DRAFT
Flying Cloud Airport
Joint Airport Zoning Board (JAZB)
Airport Zoning Ordinance

Airport Zoning Ordinance Update Technical Report
Draft – April 5, 2018
TABLE OF CONTENTS

ES EXECUTIVE SUMMARY............................................................................................................................... i
ES.1 INTRODUCTION......................................................................................................................................... i
ES.2 SAFETY/RISK STUDY UPDATE............................................................................................................... ii
ES.3 ECONOMIC IMPACT ANALYSIS UPDATE ................................................................................................. v
ES.4 2017 FCM AIRPORT ZONING ORDINANCE.............................................................................................. v

1. INTRODUCTION AND BACKGROUND ............................................................... 1-1
1.1 OVERVIEW ............................................................................................................................................... 1-1
1.2 REVIEW OF FCM JAZB HISTORICAL TIMELINE AND ACTIVITIES .......................................................... 1-1
1.3 SUMMARY OF DRAFT FCM ZONING ORDINANCE ............................................................................. 1-2

2. SAFETY/RISK STUDY UPDATE ......................................................................... 2-1
2.1 INTRODUCTION ....................................................................................................................................... 2-1
2.2 STUDY METHODOLOGY .......................................................................................................................... 2-1
2.3 UPDATED DATA TO BE USED IN THE ANALYSIS ..................................................................................... 2-1
  2.3.1 Crosswind Runway 18-36 Length and Position ..................................................................................... 2-2
  2.3.2 North Parallel Runway 10R-28L Designation ..................................................................................... 2-2
2.4 APPLICABLE PROBABLITY STANDARD ............................................................................................... 2-2
2.5 DEFINITION OF ANALYSIS AREAS ..................................................................................................... 2-3
2.6 ACCIDENT FREQUENCY DATA ............................................................................................................. 2-3
2.7 LOCATION AND DISTRIBUTION OF AIRCRAFT ACCIDENT DATA .................................................... 2-4
2.8 OPERATIONS FORECAST ....................................................................................................................... 2-9
2.9 CALCULATION OF ACCIDENT PROBABILITIES ................................................................................... 2-10
2.10 FINDINGS ............................................................................................................................................. 2-14

3. ECONOMIC IMPACT ANALYSIS ......................................................................... 3-1
3.1 INTRODUCTION ....................................................................................................................................... 3-1
3.2 STUDY METHODOLOGY .......................................................................................................................... 3-1
3.3 FINDINGS ................................................................................................................................................. 3-2
  3.3.1 Residential Development ..................................................................................................................... 3-2
  3.3.2 Commercial Development ................................................................................................................... 3-5
  3.3.3 Combined Development ..................................................................................................................... 3-7
  3.3.4 Potential Employment Generation Impacts ........................................................................................ 3-8
  3.3.5 Summary ........................................................................................................................................... 3-8

4. 2017 FCM AIRPORT ZONING ORDINANCE ....................................................... 4-1
4.1 INTRODUCTION ....................................................................................................................................... 4-1
4.2 FCM AIRPORT ZONING ORDINANCE LANGUAGE AND FIGURES .................................................... 4-1
  4.2.1 Permitted Residential Areas ................................................................................................................ 4-1
4.3 FCM AIRSPACE ZONES WITHIN ZONING LIMITS GRID MAPS (AIRSPACE ZONES) .......................... 4-2
4.4 FCM SAFETY ZONES WITHIN ZONING LIMITS GRID MAPS (SAFETY ZONES). 4-2
4.5 FCM MAXIMUM CONSTRUCTION HEIGHTS WITHOUT PERMIT WITHIN ZONING LIMITS GRID MAPS (MAXIMUM CONSTRUCTION HEIGHTS WITHOUT A PERMIT)................................................................................................................... 4-2

5. STAKEHOLDER ENGAGEMENT AND PUBLIC INFORMATION PROCESS ..... 5-1

5.1 INTRODUCTION ....................................................................................................... 5-1

5.2 PUBLIC COMMENT PERIOD ................................................................................... 5-1

5.3 RESPONSES TO PUBLIC QUESTIONS AND COMMENTS ................................... 5-2
  5.3.1 JAZB Safety Zone C Restrictions ..................................................................... 5-2
  5.3.2 JAZB Safety Zone B Contiguous Open Space Requirements ....................... 5-3

5.4 SUMMARY OF MNDOT AERONAUTICS REVIEW (FIRST SUBMITTAL) ........... 5-3
TABLE OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure ES-1</td>
<td>Proposed JAZB Safety Zones</td>
</tr>
<tr>
<td>Figure 1-1</td>
<td>FCM Draft Zoning Ordinance Airspace Zones</td>
</tr>
<tr>
<td>Figure 1-2</td>
<td>FCM Draft Zoning Ordinance Safety Zones</td>
</tr>
<tr>
<td>Figure 1-3</td>
<td>FCM Draft Zoning Ordinance Maximum Construction Heights Without a Zoning Permit</td>
</tr>
<tr>
<td>Figure 2-1</td>
<td>FCM Airfield Configuration</td>
</tr>
<tr>
<td>Figure 2-2</td>
<td>FCM 2017 Safety/Risk Study Analysis Areas</td>
</tr>
<tr>
<td>Figure 2-3</td>
<td>FCM 2017 Safety/Risk Study Occupant Areas</td>
</tr>
<tr>
<td>Figure 2-4</td>
<td>FCM Historical Aircraft Accident Locations (1997 – 2016)</td>
</tr>
<tr>
<td>Figure 2-5</td>
<td>Historic Nationwide GA Accident Locations Superimposed on FCM Runway 10L and 10R Ends</td>
</tr>
<tr>
<td>Figure 2-6</td>
<td>Historic Nationwide GA Accident Locations Superimposed on FCM Runway 28L and 28R Ends</td>
</tr>
<tr>
<td>Figure 2-7</td>
<td>Historic Nationwide GA Accident Locations Superimposed on FCM Runway 18 End</td>
</tr>
<tr>
<td>Figure 2-8</td>
<td>Historic Nationwide GA Accident Locations Superimposed on FCM Runway 36 End</td>
</tr>
<tr>
<td>Figure 2-9</td>
<td>Proposed JAZB Safety Zones</td>
</tr>
<tr>
<td>Figure 3-1</td>
<td>FCM Safety Zone Land Uses for Economic Impact Analysis – Model State Safety Zones</td>
</tr>
<tr>
<td>Figure 3-2</td>
<td>FCM Safety Zone Land Uses for Economic Impact Analysis – JAZB Safety Zones</td>
</tr>
<tr>
<td>Figure 3-3</td>
<td>Summary of 2017 Economic Impact Analysis Results</td>
</tr>
<tr>
<td>Figure 4-1</td>
<td>FCM Airspace Zones Grip Map Summary</td>
</tr>
<tr>
<td>Figure 4-2</td>
<td>FCM Safety Zones Grip Map Summary</td>
</tr>
<tr>
<td>Figure 4-3</td>
<td>FCM Maximum Construction Height Without Permit Grip Map Summary</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 2-1: FCM Historical Accident Rate Calculations ......................................................... 2-4
Table 2-2: FCM Historical Aircraft Accident Locations ........................................................ 2-4
Table 2-3: Accident Location Data Set Application ................................................................. 2-5
Table 2-4: Calculation of Total Accidents by Runway End for Analysis ............................ 2-7
Table 2-5: Accident Location Distribution by Runway End ................................................. 2-8
Table 2-6: FCM 2040 Aircraft Operations Forecast .............................................................. 2-9
Table 2-7: FCM 2016 Runway Use Distribution ................................................................. 2-10
Table 2-8: FCM 2040 Aircraft Operations by Runway End ................................................. 2-10
Table 2-9: FCM Accident Probability per Analysis Area Summary .................................... 2-12
Table 2-10: FCM Accident Probability per Occupant Area Summary ............................. 2-13
Table 2-11: Contiguous Open Space Acreages in JAZB Safety Zone B ........................... 2-15
Table 2-12: JAZB Safety Zone Dimensions ................................................................. 2-15

Table 3-1: Land Use Acreages by Runway End Within Safety Zones ............................... 3-2
Table 3-2: Residential Development Economic Impact Results ....................................... 3-4
Table 3-3: Commercial Development Economic Impact Results ...................................... 3-6
Table 3-4: Combined Residential and Commercial Economic Impact Results ............... 3-7
Table 3-5: Impacts to Employment Potential ................................................................. 3-8

Table 5-1: JAZB Meetings (September 2017 – April 2018) ................................................. 5-1
LIST OF APPENDICES

Appendix 1: 2009 FCM Safety/Risk Study
Appendix 2: FCM Aircraft Accident Data (1997 – 2016)
Appendix 3: California Study Aircraft Accident Locations
Appendix 4: FCM Aircraft Activity Forecast Documentation
Appendix 5: Aircraft Accident Probability Risk Calculation Tables
Appendix 6: Economic Impact Analysis Detail Tables
Appendix 7: FCM Zoning Ordinance Language and Exhibits
Appendix 8: FCM Airspace Zoning Grid Maps
Appendix 9: FCM Safety Zone Grid Maps
Appendix 10: FCM Maximum Construction Height Without Permit Grid Maps
Appendix 11: Public Hearing Report
EXECUTIVE SUMMARY
ES  EXECUTIVE SUMMARY

ES.1 INTRODUCTION

The Joint Airport Zoning Board (JAZB) for Flying Cloud Airport (FCM) is tasked with developing an airport zoning ordinance for land uses around FCM as required per Minnesota Statutes 360.061 through 360.074 and Minnesota Rules 8800.1200 and 8800.2400.

A JAZB is comprised of an airport operator and representatives from the cities, counties and/or townships that control land use development around an airport. In the case of FCM the cities include Chanhassen, Eden Prairie and Shakopee.

Through a collaborative process, the JAZB seeks to develop an airport zoning ordinance that achieves a balance between a reasonable level of public safety and compatible community development. In determining what minimum airport zoning regulations to adopt, Minnesota State Statutes guide the local airport zoning authority (JAZB) to consider the social and economic costs of restricting land uses versus the benefits derived from a strict application of the standards of the commissioner (the State’s Model Zoning Ordinance).

The goal for the Flying Cloud (FCM) Joint Airport Zoning Board (JAZB) is to develop an airport safety zoning ordinance for review and approval by the MnDOT Commissioner of Transportation, then for subsequent adoption by the JAZB, and finally by local communities.

The FCM JAZB was initially seated in 2009 and first met in July of that year. By April of 2010, the group had developed a draft Airport Zoning Ordinance that was ready for public review. A public hearing for the ordinance was held on April 29, 2010. The Draft Airport Zoning Ordinance was then finalized and submitted to the MnDOT Commissioner of Transportation for review and action in December 2010.

However, in early 2011, MAC requested, on behalf of the JAZB, that MnDOT temporarily suspend review of the Draft Ordinance due to legal uncertainties surrounding airport zoning related litigation that was pending in the State at the time. Another factor that affected the timing of the review was a collaborative effort initiated by MnDOT Aeronautics to update the state zoning statutes and rules, which began in earnest in the 2014 timeframe and is still ongoing.

By 2016, completing the zoning effort at FCM re-emerged as a priority due to the pace of development activity occurring in the vicinity of the airport. As such, MAC requested that MnDOT re-initiate its review of the draft Ordinance that had been submitted in December 2010 but was subsequently withdrawn. After consideration, MnDOT determined that they would be unable to review the draft Ordinance until 1] the JAZB was recalled; 2] the JAZB held a public hearing about the proposed zoning regulations; and 3] the JAZB submitted a record of its official action requesting review of the proposed zoning.

The FCM JAZB was re-seated and its first meeting was held on September 21, 2017.
The original JAZB’s focus was on identifying land use controls necessary to ensure a reasonable level of safety while considering the social and economic costs associated with implementing the proposed land use controls. The guiding concept employed throughout the process was that of reasonableness. Using the list of reasonableness considerations currently provided in state statute, the original JAZB set out to strike a balance between safety and economic cost considerations.

The first step was to conduct an airport-specific Safety/Risk Study to evaluate the probability of aircraft accidents occurring adjacent to FCM. This assessment used the same target risk standard and overall methodology that had previously been developed for the Minneapolis/St. Paul International Airport (MSP) zoning process – one accident per 10,000,000 flight operations. The study concluded that the accident probability in existing or planned Occupant Areas – land that is or could likely be developed to accommodate congregations of people in designated safety zones – in the vicinity of the FCM was less than the targeted risk standard.

Another key step in the process was to estimate the economic impact to the surrounding community of strictly implementing the State’s Model Zoning Ordinance. For this task, Eden Prairie’s planning and economic development team identified the impacts related to lost private property development potential, property taxes, and employment. The study concluded that implementation of the State Model Zoning Ordinance would result in an estimated loss of $150,000,000 in commercial development, $12,000,000 in residential development, and $600,000 in annual property taxes.

With all these factors considered, the original JAZB recommended that Safety Zone A be co-located with the FAA RPZ. However, to address the potential for variability in aircraft accident locations beyond the FAA RPZ, the recommendation included a provision for contiguous open space in Zone B that would allow a pilot to set down a disabled aircraft. It also removed site acre and structure limitations in Zone B and identified permitted residential areas that would be treated as conforming land uses.

The purpose for the balance of this report is to document updates being made to the relevant sections of the Draft Zoning Ordinance to reflect current conditions and trends.

**ES.2 SAFETY/RISK STUDY UPDATE**

Section 2 summarizes the updates that have been made to the Safety/Risk Study completed in 2009 to bring the analysis up-to-date. The updated study will be referred to as the 2017 Safety/Risk Study.

The purpose of the Safety/Risk Study is to evaluate the reasonableness of potential land use restrictions pertaining to areas off the runway ends at Flying Cloud Airport (FCM) based upon the probability of an accident occurring in MnDOT Safety Zone A beyond the FAA-defined Runway Protection Zones (RPZ) and MnDOT Safety Zone B, the character of flying operations expected to be conducted at the airport, and features of the airport vicinity.

The 2009 Safety/Risk Study found that the accident probability exceeded the targeted risk standard beyond the FAA-defined RPZ in several instances at Flying Cloud. With additional analysis, however, the study concluded that the accident probability in existing
or planned occupant areas – land that is or could likely be developed to accommodate congregations of people in designated safety zones – in the vicinity of the Airport was less than the targeted risk standard.

The 2017 Safety/Risk Study confirms that the conclusions of the 2009 Study remain valid in terms of the risk of an aircraft accident in the vicinity of FCM. Specifically, the risk probability of an aircraft accident in an existing or future occupant area is below the targeted risk standard of one accident per 10,000,000 flight operations (see Table 2-10). This suggests that a strict application of the land use controls prescribed in the MnDOT Model Zoning Ordinance exceeds what is necessary to provide a reasonable level of safety at FCM.

However, the findings also continue to support the 2009 JAZB recommendation that distinct open spaces (20-acre minimum) in proximity to the extended runway centerline beyond the RPZ and adjacent to occupant areas should be preserved.

This study confirms that the following elements of the Draft FCM Zoning Ordinance are appropriate from a safety/risk perspective:

- JAZB Safety Zone A is co-terminus with the FAA Runway Protection Zone (RPZ); and
- JAZB Safety Zone B is comprised of the portion of Model State Safety Zone A beyond the RPZ plus Model State Safety Zone B. Safety Zone B does not include site acre/structure limitations, site area to building plot area ratios, or population criteria for designated occupant areas. Occupant Areas guided for residential use will allow for the improvement, expansion, and development of new residential uses that will be treated as conforming uses in the zoning ordinance.

To provide for an extra margin of safety, JAZB Zone B will contain a provision that a minimum of 20 percent of the total Zone B acreage or 20 acres, whichever is greater, will be preserved as contiguous open space.

The proposed JAZB Safety Zones A and B are shown in Figure ES-1.
Figure ES-1: Proposed JAZB Safety Zones
ES.3 ECONOMIC IMPACT ANALYSIS UPDATE

In determining what minimum airport zoning regulations to adopt, Minnesota State Statutes guide the local airport zoning authority (JAZB) to consider the social and economic costs of restricting land uses versus the benefits derived from a strict application of the standards of the commissioner (the State’s Model Zoning Ordinance).

In 2010, the City of Eden Prairie’s planning and economic development team identified the impacts related to lost private property development potential, property taxes, and employment that would be associated with a strict application of the State Model Zoning Ordinance. The study concluded that strict implementation of the State Model Zoning Ordinance would result in an estimated loss of $150,000,000 in commercial development, $12,000,000 in residential development, and $600,000 in annual property taxes.

Section 3 summarizes updates that have been made to the City’s Economic Impact Analysis completed in 2010 to bring the analysis up-to-date. The updated study will be referred to as the 2017 Economic Impact Analysis.

The 2017 Economic Impact Analysis concludes that strict implementation of the State Model Zoning Ordinance would result in an estimated loss of approximately $38,000,000 to $58,000,000 in commercial development, approximately $6,000,000 to $15,000,000 in residential development, and approximately $139,000 to $257,000 in annual property taxes. While these values are somewhat more conservative than those reported in the 2010 study, they still indicate that a strict implementation of the State Model Zoning Ordinance would have a significant adverse long-term economic impact on the surrounding community in the magnitude of $56,000,000 to $69,000,000 over a 20-year period, not including the loss of employment generating potential.

ES.4 2017 FCM AIRPORT ZONING ORDINANCE

This section describes updates that have been made to the Draft FCM Airport Zoning Ordinance document.

Changes from the 2010 Draft Ordinance language are shown as tracked-changes in Appendix 7. Most of the language changes reflect updated elements that have been described in this report. Other changes include the following items:

- Section I, Purpose and Authority: Removed the City of Bloomington from the list of JAZB participants as the proposed zoning surfaces do not extend into the municipal boundaries of Bloomington (page 1)
- Section IV, Airspace Obstruction Zoning, Subsection B, Height Restrictions: Added clarifying language to items 1 and 2 about use of an FAA 7460 Obstruction Evaluation and determination by FAA (pages 9 and 10)
- Section XIV, Judicial Review: Clarified language to better align with state statute (page 22)

The updated Draft FCM Zoning Ordinance will continue to allow for the improvement, expansion and development of new residential uses in existing and planned Occupant
Areas guided for residential use. These residential uses, as designated Permitted Residential Areas, are recognized and treated as conforming land uses in the ordinance.

The exhibits and grid maps supporting and attached to the Zoning Ordinance have also been updated to reflect updated elements described in this report. The updated items include:

- Zoning Ordinance Exhibits (see Appendix 7)
  - Exhibit A, Airport Boundary
  - Exhibit B, Residential Permitted Parcels on JAZB Zone B
  - Exhibit C, Permitted Residential Areas
  - Exhibit D, Airport Boundary and Airspace Zoning Limits
  - Exhibit E, Airport Boundary and Airspace Contours
  - Exhibit F, Airport Boundary and Safety Zoning Limits
- FCM Airspace Zones Within Zoning Limits Grid Maps (see Appendix 8)
- FCM Safety Zones Within Zoning Limits Grid Maps (see Appendix 9)
- FCM Maximum Construction Heights Without Permit Grid Maps (see Appendix 10)
SECTION 1:

INTRODUCTION AND BACKGROUND
1. INTRODUCTION AND BACKGROUND

1.1 OVERVIEW

The Joint Airport Zoning Board (JAZB) for Flying Cloud Airport (FCM) is tasked with developing an airport zoning ordinance for land uses around FCM as required per Minnesota Statute 360.061 through 360.074 and Minnesota Rules 8800.1200 and 8800.2400.

A JAZB is comprised of an airport operator and representatives from the cities, counties and/or townships that control land use development around an airport. In the case of FCM the cities include Chanhassen, Eden Prairie and Shakopee.

Through a collaborative process, the JAZB seeks to develop an airport zoning ordinance that achieves a balance between a reasonable level of public safety and compatible community development. In determining what minimum airport zoning regulations to adopt, Minnesota State Statutes guide the local airport zoning authority (JAZB) to consider the social and economic costs of restricting land uses versus the benefits derived from a strict application of the standards of the commissioner (the State’s Model Zoning Ordinance).

The goal for the Flying Cloud (FCM) Joint Airport Zoning Board (JAZB) is to develop an airport safety zoning ordinance for review and approval by the MnDOT Commissioner of Transportation, then for subsequent adoption by the JAZB, and finally by local communities.

