds. The standard runway width for design group A-I is 60-feet. The runway meets the minimum design standards for runway width for the existing design group.

Runway and Taxiway Separation: The terminal taxiway in Quadrant One is located west of the northern portion of Runway 4-22. The runway centerline to taxiway centerline separation is approximately 87-feet at the closest point. The standard separation for design group A-I is 150-feet. The runway does not meet the minimum design standards for runway and taxiway centerline separation for the existing design group.

In order to bring the Runway 4-22 to Terminal Taxiway centerline separation in compliance with FAA Design Standards, it is recommended in the Airport Plan Update that the turf Runway 4-22 be relocated approximately 63-feet to the east.

Runway and Apron Separation: The current separation between the centerline of Runway 4-22 and the edge of the nearest apron area is 187-feet. The standard minimum separation for design group A-I is 125-feet. The runway meets the minimum design standard for runway and apron separation for the existing design group.

Runway Safety Areas: Runway safety areas are prepared turf surfaces that surround a runway end and are required to be “clear and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations.” The current safety areas off of each end of Runway 4-22 are 240-feet long by 120-feet wide. The minimum safety area for design group A-I is 240-feet long by 120-feet wide. The runway meets the minimum standard for runway safety areas for the existing design group.

With the relocation of Runway 4-22 by approximately 63-feet to the east, portions of the runway safety area and runway object free area (see discussion below), will be located off-airport property. In order to keep all runway safety areas on airport property, it is recommended that the turf Runway 4-22 be shortened by approximately 150-feet.

Runway Object Free Area: The object free area is a prepared turf surface surrounding a runway that is to be kept free of objects, except those needed for navigation or other aviation uses. The standard object free area for design group A-I is 240-feet in length and

250-feet in width. The runway meets the minimum standard runway object free areas for the existing design group.

Runway Protection Zone: The runway protection zone is a trapezoidal-shaped area that is longitudinally centered on the extended runway centerline and has a predetermined inner and outer width and a predetermined length. The length and width of the runway protection zone is predicated upon the visibility minimums and the aircraft approach category of the critical aircraft. The runway protection zone starts 200-feet beyond the pavement available for take-off or landing. For runways serving small aircraft exclusively, the runway protection zone has an inner width of 250-feet, an outer width of 450-feet and a horizontal length of 1,000-feet. It is not forecasted that Runway 4-22 will serve any aircraft larger than 12,500 pounds and that the runway will continue to serve small aircraft exclusively.

The Federal Aviation Administration recommends that the airport sponsor have “sufficient property interest” on the land included in the runway protection zone. As of 1999, the runway protection zones off of both ends to Runway 4-22 are located both on- and off-airport-property. The runway protection zone located off the approach end to Runway 4 is entirely located off airport property (approximately 8.03-acres). The runway protection zone off the approach end to Runway 22 is located both on and off-airport property. Approximately 6.81-acres of the runway protection zone is located off-airport property and approximately 1.22-acres located on-airport property. It is recommended that the Town of Mansfield either purchase in fee simple, as land becomes available on the real estate market, the portion of land located in the runway protection zone that is located off airport property. Until such time as land is available for purchase in fee simple, it is recommended that the airport purchase avigation easements over the portions of the Runway Protection Zone that extend off-airport property.

With the relocation and reduction in length of Runway 4-22 (the reduction in length is to maintain appropriate RSA and ROFA lengths beyond end of the runway) and the characteristics of the airport property line, a greater amount of the runway protection zones for both Runway 4 and Runway 22 will be located on airport property. When Runway 4-22 is relocated to a position that allows for an adequate runway and terminal taxilane separation standard, approximately 7.72-acres of the runway protection zone for Runway 4 and approximately 6.54-acres of the runway protection zone for Runway 22 will located off-airport property. It is recommended that the Town of Mansfield either purchase in fee simple, as land becomes available on the real estate market, the portion of land located in the runway protection zone that is located off airport property. Until such time as land is available for purchase in fee simple, it is recommended that the airport purchase avigation easements over the portions of the Runway Protection Zone that extend off-airport property.

Some areas of the existing and future runway protection zones for Runway 4-22 overlap. If the airport sponsor purchases in fee simple or via avigation easements the existing areas of the runway protection zone located off-airport property, then the amount of additional area needing to be under “sufficient interest” should be identified. A total of 5.12-acres of land are located in both the existing and future runway protection zones located off-airport property for Runway 4 and approximately 5.82-acres for Runway 22.

4.3.2 CFR 14 Part 77 Surfaces

Primary Surface: This is a rectangular surface that is longitudinally centered on the runway centerline. The elevation of any point of the primary surface is equal to the elevation of the nearest point on the runway centerline. The width of the primary surface is dependent upon the type of approach existing and planned for the runway and the visibility minimums. For runways with a specially prepared hard surface, the primary surface extends 200-feet beyond the physical end of the runway. For runways that do not have a specially prepared hard surface, the primary surface does not extend beyond the physical end of the runway.

The current primary surface is 250-wide and terminates at the physical end of each runway. No change in the width of the primary surface is expected unless a non-precision instrument approach is established to Runway 4-22 or the visibility minimums lowered. The airport meets the requirement of maintaining the primary surface clear of obstructions. Should Runway 4-22 be paved in the future, the length of the primary surface beyond the physical end of the runway will increase to 200-feet. **It must be noted that the paving of Runway 4-22 is not a recommendation of this master plan.**

Transitional Surface: This surface rises at a slope of one-foot vertical for every seven-feet of horizontal distance (7:1) as measured at 90-degree angles from the runway and extended runway centerline. The transitional surface starts at the edge of the primary surface and approach surface and terminates when intersecting the horizontal surface at an elevation of 150-feet above the established airport elevation.

Although the transitional surface to Runway 4-22 is clear of vegetative obstructions, there is one obstruction to the transitional surface. The center of the blimp tie-down area is located approximately 410-feet to the east of the Runway 4-22 centerline and 285-feet from the edge of the primary surface. The use of the tie down area is such that the nose of the blimp is tied down while the body of the ship is allowed to rotate into the wind, thus creating a circular tie-down area equal to the length of the ship. At no time is more than one ship tied down at Mansfield Municipal Airport. The most common blimp to use the Airport is about 145 feet in length and about 65-feet in height (including the gondola, fins and landing gear). Given these dimensions, a tied down blimp would present a 65-foot object, approximately 140-feet from the edge of the existing primary surface. The height of the transition surface at this location is approximately 20-feet.

The blimp tie-down area does present an obstruction to the existing and future transitional surface. When blimps are parked at Mansfield Municipal Airport, Runway 4-22 is closed and the appropriate Notices-to-Airmen (NOTAMs) are issued.

Approach Surfaces: This is a trapezoidal shaped plane, longitudinally centered on the extended runway centerline. It extends outward and upward from each end of the primary surface. The dimensions and slope of the approach surface are determined by the approach planned or available for the runway and visibility minimums. For all utility runways, the slope of the approach surface is one-foot vertically for every twenty-foot of horizontal distance (20:1) along the extended runway centerline.

The inner width of the approach surface is always the same width as the primary surface. At Mansfield Municipal Airport, the approach surface for Runway 4-22 is 250-feet in width and extends outward and upward at a slope of twenty-feet horizontally for every one-foot vertically along the extended runway centerline (20:1) for a horizontal distance of 5,000-feet. The outer width of the approach surface is 450-feet at a point 5,000 horizontal feet from the end of the primary surface. No change in the approach surface is expected since Runway 4-22 is expected to remain a utility runway. The approach surface will only change if a non-precision instrument approach is installed, the visibility minimums reduced or the runway is paved. The runway meets the requirement of keeping the approach surface clear of obstructions. Should Runway 4-22 be paved in the future, the approach surface will begin 200-feet before the approach end of the runway. This change in the beginning point of the approach surface will increase the number of potential obstructions and, consequently, result in a greater number of avigation easements needed to be purchased so that obstructions to the Part 77 surfaces can be eradicated. It must be noted that the paving of Runway 4-22 is not a recommendation of this master plan.

4.4 RUNWAY LENGTH

Contrary to common belief, runway length is not a FAA design standard. The FAA suggests recommended runway lengths, however, there is no design standard, or minimum length requirement, for runways. This is because the factors that determine the amount of runway needed for an aircraft operation is dependent on many variables that would be impossible to model and then aggregate into standards for groups of aircraft. Elevation, air temperature, aircraft weight, and aircraft performance (i.e., types of engines on the aircraft and the thrust they produce) are all examples of variables that go into the determination of an aircraft's take-off or landing requirements. There are two standard ways to determine the suggested amount of runway required for take-off or landing: 1) using Federal Aviation Administration Airport Design software and 2) using aircraft performance curves for the design aircraft during a standard atmospheric day.

Since weather conditions change from place to place and from time to time, a *standard day* is commonly used to determine how atmospheric conditions affect aircraft performance. Standard day is a meteorological term that has been adopted in order to effectively measure aircraft performance in a constantly changing atmosphere. A standard day has an air temperature of 59-degrees Fahrenheit at sea level and an atmospheric pressure of 29.92-inches of mercury.

A representative critical aircraft for Mansfield Municipal Airport is the Beechcraft King Air BE-200, an Airport Reference Code B-II aircraft. The BE-200 has a wingspan of 57.9-feet and a Maximum Gross Takeoff Weight of 12,500 pounds. The BE-200 typically requires a runway length of 3,500-feet for operations at mean maximum daily temperatures which, for Mansfield Municipal, is 84-degrees Fahrenheit.

TABLE 4-6

SUGGESTED RUNWAY LENGTHS

<u>Given Information</u>			
Airport Elevation:			122-feet
Mean daily maximum temperature of the hottest month:			84 F
Maximum difference in runway centerline elevation:			3-feet
Length of haul for airplanes of more than 60,000 lbs.:			500 miles
<u>Category</u>	Dry Runway Suggested <u>Length</u>	Wet Runway Suggested <u>Length</u>	
Small airplanes with approach speeds of less than 30 knots	300'	300'	
Small airplanes with approach speeds of less than 50 knots	810'	810'	
Small airplanes with less than 10 passenger seats			
75-percent of these small airplanes	2,480'	2,480'	
95-percent of these small airplanes	3,040'	3,040'	
100-percent of these small airplanes	3,600'	3,600'	
Small airplanes with 10 or more passenger seats	4,180'	4,180'	
Large airplanes of 60,000 pounds or less			
75-percent of these large airplanes at 60-percent useful load	4,650'	5,320'	
75-percent of these large airplanes at 90-percent useful load	6,320'	7,000'	
100-percent of these large airplanes at 60-percent useful load	5,210'	5,500'	
100-percent of these large airplanes at 90-percent useful load	7,820'	7,820'	
Airplanes of more than 60,000 pounds	5,060'	5,060'	
Source: Chapter 2 of AC 150/5325-4A, Runway Length Requirements for Airport Design, no changes included			

Existing length of Runway 14-32 is 3,495-feet which will satisfy 90-percent of small aircraft with fewer than 10 seats. It would be beneficial to increase the length of Runway 14-32 by 700-feet to an overall length of 4,195-feet to enable the airport to accommodate most twin-engine turbo prop business aviation aircraft. Permanent obstructions (Interstate-495 to the east and residential homes to the west) within the approach areas to each end of the runway will permit only a 100-

foot extension to the west. It is still possible, however, to improve the operational length of the runway by constructing **stopways** at each end of Runway 14-32.