The implementation of airport safety zoning remains important for FCM for the following reasons:

- Airport safety zoning accomplishes the state law direction to prevent airport hazards, and MnDOT’s expectation is that the JAZB will successfully zone FCM in order to avoid potential airport grant funding implications;
- The pace of development around FCM is only increasing and the lack of an adopted airport safety zoning ordinance is creating uncertainty and confusion about possible land use controls and/or restrictions;
- MAC would like to continue to pursue non-aeronautical uses of some FCM parcels located within designated safety zones. Uncertainty regarding zoning is holding up land release approvals.

1.2 REVIEW OF FCM JAZB HISTORICAL TIMELINE AND ACTIVITIES

The FCM JAZB was initially seated in 2009 and first met in July of that year. By April of 2010, the group had developed a draft Airport Zoning Ordinance that was ready for public review. A public hearing for the ordinance was held on April 29, 2010. The Draft Airport Zoning Ordinance was then finalized and submitted to the MnDOT Commissioner of Transportation for review and action in December 2010.
A copy of the Draft FCM Airport Zoning Ordinance that was submitted to MnDOT is available on the MAC website and can be viewed through the following link: https://metroairports.org/General-Aviation/Airports/Flying-Cloud/Joint-Airport-Zoning-Board-Flying-Cloud/Draft-FCM-Zoning-Ordinance-12-21-10_reduced_size.aspx

However, in early 2011, MAC requested, on behalf of the JAZB, that MnDOT temporarily suspend review of the Draft Ordinance due to legal uncertainties surrounding airport zoning related litigation that was pending in the State at the time. Another factor that affected the timing of the review was a collaborative effort initiated by MnDOT Aeronautics to update the state zoning statutes and rules, which began in earnest in the 2014 timeframe and is still ongoing.

By 2016, completing the zoning effort at FCM re-emerged as a priority due to the pace of development activity occurring in the vicinity of the airport. As such, MAC requested that MnDOT re-initiate its review of the draft Ordinance that had been submitted in December 2010 but was subsequently withdrawn. After consideration, MnDOT determined that they would be unable to review the draft Ordinance until 1] the JAZB was recalled; 2] the JAZB held a public hearing about the proposed zoning regulations; and 3] the JAZB submitted a record of its official action requesting review of the proposed zoning.

The FCM JAZB was re-seated and its first meeting was held on September 21, 2017. A record of all JAZB meeting materials is available on the MAC website through the following link: https://metroairports.org/General-Aviation/Airports/Flying-Cloud/Joint-Airport-Zoning-Board-Flying-Cloud.aspx

1.3 SUMMARY OF DRAFT FCM ZONING ORDINANCE

The original JAZB’s focus was on identifying land use controls necessary to ensure a reasonable level of safety while considering the social and economic costs associated with implementing the proposed land use controls. The guiding concept employed throughout the process was that of reasonableness. Using the list of reasonableness considerations currently provided in state statute, the original JAZB set out to strike a balance between safety and economic cost considerations.

The first step was to conduct an airport-specific Safety/Risk Study to evaluate the probability of aircraft accidents occurring adjacent to FCM, including in the Federal Aviation Administration (FAA)-defined Runway Protection Zone (RPZ), in model State Safety Zone A beyond the RPZ, and in model State Safety Zone B. This assessment used the same target risk standard and overall methodology that had previously been developed for the Minneapolis/St. Paul International Airport (MSP) zoning process – that is, one accident per 10,000,000 flight operations. For context:

- The Runway Protection Zone (RPZ) is the trapezoid surface beyond the end of the runway that the Federal Aviation Administration (FAA) stipulates should be kept clear of incompatible land uses;
- MnDOT’s State Model Zone A restricts all buildings and uses which bring together an assembly of persons and extends for a distance that is 2/3 of the
runway length. At FCM, State Model Zone A extends beyond the FAA RPZ off each runway end;

- MnDOT’s State Model Zone B is less restrictive, but still limits density and site population to 15 times that of the site acreage. Zone B extends beyond Zone A for a distance that is 1/3 of the runway length; and

- MnDOT’s State Zone C is defined by a set radius from the runway ends, has general land use restrictions against interfering with airport operations, and is established at an elevation of 150 feet above the airport.

The Safety/Risk Study found that the accident probability exceeded the targeted risk standard beyond the FAA RPZ in several instances at FCM.

With additional analysis, however, the study concluded that the accident probability in existing or planned Occupant Areas – land that is or could likely be developed to accommodate congregations of people in designated safety zones – in the vicinity of the FCM was less than the targeted risk standard.

Another key step in the process was to estimate the economic impact to the surrounding community of strictly implementing the State’s Model Zoning Ordinance. For this task, Eden Prairie’s planning and economic development team identified the impacts related to lost private property development potential, property taxes, and employment. The study concluded that implementation of the State Model Zoning Ordinance would result in an estimated loss of $150,000,000 in commercial development, $12,000,000 in residential development, and $600,000 in annual property taxes.

With all these factors considered, the original JAZB recommended that Safety Zone A be co-located with the FAA RPZ. However, to address the potential for variability in aircraft accident locations beyond the RPZ, the recommendation included a provision for contiguous open space in Zone B that would allow a pilot to set down a disabled aircraft. It also removed site acre and structure limitations in Zone B and identified permitted residential areas that would be treated as conforming land uses.

In addition to the safety zones, the Draft Zoning Ordinance establishes airspace, or height, limitations in the vicinity of the airport. Per the draft ordinance, an airport zoning permit will not be required for development up to a “maximum construction height without a permit” elevation established on a parcel-by-parcel basis.

If a proposed development exceeds the maximum construction height without a permit elevation, a zoning permit from the municipal Zoning Administrator will be required to ensure that the airspace zoning limit above the parcel is not exceeded. If the proposed development penetrates the airspace zoning surface, a variance will be required from a Board of Adjustment. The draft ordinance makes an exception to the requirement for a variance is if the proposed development has received a “determination of no hazard” based on a formal FAA airspace review.

Summary images from the Draft Zoning Ordinance showing the extents of the safety zones, airspace height zoning limits, and maximum construction heights without a permit are shown in Figures 1-1 through 1-3.
The purpose for the balance of this report is to document updates being made to the relevant sections of the Draft Zoning Ordinance to reflect current conditions and trends.
Figure 1-1: FCM Draft Zoning Ordinance Airspace Zones
Figure 1-2: FCM Draft Zoning Ordinance Safety Zones

FCM Safety Zones
Within Safety Zoning Limits

Index Sheet

- Zone A (Federal RPZ)
- Zone B
- Zone C
- FCM Pavement
- MAC Property
- Municipal Boundaries
Figure 1-3: FCM Draft Zoning Ordinance Maximum Construction Heights Without a Zoning Permit
SECTION 2:

SAFETY/RISK STUDY UPDATE
2. SAFETY/RISK STUDY UPDATE

2.1 INTRODUCTION
This chapter summarizes updates that have been made to the Safety/Risk Study completed in 2009 to bring the analysis up-to-date. The updated study will be referred to as the 2017 Safety/Risk Study.

The purpose of the Safety/Risk Study is to evaluate the reasonableness of potential land use restrictions pertaining to areas off the runway ends at Flying Cloud Airport (FCM) based upon the probability of an accident occurring in MnDOT Safety Zone A beyond the FAA-defined Runway Protection Zones (RPZ) and MnDOT Safety Zone B, the character of flying operations expected to be conducted at the airport, and features of the airport vicinity.

The 2009 Safety/Risk Study found that the accident probability exceeded the targeted risk standard beyond the FAA-defined RPZ in several instances at Flying Cloud. With additional analysis, however, the study concluded that the accident probability in existing or planned occupant areas – land that is or could likely be developed to accommodate congregations of people in designated safety zones – in the vicinity of the Airport was less than the targeted risk standard.

A copy of the 2009 Safety/Risk Study is included as Appendix 1.

2.2 STUDY METHODOLOGY
This 2017 Safety/Risk Study uses the same eight-step methodology that was established for the 2009 study, as follows:

- Determine the appropriate data to be used in the analysis;
- Identify applicable probability standards;
- Define the areas to be studied;
- Compile appropriate data to determine accident rates and locations;
- Distribute accident data to the areas being analyzed;
- Determine the number of future operations for the runway end being studied;
- Calculate the accident probabilities in the study areas; and
- Compare the accident probabilities to the applicable probability standards.

The 2017 Safety/Risk Study will use an analysis year of 2040.

2.3 UPDATED DATA TO BE USED IN THE ANALYSIS
The following airfield configuration changes are included in the 2017 Safety/Risk Study, which evaluates conditions expected to be present at FCM in the analysis year of 2040:

- Crosswind Runway 18-36 length and position; and
2.3.1 Crosswind Runway 18-36 Length and Position

At the time when the 2009 Safety/Risk Study was prepared, the future airfield plan for FCM included a project to both shift and extend the crosswind Runway 18-36 by about 100 feet, for a total length of 2,800 feet. In the intervening years, however, the future airfield plan has been refined and the proposed changes to the length and positioning of the existing crosswind runway ends have been removed. Therefore, the 2017 Safety/Risk Study will reflect the existing crosswind runway length, 2,691 feet, and the existing runway ends. This change affects both the starting point for the RPZs and Safety Zones that are tied to the runway end. It also affects the length of the State Model Safety Zones as they are tied to the length of the runway. The analysis will, however, take into account the establishment of a future non-precision instrument approach to the Runway 18 end.

2.3.2 North Parallel Runway 10R-28L Designation

While no changes are proposed to the physical length or width of the north parallel Runway 10R-28L, its designation is proposed to change from “other than utility” to “utility”. The distinction between the designations has to do with the types of aircraft that use the runway on a regular basis – those that weigh over 12,500 pounds or under 12,500 pounds. Since the north parallel runway does not routinely accommodate aircraft that weigh over 12,500 pounds, the utility designation is appropriate. The re-designation is being proposed as a solution to reduce the number of runway incursions – in this case instances where aircraft enter the runway environment without permission from the Tower – as it will allow the runway hold short lines to move in closer to the runway centerline. This will allow pilots to get lined up on the crossing taxiway before they reach the hold short line.

From a zoning and land use perspective, this change will result in a smaller RPZ at each end of north parallel Runway 10R-28L. In the draft JAZB zoning ordinance, Safety Zone A was proposed to be co-located with the FAA RPZ, so this would result in a smaller JAZB Zone A in the updated ordinance. From an airspace and height limitation perspective, it also results in a steeper, or less restrictive, approach surface slope and a slightly smaller Safety Zone C radius to the north of the airport. The changes associated with the north parallel Runway 10R-28L re-designation are planned to be implemented in mid-2018.

2.4 APPLICABLE PROBABILITY STANDARD

The 2017 Safety/Risk Study will continue to use the targeted risk standard identified in the previous study. The threshold probability of one accident per 10 million aircraft operations \((10^{-7})\) will continue to be used as the standard for measuring the accident probabilities in the analysis areas\(^1\). An accident will be considered as a collision with the

---

\(^1\) An event with an occurrence probability of less than or equal to one in \(10^{-7}\) is generally considered to be in a likelihood category of “extremely remote” per FAA Safety Management System (SMS) criteria. The “extremely remote” category also generally correlates to events expected to occur every 10-100 years. Events occurring less than every 100 years correlate to the “extremely improbable” likelihood category.
ground or with an object above the ground that results in substantial damage to the aircraft or serious injury to persons in the aircraft or on the ground.

2.5 DEFINITION OF ANALYSIS AREAS

The 2017 Safety/Risk Study will continue to use the four analysis areas identified in the previous study. These areas have been updated to reflect the existing and planned year 2040 airfield configuration and are shown in Figure 2-2.

- The area inclusive of the airfield, airport property, and the FAA-defined RPZ;
- MnDOT Model State Safety Zone A beyond the RPZ;
- MnDOT Model State Safety Zone B; and
- Other off-airport areas beyond State Model Safety Zones A and B.

In addition, existing and planned Occupant Areas have been updated to reflect current land use guidance provided by the City of Eden Prairie for off-airport parcels (not owned by MAC) and MAC non-aeronautical property development strategies for on-airport parcels (owned by MAC). Occupant Areas are defined as land that is or could likely be developed to accommodate congregations of people in the designated Safety Zones. Examples of Occupant Areas include existing and planned residential, office/commercial, industrial, and church uses. The Occupant Areas identified for the 2017 Safety/Risk Study analysis are shown in Figure 2-3.

2.6 ACCIDENT FREQUENCY DATA

The 2009 Safety/Risk Study analyzed aircraft accidents that occurred at FCM during the 20-year period between 1989 and 2008. Based on the 1989-2008 data set, the accident rate at FCM was calculated to be 0.7545 accidents per 100,000 aircraft operations.

The 2017 Safety/Risk Study updates the data set to consider accidents that occurred during the 20-year period between 1997 and 2016. Based on the 1997-2016 data set, the accident rate at FCM is calculated to be 0.8403 accidents per 100,000 aircraft operations.

The FCM accident rate per 100,000 aircraft operations is a key input into the subsequent accident probability calculations.

As shown in Table 2-1, there have been fewer aircraft accidents at FCM in the 1997 – 2016 timeframe than there were in 1989 – 2009. However, the number of aircraft operations has declined as well, resulting in an increase in the accident rate per 100,000 aircraft operations.
Table 2-1: FCM Historical Accident Rate Calculations

<table>
<thead>
<tr>
<th></th>
<th>1989 - 2008</th>
<th>1997 - 2016</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Aircraft Operations</td>
<td>3,711,199</td>
<td>2,737,022</td>
<td>-26%</td>
</tr>
<tr>
<td>Total Aircraft Accidents</td>
<td>28</td>
<td>23</td>
<td>-18%</td>
</tr>
<tr>
<td>Accident Rate Per 100,000 Aircraft Operations</td>
<td>0.75</td>
<td>0.84</td>
<td>11%</td>
</tr>
</tbody>
</table>

Source: FAA Air Traffic Activity Data System (ATADS) database; NTSB accident database

Figure 2-4 shows the approximate locations of the FCM accidents that occurred in the vicinity of the airport between 1997 and 2016 and were considered in this analysis. Table 2-2 provides a summary of the general location of the accidents included in both the 2009 and 2017 Safety/Risk Studies, based upon available accident records from the National Transportation Safety Board (NTSB).

Table 2-2: FCM Historical Aircraft Accident Locations

<table>
<thead>
<tr>
<th>FCM Accident Location Area</th>
<th>1989 - 2008</th>
<th></th>
<th>1997 - 2016</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Accidents</td>
<td>% of Total</td>
<td>Accidents</td>
<td>% of Total</td>
</tr>
<tr>
<td>Airfield/On-Airport</td>
<td>16</td>
<td>57%</td>
<td>14</td>
<td>61%</td>
</tr>
<tr>
<td>Runway Protection Zone (RPZ)</td>
<td>2</td>
<td>7%</td>
<td>3</td>
<td>13%</td>
</tr>
<tr>
<td>State Safety Zone A Beyond RPZ</td>
<td>1</td>
<td>4%</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>State Safety Zone B</td>
<td>1</td>
<td>4%</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>Off Airport Beyond Safety Zones A/B</td>
<td>8</td>
<td>29%</td>
<td>4</td>
<td>17%</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>100%</td>
<td>23</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: MAC analysis of NTSB accident records using methodology from 2009 Safety/Risk Study prepared by HNTB

Additional details about aircraft accidents at FCM are provided in Appendix 2.

2.7 LOCATION AND DISTRIBUTION OF AIRCRAFT ACCIDENT DATA

The 2017 Safety/Risk Study continues to use the general aviation aircraft accident location distribution research conducted by the University of California at Berkeley for the California Airport Land Use Planning Handbook, which was published in 2002 and updated in 2011 (“California Study”). A link to the updated California Study report is provided below: http://dot.ca.gov/hq/planning/aeronaut/documents/alucp/AirportLandUsePlanningHandbook.pdf

The California Study compiled 873 general aviation aircraft accidents that occurred between 1983 and 1992 and had land-use compatibility implications. It found that the
number and location of reported accidents varied by runway length and therefore grouped the accident locations by the following categories:

- Runway length less than 4,000 feet;
- Runway length between 4,000 feet and 5,999 feet; and
- Runway length 6,000 feet and greater.

Table 2-3 shows the California Study data sets that were applied to each runway at FCM.

<table>
<thead>
<tr>
<th>Accident Data Set Based on Runway Length</th>
<th>RWY 18-36 (2,691 feet)</th>
<th>RWY 10L-28R (3,900 feet)</th>
<th>RWY 10R-28L (5,000 feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 4,000 feet</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Between 4,000 feet and 5,999 feet</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>6,000 feet or greater</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: MAC analysis

These are the same accident location data sets that were applied in the 2009 Safety/Risk Study. However, the digital accident location files from the California Study are now available and were used for the 2017 study analysis. The 2009 study relied on accident locations that were digitized from hard copy prints of the California Study report as the digital files were not available at the time it was produced. The accident locations contained in the digital files (reproduced in Appendix 3) were superimposed on the appropriate FCM runway ends to provide a representative sample of where general aviation accidents are likely to occur in relation to a runway.

For each runway end, the number of accident locations associated with arrivals to that end, along with departures from the opposite end, were combined. For example, the Runway 18 end accident location count includes accidents locations associated with arrivals to Runway 18 and departures from Runway 36. Also, due to their close proximity, arrival and departure accident locations for parallel Runways 10L-28R and 10R-28L at FCM often overlap each other. To account for this, the accident count data were for reported both individually and combined (10L with 10R, 28L with 28R) for each of the parallel runway ends.

Figures 2-5 through 2-8 show the superimposed accident locations for each runway end at FCM. However, it is important to reiterate that these figures illustrate a compilation of national aircraft accident data over a long period of time that is superimposed on each runway end at FCM to determine a likely aircraft accident distribution profile. They do not illustrate actual accident locations at FCM.

Another factor to consider is adjusting the accident data set to reflect the likely total of accident locations for a given runway end. As noted earlier, the California Study only included accident locations that were considered to have land use compatibility.
implications; it did not provide a total number of accidents. The California Study does provide, however, the following generalized distribution profile of general aviation accident locations:

- 68% of general aviation accidents take place on an airport;
- 3% of general aviation accidents are enroute accidents, occurring more than approximately five miles from an airport; and,
- The remaining 29% of general aviation accidents occur in the vicinity of an airport (within approximately five miles from an airport).

This accident location profile was used to adjust the number of accident locations in the California Study to determine a total number of accidents to use in the subsequent probability calculations. The calculations of total accident locations by runway end are shown in Table 2-4. The resulting percentage distribution of accident locations by analysis area are shown in Table 2-5.
### Table 2-4: Calculation of Total Accidents by Runway End for Analysis

<table>
<thead>
<tr>
<th>Accident Locations</th>
<th>FCM Runway End</th>
<th>10R</th>
<th>28L</th>
<th>10L</th>
<th>28R</th>
<th>10L+10R</th>
<th>28L+28R</th>
<th>18</th>
<th>36</th>
<th>All Ends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport Vicinity Accidents</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPZ</td>
<td></td>
<td>65</td>
<td>35</td>
<td>70</td>
<td>70</td>
<td>158</td>
<td>117</td>
<td>69</td>
<td>70</td>
<td>422</td>
</tr>
<tr>
<td>SSZ A Beyond RPZ</td>
<td></td>
<td>8</td>
<td>37</td>
<td>44</td>
<td>44</td>
<td>47</td>
<td>152</td>
<td>36</td>
<td>35</td>
<td>278</td>
</tr>
<tr>
<td>SSZ B</td>
<td></td>
<td>12</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>19</td>
<td>17</td>
<td>8</td>
<td>9</td>
<td>59</td>
</tr>
<tr>
<td>Other Off Airport</td>
<td></td>
<td>100</td>
<td>108</td>
<td>48</td>
<td>84</td>
<td>145</td>
<td>182</td>
<td>85</td>
<td>105</td>
<td>507</td>
</tr>
<tr>
<td>Total Accidents</td>
<td></td>
<td>638</td>
<td>659</td>
<td>572</td>
<td>697</td>
<td>1,272</td>
<td>1,614</td>
<td>683</td>
<td>755</td>
<td>4,366</td>
</tr>
<tr>
<td>(Vicinity Accidents / 29%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enroute Accidents</td>
<td></td>
<td>19</td>
<td>20</td>
<td>17</td>
<td>21</td>
<td>38</td>
<td>48</td>
<td>20</td>
<td>23</td>
<td>131</td>
</tr>
<tr>
<td>(3% of Total Accidents)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-Airport Accidents</td>
<td></td>
<td>434</td>
<td>448</td>
<td>389</td>
<td>474</td>
<td>865</td>
<td>1,097</td>
<td>464</td>
<td>514</td>
<td>2,969</td>
</tr>
<tr>
<td>(68% of Total Accidents)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPZ Accidents</td>
<td></td>
<td>65</td>
<td>35</td>
<td>70</td>
<td>70</td>
<td>158</td>
<td>117</td>
<td>69</td>
<td>70</td>
<td>422</td>
</tr>
<tr>
<td>On-Airport + RPZ</td>
<td></td>
<td>499</td>
<td>483</td>
<td>459</td>
<td>544</td>
<td>1,023</td>
<td>1,214</td>
<td>533</td>
<td>584</td>
<td>3,391</td>
</tr>
<tr>
<td>SSZ A Beyond RPZ</td>
<td></td>
<td>8</td>
<td>37</td>
<td>44</td>
<td>44</td>
<td>47</td>
<td>152</td>
<td>36</td>
<td>35</td>
<td>278</td>
</tr>
<tr>
<td>SSZ B</td>
<td></td>
<td>12</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>19</td>
<td>17</td>
<td>8</td>
<td>9</td>
<td>59</td>
</tr>
<tr>
<td>Other Off Airport</td>
<td></td>
<td>100</td>
<td>108</td>
<td>48</td>
<td>84</td>
<td>145</td>
<td>182</td>
<td>85</td>
<td>105</td>
<td>507</td>
</tr>
<tr>
<td>Total Accidents for Analysis</td>
<td></td>
<td>619</td>
<td>639</td>
<td>555</td>
<td>676</td>
<td>1,234</td>
<td>1,565</td>
<td>662</td>
<td>733</td>
<td>4,235</td>
</tr>
</tbody>
</table>

Notes:
1. RPZ, SSZ A Beyond RPZ, SSZ B, and Other Off Airport accident locations are counted from the California Study data superimposed on each FCM runway end. The remaining accident location counts are calculated values.