A stopway is an area beyond the takeoff runway, centered on the extended runway centerline, and designated by the airport owner for use in decelerating an airplane during an aborted takeoff. It must be at least as wide as the runway and able to support an airplane during an aborted takeoff without causing structural damage to the airplane.

There is sufficient area on-airport property to construct stopways at each end of Runway 14-32. A 375-foot stopway from the takeoff end of Runway 32, and a 225-foot stopway from the takeoff end of Runway 14 is feasible. This would increase the runway length available for takeoff to 3,720-feet on Runway 32 and 3,870-feet on Runway 14. The landing length at the airport would also increase, depending on the approach of the aircraft. With the displaced threshold on Runway 14, the available landing length to an aircraft landing on Runway 14 would be 3,287-feet. Similarly, with the displaced threshold on Runway 32, the available landing length to an aircraft landing on Runway 32 would be 3,550-feet. By providing the stopways, Mansfield Municipal would be able to accommodate 100-percent of the small aircraft with less than 10 seats.

It is important to note that the construction of stopways does not mean the airport is exempt from providing the necessary runway safety areas and runway object free areas. The runway safety area and runway object free area extend beyond the end of a stopway when a stopway is present on the runway. The provision of adequate runway safety area and runway object free area could have an environmental impact on wetlands and Back Bay Brook. The decision to apply stopways must be based on subsequent environmental study and is not recommended in the Airport Master Plan at this point.

4.5 TAXIWAYS AND TAXILANES

Taxiways and taxilanes must also meet FAA design standards as aircraft move and operate in these areas. The separation between other taxiways and taxilanes, and the separation between fixed or movable objects, are of particular importance. **Taxilanes** are like taxiways but are located on an aircraft apron or other parking or storage area and are typically found in the terminal area of an airport. Because aircraft are moving at slower speeds in these areas, the separation standards are less for taxilanes than for taxiways (see Table 4-2).

All aircraft currently using the airport are design group B-I or smaller. The minimum taxiway centerline to taxilane centerline separation for design group B-I is 69-feet. The minimum taxiway centerline to taxilane centerline separation for design group B-II is 105-feet. The parallel terminal taxiway and apron taxilane are currently separated by 160-feet, which exceeds the FAA standard for both the existing and future design groups.

The Airport does not, however, meet the required standards for the separation between the terminal apron taxilanes and parked aircraft. The minimum separation between taxilane centerline and a fixed or moveable object is 39.5-feet for design group B-I and 57.5-feet for design group B-II. The current separation between the taxilane centerlines and the parked aircraft on main terminal apron is approximately 27.5-feet.

FAA Design Standards, however, allow a smaller separation through the application of what is called a **modification of standards (MOS)**. For the minimum separation between taxilane centerline and a fixed or moveable object, the modification of standards is equal to 0.6 times the wingspan of the largest aircraft, plus 10-feet. The aircraft parked on the main terminal apron are all single-engine aircraft with a typical wingspan of approximately 36-feet. If the modification of standards is approved, the separation between the taxilane centerline and a fixed or movable object can be reduced to 32-feet. However, this is still greater than the existing separation. The design plans for the reconstruction of the main terminal apron, however, include a reconfiguration of the taxilanes and aircraft tiedowns so that they provide a 32-foot separation.

4.6 AIRPORT CAPACITY

An airport's capacity relates to both the airfield and landside capacity. The airfield capacity relates to the number of aircraft that can safely operate at an airport while the landside capacity relates to the number of aircraft that can park at the airport.

4.6.1 Airfield Capacity

It is generally useful for decision makers and the community at large to understand the relationship between an airfield's capacity and the existing and future demand. This relationship is frequently called the "demand/capacity ratio", or "D/C ratio." Typically, the FAA suggests that an airport begin the planning and design for capacity enhancing projects when demand equals 60-percent of capacity and to have capacity enhancing projects completed when demand equals 80-percent of capacity. Capacity enhancing projects are generally related to airfield geometry improvements (i.e., new taxiway exits, a new taxiway, apron expansion and in some cases, a new runway).

Based on the airfield geometry, fleet mix, and capacity guidance in AC 150/5060-5, the airfield capacity of Mansfield Municipal Airport was determined to be 230,000 annual operations per year. This capacity is not expected to increase or decrease throughout the planning horizon since no major airfield geometry projects are recommended other than the relocation of Runway 4-22 and the relocation of the existing parallel taxiway to Runway 14-32. Using the three different growth scenarios presented in Chapter Three, the airfield capacity is sufficient to accommodate the forecasted growth in operations throughout the planning horizon.

Under the low-growth scenario, the demand-capacity ratio will reach 28.9-percent by 2005, 31-percent by 2010 and 35.6-percent by 2020. Under the moderate-growth scenario, the demand-capacity ratio will reach 31.6-percent by 2005, 36.4-percent by 2010 and 48.5-percent by 2020.

Under the high-growth scenario, the demand-capacity ratio will reach 32.7-percent by 2005, 38.8-percent by 2010 and 54.8-percent by 2020 (see Table 4-7).