Source: California Land Use Compatibility Handbook; MAC analysis using methodology from 2009 Safety/Risk Study prepared by HNTB
### Table 2-5: Accident Location Distribution by Runway End

<table>
<thead>
<tr>
<th>Accident Location Analysis Areas</th>
<th>10R</th>
<th>28L</th>
<th>10L</th>
<th>28R</th>
<th>10L+10R</th>
<th>28L+28R</th>
<th>18</th>
<th>36</th>
<th>All Ends</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-Airport + RPZ</td>
<td>81%</td>
<td>76%</td>
<td>83%</td>
<td>80%</td>
<td>83%</td>
<td>78%</td>
<td>81%</td>
<td>80%</td>
<td>80%</td>
</tr>
<tr>
<td>SSZ A Beyond RPZ</td>
<td>1%</td>
<td>6%</td>
<td>8%</td>
<td>7%</td>
<td>4%</td>
<td>10%</td>
<td>5%</td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td>SSZ B</td>
<td>2%</td>
<td>2%</td>
<td>1%</td>
<td>1%</td>
<td>2%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Other Off Airport</td>
<td>16%</td>
<td>17%</td>
<td>9%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>13%</td>
<td>14%</td>
<td>12%</td>
</tr>
<tr>
<td><strong>Total Accidents for Analysis</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Notes:**

1. RPZ, SSZ A Beyond RPZ, SSZ B, and Other Off Airport accident locations are counted from the California Study data superimposed on each FCM runway end. The remaining accident location counts are calculated values.

**Source:** California Land Use Compatibility Handbook; MAC analysis using methodology from 2009 Safety/Risk Study prepared by HNTB
2.8 OPERATIONS FORECAST

The accident probability calculations require an operations forecast for the number of aircraft takeoffs and landings in the analysis year, which in this case is 2040.

The latest aviation activity forecast prepared for FCM was completed in 2015 and used 2035 as its planning horizon year. This forecast projected an activity level of 93,255 aircraft operations at FCM in 2035. A summary of this forecast is provided in Appendix 4.

To extend the 2035 forecast to 2040, the average annual growth rate for aircraft operations from the 2030 to 2035 period was applied to the 2035 to 2040 period. As illustrated in Table 2-6, this extrapolation results in a 2040 operations forecast of 101,042.

Table 2-6: FCM 2040 Aircraft Operations Forecast

<table>
<thead>
<tr>
<th>Year</th>
<th>Forecast Aircraft Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>83,889</td>
</tr>
<tr>
<td>2020</td>
<td>81,516</td>
</tr>
<tr>
<td>2025</td>
<td>83,623</td>
</tr>
<tr>
<td>2030</td>
<td>86,068</td>
</tr>
<tr>
<td>2035</td>
<td>93,255</td>
</tr>
<tr>
<td>2040</td>
<td>101,042</td>
</tr>
</tbody>
</table>

2030 - 2035 Annual Growth Rate 1.62%
2035 - 2040 Annual Growth Rate 1.62%

Source: HNTB Minneapolis-St. Paul Reliever Airports Activity Forecasts Technical Report, October 2015; MAC extrapolation

The next step is to distribute the total number of aircraft operations to each individual runway end. Table 2-7 illustrates actual runway use percentages at FCM in 2016, which will be carried forward into the 2040 analysis year.
Table 2-7: FCM 2016 Runway Use Distribution

<table>
<thead>
<tr>
<th>FCM Runway</th>
<th>2016 Arrival %</th>
<th>2016 Departure %</th>
</tr>
</thead>
<tbody>
<tr>
<td>10R</td>
<td>20%</td>
<td>15%</td>
</tr>
<tr>
<td>28L</td>
<td>23%</td>
<td>19%</td>
</tr>
<tr>
<td>10L</td>
<td>17%</td>
<td>15%</td>
</tr>
<tr>
<td>28R</td>
<td>26%</td>
<td>32%</td>
</tr>
<tr>
<td>18</td>
<td>10%</td>
<td>14%</td>
</tr>
<tr>
<td>36</td>
<td>4%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Source: MACNOMS data analysis

The forecasted number of aircraft operations for the analysis year 2040 is presented in Table 2-8.

Table 2-8: FCM 2040 Aircraft Operations by Runway End

<table>
<thead>
<tr>
<th>FCM Runway</th>
<th>2040 Arrivals</th>
<th>% Total Arrivals</th>
<th>2040 Departures</th>
<th>% Total Departures</th>
<th>Total Operations at Runway End</th>
</tr>
</thead>
<tbody>
<tr>
<td>10R</td>
<td>10,024</td>
<td>20%</td>
<td>7,457</td>
<td>15%</td>
<td>19,731</td>
</tr>
<tr>
<td>28L</td>
<td>11,919</td>
<td>23%</td>
<td>9,707</td>
<td>19%</td>
<td>19,376</td>
</tr>
<tr>
<td>10L</td>
<td>8,643</td>
<td>17%</td>
<td>7,509</td>
<td>15%</td>
<td>24,438</td>
</tr>
<tr>
<td>28R</td>
<td>13,309</td>
<td>26%</td>
<td>15,795</td>
<td>32%</td>
<td>20,818</td>
</tr>
<tr>
<td>18</td>
<td>5,134</td>
<td>10%</td>
<td>7,068</td>
<td>14%</td>
<td>7,517</td>
</tr>
<tr>
<td>36</td>
<td>2,094</td>
<td>4%</td>
<td>2,384</td>
<td>5%</td>
<td>9,162</td>
</tr>
<tr>
<td>Total</td>
<td>51,122</td>
<td>100%</td>
<td>49,920</td>
<td>100%</td>
<td>101,042</td>
</tr>
<tr>
<td>10L+10R</td>
<td>18,666</td>
<td>37%</td>
<td>14,966</td>
<td>30%</td>
<td>44,169</td>
</tr>
<tr>
<td>28L+28R</td>
<td>25,228</td>
<td>49%</td>
<td>25,502</td>
<td>51%</td>
<td>40,194</td>
</tr>
</tbody>
</table>

Notes:
Operations at a runway end are the sum of arrivals at that end plus departures from the opposite end

Source: MAC analysis using methodology from 2009 Safety/Risk Study prepared by HNTB

2.9 CALCULATION OF ACCIDENT PROBABILITIES

The probability of an aircraft accident occurring in an accident analysis area in 2040 is calculated in the following manner:
- Multiply the FCM historical accident rate per 100,000 aircraft operations (0.84 per Table 2-1) by the number of forecasted aircraft operations by runway end for 2040 (per Table 2-7);
- Multiply the result by the percent of accidents location in the nationwide data set distributed to the applicable analysis areas (per Table 2-5). This represents the probability of an aircraft accident within the analysis area based on forecasted 2040 operational levels;
- Calculate the number of years between aircraft accidents based on the probability factor (1/probability); and
- Convert accident probabilities to a “per 10,000,000” factor to compare against the targeted risk standard of one per 10,000,000. This is accomplished by multiplying the accident probability by 10,000,000 and then dividing by the number of forecasted aircraft operations for the applicable runway end.
- A summary of the calculations is shown in Table 2-9. More detailed calculation tables are included in Appendix 5.

The results indicate that – consistent with the 2009 Safety/Risk Study – the risk probability exceeds the targeted standard in several analysis areas. However, it is important to recognize that the analysis so far assumes that the entire analysis area is covered by above-ground objects or structures that promote congregations of people. Of course, this is not the case as large parcels of airport-owned property off each runway end are vacant and will remain so. A primary purpose for implementing safety and land use zoning is to protect the lives and property of users of the airport and of occupants of land in its vicinity. This leads to the last step of the probability calculation process, which is calculating the probability of aircraft accidents in occupant areas where existing and/or future congregations of people are likely to occur in the vicinity of FCM.

Based on the existing and future occupant areas shown in Figure 2-3, the risk probabilities were re-calculated using the number of aircraft accident locations within each of the occupant areas per analysis area, instead of the analysis area as a whole. A summary of the calculations are shown in Table 2-10. More detailed calculation tables are included in Appendix 5.

These results are also consistent with the 2009 Safety/Risk Study in that the risk probability does not exceed the targeted risk standard of one accident per 10,000,000 operations in the occupant areas.
Table 2-9: FCM Accident Probability per Analysis Area Summary

<table>
<thead>
<tr>
<th>FCM Runway</th>
<th>On-Airfield + RPZ</th>
<th>State Safety Zone A Beyond RPZ</th>
<th>State Safety Zone B</th>
<th>Off Airport Beyond Safety Zones</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Years Between</td>
<td>Years Between</td>
<td>Years Between</td>
<td>Years Between</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Per 10m</td>
<td>Per 10m</td>
<td>Per 10m</td>
<td>Per 10m</td>
<td></td>
</tr>
<tr>
<td>10R</td>
<td>7</td>
<td>467</td>
<td>311</td>
<td>37</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>67.7</td>
<td>1.1</td>
<td>1.6</td>
<td>13.6</td>
<td>84.0</td>
</tr>
<tr>
<td>28L</td>
<td>8</td>
<td>106</td>
<td>357</td>
<td>36</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>63.5</td>
<td>4.9</td>
<td>1.4</td>
<td>14.2</td>
<td>84.0</td>
</tr>
<tr>
<td>10L</td>
<td>6</td>
<td>61</td>
<td>676</td>
<td>56</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>69.5</td>
<td>6.7</td>
<td>0.6</td>
<td>7.3</td>
<td>84.0</td>
</tr>
<tr>
<td>28R</td>
<td>7</td>
<td>88</td>
<td>966</td>
<td>46</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>67.6</td>
<td>5.5</td>
<td>0.5</td>
<td>10.4</td>
<td>84.0</td>
</tr>
<tr>
<td>18</td>
<td>20</td>
<td>291</td>
<td>1,311</td>
<td>123</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>67.7</td>
<td>4.6</td>
<td>1.0</td>
<td>10.8</td>
<td>84.0</td>
</tr>
<tr>
<td>36</td>
<td>16</td>
<td>272</td>
<td>1,057</td>
<td>91</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>66.9</td>
<td>4.0</td>
<td>1.0</td>
<td>12.0</td>
<td>84.0</td>
</tr>
<tr>
<td>All</td>
<td>1</td>
<td>18</td>
<td>85</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>67.3</td>
<td>5.5</td>
<td>1.2</td>
<td>10.1</td>
<td>84.0</td>
</tr>
<tr>
<td>10L+10R</td>
<td>3</td>
<td>71</td>
<td>175</td>
<td>23</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>69.7</td>
<td>3.2</td>
<td>1.3</td>
<td>9.9</td>
<td>84.0</td>
</tr>
<tr>
<td>28L+28R</td>
<td>4</td>
<td>30</td>
<td>273</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>65.2</td>
<td>8.2</td>
<td>0.9</td>
<td>9.8</td>
<td>84.0</td>
</tr>
</tbody>
</table>

Notes:
Targeted risk standard is 1 accident per 10,000,000 aircraft operations.
Values in red text exceed the targeted risk standard.
Values in green text are at or below the targeted risk standard.

Source: MAC analysis using methodology from 2009 Safety/Risk Study prepared by HNTB
### Table 2-10: FCM Accident Probability per Occupant Area Summary

<table>
<thead>
<tr>
<th>FCM Runway</th>
<th>State Safety Zone A Beyond RPZ</th>
<th>State Safety Zone B</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Accident Locations</td>
<td>Years Between</td>
<td>Per 10m</td>
</tr>
<tr>
<td>10R</td>
<td>2</td>
<td>1,866</td>
<td>0.3</td>
</tr>
<tr>
<td>28L</td>
<td>2</td>
<td>1,962</td>
<td>0.3</td>
</tr>
<tr>
<td>10L</td>
<td>0</td>
<td>---</td>
<td>0.0</td>
</tr>
<tr>
<td>28R</td>
<td>1</td>
<td>3,862</td>
<td>0.1</td>
</tr>
<tr>
<td>18</td>
<td>0</td>
<td>---</td>
<td>0.0</td>
</tr>
<tr>
<td>36</td>
<td>0</td>
<td>---</td>
<td>0.0</td>
</tr>
<tr>
<td>All</td>
<td>7</td>
<td>712</td>
<td>0.1</td>
</tr>
<tr>
<td>10L+10R</td>
<td>2</td>
<td>1,663</td>
<td>0.1</td>
</tr>
<tr>
<td>28L+28R</td>
<td>5</td>
<td>927</td>
<td>0.3</td>
</tr>
</tbody>
</table>

**Notes:**
- Targeted risk standard is 1 accident per 10,000,000 aircraft operations.
- Values in **red text** exceed the targeted risk standard.
- Values in **green text** are at or below the targeted risk standard.

**Source:** MAC analysis using methodology from 2009 Safety/Risk Study prepared by HNTB
2.10 FINDINGS

The 2017 Safety/Risk Study confirms that the conclusions of the 2009 Study remain valid in terms of the risk of an aircraft accident in the vicinity of FCM. Specifically, the risk probability of an aircraft accident in an existing or future occupant area is below the targeted risk standard of one accident per 10,000,000 flight operations. This suggests that a strict application of the land use controls prescribed in the MnDOT Model Zoning Ordinance exceeds what is necessary to provide a reasonable level of safety at FCM.

However, the findings also continue to support the 2009 JAZB recommendation that distinct open spaces (20-acre minimum) in proximity to the extended runway centerline beyond the RPZ and adjacent to occupant areas should be preserved. This open space gives the pilot of a disabled aircraft an area to clearly locate and contain the extent of a crash site. Assuming a crash site area of approximately 5,000 square feet\(^2\), it would impact approximately 0.6% of a 20-acre open space (871,200 square feet).

This study confirms that the following elements of the Draft FCM Zoning Ordinance are appropriate from a safety/risk perspective:

- JAZB Safety Zone A is co-terminus with the FAA Runway Protection Zone (RPZ); and

- JAZB Safety Zone B is comprised of the portion of Model State Safety Zone A beyond the RPZ plus Model State Safety Zone B. Safety Zone B does not include site acre/structure limitations, site area to building plot area ratios, or population criteria for designated occupant areas. Occupant Areas guided for residential use will allow for the improvement, expansion, and development of new residential uses that will be treated as conforming uses in the zoning ordinance (Permitted Residential Areas, see Section 4.5).

- To provide for an extra margin of safety, JAZB Zone B will contain a provision that a minimum of 20 percent of the total Zone B acreage or 20 acres, whichever is greater, will be preserved as contiguous open space. This open space requirement applies to the totality of the proposed JAZB Safety Zone B area, and not to each parcel within the zone. The JAZB Safety Zone B open space requirement is easily met by existing airport-owned land, along with off-airport property guided to remain as open space or otherwise not expected to be regularly occupied. The amount of contiguous open space within JAZB Zone B as proposed in the updated Draft FCM Zoning Ordinance is shown in Table 2-11.

The proposed JAZB Safety Zones A and B are shown in Figure 2-9.

---

\(^2\) Assumes a 100-foot long by 50-foot wide accident swath (distance between where an accident aircraft first touched the ground or an object on the ground and where it subsequently came to a rest).
Table 2-11: Contiguous Open Space Acreages in JAZB Safety Zone B

<table>
<thead>
<tr>
<th>FCM Runway</th>
<th>JAZB Zone B Total</th>
<th>20% Minimum or 20 ac.</th>
<th>Proposed Contiguous Open Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>10L+10R</td>
<td>163.0</td>
<td>32.6</td>
<td>76.1</td>
</tr>
<tr>
<td>28L+28R</td>
<td>197.7</td>
<td>39.5</td>
<td>126.8</td>
</tr>
<tr>
<td>18</td>
<td>47.8</td>
<td>20.0</td>
<td>47.8</td>
</tr>
<tr>
<td>36</td>
<td>47.8</td>
<td>20.0</td>
<td>47.5</td>
</tr>
<tr>
<td>Total</td>
<td>456.3</td>
<td>91.3</td>
<td>298.2</td>
</tr>
</tbody>
</table>

Source: MAC analysis

The dimensions of the proposed JAZB Safety Zones are shown in Table 2-12.

Table 2-12: JAZB Safety Zone Dimensions

<table>
<thead>
<tr>
<th>JAZB Zone</th>
<th>JAZB Safety Zone Dimensions by Runway End (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10R</td>
</tr>
<tr>
<td>Zone A Inner Width</td>
<td>1,000</td>
</tr>
<tr>
<td>Zone A Outer Width</td>
<td>1,750</td>
</tr>
<tr>
<td>Zone A Length</td>
<td>2,500</td>
</tr>
<tr>
<td>Zone B Inner Width</td>
<td>1,750</td>
</tr>
<tr>
<td>Zone B Outer Width</td>
<td>2,500</td>
</tr>
<tr>
<td>Zone B Length</td>
<td>2,500</td>
</tr>
</tbody>
</table>

Source: MAC analysis
Figure 2-1: FCM Airfield Configuration
Figure 2-2: FCM 2017 Safety/Risk Study Analysis Areas
Figure 2-3: FCM 2017 Safety/Risk Study Occupant Areas
Figure 2-4: FCM Historical Aircraft Accident Locations (1997 – 2016)
Figure 2-5: Historic Nationwide GA Accident Locations Superimposed on FCM Runway 10L and 10R Ends
Figure 2-6: Historic Nationwide GA Accident Locations Superimposed on FCM Runway 28L and 28R Ends
Figure 2-7: Historic Nationwide GA Accident Locations Superimposed on FCM Runway 18 End
Figure 2-8: Historic Nationwide GA Accident Locations Superimposed on FCM Runway 36 End
Figure 2-9: Proposed JAZB Safety Zones
SECTION 3:

ECONOMIC IMPACT ANALYSIS UPDATE
3. ECONOMIC IMPACT ANALYSIS

3.1 INTRODUCTION
In determining what minimum airport zoning regulations to adopt, Minnesota State Statutes guide the local airport zoning authority (JAZB) to consider the social and economic costs of restricting land uses versus the benefits derived from a strict application of the standards of the commissioner (the State’s Model Zoning Ordinance).

In 2010, the City of Eden Prairie’s planning and economic development team identified the impacts related to lost private property development potential, property taxes, and employment that would be associated with a strict application of the State Model Zoning Ordinance. The study concluded that strict implementation of the State Model Zoning Ordinance would result in an estimated loss of $150,000,000 in commercial development, $12,000,000 in residential development, and $600,000 in annual property taxes.

This chapter summarizes updates that have been made to the City’s Economic Impact Analysis completed in 2010 to bring the analysis up-to-date. The updated study will be referred to as the 2017 Economic Impact Analysis.

3.2 STUDY METHODOLOGY
The 2017 Economic Impact Analysis evaluated the economic development potential of two development scenarios for comparison:

- Value of development under the MnDOT State Model Zoning Ordinance land use criteria within State Safety Zones A and B (State Model Safety Zone scenario); and
- Value of development under the proposed JAZB Airport Zoning Ordinance (JAZB Safety Zone scenario).

The study evaluates the following economic impact categories:

- Value of building development, both residential and commercial
- Value of city real estate taxes, both residential and commercial
- Number of potential jobs associated with proposed development

Each parcel within the JAZB Safety Zones was assigned a probable land use so that its economic development potential could be assessed. The only exception is a parcel of MAC-owned property on the west side of FCM that is labeled with an “undefined” land use as its ultimate disposition is unclear at this time. This parcel was identified as a Permitted Residential Area in the draft Zoning Ordinance, so it was included in the Safety/Risk Study as an Occupant Area. From an economic impact perspective, this parcel will be evaluated in two separate cases – one for a Residential development scenario, and another as a Commercial/Office development scenario.

Acreages of assigned land uses off each runway end are presented in Table 3-1. The assigned land uses are shown in Figure 3-1 for the State Model Safety Zone scenario and Figure 3-2 for the proposed JAZB Safety Zone scenario.
The analysis does not consider the financial impact of property takings claims in the State Model Safety Zone scenario, which could be significant.

### Table 3-1: Land Use Acreages by Runway End Within Safety Zones

<table>
<thead>
<tr>
<th>Land Use</th>
<th>FCM Runway End</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10L/10R</td>
</tr>
<tr>
<td>Airport Commercial</td>
<td>---</td>
</tr>
<tr>
<td>Airport Office</td>
<td>5.3</td>
</tr>
<tr>
<td>Airport Undeveloped</td>
<td>92.5</td>
</tr>
<tr>
<td>Church</td>
<td>12.2</td>
</tr>
<tr>
<td>Commercial</td>
<td>---</td>
</tr>
<tr>
<td>Former Landfill</td>
<td>---</td>
</tr>
<tr>
<td>Industrial</td>
<td>---</td>
</tr>
<tr>
<td>Park / Open Space</td>
<td>8.1</td>
</tr>
<tr>
<td>Residential</td>
<td>29.4</td>
</tr>
<tr>
<td>Undefined</td>
<td>11.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>158.6</strong></td>
</tr>
</tbody>
</table>

Source: MAC analysis

### 3.3 FINDINGS

#### 3.3.1 Residential Development

Of the residential development acreage presented in Table 3-1, only 6.9 acres are currently undeveloped. Of this, 2.7 acres are in Model State Safety Zone A, and thus undevelopable for residential uses in the State Model Safety Zone scenario, with the remaining 4.2 acres in Model State Safety Zone B. The entire 6.9 acres are within JAZB Safety Zone B.

The study evaluated residential development potential in two separate cases for both the State Model Safety Zone and JAZB Safety Zone scenarios:

- Case 1 assumes that the MAC-owned parcel with an undefined land use would be developed as Residential. Thus, total residential land use acreage would increase to 18.0 acres.
- Case 2 assumes that the MAC-owned parcel with an undefined land use would be developed as Commercial/Office. Thus, total residential land use acreage would remain at 6.9 acres.
The following assumptions were applied in the analysis:

- Residential Units per Acre:
  - 2.5 for the JAZB Safety Zone Scenario based on Eden Prairie development criteria
  - 0.3 for the State Model Safety Zone Scenario based on Zone B density restrictions in MnDOT zoning guidance. This constrains development to no more than one unit per a minimum three-acre lot.
- Value per Residential Unit: average of $378,000
- Annual Real Estate Tax Per Unit: average of $1,255

As shown in Table 3-2, the impact of strictly implementing the State Model Safety Zone Scenario on residential development is estimated to be:

- Reduction in total residential development value of approximately $6,000,000 (Case 1) to $15,000,000 (Case 2)
- Reduction in annual real estate taxes of approximately $20,000 (Case 1) to $50,000 (Case 2)
<table>
<thead>
<tr>
<th>Residential Development Scenario</th>
<th>Acres</th>
<th>Units/Acre</th>
<th>Units</th>
<th>Value/Unit</th>
<th>Total Development Value</th>
<th>Real Estate Tax/Unit</th>
<th>Annual Real Estate Tax Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JAZB Scenario</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case 1</td>
<td>18.0</td>
<td>2.5</td>
<td>44.8</td>
<td>$378,000</td>
<td>$16,935,040</td>
<td>$1,255</td>
<td>$56,226</td>
</tr>
<tr>
<td>Case 2</td>
<td>6.9</td>
<td>2.5</td>
<td>17.2</td>
<td>$378,000</td>
<td>$6,483,592</td>
<td>$1,255</td>
<td>$21,526</td>
</tr>
<tr>
<td><strong>State Model Scenario</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case 1</td>
<td>15.3</td>
<td>0.3</td>
<td>5.1</td>
<td>$378,000</td>
<td>$1,927,473</td>
<td>$1,255</td>
<td>$6,399</td>
</tr>
<tr>
<td>Case 2</td>
<td>4.2</td>
<td>0.3</td>
<td>1.4</td>
<td>$378,000</td>
<td>$527,584</td>
<td>$1,255</td>
<td>$1,752</td>
</tr>
<tr>
<td><strong>Differential</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case 1</td>
<td>2.7</td>
<td>2.2</td>
<td>39.7</td>
<td>0.0</td>
<td>$15,007,567</td>
<td>0.0</td>
<td>$49,827</td>
</tr>
<tr>
<td>Case 2</td>
<td>2.7</td>
<td>2.2</td>
<td>15.8</td>
<td>0.0</td>
<td>$5,956,008</td>
<td>0.0</td>
<td>$19,775</td>
</tr>
</tbody>
</table>

Notes:

- Case 1 assumes residential development on the undefined MAC-owned parcel
- Case 2 assumes office development on the undefined MAC-owned parcel
- JAZB scenario units per acre, value per unit, and real estate tax per unit values assigned by City of Eden Prairie
- State Model scenario units per acre assigned consistent with MnDOT zoning guidance

Source: Eden Prairie analysis
3.3.2 Commercial Development

For the purpose of this analysis, commercial development is inclusive of commercial, office, and industrial land uses.

The following assumptions were applied in the analysis:

- **Building Square Footage**
  - Based on floor-to-area ratios developed by Eden Prairie for the JAZB Safety Zone scenario. For each case, a low and high range were developed. The low range represents a typical floor-to-area ratio for a single story building, while the high range represents a typical floor-to-area ratio for a multi-story building. For summary purposes, the mid-point of the low and high ranges will be reported in this section. The results of the individual low and high range calculations are reported separately in Appendix 6.
  - Based on Zone B density restrictions in MnDOT zoning guidance for the State Model Safety Zone scenario. This constrains development to a square footage that would support a site population of no more than 15 times the site acreage.

- **Value per Square Foot (SF)**
  - $180 per SF for Airport Commercial uses (on airport leased land)
  - $150 per SF for Airport Office uses (on airport leased land)
  - $200 per SF for Commercial uses (not on airport leased land)
  - $80 per SF for Industrial uses (not on airport leased land)

- **Annual Real Estate Tax Value**: calculated and provided by Eden Prairie

As shown in Table 3-3, the impact of strictly implementing the State Model Safety Zone Scenario on commercial development is estimated to be:

- Reduction in total commercial development value of approximately $38,000,000 (Case 1) to $58,000,000 (Case 2)
- Reduction in annual real estate taxes of approximately $89,000 (Case 1) to $237,000 (Case 2)
Table 3-3: Commercial Development Economic Impact Results

<table>
<thead>
<tr>
<th>Commercial Development Scenario</th>
<th>Acres</th>
<th>Building SF</th>
<th>Value/SF</th>
<th>Total Commercial Value</th>
<th>Annual Real Estate Tax Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JAZB Scenario Case 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>15.8</td>
<td>258,942</td>
<td>$153</td>
<td>$39,747,510</td>
<td>$97,722</td>
</tr>
<tr>
<td><strong>State Model Scenario Case 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>2.4</td>
<td>13,322</td>
<td>$150</td>
<td>$1,998,285</td>
<td>$8,233</td>
</tr>
<tr>
<td><strong>Differential Case 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>13.4</td>
<td>245,620</td>
<td>$3</td>
<td>$37,749,225</td>
<td>$89,489</td>
</tr>
<tr>
<td><strong>JAZB Scenario Case 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>26.9</td>
<td>452,348</td>
<td>$152</td>
<td>$68,758,485</td>
<td>$282,700</td>
</tr>
<tr>
<td><strong>State Model Scenario Case 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>13.5</td>
<td>73,707</td>
<td>$150</td>
<td>$11,056,084</td>
<td>$45,551</td>
</tr>
<tr>
<td><strong>Differential Case 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>13.4</td>
<td>378,641</td>
<td>$2</td>
<td>$57,702,401</td>
<td>$237,149</td>
</tr>
</tbody>
</table>

Notes:
- Includes office, commercial, and industrial development
- Case 1 assumes residential development on the MAC-owned undefined parcel
- Case 2 assumes office development on MAC-owned undefined parcel
- Building SF based on the mid-point of low and high floor-to-area ratios assigned by City of Eden Prairie for JAZB Scenario and MnDOT density restrictions for State Scenario
- Value per SF of development ranged from $80/SF to $200/SF
- Annual real estate tax value assigned by City of Eden Prairie

Source: Eden Prairie analysis
3.3.3 Combined Development

Table 3-4 illustrates the impact that strictly implementing the State Model Safety Zone scenario could have on combined residential and commercial development potential in the vicinity of FCM.

- Reduction in total development value of approximately $53,000,000 (Case 1) to $64,000,000 (Case 2)
- Reduction in annual real estate taxes of approximately $139,000 (Case 1) to $257,000 (Case 2)

While the development value is a one-time economic impact, the loss of tax revenue is an ongoing occurrence. To estimate the long-term impact of strictly implementing the State Model Safety Zone scenario, the aggregated value of 20 years of real estate taxes was combined with the total development value to arrive at the following impact:

- Reduction in long-term economic impact value of approximately $56,000,000 (Case 1) to $69,000,000 (Case 2)

Table 3-4: Combined Residential and Commercial Economic Impact Results

<table>
<thead>
<tr>
<th>Combined Development Scenario</th>
<th>Total Development Value</th>
<th>Total Annual Real Estate Tax Value</th>
<th>20-Year Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JAZB Scenario Case 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>$56,682,550</td>
<td>$153,948</td>
<td>$59,761,503</td>
</tr>
<tr>
<td><strong>State Model Scenario Case 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>$3,925,758</td>
<td>$14,632</td>
<td>$4,218,405</td>
</tr>
<tr>
<td><strong>Differential Case 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>$52,756,792</td>
<td>$139,315</td>
<td>$55,543,098</td>
</tr>
<tr>
<td><strong>JAZB Scenario Case 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>$75,242,077</td>
<td>$304,226</td>
<td>$81,326,601</td>
</tr>
<tr>
<td><strong>State Model Scenario Case 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>$11,583,668</td>
<td>$47,303</td>
<td>$12,529,722</td>
</tr>
<tr>
<td><strong>Differential Case 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>$63,658,409</td>
<td>$256,924</td>
<td>$68,796,879</td>
</tr>
</tbody>
</table>

Notes:
Scenario 1 assumes residential development on the MAC-owned undefined parcel
Scenario 2 assumes office development on the MAC-owned undefined parcel
20-year value sums one-time development value plus recurring annual real estate tax value

Source: Eden Prairie analysis
3.3.4 Potential Employment Generation Impacts

Another economic impact factor to consider is the regional employment potential that could be generated on commercial land uses within the Safety Zones at FCM. Table 3-5 illustrates the impact that strictly implementing the State Model Safety Zone scenario could have on new employment generation potential.

- Reduction in employment generation potential of approximately 600 (Case 1) to 1,000 (Case 2) new jobs

<table>
<thead>
<tr>
<th>Development Scenario</th>
<th>Employment Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JAZB Scenario Case 1</strong></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>641</td>
</tr>
<tr>
<td><strong>State Model Scenario Case 1</strong></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>37</td>
</tr>
<tr>
<td><strong>Differential Case 1</strong></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>604</td>
</tr>
<tr>
<td><strong>JAZB Scenario Case 2</strong></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>1,173</td>
</tr>
<tr>
<td><strong>State Model Scenario Case 2</strong></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>203</td>
</tr>
<tr>
<td><strong>Differential Case 2</strong></td>
<td></td>
</tr>
<tr>
<td>Range Midpoint</td>
<td>970</td>
</tr>
</tbody>
</table>

Notes:
- Scenario 1 assumes residential development on the MAC-owned undefined parcel
- Scenario 2 assumes office development on the MAC-owned undefined parcel
- Employment potential for JAZB Scenario estimated by Eden Prairie
- Employment potential for State Model Scenario based on MnDOT site density restrictions

Source: Eden Prairie analysis

3.3.5 Summary

The 2017 Economic Impact Analysis concludes that strict implementation of the State Model Zoning Ordinance would result in an estimated loss of approximately $38,000,000 to $58,000,000 in commercial development, approximately $6,000,000 to $15,000,000 in residential development, and approximately $139,000 to $257,000 in annual property taxes. While these values are somewhat more conservative than those reported in the 2010 study, they still indicate that a strict implementation of the State Model Zoning
Ordinance would have a significant adverse long-term economic impact on the surrounding community in the magnitude of $56,000,000 to $69,000,000 over a 20-year period, not including the loss of employment generating potential. It is also noteworthy to consider that the Safety/Risk Study concluded that the statistical likelihood of an aircraft accident occurring in a designated Occupant Area in the vicinity of FCM is once every 185 years (see Table 2-10).

A graphic summarizing the results of the 2017 Economic Impact Analysis for both cases is provided in Figure 3-3.
Figure 3-1: FCM Safety Zone Land Uses for Economic Impact Analysis – Model State Safety Zones
Figure 3-2: FCM Safety Zone Land Uses for Economic Impact Analysis – JAZB Safety Zones
Figure 3-3: Summary of 2017 Economic Impact Analysis Results
SECTION 4:

2017 FCM AIRPORT ZONING ORDINANCE
PAGE INTENTIONALLY LEFT BLANK
4. 2017 FCM AIRPORT ZONING ORDINANCE

4.1 INTRODUCTION
This chapter describes updates that have been made to the Draft FCM Airport Zoning Ordinance document.

4.2 FCM AIRPORT ZONING ORDINANCE LANGUAGE AND FIGURES
The proposed language and accompanying figures for the updated Draft FCM Zoning Ordinance are presented in Appendix 7.

Changes from the 2010 Draft Ordinance language are shown as tracked-changes in Appendix 7. Most of the language changes reflect simple updates to items that have described in this report. Other changes include the following items:

- Section I, Purpose and Authority: Removed the City of Bloomington from the list of JAZB participants as the proposed zoning surfaces do not extend into the municipal boundaries of Bloomington (page 1)
- Section IV, Airspace Obstruction Zoning, Subsection B, Height Restrictions: Added clarifying language to items 1 and 2 about use of an FAA 7460 Obstruction Evaluation and determination by FAA (pages 9 and 10)
- Section XIV, Judicial Review: Clarified language to better align with state statute (page 22)

In addition, the following Zoning Ordinance Exhibits have been updated:

- Exhibit A, Airport Boundary
- Exhibit B, Residential Permitted Parcels on JAZB Zone B
- Exhibit C, Permitted Residential Areas
- Exhibit D, Airport Boundary and Airspace Zoning Limits
- Exhibit E, Airport Boundary and Airspace Contours
- Exhibit F, Airport Boundary and Safety Zoning Limits

4.2.1 Permitted Residential Areas
The updated Draft FCM Zoning Ordinance will continue to allow for the improvement, expansion and development of new residential uses in existing and planned Occupant Areas guided for residential use. These residential uses, as designated Permitted Residential Areas, are recognized and treated as conforming land uses in the ordinance.

Designated Permitted Residential Areas are identified in the Draft FCM Zoning Ordinance Figures B and C, which are provided in Appendix 7.
4.3 FCM AIRSPACE ZONES WITHIN ZONING LIMITS GRID MAPS (AIRSPACE ZONES)

The FCM Airspace Zone grid maps depict height limitations imposed by the Draft Zoning Ordinance. These airspace heights are based on the Federal Aviation Administration’s (FAA) 14 CFR Part 77\(^3\) criteria. The FCM Airspace Zones have been updated to reflect the airfield configuration changes described in Section 2.3. The most noticeable change from the previous version of the ordinance is that the airspace zones for the north parallel Runway 10L-28R are based on a steeper, or less restrictive, approach surface slope due to the change in runway designation.

Figure 4-1 summarizes the FCM Airspace Zones grid maps that have been developed for the updated Draft FCM Airport Zoning Ordinance. The individual grip maps showing airspace zone heights on a parcel basis are provided in Appendix 8.

4.4 FCM SAFETY ZONES WITHIN ZONING LIMITS GRIP MAPS (SAFETY ZONES)

The FCM Safety Zone grid maps depict the JAZB-proposed Safety Zones described in Section 2-10.

Figure 4-2 summarizes the FCM Safety Zone grid maps that have been developed for the updated Draft FCM Airport Zoning Ordinance. The individual grip maps showing safety zone limits on a parcel basis are provided in Appendix 9.

4.5 FCM MAXIMUM CONSTRUCTION HEIGHTS WITHOUT PERMIT WITHIN ZONING LIMITS GRID MAPS (MAXIMUM CONSTRUCTION HEIGHTS WITHOUT A PERMIT)

The updated Draft Ordinance carries forward the policy that an airport zoning permit will not be required for development up to a "maximum construction height without a permit" elevation established on a parcel-by-parcel basis.

The Maximum Construction Height Without Permit grid maps have been updated based upon the following factors:

- The airspace zoning surfaces associated with north parallel Runway 10L-28R are less restrictive (i.e., a steeper slope) with the “utility” designation. This results in greater allowable building heights without a permit for some parcels to the northeast and northwest of FCM;

- Updated and more precise ground elevation contours are available; and,

- Updated and more precise airspace surface elevation contours are available.

The elevation for each parcel is determined in the following manner:

---

\(^3\) Safe, Efficient Use, and Preservation of the Navigable Airspace (14 CFR Part 77)
• Identify the location on each parcel where the highest ground elevation underlies the lowest airspace zoning elevation;

• Subtract the ground elevation from the airspace zoning elevation at the identified location; and,

• Round the height down to the nearest ten foot interval.

**Figure 4-3** summarizes the Maximum Construction Height Without Permit grid maps that have been developed for the updated Draft FCM Airport Zoning Ordinance. Exhibits showing a greater level of detail on a parcel basis are provided in **Appendix 10**.
Figure 4-1: FCM Airspace Zones Grip Map Summary

FCM Airspace Zones
Within Zoning Limits
A - Index Sheet

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours
Figure 4-2: FCM Safety Zones Grip Map Summary
Figure 4-3: FCM Maximum Construction Height Without Permit Grip Map Summary
5. STAKEHOLDER ENGAGEMENT AND PUBLIC INFORMATION PROCESS

5.1 INTRODUCTION

One of the stated goals for the JAZB is to ensure that an appropriate level of stakeholder/community engagement occurs throughout the process of developing and implementing the proposed airport zoning ordinance for Flying Cloud Airport.

Between September 2017 and April 2018, the JAZB conducted four (4) meetings that were open to the public, along with an advertised public hearing. These meetings are listed in Table 5-1.

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Location</th>
<th>Materials Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/21/17</td>
<td>4:30pm</td>
<td>Eden Prairie City Center</td>
<td>JAZB Kickoff</td>
</tr>
<tr>
<td>10/26/17</td>
<td>9:00am</td>
<td>Eden Prairie City Center</td>
<td>Proposed Zoning Ordinance Updates</td>
</tr>
<tr>
<td>01/18/18</td>
<td>4:00pm</td>
<td>Eden Prairie City Center</td>
<td>Results of Zoning Ordinance Updates</td>
</tr>
<tr>
<td>02/27/18</td>
<td>6:00pm</td>
<td>Eden Prairie City Center</td>
<td>Public Hearing</td>
</tr>
<tr>
<td>04/05/18</td>
<td>2:00pm</td>
<td>Eden Prairie City Center</td>
<td>Review of Public Input &amp; Approval to Submit</td>
</tr>
</tbody>
</table>

A record of all JAZB meeting materials is available on the MAC website through the following link: https://metroairports.org/General-Aviation/Airports/Flying-Cloud/Joint-Airport-Zoning-Board-Flying-Cloud.aspx

5.2 PUBLIC COMMENT PERIOD

At its meeting on January 18, 2018, the JAZB formally approved an updated version of the Draft Airport Zoning Ordinance for formal public review and comment, and to serve as the basis for the public hearing.