TABLE 4-7

AIRFIELD DEMAND AND CAPACITY			
<u>Growth-Scenario</u>	<u>2005</u>	<u>2010</u>	<u>2020</u>
Low			
Airfield Capacity	230,000	230,000	230,000
Forecasted Demand	66,469	71,254	81,882
D/C Ratio	28.9%	30.9%	35.6%
Moderate			
Airfield Capacity	230,000	230,000	230,000
Forecasted Demand	72,591	83,745	111,458
D/C Ratio	31.6%	36.4%	48.5%
High			
Airfield Capacity	230,000	230,000	230,000
Forecasted Demand	75,168	89,276	125,932
D/C Ratio	32.7%	38.8%	54.8%

Source: Campbell and Paris Engineers, P.C. 2001

4.6.2 Aircraft Parking Areas

In 1999, 109 aircraft were based at Mansfield Municipal Airport and parked on either tie-down areas or in hangars. The apron area provides 67 paved aircraft tie-downs, the t-hangars house 20 aircraft, the storage hangar can accommodate 3 aircraft, and the maintenance hangar another 3 aircraft totaling 93 potential aircraft parking positions (see Table 4-8). This leaves a current deficit of sixteen parking spaces. These 16 spaces are accommodated in various turf parking areas, some of which are in close proximity to runways and taxiways.

With the forecasted moderate-growth of 196-based aircraft by the end of the planning horizon, Mansfield Municipal Airport requires 103 additional parking positions. It is recommended that parking areas be constructed to a size that can accommodate a total of 219 aircraft parking positions to allow for adequate parking facilities for based aircraft and some un-occupied spaces for transient aircraft.

T-hangar facility requirements were predicated on the assumption that 40-percent of the based single-engine general aviation population would require hangar space. Using this assumption, the moderate-growth forecasts calls for approximately 80 t-hangar units to be constructed by the end of the planning horizon. The remaining 119 aircraft are assumed to require apron or turf tie-downs.

According to airport management, the lack of tie-down and hangar space for visiting aircraft has significantly affected the use of the airport by twin-engine turbo-prop business aviation aircraft. In addition to increased apron and hangar space for based aircraft, the airport is also in need for

transient parking space. Reserving 10- to 15-percent of total tie-downs for transient aircraft parking is typically sufficient. While the forecast of aviation demand assumed that 24-percent of annual operations at Mansfield Municipal Airport were conducted by visiting aircraft, some of this traffic is for flight training purposes which do not require tie-down or hangar space as flight training is typically touch-and-go operations. Thus, it was assumed that approximately 10-percent of the tie-down spaces should be reserved for transient parking.

The terminal area plan for Mansfield Municipal Airport accommodates approximately forty-eight (48) additional paved tie-down positions and eighteen (18) additional t-hangar spaces and two corporate hangars (see Figure 4.5). The construction of these facilities will bring total parking positions to 159 that will accommodate the forecasted based aircraft up to planning year 2012. A total of 115 paved tie-downs, 38 t-hangars and 6 corporate hangars will be available after construction of these facilities. After planning year 2012, the airport will have to consider development of aviation facilities in either Quadrant Two or Three.

TABLE 4-8

“NEED-GAP” ANALYSIS FOR AIRCRAFT PARKING/STORAGE POSITIONS

<u>Unit of Storage</u>	<u>Existing Spaces (1999)</u>	<u>Based Aircraft (1999)</u>	<u>Forecasted Based Aircraft (2020)</u>	<u>Need/Gap</u>	<u>Forecasted Spaces (2000)</u>	<u>Deficit/Surplus</u>
Paved Tie-Down	67				131	
Turf Tie-Down	0				0	
Hangar	6				6	
T-Hangar	20				80	
TOTAL	93	109	196	-103	217	23

Source: Campbell and Paris Engineers, P.C., 2001

4.6.3 Automobile Access

Both Quadrant One and Quadrant Four are accessible by automobile, however only Quadrant One is accessible via a paved road. The other two quadrants are not accessible by automobile at all (see Figure 1.1). The key to future development at Mansfield Municipal Airport is automobile access to Quadrant Four.

As indicated in Section 4.6.2, the airport has a significant shortage of aircraft apron and hangar areas. Quadrant One is almost fully developed and can only accommodate one additional apron area. All other airport development must occur within the other quadrants. However, in order to develop aircraft apron and hangar facilities within these quadrants, the areas must be made accessible to automobiles. It should be noted that Quadrants Two and Three and portions of Quadrant Four are reserved for future aviation development as demand for aviation facilities grows.

4.6.4 Aircraft Maintenance Facilities

Maintenance space requirements at Mansfield Municipal Airport were developed based on the frequency of maintenance activities required for the different types of aircraft forecasted to use the airport on a regular or transient basis. The small single-engine general aviation aircraft typically only requires several maintenance days a year while the larger multi-engine and business aviation aircraft may require more frequent maintenance activity. The assumptions used to generate the required maintenance facilities at Mansfield Municipal are summarized below:

MAINTENANCE SPACE AND DEMAND FACTORS	
➤	Based single engine aircraft need maintenance space 5 days per year for annual inspections/routine maintenance.
➤	Based multi-engine aircraft need maintenance space 12 days per year for annual inspections/routine maintenance/Part 135 (100 hour) maintenance.
➤	Based turboprop, business jets, and helicopters need maintenance space 5 days per month for cycle maintenance/Part 135 (100 hour)/routine maintenance.
➤	Based aircraft requirements are increased by 10% to accommodate transient demand
➤	25% of based aircraft population will have maintenance performed elsewhere
➤	All space requirements equal 2x storage factors: <ul style="list-style-type: none"> ➤ SE/ME and Helos: 3,600 sq. ft. ➤ TP: 7,800 sq. ft. ➤ TJ: 17,200 sq.ft.
➤	Office requirements are equal to 20-percent of total hangar space.
Source: Campbell & Paris Engineers, P.C. 2001	

The application of these planning factors to the forecasted based aircraft at Mansfield Municipal results in the apparent need to provide additional maintenance facilities. The 6,144 square foot maintenance facility operated by Casey Aviation will provide adequate aircraft maintenance space for the immediate short term planning horizon. The projected growth in single-engine general aviation aircraft and based multi-engine aircraft will result in the need to construct approximately 11,000 square feet of maintenance space by the end of the planning horizon which results in the need to construct a 5,000 square foot addition or new maintenance building at the airport. Figure 4.3 illustrates a maintenance hangar commensurate with the forecasted facility requirement for maintenance facilities at Mansfield. Table 4-9 presents the facility requirements by planning year.

TABLE 4-9

MAINTENANCE FACILITY REQUIREMENTS BY PLANNING YEAR

<u>Input</u>	<u>2005</u>	<u>2010</u>	<u>2020</u>
Based SE Aircraft	126	145	192
Based ME Aircraft	3	3	5
Based TP	0	1	2
Based TJ	0	0	0
Based Helo	0	0	0
Based Aircraft Requiring Maintenance	97	112	150
Total Maintenance Requirement (sq. ft.)	5,419	6,404	8,723
Office Markup	1.2	1.2	1.2
Total Building Space (sq. ft.)	6,503	7,685	10,467

Source: Campbell and Paris Engineers, P.C. 2001

4.7 EXISTING ON-AIRPORT LAND USE

4.7.1 Quadrant One

Quadrant One is approximately 33-acres in size and contains the airport's terminal building, FBO facilities, aprons, and aircraft hangars. With the exception of approximately three acres above the East Ramp, there is no other land in this quadrant suitable for future development. The remaining undeveloped areas within this quadrant are restricted due to the proximity of the airport's runways and associated design standards and Part 77 surfaces or due to environmental concerns.

4.7.2 Quadrant Two

Quadrant Two is approximately 21-acres in size and, except for the runway system, is not developed. Approximately five acres of land are suitable for development with the remaining portions of this quadrant not suitable for development because of the associated design standards and Part 77 surfaces for Runway 14-32 and Runway 4-22.

4.7.3 Quadrant Three

Quadrant Three is approximately 58-acres in size and, except for the runway system, is not developed. There is currently no vehicle access to this quadrant. Due to the airport's runway system and associated design standards and Part 77 surfaces to the north and west and wetland areas to the east, approximately 15-acres of this quadrant is suitable for future development. This area has very good access to both runways and is the largest area suitable for aviation development. However, the development is not anticipated in the immediate future and will be contemplated only if economic conditions dictated in the long-term (i.e., 10-20 years).

Figure 4.3 Maintenance Hangar

FIGURE 4.4

4.7.4 Quadrant Four

Quadrant Four is approximately 100-acres in size and, except for the runway and taxiway system, is not developed. Vehicle access, water, sewer, electric, and phone service is available from Fruit Street. Due to the airport's runway system to the south and west and associated design standards and Part 77 surfaces and wetland areas to the east, approximately ten -acres of this quadrant is suitable for development. This area will be developed for apron and hangar use in the immediate future. The Airport Commission has set aside their share of capital improvement funds for these projects.

4.8 DEVELOPMENT STRATEGY

The future development of Mansfield Municipal Airport needs to follow a specific strategy in order to fully utilize its existing resources and to maximize its potential revenue returns. In order to accomplish this, the following objectives were identified:

- Compliance Improvements;
- Community Impacts;
- Capacity Improvements;
- Economic Return;
- Compatibility of Existing Land-Use;
- Transportation and Economic Needs, and;
- Implementation Priorities

4.8.1 Compliance Improvements

In order to provide the safest and most efficient airport as possible, and to ensure that the airport continues to receive federal and state funding assistance, the airport's facilities must be brought into full compliance with current FAA design standards. Table 4-5 identified what airport facilities do not meet current FAA design standards. In order to bring the airport into compliance, the Runway 14-32 Safety Areas need to be expanded, the Runway 14-32 Object Free Area needs to be cleared and graded and Runway 4-22 needs to be moved approximately 70-feet to the east. In addition, an FAA determination of obstructions to Part 77 surfaces should be accomplished. All obstructions identified as hazards to air navigation need to be mitigated as quickly as possible. The improvements to Runway 14-32 Safety Area and Object Free Area, as well as moving Runway 4-22, may require an environmental review.

4.8.2 Community Impacts

Future improvements and developments need to consider community impacts. Like many airports, the primary community impact at Mansfield Municipal Airport is noise. The Airport Commission and management have made significant efforts to minimize noise impacts within their legal abilities to do so. The infield area within Quadrant Four offers the best opportunity to balance future development needs and community impacts. Airport management encourages

community input to reduce the potential for negative impact on the neighborhood due to future development activities.

4.8.3 Capacity Improvements

The airport's throughput capacity is currently at 27-percent of the annual service volume and is not expected to reach the 60-percent threshold until after the planning horizon. However, demand for aircraft parking spaces at the airport is currently greater than capacity. As discussed in Section 4.6.2, the airport needs significantly more apron tie-downs and hangar storage to accommodate current demand and the anticipated growth over the planning horizon. The lack of tie-down areas hinders the number of visiting aircraft that the airport can accommodate and the ability for the airport to attract more based aircraft.