The public comment period for the Draft Flying Cloud Airport Zoning Ordinance opened on Monday, February 12, 2018. A public hearing was held on Tuesday, February 27, 2018 to provide information about the draft ordinance to interested stakeholders and citizens. Materials from the public hearing are reproduced in Appendix 11. The public comment period closed on Wednesday, March 14, 2018.

Notices about the public hearing were published in the following periodicals:

- Star Tribune newspaper on February 12 and February 19, 2018;
- Eden Prairie News newspaper on February 15; and
• State Register on February 12.

In addition, notices were mailed to the governing Boards of JAZB member cities, Hennepin County and Scott County; to property owners within approximately one mile of the Flying Cloud Airport boundary as determined by the City of Eden Prairie (approximately 4,400 addresses); and distributed electronically to persons subscribing to the Metropolitan Airports Commission GovDelivery news service. The public notice was also posted on the Flying Cloud Airport JAZB page of the MAC website.

The notice and proposed Flying Cloud Airport Zoning Ordinance were available for public inspection at the following locations: the Metropolitan Airports Commission’s Main Office, 6040 28th Avenue South, Minneapolis; the City Halls of the cities of Eden Prairie, Shakopee, and Chanhassen; and the Eden Prairie Library, 565 Prairie Center Drive, Eden Prairie.

Twelve people signed in on the hearing attendance sheets. No verbal testimony was given during the hearing. A transcript from the hearing is included in Appendix 11.

During the public comment period, the JAZB received a total of four written comments from members of the public. Based on the public comments received, no content changes are proposed to the updated Draft Airport Zoning Ordinance that was presented at the hearing.

5.3 RESPONSES TO PUBLIC QUESTIONS AND COMMENTS

Responses to the written public comments received are provided in Appendix 11. In addition, the JAZB offers the following responses to verbal questions received during the public comment period that were generally relevant to the proposed ordinance and not parcel specific.

5.3.1 JAZB Safety Zone C Restrictions

Questions were raised as to whether the proposed restrictions within JAZB Safety Zone C would prohibit the use of rooftop solar panels on homes or restrict the use of FCC-approved amateur radio stations.

The draft ordinance does not seek to prohibit residential solar installations or restrict the use of properly-permitted amateur radio stations within JAZB Safety Zone C.

If a particular solar installation is determined to cause glare issues for pilots using the airport, the zoning ordinance would serve as a basis to work with the property owner to mitigate the visual impairment. However, based on operational experience, the likelihood of a residential rooftop solar installation to cause a serious glare problem is expected to be a very rare occasion.

Similarly, if a particular amateur radio station is determined to cause interference with navigational aids or communications between aircraft and air traffic controllers, the zoning ordinance would serve as the basis to work with the radio operator and/or the FCC to mitigate the interference.
5.3.2 JAZB Safety Zone B Contiguous Open Space Requirements

A property owner asked if the proposed JAZB Safety Zone B requirement for contiguous open space was meant to be applied to each parcel within the zone.

JAZB Safety Zone B contains a requirement to provide a minimum of 20% of the total Zone B acreage, or 20 acres, whichever is greater, to remain as contiguous open space. The purpose for this open space is to provide an extra margin of safety by providing a large area for the pilot of a disabled aircraft to use for an emergency landing.

This open space requirement applies to the totality of the proposed JAZB Safety Zone B area, and not to each parcel within the zone. The JAZB Safety Zone B open space requirement is easily met by existing airport-owned land, along with off-airport property guided to remain as open space or otherwise not expected to be regularly occupied.

5.4 SUMMARY OF MNDOT AERONAUTICS REVIEW (FIRST SUBMITTAL)
[placeholder for MnDOT Aeronautics review summary]
LIST OF APPENDICES

Appendix 1: 2009 FCM Safety/Risk Study
Appendix 2: FCM Aircraft Accident Data (1997 – 2016)
Appendix 3: California Study Aircraft Accident Locations
Appendix 4: FCM Aircraft Activity Forecast Documentation
Appendix 5: Aircraft Accident Probability Risk Calculation Tables
Appendix 6: Economic Impact Analysis Detail Tables
Appendix 7: FCM Zoning Ordinance Language and Exhibits
Appendix 8: FCM Airspace Zoning Grid Maps
Appendix 9: FCM Safety Zone Grid Maps
Appendix 10: FCM Maximum Construction Height Without Permit Grid Maps
Appendix 11: Public Hearing Report
Appendix 1: 2009 FCM Safety/Risk Study

<table>
<thead>
<tr>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009 FCM Zoning Ordinance Safety/Risk Study</td>
<td>1-1</td>
</tr>
</tbody>
</table>
MEMORANDUM

TO: FCM Joint Airport Zoning Board
FROM: HNTB Corporation (HNTB)
DATE: November 6, 2009
SUBJECT: Analysis of Probability of Aircraft Accidents in Mn/DOT Safety Zones A and B for Runways 10R-28L, 10L-28R and 18-36 at Flying Cloud Airport

I. Background
At the August 13th, 2009 meeting of the Flying Cloud Airport Joint Airport Zoning Board (JAZB), the Board directed staff (MAC) to complete a safety study for the Flying Cloud Airport (FCM). MAC retained HNTB to prepare the study. The safety study in this memorandum will be based upon the following statute.

Minnesota law, Chapter 360.066, Subdivision 1. includes the following:

“Reasonableness Standards of the commissioner defining airport hazard areas and the categories of uses permitted and airport zoning regulations adopted under sections 360.011 to 360.076, shall be reasonable, and none shall impose a requirement or restriction which is not reasonably necessary to effectuate the purposes of sections 360.011 to 360.076. In determining what minimum airport zoning regulations may be adopted, the commissioner and a local airport zoning authority shall consider, among other things, the character of the flying operations expected to be conducted at the airport, the location of the airport, the nature of the terrain within the airport hazard area, the existing land uses and character of the neighborhood around the airport, the uses to which the property to be zoned are planned and adaptable, and the social and economic costs of restricting land uses versus the benefits derived from a strict application of the standards of the commissioner.”

The purpose of this memorandum is to help evaluate the reasonableness of the land use restrictions in the Mn/DOT’s rules’ pertaining to areas off the runway ends at Flying Cloud Airport (FCM) based upon the probability of an accident occurring in Mn/DOT Safety Zone A outside the runway protection zone (RPZ) and Mn/DOT Safety Zone B, the character of the flying operations expected to be conducted at the airport, the location of the airport, and the nature of the terrain within the airport hazard area. The analysis herein incorporates appropriate

1 Minnesota Rules 8800.2400

A. Definitions

Operation
An “operation” is defined as a takeoff/departure or landing/arrival of an aircraft at FCM.

FCM Accident
An “FCM accident” is defined as an occurrence associated with the act of operating an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage as the result of an FCM operation and a collision with the ground or an object on the ground located within four miles of FCM.

Incident
An “incident” is defined as an occurrence other than an accident that is associated with the act of operating an aircraft and that affects, or could affect, the safety of an operation. For example, if a maintenance vehicle hits an aircraft with no one on board with the intent to fly, then this is an incident even though there is substantial damage to the aircraft or serious injury to maintenance or other personnel.

FCM Accident Rate
The “FCM accident rate” is defined as the number of FCM accidents that have been reported to the National Transportation Safety Board (NTSB) during the past 20 years – divided by the total number of FCM operations during the past 20 years.

2025 Forecast
The “2025 forecast” is the number of based aircraft, and the associated number of operations on each runway predicted to occur, at FCM in the year 2025.

Probability of an Accident at FCM Runway End in 2025
The “Probability of an Accident at FCM Runway End in 2025” is equal to the FCM accident rate multiplied by the 2025 forecast of operations at the runway end.

Probability of an Accident in Mn/DOT Safety Zone in 2025
The probability of an accident occurring in a Mn/DOT Safety Zone off an FCM runway end in 2025 is equal to the Probability of an Accident at the FCM Runway End in 2025 multiplied by the percent of historical general aviation accidents throughout the United States that have occurred in an area the same size as the Mn/DOT Safety Zone, as reported to the NTSB².

II. Accident Probability Analysis Methodology
The accident probability analysis in this report uses an eight-step methodology, as follows:

1. Determine the appropriate data to be used in the analysis based on the factors to be considered stated in Minn. Stat. §360.066, subd. 1.

² This data was compiled by the University of California at Berkeley in 1993 and is the only available data for the location of general aviation accidents in the vicinity of a general aviation airport in the U.S.
2. Identify applicable probability standards.
3. Define the areas to be studied.
4. Compile the appropriate data to determine accident rates and locations.
5. Distribute accident data to the areas being analyzed.
6. Determine the number of future operations for the runway end being studied.
7. Calculate the accident probabilities in the study areas.
8. Compare the accident probabilities to the applicable probability standards.

III. Appropriate Data to be Used in the Analysis

The appropriate data to be used in the statistical analysis should best represent the conditions expected to be present at FCM in the analysis year (2025) – the fleet mix, airport instrumentation and airport operating procedures (i.e., the character of the flying operations expected to be conducted at the airport in accordance with Minn. Stat. §360.066, subd. 1). Data can be available at the national level and the local level. The issue is which data best represents the conditions at FCM – national data or site specific local data. This is also an issue in determining ground traffic impacts from a proposed land use in a city or neighborhood. The Institute of Transportation Engineers (ITE) compiles traffic generated by different land uses across the U.S. and publishes a Trip Generation Handbook and user guide. ITE states that there is a “need to collect local trip generation data to either validate the use of Trip Generation data for local use or establish a new trip generation rate”.

Aircraft accidents in the U.S. are reported to the National Transportation Safety Board (NTSB). The NTSB provides a general aviation (GA) accident rate per 100,000 flight hours for the previous 20 years. This data could be used for the accident rate at FCM in 2025 by attempting to estimate the number of flight hours per operation; however, this data is not representative of the operating conditions at FCM. It includes GA airports with short, unpaved runways, runways without a precision instrument landing system (ILS), airports without an Air Traffic Control Tower, airports that serve aircraft without sophisticated instrumentation, and airports located in rugged terrain.

Based on the above and the analysis in Subsections A and B below, it was determined that available site-specific local data is the appropriate data to be used in determining the accident rate for the analysis in this memorandum.

The following is an analysis of “the character of the flying operations expected to be conducted at the airport, the location of the airport, (and) the nature of the terrain within the airport hazard area” in accordance with Minn. Stat. §360.066, subd. 1.

A. Character of FCM Flying Operations

The character of flying operations is based on the types of aircraft operating at the airport, the purpose of their operations, their safety records and the airport facilities that influence their operations.

---

FCM is classified as a Minor Airport in the Metropolitan Council’s Metropolitan Airport System Plan and is a secondary reliever of Minneapolis/St. Paul International Airport (MSP). It has an Air Traffic Control Tower (ATCT) and three runways. The longest runway is Runway 10R-28L. It is under construction and will be 5,000 feet in length with a precision instrument approach to Runway 10R. FCM provides the facilities and services to attract and serve general aviation and corporate aircraft that require a runway up to 5,000 feet. The existing and forecast fleet of based aircraft is given in Table 1. In 2007, 80% were single engine piston aircraft and 5.5% of the based aircraft were jets. The 2025 forecast of based aircraft has 71% single engine piston aircraft and 15% jets. The safety record of jets is significantly better than single engine piston aircraft. When considering the current NTSB records of accidents in 2008 through May it is noteworthy to consider that flights conducted for personal, aerial applications, instructional and other reasons are made primarily by non-jet aircraft and constituted about 97% of the accidents through May of 2008.

Table 1
FCM 2025 Based Aircraft Forecast

<table>
<thead>
<tr>
<th>Year</th>
<th>Single Engine Piston</th>
<th>Multi-Engine Piston</th>
<th>Turbo-prop</th>
<th>Jets</th>
<th>Microjet</th>
<th>Other</th>
<th>Helicopter</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>336</td>
<td>37</td>
<td>20</td>
<td>0</td>
<td>23</td>
<td></td>
<td>5</td>
<td>0</td>
<td>421</td>
</tr>
<tr>
<td>2010</td>
<td>326</td>
<td>36</td>
<td>21</td>
<td>3</td>
<td>27</td>
<td></td>
<td>7</td>
<td>0</td>
<td>420</td>
</tr>
<tr>
<td>2015</td>
<td>310</td>
<td>32</td>
<td>20</td>
<td>8</td>
<td>34</td>
<td></td>
<td>7</td>
<td>0</td>
<td>411</td>
</tr>
<tr>
<td>2020</td>
<td>296</td>
<td>29</td>
<td>20</td>
<td>15</td>
<td>38</td>
<td></td>
<td>8</td>
<td>0</td>
<td>406</td>
</tr>
<tr>
<td>2025</td>
<td>286</td>
<td>27</td>
<td>20</td>
<td>20</td>
<td>40</td>
<td></td>
<td>8</td>
<td>0</td>
<td>401</td>
</tr>
</tbody>
</table>

Source: HNTB, April 2009.

According to the NTSB’s Annual Review of Aircraft Accident Data U.S. General Aviation, Calendar Year 2003, “in 2003, the highest proportion of flying time was associated with personal recreation/business operations, which accounted for the largest proportion of accidents, 69% (n = 1197), a percentage consistent with the 10-year average. Less than 1% of the accidents (n = 5) were corporate/executive operations, 5% were aerial application (n = 86), and 14.7%, instructional flying (n = 255).” The proportion of flight hours was higher than the proportion of accidents for corporate operations reflecting the relative safety of these types of flights.

General Aviation encompasses a wide range of operations, including personal recreation/business, corporate, flight instruction and aerial applications. National NTSB accident rates include all of these operations together. Personal recreation/business flights make up the bulk of GA activity, and typically use single and multi engine piston aircraft. Corporate flying includes business transportation with a professional crew and usually involves larger twin piston, turboprop and jet aircraft. The proportion of corporate flying is expected to continue to increase at FCM.

Based on the above, accident data specific to FCM is the appropriate data to be used in determining the accident rate at FCM. This eliminates the inaccuracies that would result from the use of national generalized GA data that include GA airports with short unpaved runways,
runways without an ILS, airports without an Air Traffic Control Tower, airports that serve aircraft without sophisticated instrumentation, and airports located in rugged terrain. Moreover, utilizing specific FCM accident data is in keeping with the statutory requirement to consider “the character of the flying operations expected to be conducted at the airport,” due to the fact that the accident statistics at the airport are a direct result of the character of the flying operations conducted at the airport.

B. FCM Location and Nature of Terrain within Model State Safety Zones

FCM is located on a plateau north of the Minnesota River at an elevation of 906 feet above MSL (mean sea level). The plateau drops off sharply towards the Minnesota River (200 feet lower) to the south and east and into a ponding area to the west. Staring Lake, to the north, is approximately 100 feet lower than the airport. The airport location is generally good for airport operations; there are no features that would cause substantive turbulence or adverse wind conditions. When winds are strong out of the north, pilots landing on Runway 36 tend to come in high so as not to be effected by potential downdrafts from the Minnesota River Valley.

State Safety Zones A and B overlay these lower areas off the runways’ ends. The terrain does not impact the approach slope to any of the runways. Higher than normal climb and descent rates are not necessary. The runways have standard approach and departure procedures.

IV. Applicable Probability Standard

The FAA Flight Standards Division employs a collision-risk model for some proposed Instrument Landing Systems to determine the probability of a collision with an object on the ground during landings. This model determines the probability of a collision involving aircraft regardless of whether injuries or deaths result from a collision. The FAA uses a threshold probability of $10^{-7}$ or one collision per 10,000,000 landings. That is, if the collision-risk analysis determines there could be more than one collision per 10 million landings, then the placement of the proposed object is not approved.

For purposes of this analysis, the threshold probability of $10^{-7}$ or one collision/accident per 10 million operations will be used as the standard for measuring the accident probabilities in the analysis areas and will be known as the FAA Collision Standard. An “accident” will be considered as a collision with the ground or with an object on the ground that results in substantial damage to the aircraft or serious injury to persons in the aircraft or on the ground.

V. Definition of Analysis Areas

Four analysis areas will be assessed, as listed below and shown in Figure 1. (Figures are located at the back of this memorandum following Appendix A.4)

1. The area within the airfield plus the FAA runway protection zone (RPZ)
2. Mn/DOT Model Safety Zone A outside the RPZ
3. Mn/DOT Model Safety Zone B
4. The area outside the airfield and Zones A and B (Off Airport).
A. On Airfield + RPZ
At each runway end, there is a runway protection zone (RPZ) that is to be clear of any structures except navigational aids and is trapezoidal in shape. The RPZ commences at the end of the runway’s Primary Surface, which is 200 feet from the runway end. The length and width of the RPZ differ depending on the characteristics of the critical aircraft using the runway (weight and approach speed) and the type of landing approach available for the runway end (visual, non-precision or precision with visibility minimums). Runway 18-36 is designated as a “utility” runway, which means it serves small aircraft exclusively (aircraft under 12,500 pounds maximum gross take-off weight). The RPZ for Runway 18-36 is 250 feet inner width, 450 feet outer width and 1,000 feet in length. The RPZ for Runway 10L-28R is 500 feet inner width, 700 feet outer width and 1,000 feet in length. Runway 10R has a precision instrument landing system (ILS) with approach visibility minimums of ½ mile. This requires an RPZ of 1,000 feet inner width, 1,750 feet outer width and 2,500 feet long. Runway 28L has non-precision instrument approach capability with 1 mile visibility minimums. This requires an RPZ of 500 feet inner width, 700 feet outer width and 1,000 feet long. The runway RPZs are shown in Figure 1 (all figures are in Appendix B of this Memorandum).

B. Land Use Safety Zones A and B
Mn/DOT has promulgated rules requiring airports in Minnesota to establish, by zoning for each runway end, two land use safety zones, State Safety Zones A and B, in which both land uses and densities are restricted. State Safety Zone A is to begin at the end of the Primary Surface (200 feet from the runway end) and extend for a distance equal to two-thirds the runway length, which includes the RPZ. State Safety Zone B is to begin at the end of State Safety Zone A and extend a distance equal to one-third the runway length. Together, the zones are to comprise a trapezoid with a total length equal to the runway length. The trapezoid follows the airspace approach zones of a runway as defined in subpart 3.D of Minnesota Rules 8800.2400.

VI. Accident Frequency Data
Aircraft accident data was obtained from two sources for this analysis – the FAA and the National Transportation Safety Board (NTSB). This section presents the data specific to FCM. The number of aircraft accidents reported from 1989-2008 for operations at FCM are listed in Table 2. The use of the past 20 years of accident data is consistent with accident frequency data presented annually by the NTSB and with page 10 of Appendix 7 of the Minnesota Airport Land Use Compatibility Manual, which assessed data in a 20-year history. There were a total of 28 incidents at FCM from 1989-2008; all were accidents attributable to FCM, as discussed in Appendix A.1. Sixteen of the accidents occurred on the airfield; twelve occurred in the area considered airport vicinity. Of those twelve, two accidents occurred in the RPZs, one in a State Safety Zone A outside the RPZ and one in a State Safety Zone B. Figure 2 shows the approximate locations of the accidents that were considered in this analysis and have occurred near the airport over the past 20 years. Location information was not available for three of the accidents and therefore are not depicted, and one accident occurred beyond the limits of the figure. The recent accident that occurred near the airport on 8/12/2009 is shown on Figure 2 but is not included in the accident rate calculation because a full year of 2009 operation and accident data is not available. The accidents and incidents are described in the Appendix A.1. The majority of the accidents occurred on the airport and their locations are estimated based on the NTSB accident report. NTSB does not supply this information on their public web site.
Based on the 1989-2008 data, the accident rate is **0.7544 accidents per 100,000 operations.**

### Table 2

<table>
<thead>
<tr>
<th>Year</th>
<th>All Aircraft</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Accidents</td>
</tr>
<tr>
<td>1989</td>
<td>1</td>
</tr>
<tr>
<td>1990</td>
<td>3</td>
</tr>
<tr>
<td>1991</td>
<td>1</td>
</tr>
<tr>
<td>1992</td>
<td>0</td>
</tr>
<tr>
<td>1993</td>
<td>1</td>
</tr>
<tr>
<td>1994</td>
<td>1</td>
</tr>
<tr>
<td>1995</td>
<td>3</td>
</tr>
<tr>
<td>1996</td>
<td>2</td>
</tr>
<tr>
<td>1997</td>
<td>1</td>
</tr>
<tr>
<td>1998</td>
<td>3</td>
</tr>
<tr>
<td>1999</td>
<td>2</td>
</tr>
<tr>
<td>2000</td>
<td>2</td>
</tr>
<tr>
<td>2001</td>
<td>2</td>
</tr>
<tr>
<td>2002</td>
<td>0</td>
</tr>
<tr>
<td>2003</td>
<td>1</td>
</tr>
<tr>
<td>2004</td>
<td>2</td>
</tr>
<tr>
<td>2005</td>
<td>1</td>
</tr>
<tr>
<td>2006</td>
<td>1</td>
</tr>
<tr>
<td>2007</td>
<td>1</td>
</tr>
<tr>
<td>2008</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
</tr>
</tbody>
</table>

**Average Accident Rate** 0.75447

---

Sources: National Transportation Safety Board; Federal Aviation Administration; HNTB analysis.