Another capacity improvement is the construction of a holding bay on the approach end of Runway 32. FAA guidance suggests that a holding bay is warranted when activity at the airport exceeds 30 peak hour operations. Using the moderate forecast and FAA guidance found in Advisory Circular 150/5060-5 "Airport Capacity"; it is anticipated that Mansfield Municipal will exceed 30 peak hour operations in 2018. It is recommended that the holding bay be included as part of the reconstruction/relocation of the parallel taxiway. The holding bay will replace the existing by-pass taxiway on the approach end of Runway 32 and will provide the same function as the by-pass taxiway by providing a location for aircraft to hold without obstructing the taxiway. The construction of the holding bay will provide a dedicated space where pilots can perform last minute pre-flight checks and receive instructions from ATC. Based on the information contained in the Pavement Management Plan in Appendix E and the moderate forecasts of aviation demand, the reconstruction of the taxiway is programmed for 2015.

4.8.4 Economic Return

In order to help finance future improvements as well as apron and hangar developments, the airport needs to generate additional revenues. Terms within the current lease agreement for the management and maintenance of the airport restrict the airport from receiving additional revenues for improvements or developments within Quadrant One. Therefore, future improvements and developments, such as new hangar and apron areas, should be encouraged within Quadrant Four.

4.8.5 Compatibility of Existing Land Use

To best utilize the airport's existing resources, future improvements should be encouraged within areas that are suitable for development. The infield area within Quadrant Four is mostly cleared and available for development. Although a paved road will need to be constructed, automobile access to Quadrant Four is available from Fruit Street through Gate D. Furthermore, the area that borders Route 495 within Quadrant Three is also suitable for development such as apron, hangar, and blimp tie-down areas. This is not currently being contemplated except as a

very long-term possibility. In addition to on-airport land-use, the compatibility of off-airport land-uses needs to be monitored.

4.8.6 Transportation & Economic Needs

Mansfield Municipal Airport is an important part of the local economy. The airport provides local business and commercial facilities with access to the national air transportation system. The Guide to Mansfield Municipal Airport prepared by the Massachusetts Aeronautics Commission and the Airport Commission provides important data concerning the value of the airport and of the Statewide Airport System. A primary goal of the airport is to continue to meet the aviation transportation needs of the local community which can be accomplished by providing adequate apron, hangar, and fueling services, and by ensuring that the runway system meets the needs of corporate and business aircraft.

The future requirements of the airport's runway system may change as local economic conditions and developments change. The airport's primary runway is 3,500-feet long that can accommodate many of the small general aviation aircraft. Performance curves for business aviation aircraft reveals that these aircraft typically require a runway greater than 4,000-feet in length.

4.8.7 Implementation Priorities

The information presented in this chapter has discussed compliance, capacity, and land use issues and the recommended improvements that will be implemented over a period of time. Priority should be given to meeting compliance requirements, meeting current capacity constraints, and aimed at realistic future demands. The recommendations of this report are based on an estimate of future needs presented over a period of time. Like any planning study, the larger the planning horizon, the less accurate the results become. Improvements that are presented as long-term issues should be considered more as guidelines for future development, or protection of future options, rather than absolute recommendations.

4.9 RECOMMENDED IMPROVEMENTS

Based on the information presented in this chapter, a series of recommended improvements have been identified and are presented in this section. The prioritization of these improvements, the estimated cost, and the implementation schedule are presented in Chapter 6. The recommended improvements have been grouped in three categories: Compliance Improvements, Capacity Improvements, and Pavement Reconstruction.

4.9.1 Compliance Improvements

Mansfield Municipal Airport is required by federal regulations to comply with current FAA design standards. Several deficiencies, including inadequate Runway Safety Areas beyond each end of Runway 14-32, the Object Free Areas beyond each end of Runway 14-32, obstructions

within the approaches to Runway 14-32, and the separation between the terminal taxiway and Runway 4-22.

1. **Runway 14-32 Safety Areas:** The Runway Safety Area (RSA) for Runway 14-32 does not meet FAA design standards for design groups B-I or B-II aircraft. The FAA standard RSA for design group B-I aircraft is 240-feet in length by 120-feet in width and for B-II aircraft, 300-feet in length by 150-feet in width. The areas beyond each end of Runway 14-32 do not meet either the existing or future design groups.

Back Bay Brook and associated vegetation are located approximately 200-feet from the approach end of Runway 14 and is within the required safety area. A wetland area is located approximately 220-feet from the approach end to Runway 32. Some grading, filling, and vegetation control needs to be conducted to make this area suitable for supporting aircraft or emergency equipment. It is recommended that safety areas initially 240-feet beyond the ends of Runway 14-32 be constructed with the capability of being expanded to 300-feet beyond the ends of Runway 14-32 if and when the design group changes to group B-II.

2. **Runway 14-32 Object Free Areas:** The Runway Object Free Area (OFA) for Runway 14-32 does not meet FAA Design Standards for design groups B-I or B-II aircraft. The FAA standard OFA for design group B-I is 240-feet beyond the runway end and 250-feet in width and for B-II aircraft, 300-feet beyond the runway end and 500-feet in width.
3. **Runway 14-32 and Runway 4-22 Runway Protection Zone Property Acquisition:** With portions of the existing and ultimate Runway Protection Zones to Runways 4, 14, 22 and 32 located off airport property, the airport does not meet the standard of having sufficient property interest over the Runway Protection Zones. It is recommended that the Town of Mansfield either purchase in fee simple, as land becomes available on the real estate market, the portion of land located in the runway protection zone that is located off airport property. Until such time as land is available for purchase in fee simple, it is recommended that the airport purchase avigation easements over the portions of the Runway Protection Zone that extend off-airport property.
4. **Runway 14-32 and Parallel Taxiway Separation:** Currently, the runway centerline and taxiway centerline are separated by 200-feet. The current separation standard is 150-feet for group B-I aircraft. It is recommended that the parallel taxiway to Runway 14-32 be shifted 40-feet to the north in order to satisfy group II design standards.
5. **Runway 4-22 and Terminal Taxiway Separation:** The required separation between the runway centerline and the terminal taxiway centerline is 150-feet for design group B-I and 240-feet for design group B-II aircraft. **In order for the airport to comply with the required separation standards, it is recommended that Runway 4-22 be re-located by approximately 70-feet to the east.** When

Runway 4-22 is relocated, the runway will need to be shortened by 200-feet in order to have the entire length and width of the runway safety areas and runway object free areas on airport property and underneath airport control.