A “Accident” is an occurrence associated with the act of operating an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage as the result of an FCM operation and a collision with the ground or an object on the ground located within four miles of FCM.

B See Appendix A.1 for a brief summary of the accident damage and injuries.

C Since OPSNET records were only available since 1990, MAC records were used for 1989.
VII. Location and Distribution of Accident Data

Since there have been relatively few accidents reported in the Mn/DOT safety zones for FCM and since there is the possibility of an accident/crash in these areas in 2025, more generalized national location data was researched. An aircraft accident distribution study was done by the University of California at Berkeley for the California Airport Land Use Planning Handbook (January 2002). The purpose of the study was to compile accident locations that had land use compatibility implications from the NTSB data base. The findings of that study were referred to and used in the Mn/DOT Airport Land Use Compatibility Manual and are used here to determine where accidents have occurred. The Berkeley study compiled 873 general aviation aircraft accidents that occurred between 1983 and 1992. It found that the number and location of reported accidents varied by runway length and displayed the locations for runways less than 4,000 feet, 4,000 to 5,999 feet and 6,000 feet or more. These accident locations are included in the Mn/DOT Airport Land Use Compatibility Manual as Figures D, E and F in Appendix 7, and are used in the HNTB analysis.

In order to determine the distribution of accidents for a runway end, the total number of accidents for the runway end must be known. The Berkeley accident location study did not provide the total accidents for the runway lengths. The purpose of the study was to provide the locations of accidents that have land-use compatibility implications. The 10-year NTSB records included over 11,000 incidents and/or accidents that occurred on or near the runway, but they were not researched because they did not have land-use compatibility implications. As stated on pages 8-5 to 8-7 of the January 2002 California Land Use Compatibility Handbook, compilation of NTSB accident-proximity data for the years 1990 through 2000 showed that 68 percent of GA accidents occur on the airport and 3 percent occur en route, which leaves 29 percent as airport-vicinity accidents. The accidents shown in Figures D and/or E in Appendix B of this Memorandum obtained from the Mn/DOT manual were superimposed on the appropriate FCM runway end as shown on Figures 3, 4, 5 and 6. The number of airport-vicinity accidents were counted and divided by 29 percent to obtain the total accidents. Because the parallel runways are closely spaced, arrival and departure accidents on each runway end overlap one another. That is, there are arrival and departure accidents on 10L-28R that occur in the analysis areas of 10R-28L and vice-versa, as shown in Figures 3 and 4. Therefore, the accidents for these runways are combined. The results are shown in Table 3.
Table 3
Determination of Number of Accidents at Runway End

<table>
<thead>
<tr>
<th>Runway Length</th>
<th>Runway End</th>
<th>Airport Vicinity (29%)</th>
<th>Total</th>
<th>En Route (3%)</th>
<th>On Airfield (68%)</th>
<th>On Airfield + RPZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure D (Less than 4,000 ft.) as shown in Figures 5 and 6</td>
<td>18</td>
<td>204</td>
<td>703</td>
<td>21</td>
<td>478</td>
<td>535</td>
</tr>
<tr>
<td></td>
<td>36</td>
<td>211</td>
<td>728</td>
<td>22</td>
<td>495</td>
<td>552</td>
</tr>
<tr>
<td>Figure D Combined with Figure E (4,000 – 5,999 ft.) As shown in Figure 3</td>
<td>10L</td>
<td>357</td>
<td>1,231</td>
<td>37</td>
<td>837</td>
<td>893</td>
</tr>
<tr>
<td></td>
<td>10R</td>
<td>357</td>
<td>1,231</td>
<td>37</td>
<td>837</td>
<td>891</td>
</tr>
<tr>
<td>Figure D Combined with Figure E As shown in Figure 4</td>
<td>28R</td>
<td>399</td>
<td>1,376</td>
<td>41</td>
<td>936</td>
<td>995</td>
</tr>
<tr>
<td></td>
<td>28L</td>
<td>401</td>
<td>1,383</td>
<td>41</td>
<td>940</td>
<td>959</td>
</tr>
</tbody>
</table>

Sources: Mn/DOT Airport Land Use Compatibility Manual; California Land Use Compatibility Handbook (January 2002); HNTB analysis

The number and percent of the accidents in each analysis area are presented in Table 4.

Table 4
Distribution of Accident Locations

<table>
<thead>
<tr>
<th>Runway End</th>
<th>On Airfield + RPZ</th>
<th>State Safety Zone A outside RPZ</th>
<th>State Safety Zone B</th>
<th>Off Airport</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>10R</td>
<td>891</td>
<td>74.63</td>
<td>7</td>
<td>0.59</td>
<td>17</td>
</tr>
<tr>
<td>28L</td>
<td>959</td>
<td>71.52</td>
<td>149</td>
<td>11.11</td>
<td>19</td>
</tr>
<tr>
<td>10L</td>
<td>893</td>
<td>74.79</td>
<td>38</td>
<td>3.18</td>
<td>21</td>
</tr>
<tr>
<td>28R</td>
<td>995</td>
<td>74.52</td>
<td>34</td>
<td>2.55</td>
<td>11</td>
</tr>
<tr>
<td>18</td>
<td>535</td>
<td>78.46</td>
<td>33</td>
<td>4.84</td>
<td>15</td>
</tr>
<tr>
<td>36</td>
<td>552</td>
<td>78.18</td>
<td>33</td>
<td>4.68</td>
<td>15</td>
</tr>
</tbody>
</table>

Sources: Mn/DOT Airport Land Use Compatibility Manual; California Land Use Compatibility Handbook (January 2002); HNTB analysis

VIII. Forecast of Operations

To determine the probability of an accident off a runway end, the expected number of operations must be known. The forecast of operations prepared in July 2008 at each runway end for the year 2025 is given in Table 5.
Table 5
FCM 2025 Forecast

<table>
<thead>
<tr>
<th>Runway</th>
<th>Arrivals</th>
<th>Departures</th>
<th>Total Operations at Runway End&lt;sup&gt;A&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>10R</td>
<td>11,299</td>
<td>10,055</td>
<td>24,309</td>
</tr>
<tr>
<td>28L</td>
<td>14,759</td>
<td>13,009</td>
<td>24,814</td>
</tr>
<tr>
<td>10L</td>
<td>6,439</td>
<td>9,210</td>
<td>19,128</td>
</tr>
<tr>
<td>28R</td>
<td>11,759</td>
<td>12,689</td>
<td>20,969</td>
</tr>
<tr>
<td>18</td>
<td>9,078</td>
<td>8,599</td>
<td>12,454</td>
</tr>
<tr>
<td>36</td>
<td>3,605</td>
<td>3,376</td>
<td>12,204</td>
</tr>
<tr>
<td>Total</td>
<td>56,938</td>
<td>56,938</td>
<td>113,877</td>
</tr>
</tbody>
</table>

<sup>A</sup> Operations at a runway end are the arrivals at that end plus the departures from the opposite end (e.g., for 10R, it is 11,299 + 13,009 = 24,309)

Sources: HNTB Forecast, April 2009; MAC Runway Use, August 2009.

IX. Calculation of Accident Probabilities

The probability of an accident occurring in an accident analysis area in 2025 is calculated by multiplying the applicable accident rate by the number of forecast operations in 2025, which is then multiplied by the percent of historical accidents distributed to the applicable analysis area. The probability of an accident in each analysis area is calculated by applying the overall probability of accidents on the ends of the runways in 2025 to the distribution of accidents presented in Table 4. The results of these calculations are presented in Table 6.

Table 6
Probability of an Accident in Runway End Analysis Areas in 2025

<table>
<thead>
<tr>
<th>Runway End</th>
<th>2025 Forecast of Operations</th>
<th>On Airfield + RPZ</th>
<th>State Safety Zone A outside RPZ</th>
<th>State Safety Zone B</th>
<th>Off Airport</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>10R</td>
<td>43,437&lt;sup&gt;A&lt;/sup&gt;</td>
<td>0.24456 (4 yrs.)&lt;sup&gt;B&lt;/sup&gt;</td>
<td>0.00192 (521 yrs.)</td>
<td>0.00467 (214 yrs.)</td>
<td>0.07657 (13 yrs.)</td>
<td>0.32772 (3 yrs.)</td>
</tr>
<tr>
<td>28L</td>
<td>45,783&lt;sup&gt;A&lt;/sup&gt;</td>
<td>0.24704 (4 yrs.)</td>
<td>0.03837 (26 yrs.)</td>
<td>0.00489 (204 yrs.)</td>
<td>0.05511 (18 yrs.)</td>
<td>0.34542 (3 yrs.)</td>
</tr>
<tr>
<td>10L</td>
<td>43,437&lt;sup&gt;A&lt;/sup&gt;</td>
<td>0.24511 (4 yrs.)</td>
<td>0.01043 (96 yrs.)</td>
<td>0.00576 (174 yrs.)</td>
<td>0.06642 (15 yrs.)</td>
<td>0.32772 (3 yrs.)</td>
</tr>
<tr>
<td>28R</td>
<td>45,783&lt;sup&gt;A&lt;/sup&gt;</td>
<td>0.25742 (4 yrs.)</td>
<td>0.00880 (114 yrs.)</td>
<td>0.00285 (351 yrs.)</td>
<td>0.07635 (13 yrs.)</td>
<td>0.34542 (3 yrs.)</td>
</tr>
<tr>
<td>18</td>
<td>12,454</td>
<td>0.07372 (14 yrs.)</td>
<td>0.00454 (220 yrs.)</td>
<td>0.00207 (484 yrs.)</td>
<td>0.01363 (73 yrs.)</td>
<td>0.09396 (11 yrs.)</td>
</tr>
<tr>
<td>36</td>
<td>12,204</td>
<td>0.07198 (14 yrs.)</td>
<td>0.00431 (232 yrs.)</td>
<td>0.00196 (511 yrs.)</td>
<td>0.01383 (72 yrs.)</td>
<td>0.09207 (11 yrs.)</td>
</tr>
</tbody>
</table>

<sup>A</sup> Parallel runway operations are combined.

<sup>B</sup> Average number of years between an accident assuming 2025 forecast operations at the runway end remain constant.
For example, the estimated number/overall probability of an annual accident that could occur for the Runway 10R end is 0.32772 (0.75447 x 43,437 / 100,000). Land use in Safety Zone A outside the RPZ would have an annual probability of 0.00192 accidents per 43,437 operations or one accident every 521 years (assuming 43,437 operations each year). Land use in State Safety Zone B would have an annual probability of 0.00467 accidents per 43,437 operations or one accident every 214 years. All the probabilities are calculated for 2025 forecast traffic levels. Any increase or decrease in operations off the west end of Runway 10R-28L would proportionally increase or decrease the probability of an accident.

As shown in Table 6, there is a higher probability of an accident/crash in the Off Airport area than in Safety Zone A outside the RPZ and Safety Zone B at each runway end. This is due to the size of the Off Airport area; the probability of a crash at a site within the area would be lower. All the probabilities are calculated for 2025 forecast traffic levels. Any increase or decrease in operations off the ends of the runways would proportionally increase or decrease the probability of an accident.

The average number of years between an accident in Safety Zone A outside the RPZ varies from 26 years for the Runway 28L end to 521 years for the Runway 10R end, assuming the 2025 forecast operations at the runway ends remain constant. The average number of years between an accident in Safety Zone B varies from 174 years for the Runway 10L end to 511 years for the Runway 36 end, assuming the 2025 forecast operations at the runway ends remain constant.

It is important to recognize that the probabilities in each analysis area presented in Table 6 assume an above ground object equal to the total size of each analysis area. An object/structure on a specific site within an analysis area would have a much lower probability of a collision by an aircraft. The purpose of the Mn/DOT safety standards is to protect the lives and property of users of the airport and of occupants of land in its vicinity. The only existing occupants of land in the analysis areas are the residential areas in State Safety Zone B at the Runway 10R and 28R ends and the residential and park areas at the 28L end. Based on Figure 3.2, Land Use Guide Plan Map 2030, in the adopted Eden Prairie Comprehensive Plan Update 2007, land use with occupants in the analysis areas expected by 2025 is shown in Figures 7 and 8 (none are planned at the Runway 18-36 ends). Inspection of Figures 7 and 8 shows there are two (2) accidents from the Berkeley study in the land use area with occupants in 10L Zone B, four (4) in 10R Zone B, three (3) in 28R Zone B, ten (10) in 28L Zone B and three (3) in 28L Zone A. The probability of an accident in these areas is given in Table 7. The average number of years between accidents in these areas varies from 388 years to 1,821 years, assuming the 2025 forecast operations at the runway ends remain constant.

---

4 Minnesota Law, Chapter 360.062(a)
Table 7
Probability of an Accident in Existing and Planned Occupant Areas within the Mn/DOT Safety Zones in 2025

<table>
<thead>
<tr>
<th>Runway End</th>
<th>2025 Forecast Per 100,000 Operations</th>
<th>State Safety Zone A outside RPZ</th>
<th>State Safety Zone B</th>
<th>Avg. Yrs. Between Accident</th>
<th>Probability</th>
<th>Avg. Yrs. Between Accident</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>10R</td>
<td>0.43437 A</td>
<td>0.0007727 (0.43437 x 0.75447 x 4/1,194)</td>
<td>910</td>
<td>0.001098</td>
<td>910</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28L</td>
<td>0.45783 A</td>
<td>0.0007727 (0.45783 x 0.75447 x 3/1,341)</td>
<td>388</td>
<td>0.002576</td>
<td>388</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10L</td>
<td>0.43437 A</td>
<td>0.0007727 (0.43437 x 0.75447 x 2/1,194)</td>
<td>1,821</td>
<td>0.005494</td>
<td>1,821</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28R</td>
<td>0.45783 A</td>
<td>0.0007727 (0.45783 x 0.75447 x 3/1,335)</td>
<td>1,288</td>
<td>0.005494</td>
<td>1,288</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* A Parallel runway operations are combined.

Sources: Figures 3, 4, 7 and 8; Table 4; HNTB analysis.

X. Comparison of FCM Accident Probabilities to the FAA Collision Standard

The probability of an accident in each analysis area based on the forecast of operations in Tables 6 and 7 is converted to 10,000,000 operations by multiplying the values in Tables 6 and 7 by 10,000,000 divided by the number of operations forecast at each runway end. The results are except for Safety Zone A outside the RPZ at the 10R end and Safety Zone B at the 28R end, which are below the Standard. The probability of an accident in the residential areas is well below the FAA Collision Standard.

It is important to note that if the 2025 forecasted number of operations was increased or decreased, the comparison of accident probabilities for the runway ends in 2025 to the FAA Collision Standard outlined in Table 8 remains unchanged. This is due to the fact that these probabilities are based upon 10,000,000 operations instead of the forecast number, in accordance with the FAA Collision Standard of one accident per 10 million operations.
Table 8
Comparison of Accident Probabilities for the Runway Ends in 2025
to the FAA Collision Standard of One Accident per 10 Million Operations

<table>
<thead>
<tr>
<th>Runway End</th>
<th>On Airfield + RPZ</th>
<th>State Safety Zone A outside RPZ</th>
<th>State Safety Zone B</th>
<th>Off Airport</th>
<th>FAA Collision Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>10R</td>
<td>56.30</td>
<td>0.44</td>
<td>1.07</td>
<td>17.63</td>
<td>1.00</td>
</tr>
<tr>
<td>10R Occupant Area in E.P. 2030 Plan</td>
<td></td>
<td>0.253</td>
<td></td>
<td></td>
<td>1.00</td>
</tr>
<tr>
<td>28L</td>
<td>53.93</td>
<td>8.38</td>
<td>1.07</td>
<td>12.04</td>
<td>1.00</td>
</tr>
<tr>
<td>28L Occupant Area in E.P. 2030 Plan</td>
<td></td>
<td>0.169</td>
<td>0.563</td>
<td></td>
<td>1.00</td>
</tr>
<tr>
<td>10L</td>
<td>56.43</td>
<td>2.40</td>
<td>1.33</td>
<td>15.29</td>
<td>1.00</td>
</tr>
<tr>
<td>10L Occupant Area in E.P. 2030 Plan</td>
<td></td>
<td>0.126</td>
<td></td>
<td></td>
<td>1.00</td>
</tr>
<tr>
<td>28R</td>
<td>56.23</td>
<td>1.92</td>
<td>0.62</td>
<td>16.68</td>
<td>1.00</td>
</tr>
<tr>
<td>28R Occupant Area in E.P. 2030 Plan</td>
<td></td>
<td>0.170</td>
<td></td>
<td></td>
<td>1.00</td>
</tr>
<tr>
<td>18</td>
<td>59.19</td>
<td>3.65</td>
<td>1.66</td>
<td>10.95</td>
<td>1.00</td>
</tr>
<tr>
<td>36</td>
<td>58.98</td>
<td>3.53</td>
<td>1.60</td>
<td>11.33</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Sources: NTSB 1988-2007 data; California Airport Land Use Planning Handbook (January 2002) data; Figure 3.2, Land Use Guide Plan Map 2030, Eden Prairie Comprehensive Plan Update 2007; HNTB analysis.

XI. Risk

According to the FAA, risk is the composite of predicted severity and likelihood of the potential effect of a hazard. The FAA published a Safety Management System Manual (Version 1.1) in May 21, 2004, which is applicable to air traffic control (ATC) and navigation services in the National Airspace System. Excerpts from the Manual are presented in Appendix A.2. As presented in Table 4.3 of the Manual, the likelihood of the most severe consequence from an occurrence is “extremely remote” if the probability is equal to or less than 1 in 10,000,000 operations, and is “extremely improbable” if it occurs less than once every 100 years. For development in the existing and planned occupant areas in Mn/DOT Safety Zones at each FCM runway end, the likelihood of fatalities from an accident is extremely remote based on the FAA criteria – since each is less than 1 in 10,000,000 operations and would occur less than once every 100 years.

Risk is measured in probability of a certain level of consequence (e.g., probability of fatalities). An aircraft accident in the vicinity of FCM would have different consequences. For example, if the pilot has some control of the aircraft and there is enough altitude and an open space to carry out the emergency operation, he/she may do it safely. However, if the area where the pilot can

---

5 The least occurrence in an occupant area is 388 years, which is 0.26 occurrences every 100 years.
land has buildings and structures, he/she may not be able to land safely and the consequences can be severe. If the pilot has no control, even with open spaces, there is the possibility of additional consequences to the accident if the aircraft strikes a building or a structure. The Berkeley study identified that in only 5 percent of the accidents in the vicinity of airports, the pilot had no control of the aircraft.

The potential severity of an off-airport aircraft accident is highly dependent upon the nature of the land use at the accident site. Three characteristics are most important -- intensity of use; type of use (residential or non-residential); and sensitivity of use. Uses that attract a large assembly of people are the most severe. Uses that are populated 24 hours a day and 365 days a year (e.g., hospitals and nursing homes) are more likely to result in a fatality than uses that are not.