6. **Main Terminal Apron Taxiway Centerline and Fixed- or Moveable-Object Separation:** The standard separation for design group B-I aircraft is 39.5-feet and 57.5-feet for design group B-II aircraft. It is recommended that, based on the wingspan of the Cessna 182 (36-feet), that a modification of standard be approved so that the taxiway object free area is reduced to 32-feet. Furthermore, all future aprons should be sized adequately so that both Group I and Group II parking spaces can be accommodated with the standard taxiway to fixed or moveable object distances
7. **Runway 14-32 Approaches:** Both approaches to Runway 14-32 have trees within them that are considered obstructions to air navigation. As a result, both runway thresholds are displaced away from the physical ends of the runway. The threshold to Runway 14 is displaced approximately 579-feet and the threshold for Runway 32 is displaced 155-feet. The efficiency of Runway 14-32 is reduced because of the displaced thresholds that render portions of Runway 14-32 not available for landing. The extent of trees penetrating the approach surface, and the method by which they should be rectified is addressed in the Airport's Vegetation Management Plan, a separate study that is currently in progress. It is recommended that the airport remove all on-airport obstructions as soon as possible and to work towards achieving the ability to remove off-airport obstructions by purchasing control of all Runway Protection Zones and purchasing aviation easements over properties that have obstructions located on them.
8. **Runway 4-22 and Runway 14-32 Transitional Surfaces:** The transitional surfaces to Runway 4-22 and Runway 14-32 have both natural and man-made obstructions to them. Natural obstructions consist of trees and shrubbery while the location of the blimp tie-down represents a man-made obstruction. It is recommended that the airport remove all on-airport obstructions by removing trees and shrubbery and relocating the existing blimp tie-down within Quadrant Four in such a location that allows both runways at Mansfield Municipal Airport to remain open. Improvements needed to satisfy safety and design standards are recommended for implementation in the short-term planning horizon (2000-2005). A more detailed implementation schedule is provided in Chapter 6 of the report.

4.9.2 Capacity Improvements

As a result of the information presented in this chapter, several improvements to Mansfield Municipal Airport are recommended in order to improve the airport's capacity to properly park and store aircraft. These improvements include the construction of additional aircraft apron areas, hangar facilities and improvement of the existing gravel access road to Quadrant Four (see

Figure 4.3). In addition, the relocation of the blimp tie-down area in Quadrant Four is recommended so that the transitional surfaces to Runways 14-32 and 4-22 are no longer penetrated by the presence of a blimp at the airport.

Aircraft Apron and Hangar Areas: Section 4.6.2 provided a detailed discussion on the need for additional apron and hangar areas to meet the current and forecasted shortage of aircraft parking spaces (see Table 4-6). As of 1999, the airport had a shortage of sixteen (16) aircraft tie-downs or hangar spaces. Assuming the number of parking spaces remains the same, the shortage of aircraft parking positions will increase to approximately thirty-seven (37) by the end of the short-term planning horizon (2000-2005) and to 103 by the end of the long-term planning horizon (2006-2020). Several planned improvements are recommended in order to satisfy the existing and forecasted demand for parking positions when the forecasted demand is proven to be imminent:

1. **Pursue Environmental Approval for Quadrant Four Development:** Any required coordination/approval for the Quadrant Four development is expected to be accomplished in initial MEPA Environmental Notification Form (ENF) process. The initial ENF process will also address other projects expected for the short-term such as improvement to runway safety areas.
2. **Construction of Access Road to Quadrant Four:** This road can be constructed with no wetland impact and little if any environmental impact.
3. **Construction of Aviation Facilities in Quadrant Four:** Proposed Quadrant Four development will include provision of an access road, automobile parking lot, 43 paved aircraft parking spaces and two small corporate-sized hangars.

Automobile Access: Several capacity enhancing projects are recommended for the landside of Mansfield Municipal Airport. These include a new access road and new parking facilities for automobiles.

1. **Quadrant Four Access Road:** In order to provide automobile access to Quadrant Four, a new access roadway will need to be constructed. This road can be constructed without requiring wetland fill. It is important that the access road remain clear of object free areas and imaginary surface areas for Runway 4-22.
2. **Environmental Approval for Quadrant Four Access Road:** ENF processing for the access road will be accomplished at the same time as for other projects such as the remainder of Quadrant Four development and improvement of runway safety areas.

Most of the capacity improvements are needed to meet existing demands, or to meet forecast demand within the short-term planning period (2000-2005). Some of these projects may take longer to implement due to funding limitations. Any long-term development in Quadrant Three

is completely dependent on economic conditions in the long-term future. It is unlikely at this point in time that this area will be developed for the foreseeable future. (see Appendix C).

4.9.3 Reconstruction of Existing Pavements

A pavement analysis was conducted and several existing airfield pavements were identified as in need of reconstruction and others were identified as being in need of reconstruction in the future.

T-Hangar Taxilanes: The taxilanes between the existing t-hangars are in poor condition and in need of reconstruction. No change in the existing footprint or drainage pattern is expected as a result of the reconstruction.