XII. The Concept of “Acceptable Risk”

In striking a balance between land use restrictions based on safety and the social and financial costs to the community, the concept of “acceptable risk” should be discussed. A discussion of the concept of acceptable airport-related risk taken from the California Department of Transportation (Caltrans) Airport Land Use Handbook, December 1993, is presented in Appendix A.3. Mn/DOT representatives have stated that the Mn/DOT State Safety Zones and land use restrictions therein are historically based on the 1952 Report to the President’s Airport Commission, chaired by General Doolittle. The Mn/DOT minimum standard for land use in Safety Zone A is the same as that for the FAA RPZ – no structure or use that creates, attracts, or brings together an assembly of persons therein. In other words, Safety Zone A is ideally to have zero risk to a person or structure as the result of an aircraft crash in the zone -- that is, absolute safety for individuals in Safety Zone A outside the RPZ (the RPZ is regulated by the FAA).

As presented in the [1993] Caltrans report, “With respect to airport-related risks, the assessment presented in the 1952 Report to the President’s Airport Commission, chaired by General Doolittle, remains valid today. The report remarks that:

“Absolute safety for the individual is an ideal which has ever been sought but never attained. Because man does not have full control over his environment, the very function of living has inherent hazards which become more pronounced as the scheme of living grows more complex. Thus, since absolute safety is a theoretical concept, one can speak only of relative risk (pages 47-48).”

The report goes on to say that:

“… ‘calculated risk’ is an American concept which gives mobility to the whole social structure. The phrase simply means a willingness to embark deliberately on a course of action which offers prospective rewards outweighing its estimated dangers” (page 49).”

---

6 May 15, 2008 meeting of the St. Paul Downtown Airport Joint Airport Zoning Board
7 Minnesota Law, Chapter 360.062, grandfathers existing land uses that are not airport hazards, but they become nonconforming uses under the Mn/DOT Rules.
Based on the above, the Mn/DOT land use compatibility standards appear to be inconsistent with the Doolittle report. Mn/DOT has the most restrictive airport safety zoning standards in the United States. As presented in Appendix A.4, it is (as of 2002) the only state with laws or rules that restrict commercial, industrial, and residential uses in airport safety zones other than the RPZ. Only five states other than Minnesota had some form of airport-related land use safety zoning.

XIII. Findings

A. Assessment of Minn. Stat. §360.066, subd. 1 Variables in the Context of FCM

Character of Flying Operations Expected at FCM

- The character of flying operations is based on the types of aircraft operating at the airport, the purposes of their operations and their safety records;
- There are fewer accidents by jet aircraft than single engine piston (SEP) aircraft;
- The expected proportion of based aircraft at FCM in 2025 is 15% jets and 71% SEP;
- FCM provides the facilities and services to attract and serve aircraft that require a runway less than or equal to 5,000 feet;
- Accident rates and associated probabilities are directly related to the character of the flying operations at a given airport.

Location of FCM and Nature of Terrain in State Safety Zones A and B

- The airport location is generally good for airport operations; there are no features that cause substantive turbulence or adverse wind conditions;
- State Safety Zones A and B overlay relatively flat terrain to the west and east, the Minnesota River Valley to the south and Staring Lake to the north. Higher than normal climb and descent rates are not necessary. The runways have standard approach and departure procedures.

B. Probability of Accident Compared to the FAA Collision Standard

State Safety Zone A outside the RPZ

- The average number of years between an accident at the runway ends varies from 26 years for the Runway 28L end to 521 years for the Runway 10R end, assuming the 2025 forecast operations at the runway ends remain constant.
- Assuming an above-ground object equal to the total size of Zone A outside the RPZ, the probability of an aircraft accident at the Runway 10R end in 2025 is less than the FAA Collision Standard of 1.0 accidents per 10,000,000 operations and greater than the Standard at the Runway 18, 36, 10L, 28R and 28L ends.

State Safety Zone B

- The average number of years between an accident at the runway ends varies from 174 years for the Runway 10L end to 511 years for the Runway 36 end, assuming the 2025 forecast operations at the runway ends remain constant.
- Assuming an above-ground object equal to the total size of Zone B, the probability of an aircraft accident at the Runway 28R end in 2025 is less than the FAA Collision Standard
of 1.0 accidents per 10,000,000 operations and greater than the Standard at the Runway 18, 36, 10L, 10R and 28L ends.

- There is a higher probability of an aircraft accident/crash in the Off Airport area than in Safety Zone A outside the RPZ and Safety Zone B at each runway end.

**Occupant Areas in State Safety Zones**

- Minnesota Law states that the purpose of the Mn/DOT safety standards is to protect the lives and property of users of the airport and of occupants of land in its vicinity.
- The probabilities of an aircraft accident in the areas where people could use/occupy the land based on the Land Use Guide Plan Map 2030 in the *Eden Prairie Comprehensive Plan Update 2007* are as follows:
  - 0.253 per 10,000,000 operations in Runway 10R State Safety Zone B
  - 0.169 per 10,000,000 operations in Runway 28L State Safety Zone A
  - 0.563 per 10,000,000 operations in Runway 28L State Safety Zone B
  - 0.126 per 10,000,000 operations in Runway 10L State Safety Zone B
  - 0.170 per 10,000,000 operations in Runway 28R State Safety Zone B

These probabilities are well below the FAA Collision Standard of one (1.0) accident per 10,000,000 operations.

- The least accident occurrence in an occupant area in a State Safety Zone is 388 years, which is 0.26 occurrences every 100 years.
- The likelihood of a fatality from an accident in the occupant areas in the State Safety Zones is extremely remote based on FAA Risk Criteria – since the probability of each accident is less than 1.0 per 10,000,000 operations and would occur less than once every 100 years in these areas.

**C. Accident Severity and Pilot Control**

- The potential severity of an off-airport aircraft accident is highly dependent upon the nature of the land use at the accident site. Three characteristics are most important—intensity of use; type of use (residential or non-residential); and sensitivity of use. Uses that attract a large assembly of people are the most severe. Uses that are populated 24 hours a day and 365 days a year (e.g., hospitals and nursing homes) are more likely to result in a fatality than uses that are not.
- The Berkeley study found that the pilot had control of the aircraft in 95 percent of the accidents that occurred in the vicinity of GA airports – only 5 percent had no control.

**D. General Conclusion from the Findings**

- While the findings of this study do not establish that strict application of the Mn/DOT Modeling Zoning Ordinance is required to provide a reasonable standard of safety around FCM, they do support additional consideration be given to land use controls around the airport beyond what might be applied when the accident probability within a State Safety Zone is less than 1 accident in 10 million operations.
Appendix A

A.1 NTSB Accident Data for FCM
A.2 FAA Risk Criteria
A.3 The Concept of Acceptable Risk
A.4 Survey of Airport Land Use Safety Zoning by other States
## A.1 NTSB Accident Data for FCM

The following is a summary of the incident reports in the NTSB record for FCM between 1989 and 2008. These are incidents located within 20,000 feet of a runway end.

<table>
<thead>
<tr>
<th>#</th>
<th>Event Date</th>
<th>Make / Model</th>
<th>Event Severity</th>
<th>Type of Operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8/12/2009</td>
<td>Beech E18S</td>
<td>Substantial Damage 2</td>
<td>Part 91: General</td>
<td>Aircraft collided with terrain following loss of control after take-off.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fatalities</td>
<td>Aviation</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7/15/2007</td>
<td>Mooney M20J</td>
<td>Substantial Damage</td>
<td>Part 91: General</td>
<td>Aircraft collided with terrain following loss of control during take-off.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Minor Injuries</td>
<td>Aviation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No Injuries</td>
<td>Aviation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>300</td>
<td>No Injuries</td>
<td>Aviation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exec Exec</td>
<td></td>
<td>No Injuries</td>
<td>Aviation</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1/19/2004</td>
<td>Piper PA-46-</td>
<td>Substantial Damage</td>
<td>Part 91: General</td>
<td>Gear-up forced landing following loss of power during take-off.</td>
</tr>
<tr>
<td></td>
<td>500TP</td>
<td></td>
<td>No Injuries</td>
<td>Aviation</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7/2/2003</td>
<td>Deby Dragonfly</td>
<td>Substantial Damage</td>
<td>Part 91: General</td>
<td>Lost power and hit trees and terrain after take-off.</td>
</tr>
<tr>
<td></td>
<td>Mark II</td>
<td></td>
<td>No Injuries</td>
<td>Aviation</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>7/19/2001</td>
<td>Mooney M-20R</td>
<td>Substantial Damage</td>
<td>Part 91: General</td>
<td>Lost power and hit trees and terrain after take-off.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 Fatality</td>
<td>Aviation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Minor Injuries</td>
<td>Aviation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No Injuries</td>
<td>Aviation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>161</td>
<td></td>
<td>Minor Injuries</td>
<td>Aviation</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>8/30/1999</td>
<td>Piper PA-24-</td>
<td>Substantial Damage</td>
<td>Part 91: General</td>
<td>Landed gear up.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>180</td>
<td>No Injuries</td>
<td>Aviation</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Date</td>
<td>Aircraft Type</td>
<td>Damage</td>
<td>Part</td>
<td>Event Description</td>
</tr>
<tr>
<td>-----</td>
<td>------------</td>
<td>---------------</td>
<td>---------</td>
<td>------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>14</td>
<td>11/25/1998</td>
<td>Piper PA-28-R200</td>
<td>Substantial Damage</td>
<td>Part 91: General Aviation</td>
<td>Landed then lost steering and veered off runway and hit VASI.</td>
</tr>
<tr>
<td>17</td>
<td>11/20/1997</td>
<td>Mooney M20K</td>
<td>Substantial Damage</td>
<td>Part 91: General Aviation</td>
<td>Hit runway edge lights while landing.</td>
</tr>
<tr>
<td>18</td>
<td>9/8/1996</td>
<td>Cessna 182</td>
<td>Substantial Damage</td>
<td>Part 91: General Aviation</td>
<td>Ran out of fuel, lost power then landed short of runway.</td>
</tr>
<tr>
<td>19</td>
<td>8/21/1996</td>
<td>Beech C-23</td>
<td>Substantial Damage No Injuries</td>
<td>Part 91: General Aviation</td>
<td>Landed hard on runway.</td>
</tr>
<tr>
<td>21</td>
<td>12/10/1995</td>
<td>Beech B90</td>
<td>Substantial Damage</td>
<td>Part 91: General Aviation</td>
<td>Hit a hangar during taxiing.</td>
</tr>
<tr>
<td>24</td>
<td>12/23/1993</td>
<td>Beech C23</td>
<td>Substantial Damage</td>
<td>Part 91: General Aviation</td>
<td>Lost power while landing wing hit terrain.</td>
</tr>
<tr>
<td>25</td>
<td>12/10/1991</td>
<td>Cessna 140</td>
<td>Substantial Damage</td>
<td>Part 91: General Aviation</td>
<td>Aircraft swerved off the runway and nosed over.</td>
</tr>
<tr>
<td>#</td>
<td>Date</td>
<td>Aircraft</td>
<td>Condition</td>
<td>Part 91</td>
<td>Description</td>
</tr>
<tr>
<td>---</td>
<td>------------</td>
<td>------------</td>
<td>-------------------------</td>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>26</td>
<td>4/22/1990</td>
<td>Lake LA-4-200</td>
<td>Substantial Damage</td>
<td>General Aviation</td>
<td>Landing gear hit deer on runway while landing. Cartwheeled to a stop.</td>
</tr>
<tr>
<td>27</td>
<td>4/16/1990</td>
<td>Cessna 210</td>
<td>Substantial Damage</td>
<td>General Aviation</td>
<td>Veered off runway during landing. Tried go-around, aircraft bounced and wing hit, cartwheeled to stop.</td>
</tr>
<tr>
<td>28</td>
<td>3/30/1990</td>
<td>Bellanca 8KCAB</td>
<td>Substantial Damage</td>
<td>General Aviation</td>
<td>Flat tire caused aircraft to veer off runway during landing. Nosed over.</td>
</tr>
<tr>
<td>29</td>
<td>8/6/1989</td>
<td>Stinson L-5</td>
<td>Substantial Damage</td>
<td>General Aviation</td>
<td>Veered off runway during takeoff due to crosswinds.</td>
</tr>
</tbody>
</table>

1Since 2009 operations data is not yet available; accidents from 2009 are not included in the accident rate.

An “accident” is defined as an occurrence associated with the act of operating an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage as the result of a collision with the ground or an object on the ground (since the FAA Probability Standard is based on collisions). An “FCM accident” is an “accident” due to an FCM operation that was located within five miles of FCM. An “incident” is defined as an occurrence other than an accident that is associated with the act of operating an aircraft and that affects, or could affect, the safety of an operation.

The analysis in this memorandum considers FCM accidents during the past 20 years (1989 – 2008). The use of the past 20 years of accident data is consistent with the accident frequency data presented annually by the NTSB and with page 10 of Appendix 7 of the Mn/DOT Airport Land Use Compatibility Manual.
A.2 FAA Risk Criteria

The FAA published a *Safety Management System Manual (Version 1.1)* in May 21, 2004, which is applicable to air traffic control (ATC) and navigation services in the National Airspace System (NAS). The following pages are taken from the *Safety Management System (SMS) Manual*. 
Table 4.2 - Severity Definitions

<table>
<thead>
<tr>
<th>Effect On:</th>
<th>Hazard Severity Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Safety Effect</td>
<td>Minor</td>
</tr>
<tr>
<td>General</td>
<td>Does not significantly reduce system safety. Required actions are within operator's capabilities. Includes (see below):</td>
</tr>
<tr>
<td>Air Traffic Control</td>
<td>Slight increase in ATC workload</td>
</tr>
<tr>
<td>Flying Public</td>
<td>- No effect on flight crew - Has no effect on safety - Inconvenience</td>
</tr>
</tbody>
</table>

---

12 For more information regarding these definitions, refer to FAA Advisory Circular 25.1309-1A, System Design Analysis, 06-21-88.
4.40 What is likelihood, and how is it related to risk assessment?

Remember that risk is the composite of the predicted severity and likelihood of the outcome or effect (harm) of the hazard in the worst credible system state. Likelihood is an expression of how often an event is expected to occur.

Severity must be considered in the determination of likelihood. Likelihood is determined by how often the resulting harm can be expected to occur at the worst credible severity. When determining likelihood, the worst credible system states will usually determine the worst credible severity.

Likelihood definitions should be tailored to the domain and service. Table 4.3 provides likelihood definitions that could be used in this step or could be used as information to support developing definitions that work for the change to be assessed.

NAS Systems' likelihood definitions (first three columns) are currently in use when acquiring new systems. Flight Procedures definitions (the fourth column) are used by Flight Standards (AFS) in assessing flight procedures. ATC Operational definitions (the last two columns) are proposed likelihood definitions for use in assessing ATC operations (e.g., airspace changes, ATC procedures and standards, etc.).

Appendix C contains information and guidance on applying SRM to ATC procedural changes.
### Table 4.3 - Likelihood Definitions

<table>
<thead>
<tr>
<th>NAS Systems</th>
<th>Qualitative</th>
<th>Flight Procedures</th>
<th>ATC Operational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantitative</td>
<td>Qualitative</td>
<td>Per Facility</td>
<td>NAS-wide</td>
</tr>
<tr>
<td></td>
<td>Individual Item/ System</td>
<td>ATC Service/ NAS Level System</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Expected to occur about once every 3 months for an item</td>
<td>Expected to occur more than once per week</td>
<td>Expected to occur more than once every 1-2 days</td>
</tr>
<tr>
<td>Frequent</td>
<td>Probability of occurrence per operation/operational hour is equal to or greater than $1 \times 10^{-3}$</td>
<td>Continuously experienced in the system</td>
<td></td>
</tr>
<tr>
<td>Probable</td>
<td>Probability of occurrence per operation/operational hour is less than $1 \times 10^{-3}$, but equal to or greater than $1 \times 10^{-5}$</td>
<td>Expected to occur about once per year for an item</td>
<td>Expected to occur about once every month</td>
</tr>
<tr>
<td>Remote</td>
<td>Probability of occurrence per operation/operational hour is less than or equal to $1 \times 10^{-7}$</td>
<td>Expected to occur several times in life cycle of an item</td>
<td>Expected to occur about once every year</td>
</tr>
<tr>
<td>Extremely Remote</td>
<td>Probability of occurrence per operation/operational hour is less than or equal to $1 \times 10^{-9}$</td>
<td>Unlikely to occur, but possible in an item’s life cycle</td>
<td>Expected to occur about once every 10-100 years</td>
</tr>
<tr>
<td>Extremely Improbable</td>
<td>Probability of occurrence per operation/operational hour is less than $1 \times 10^{-9}$</td>
<td>So unlikely that it can be assumed that it will not occur in an item’s life cycle</td>
<td>Probability of occurrence per operation/operational hour is less than $1 \times 10^{-9}$</td>
</tr>
</tbody>
</table>
Phase 4: Assess the Risk

4.41 What is a risk matrix?

An estimation of risk is determined using the predictive risk matrix in Figure 4.9.

The risk levels used in the matrix can be defined as:

- **High risk** – Unacceptable risk - proposal cannot be implemented unless hazards are further mitigated so that risk is reduced to medium or low level and AOV approves the mitigating controls. Tracking and management are required. Catastrophic hazards that are caused by: (1) single-point events or failures, (2) common cause events or failures, or (3) undetectable latent events in combination with single point or common cause events are considered high risk, even if extremely remote. (Note: high risk is unacceptable at the time of hazard closure. However, for short periods of time, high risk may exist while mitigation plans are put into affect.)

- **Medium risk** – Acceptable risk - minimum acceptable safety objective; proposal may be implemented, but tracking and management are required.

- **Low risk** – Target - acceptable without restriction or limitation; hazards are not required to be actively managed but are documented.

![Figure 4.9 - Predictive Risk Matrix](image-url)
A.3 The Concept of Acceptable Risk

The following discussion is taken from Airport Land Use Handbook, December 1993, prepared for California Department of Transportation by Hodges and Shutt in association with Flight Safety Institute, Chris Hunter & Associates, and University of California, Berkeley, Institute of Transportation.

“Definition of appropriate safety zones is one side of the safety compatibility equation. The other, even more difficult side is establishment of suitable land use criteria to be applied within each zone. As stated in Chapter 3, the basic objective of safety compatibility criteria is to minimize the risks associated with potential aircraft accidents. This objective has two components:

- To protect people and property on the ground when accidents occur; and
- To minimize injury to the occupants of aircraft involved in accidents.

For both of these components, the fundamental question to be answered when attempting to set land use development criteria is how much risk is acceptable? Answering this question is made particularly difficult by the fact that aircraft accidents occur infrequently and, for any specific location, probably will never happen. Yet, when an accident does take place, the consequences can be great.

The balancing side to the question of acceptable risk is how much protection can be afforded? When an airport is situated in a rural area, well away from development pressures, the cost – to the landowner, the community, and the airport – for a high degree of protection may be low. Important land use development can usually be redirected toward areas where the prospects of an aircraft accident are minimal. At the other end of the spectrum, the need for developable land around urban area airports typically is such that avoidance of only the most risky forms of development – those in the most accident-prone locations or ones which greatly increase the potential severity – may be affordable. The problem with accepting the latter concept, of course, is that an aircraft accident in a developed area hardly ever results in pressure to eliminate the conflicting land use; rather the pressure inevitably is to restrict or close the airport.

Some perspective on this tradeoff can perhaps be gained from a study which examined the implications of another type of hazard – the threat of volcanic eruption (William Spangle and Associates – 1987). A volcanic eruption can reasonably be considered an ultimate example of an event which occurs with very low frequency, but can have catastrophic results when it does occur. One of the responses considered in the report was whether anything at all should be done to protect against such an event given its extreme rarity. On the other hand, the report notes that “the potential for a major catastrophe which could be averted begs for some kind of public response” (page 86). As for where to strike the balance between acceptable risk and affordable protection, the report concludes: “Do what you can, politically and fiscally, to reduce the exposure and provide for effective emergency response and that becomes, by definition, acceptable risk. An official who proposes to go farther than his constituents want will find out quickly what the limits are” (page 86).
With respect to airport-related risks, the assessment presented in the 1952 Report to the President’s Airport Commission, chaired by General Doolittle, remains valid today. The report remarks that:

“Absolute safety for the individual is an ideal which has ever been sought but never attained. Because man does not have full control over his environment, the very function of living has inherent hazards which become more pronounced as the scheme of living grows more complex. Thus, since absolute safety is a theoretical concept, one can speak only of relative risk” (pages 47-48).