Western Portion of Parallel Taxiway: This portion of the parallel taxiway was resurfaced in 1981 and is in fair condition and is showing some cracking and environmental stresses. It is nearing the end of its twenty-year life span and should be scheduled for reconstruction in the short-term planning period. As discussed in Section 4.9.1, the parallel taxiway should be shifted 40-feet to the north to achieve compliance with design group B-II criteria.

4.10 ENVIRONMENTAL OVERVIEW

The proposed improvements reviewed for environmental impacts include only those projects that are realistically expected to occur within the short-term planning period (2000-2005), or shortly thereafter. These include most of the compliance and capacity improvements discussed in Sections 4.9.1 and 4.9.2. Specifically, this overview assesses the environmental issues associated with the following projects, which are listed in no particular order:

1. Constructing 240-foot by 120-foot safety areas off of each end of Runway 14-32.
2. Moving Runway 4-22 70-feet to the east.
3. Construction of a new apron, corporate hangars, and taxiway in Quadrant Four.
4. Expansion of the East Ramp.
5. Construction of a new automobile access road to Quadrant Four.

Not included in this overview are the long-term considerations associated with the remote possibility of apron, hangar, and FBO facilities in Quadrant Three, the requirements of the possible change of design group to B-II, and any of the developments within Quadrant Three.

The Federal Aviation Administration (FAA) and the Commonwealth of Massachusetts Executive Office of Environmental Affairs provide guidelines concerning the need for environmental review of proposed improvements.

4.10.1 Actions Requiring Preparation of an Environmental Assessment (EA)

The FAA normally requires the preparation of an Environmental Assessment for a variety of airport development actions. These actions are specified in FAA Order 5050.4A "Environmental

Handbook”. A review of this document revealed that some of the proposed improvements at Mansfield Municipal Airport would necessitate the preparation of an Environmental Assessment due the potential impacts to wetland areas.

4.10.2 Actions Requiring Submission of an Environmental Notification Form (ENF)

The Massachusetts Environmental Policy Act (MEPA) includes thresholds that require the filing of an ENF, and that may or may not result in the need for further environmental review and possibly the preparation of an Environmental Impact Report (EIR). The thresholds are contained in 301 CMR 11.00. The proposed improvements to Mansfield Municipal Airport will trigger several thresholds requiring the need to file an ENF. It is likely that these thresholds will also necessitate the need for an EIR. The thresholds that will be triggered are (1) the construction of five or more acres of impervious surface; (2) the alteration of 500 or more linear feet of inland bank; (3) the construction of a new road .25 or more miles in length; and (4) the construction of a new taxiway.

4.10.3 Environmental Issues Requiring Further Review

The proposed short-term improvements will exceed several state and federal thresholds that will trigger the need for further environmental review. These thresholds are:

Wetlands: The construction of the runway safety areas at both ends of Runway 14-32 will involve approximately 1,100-square feet of wetland impact. The runway safety area on the approach end to Runway 14, will require a 70-foot long section of Back Bay Brook to be either moved or placed in a culvert. The runway safety area on the approach end to Runway 32, will require the filling of a 40-foot long by 10-foot wide bordering vegetative wetland area.

The federal threshold for wetland impacts does not quantify a minimum area of wetland impacts before further environmental review is required. The state threshold is 5,000 square feet.

Impervious Surfaces: The construction of the apron, hangar, and taxiway area in Quadrant Four and the long-term possible expansion of the East Ramp, and the construction of the two access roads will add approximately 10.5-acres of impervious surface.

There is no federal threshold for an area of impervious surface that would trigger further environmental review. The state threshold is more than five acres of impervious surface.

Inland Bank: The construction of the runway safety area on the approach end to Runway 14 could impact the banks of Back Bay Brook. The runway safety area will impact approximately 70-feet of Back Bay Brook or approximately 140-linear feet of bank.

There is no federal threshold for an area of inland bank that would trigger further environmental review. The state threshold is more than 500-linear feet.

Access Road: The proposed short-term improvements are improvements to the existing gravel road in Quadrant Four which will be approximately 950-feet in length and 25-feet in width. The road would consist solely of an internal roadway located entirely within airport property with the exception of its connection to Fruit Street.

There is no federal threshold for a new road that would trigger further environmental review. The state threshold is a new road longer than one-quarter of a mile.

New Taxiway: The proposed development in Quadrant 4 includes the construction of a new taxiway/taxilane that will be about 900-feet long. The new taxiway will provide access between the new apron and hangar areas and the existing parallel taxiway.

There is no federal threshold for a new taxiway that would trigger further environmental review. The state threshold is any new taxiway.

4.10.4 Vegetation Clearing

In order for the Airport to be in compliance with current FAA Design Standards, trees that are obstructing the runway approaches and the transitions to the sides of the runways, and the trees and bushes in the object free area need to be cleared and maintained. The clearing and vegetative maintenance of these areas are being addressed in an ongoing Vegetation Management Plan (VMP). The VMP is being prepared by the Massachusetts Aeronautics Commission per state environmental regulations.

4.10.5 Conclusion

It is clear that some further environmental review of the proposed improvements will be required given the federal and state thresholds listed above. It is likely that an Environmental Assessment will be required by the FAA to assess the wetland impacts associated with the runway safety areas. The state will require the filing of an Environmental Notification Form (ENF) because of the new impervious surfaces, the inland bank area, the new access roads and the new taxiway. The level of additional environmental review required by the state will be determined through the ENF process.

Other than the environmental issues discussed here, there are no other known environmental impacts associated with the proposed projects, considering the twenty impact categories listed in FAA Order 5050.4A and the impact categories discussed in 301 CMR 11.00.