The report goes on to say that:

“… ‘calculated risk’ is an American concept which gives mobility to the whole social structure. The phrase simply means a willingness to embark deliberately on a course of action which offers prospective rewards outweighing its estimated dangers” (page 49).”
### A.4 Survey of Airport Land Use Safety Zoning by other States

The following are the states with airport land use safety zoning in 2002 and the role of the DOT in the adoption of the zoning.

**States with Land Use Safety Zoning Outside the FAA RPZ**
(Other than Height Restrictions)

<table>
<thead>
<tr>
<th>State</th>
<th>Responsibility for Adoption</th>
<th>Basis for Zoning Regulations</th>
<th>Applicability</th>
<th>Role of DOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>California (2002)</td>
<td>County establishes Airport Land Use Commission (ALUC) that adopts the zoning</td>
<td>1993 GA study recommendations; zones are based on the actual locations of accidents; major discussion of risk, including its measurement and criteria</td>
<td>General Aviation and Major Airports</td>
<td>Develops handbook that must be used by ALUCs as guidance</td>
</tr>
<tr>
<td>Washington</td>
<td>Local Government</td>
<td>1993 California study</td>
<td>General Aviation Airports</td>
<td>Consultation</td>
</tr>
<tr>
<td>New Jersey</td>
<td>Affected Municipalities</td>
<td>DOT Standards (zone is 3000’ in length from runway end; commercial, industrial and residential uses are permitted outside RPZ)</td>
<td>General Aviation Airports</td>
<td>Adopt Standards</td>
</tr>
<tr>
<td>Florida</td>
<td>Local Government</td>
<td>Statute; public and private schools cannot be constructed along the extended runway centerlines</td>
<td>All Public Airports</td>
<td>Guidance; prohibited from establishing land use regulations or disapproving local government zoning regulations.</td>
</tr>
<tr>
<td>Maryland</td>
<td>Maryland Aviation Administration (MAA)</td>
<td>MAA; prohibits uses that would interfere with aircraft operations, and frequent or significant congregation of people in designated clear zones (e.g., RPZ)</td>
<td>All State-Owned Airports</td>
<td>Enforcement</td>
</tr>
<tr>
<td>Other Studies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denver, Colorado</td>
<td>Local Government (not mandatory)</td>
<td>1993 California study statistics</td>
<td>General Aviation Airports</td>
<td>None</td>
</tr>
<tr>
<td>Council of Gov’ts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Appendix B

List of Figures

Figure D  Accidents on Runways Less than 4,000 Feet
Figure E  Accidents on Runways of 4,000 to 5,999 Feet
Figure 1  FCM Analysis Areas
Figure 2  1989-2008 FCM Related Accidents Located in Mn/DOT Safety Zones or Off Airport
Figure 3  Historical National GA Arrival and Departure Accident Locations Superimposed on Runway 10R & 10L Ends
Figure 4  Historical National GA Arrival and Departure Accident Locations Superimposed on Runway 28L & 28R Ends
Figure 5  Historical National GA Arrival and Departure Accident Locations Superimposed on Runway 18 End
Figure 6  Historical National GA Arrival and Departure Accident Locations Superimposed on Runway 36 End
Figure 7  Occupant Areas in State Safety Zones at Runway 10R & 10L Ends
Figure 8  Occupant Areas in State Safety Zones at Runway 28L & 28R Ends
Figure D

Accidents on Runways of Less than 4,000 Feet

California Airport Land Use Planning Handbook (January 2002)
Accidents on Runways of 4,000 to 5,999 Feet

California Airport Land Use Planning Handbook (January 2002)
Figure 1: FCM Analysis Areas

Source: HNTB Analysis, September 2009
Aerial Photo: 2008
Figure 2: 1989-2009 FCM Related Accidents Located in Mn/DOT Safety Zones or Off Airport

Source: NTSB and HNTB Analysis, September 2009
Aerial Photo: 2008
Figure 3: Historic National GA Arrival and Departure Accident Locations Superimposed on Runway 10R & 10L Ends

Source: California Land Use Compatibility Handbook 01/2002
Aerial Photo: 2008
Figure 4: Historic National GA Arrival and Departure Accident Locations Superimposed on Runway 28L & 28R Ends

Source: California Land Use Compatibility Handbook 01/2002
Aerial Photo: 2008
Figure 6: Historic National GA Arrival and Departure Accident Locations Superimposed on Runway 36 End

Source: California Land Use Compatibility Handbook 01/2002
Aerial Photo: 2008
Figure 7: Occupant Areas in State Safety Zones at Runway 10R & 10L Ends
Figure 8: Occupant Areas in State Safety Zones at Runway 28L & 28R Ends

Aerial Photo: 2008
Appendix 2: FCM Aircraft Accident Data (1997 – 2016)

<table>
<thead>
<tr>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCM Aircraft Accident Summary (1997 – 2016)</td>
<td>2-1</td>
</tr>
<tr>
<td>FCM Aircraft Accident Data Records (1997 – 2016)</td>
<td>2-2</td>
</tr>
</tbody>
</table>
PAGE INTENTIONALLY LEFT BLANK
## Aircraft Accidents 1997 - 2016 from NTSB Records

<table>
<thead>
<tr>
<th>Event</th>
<th>Event Date</th>
<th>Aircraft Type</th>
<th>Severity</th>
<th>Location</th>
<th>Probable Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>03/09/2014</td>
<td>Cessna 185</td>
<td>Non-Fatal</td>
<td>Airfield</td>
<td>The pilot's loss of directional control during takeoff with a gusty crosswind.</td>
</tr>
<tr>
<td>2</td>
<td>08/05/2013</td>
<td>Embraer EMB-505</td>
<td>Non-Fatal</td>
<td>RPZ</td>
<td>The flight crew's failure to execute a go-around during a non-stabilized approach, which resulted in a runway overrun.</td>
</tr>
<tr>
<td>3</td>
<td>07/12/2012</td>
<td>Mikoyan MiG-21MF</td>
<td>Non-Fatal</td>
<td>RPZ</td>
<td>The pilot's delayed application of wheel brakes to slow the airplane down on landing and the airplane's failed drag chute, which resulted in a runway overrun.</td>
</tr>
<tr>
<td>4</td>
<td>04/08/2011</td>
<td>Rockwell 500</td>
<td>Non-Fatal</td>
<td>Airfield</td>
<td>The pilot's inadequate compensation for the crosswind while landing, which resulted in a loss of directional control.</td>
</tr>
<tr>
<td>5</td>
<td>06/27/2010</td>
<td>Beech C23</td>
<td>Non-Fatal</td>
<td>Airfield</td>
<td>The student pilot's loss of airplane control while landing with gusting wind.</td>
</tr>
<tr>
<td>6</td>
<td>04/01/2010</td>
<td>Beech 95</td>
<td>Non-Fatal</td>
<td>Model SSZ A</td>
<td>The fatigue failure of an intake valve spring on the right engine, which resulted in a partial loss of engine power on takeoff.</td>
</tr>
<tr>
<td>7</td>
<td>08/12/2009</td>
<td>Beech 18S</td>
<td>Fatal</td>
<td>Off-Airport</td>
<td>The pilot's lack of experience flying the accident make and model of airplane, which led to a loss of control while maneuvering to return to the airport. Contributing to the accident was a partial loss of engine power for undetermined reasons.</td>
</tr>
<tr>
<td>8</td>
<td>07/15/2007</td>
<td>Mooney M20J</td>
<td>Non-Fatal</td>
<td>Airfield</td>
<td>The pilot's inability to maintain control of the airplane for undetermined reasons. Contributing to the accident were the embankment and the fence.</td>
</tr>
<tr>
<td>9</td>
<td>10/27/2006</td>
<td>Bellanca 7ECA</td>
<td>Non-Fatal</td>
<td>Airfield</td>
<td>The pilot not maintaining directional control of the tailwheel airplane during the landing roll. A factor was the runway sign that was impacted.</td>
</tr>
<tr>
<td>10</td>
<td>07/04/2005</td>
<td>Piper PA-32-300</td>
<td>Non-Fatal</td>
<td>Airfield</td>
<td>The pilot's inadequate compensation for wind conditions and his failure to maintain directional control. Factors associated with the accident were the crosswind and the taxiway sign.</td>
</tr>
<tr>
<td>11</td>
<td>10/09/2004</td>
<td>Buss Rotorway Exec</td>
<td>Non-Fatal</td>
<td>Airfield</td>
<td>The pilot's inadvertent deactivation of the battery switch leading to the helicopter's loss of engine power on base leg. A factor was the crops he encountered during the emergency landing.</td>
</tr>
<tr>
<td>12</td>
<td>01/19/2004</td>
<td>Piper PA-46-500TP</td>
<td>Non-Fatal</td>
<td>RPZ</td>
<td>A loss of engine power for undetermined reasons.</td>
</tr>
<tr>
<td>13</td>
<td>07/02/2003</td>
<td>Debay Dragonfly Mark II</td>
<td>Non-Fatal</td>
<td>Model SSZ B</td>
<td>The pilot's intentional operation of the airplane with a known deficiency with regard to an improper carburetor calibration that led to the loss of engine power. The improperly calibrated carburetor and the trees were contributing factors.</td>
</tr>
<tr>
<td>14</td>
<td>07/19/2001</td>
<td>Mooney M20R</td>
<td>Fatal</td>
<td>Off-Airport</td>
<td>The fractured camshaft gear and the pilot not maintaining aircraft control. Factors relating to this accident were metal fatigue in the camshaft gear teeth, the inadvertent stall, the low airspeed, and the trees.</td>
</tr>
<tr>
<td>15</td>
<td>07/17/2001</td>
<td>Beech B19</td>
<td>Non-Fatal</td>
<td>Airfield</td>
<td>The student pilot's failure to maintain aircraft control during the landing, her failure to recover from the bounced landing, and the nose gear overload.</td>
</tr>
<tr>
<td>16</td>
<td>10/20/2000</td>
<td>Piper PT-46</td>
<td>Non-Fatal</td>
<td>Airfield</td>
<td>The pilot misjudging the landing flare, and his failure to recover from the bounced landing.</td>
</tr>
<tr>
<td>17</td>
<td>06/08/2000</td>
<td>Piper PA-28-161</td>
<td>Non-Fatal</td>
<td>Off-Airport</td>
<td>The failure of the engine and the unsuitable terrain for landing encountered by the pilot-in-command. Factors to the accident were the fracture of the crankshaft due to fatigue, excessive main bearing wear, and the swampy terrain condition.</td>
</tr>
<tr>
<td>18</td>
<td>08/30/1999</td>
<td>Piper PA-24-180</td>
<td>Non-Fatal</td>
<td>Airfield</td>
<td>The failure of the pilot to follow the landing checklist and his failure to extend the landing gear.</td>
</tr>
<tr>
<td>19</td>
<td>07/31/1999</td>
<td>Cessna 310N</td>
<td>Non-Fatal</td>
<td>Airfield</td>
<td>Maintenance personnel installed washers which were not large enough in diameter to prevent the retraction/extension scissors links from separating from each other.</td>
</tr>
<tr>
<td>20</td>
<td>11/25/1998</td>
<td>Piper PA-28-R200</td>
<td>Non-Fatal</td>
<td>Airfield</td>
<td>The pilot misjudged the flare and did not maintain directional control during touchdown. A factor was the VASI lights.</td>
</tr>
<tr>
<td>21</td>
<td>09/08/1998</td>
<td>Culver-Revolution Mini 500</td>
<td>Non-Fatal</td>
<td>Airfield</td>
<td>A design change to the fuel tank filler neck sealant made by the owner/builder of the helicopter. Factors associated with this accident were an improper sealant material used by the owner/builder and an autorotation was not possible by the pilot due to the hover-taxis low altitude.</td>
</tr>
<tr>
<td>22</td>
<td>02/08/1998</td>
<td>Beech C-23</td>
<td>Non-Fatal</td>
<td>Off-Airport</td>
<td>The pilot's improper raising of flaps and not maintaining directional control of the aircraft during the go-around sequence.</td>
</tr>
<tr>
<td>23</td>
<td>11/20/1997</td>
<td>Mooney M20K</td>
<td>Non-Fatal</td>
<td>Airfield</td>
<td>The pilot's improper decision to continue the approach beyond decision height, when he could not see the runway; and his attempt to land without being properly aligned on the runway. Factors relating to this accident were: darkness, fog and and runway lights.</td>
</tr>
</tbody>
</table>

Source: NTSB Accident Records
National Transportation Safety Board
Aviation Accident Data Summary

Location: Eden Prairie, MN
Date & Time: 03/09/2014, 0815 CDT
Aircraft: CESSNA 185
Flight Conducted Under: Part 91: General Aviation - Personal

Accident Number: CEN14CA154
Registration: N4764B
Injuries: 1 None

Analysis
While attempting to takeoff with a left crosswind of 10 knots gusting to 17 knots, the pilot began the takeoff roll with 1/2 throttle. He then advanced the throttle to full forward and pushed the control yoke forward to lift the tail. The airplane began to veer to the left with insufficient airspeed to lift off from the runway. The pilot aborted the takeoff and applied brakes. However, the airplane continued forward and collided with a snow bank, nosed over, and came to rest inverted. Substantial damage was sustained to the vertical stabilizer. The pilot reported that there were no mechanical malfunctions or failures prior to the accident. In addition, the pilot reported that the accident could have been prevented had he kept the tailwheel in contact with the runway longer and/or departed on a runway better aligned with the wind.

Flight Events
Takeoff - Other weather encounter
Takeoff - Loss of control on ground
Takeoff - Runway excursion
Takeoff - Collision with terr/obj (non-CFIT)

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's loss of directional control during takeoff with a gusty crosswind.

Findings

Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Directional control-Not attained/maintained - C
Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Airspeed-Not attained/maintained
Personnel issues-Task performance-Use of equip/info-Aircraft control-Pilot - C
Environmental issues-Conditions/weather/phenomena-Wind-Crosswind-Effect on operation
Environmental issues-Conditions/weather/phenomena-Wind-Gusts-Effect on operation
Environmental issues-Physical environment-Object/animal/substance-Snow/ice-Contributed to outcome
## Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Private</th>
<th>Age:</th>
<th>46</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Single-engine Land; Single-engine Sea</td>
<td>Instrument Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>258 hours (Total, all aircraft), 41 hours (Total, this make and model), 178 hours (Pilot in Command, all aircraft), 20 hours (Last 90 days, all aircraft), 13 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>CESSNA</th>
<th>Registration:</th>
<th>N4764B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>185 F</td>
<td>Engines:</td>
<td>1 Reciprocating</td>
</tr>
<tr>
<td>Operator:</td>
<td>On file</td>
<td>Engine Manufacturer:</td>
<td>Continental Motors</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>IO-520-D</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Personal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>KFCM, 944 ft msl</td>
<td>Weather Information Source:</td>
<td>Unknown</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>None</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>13 knots, 200°</td>
</tr>
<tr>
<td>Temperature:</td>
<td>-4°C</td>
<td>Visibility</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td>No Obscuration; No Precipitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>Eden Prairie, MN (FCM)</td>
<td>Destination:</td>
<td>Waconia, MN</td>
</tr>
</tbody>
</table>

## Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>FLYING CLOUD (FCM)</th>
<th>Runway Surface Type:</th>
<th>Asphalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>28R</td>
<td>Runway Surface Condition:</td>
<td>Dry</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>3900 ft / 75 ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>1 None</th>
<th>Aircraft Damage:</th>
<th>Substantial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>N/A</td>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
<tr>
<td>Latitude, Longitude:</td>
<td>44.827500, -93.458611 (est)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Administrative Information

Investigator In Charge (IIC): Jason T Aguilera  Adopted Date: 04/23/2014

Note: This accident report documents the factual circumstances of this accident as described to the NTSB.

Investigation Docket: http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=88899

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Analysis
The flight crew of the light jet was conducting a landing to a wet 5,000-ft-long runway. Their preflight calculations indicated an approach speed of 110 knots given the airplane’s estimated landing weight. Data obtained from the flight recorder showed that, as the airplane descended through about 500 ft above ground level on final approach, its speed was 186 knots and its rate of descent was over 3,000 ft per minute. The airplane crossed the runway threshold about 158 knots, and touched down about 1,000 feet down the runway about 145 knots. The airplane subsequently departed the end of the runway, impacted obstructions, and came to rest upright on a four-lane highway about 1,000 ft beyond the runway surface. A postaccident examination of the engines, airframe, and braking system revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation.

The operator’s procedures stated that all approaches to land must be stabilized at 500 feet above airport elevation, and any approach that became unstabilized required an immediate go-around. Among the company’s criteria for determining a stable approach was: airspeed no more than 20 knots over target, and descent rate no greater than 1,000 ft per minute. During the approach, the airspeed was 76 knots over the target approach speed and the descent rate of 3,000 ft per minute greatly exceeded the criteria for a stabilized approach.

Flight Events
Approach-VFR pattern final - Miscellaneous/other
Landing-flare/touchdown - Abnormal runway contact
Landing-landing roll - Miscellaneous/other
Landing-landing roll - Runway excursion
Landing-landing roll - Collision with terr/obj (non-CFIT)

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: The flight crew’s failure to execute a go-around during a non-stabilized approach, which resulted in a runway overrun.

Findings
Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Airspeed-Incorrect use/operation - C
Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Descent rate-Incorrect use/operation - C
Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Surface speed/braking-Attain/maintain not possible - C
Personnel issues-Action/decision/Action-Incorrect action performance-Flight crew - C
Personnel issues-Action/decision/Action-Lack of action-Flight crew - C

### Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Airline Transport</th>
<th>Age:</th>
<th>48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Multi-engine Land; Single-engine Land</td>
<td>Instrument Rating(s):</td>
<td>Airplane</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>(Estimated) 8158 hours (Total, all aircraft), 1081 hours (Total, this make and model), 4610 hours (Pilot In Command, all aircraft), 153 hours (Last 90 days, all aircraft), 74 hours (Last 30 days, all aircraft), 7 hours (Last 24 hours, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Co-Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Airline Transport</th>
<th>Age:</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Multi-engine Land; Single-engine Land</td>
<td>Instrument Rating(s):</td>
<td>Airplane</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>(Estimated) 12348 hours (Total, all aircraft), 150 hours (Total, this make and model), 5128 hours (Pilot In Command, all aircraft), 101 hours (Last 90 days, all aircraft), 48 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>EMBRAER S A</th>
<th>Registration:</th>
<th>N327FL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>EMB-505</td>
<td>Engines:</td>
<td>2 Turbo Fan</td>
</tr>
<tr>
<td>Operator:</td>
<td>FLIGHT OPTIONS LLC</td>
<td>Engine Manufacturer:</td>
<td>P&amp;W CANADA</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>Fractional Ownership; On-demand Air Taxi (135)</td>
<td>Engine Model/Serial:</td>
<td>PW535E</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Positioning</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM, 906 ft msl</td>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>Overcast / 7000 ft agl</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>4 knots, 150°</td>
</tr>
<tr>
<td>Temperature:</td>
<td>18°C</td>
<td>Visibility</td>
<td>6 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td>Moderate - Mist; In the Vicinity - Rain</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>Pittsburgh, PA (PIT)</td>
<td>Destination:</td>
<td>Eden Prairie, MN (FCM)</td>
</tr>
</tbody>
</table>
### Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>Flying Cloud Airport (FCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>10R</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>5000 ft / 100 ft</td>
</tr>
<tr>
<td>Runway Surface Type:</td>
<td>Asphalt</td>
</tr>
<tr>
<td>Runway Surface Condition:</td>
<td>Wet</td>
</tr>
</tbody>
</table>

### Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>2 None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>N/A</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
</tr>
<tr>
<td>Aircraft Damage:</td>
<td>Substantial</td>
</tr>
<tr>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
<tr>
<td>Latitude, Longitude:</td>
<td>44.826667, -93.447500 (est)</td>
</tr>
</tbody>
</table>

### Administrative Information

<table>
<thead>
<tr>
<th>Investigator In Charge (IIC):</th>
<th>Thomas Latson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adopted Date:</td>
<td>09/12/2016</td>
</tr>
<tr>
<td>Note:</td>
<td>The NTSB traveled to the scene of this accident.</td>
</tr>
<tr>
<td>Investigation Docket:</td>
<td><a href="http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=87694">http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=87694</a></td>
</tr>
</tbody>
</table>

---

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
National Transportation Safety Board  
Aviation Accident Data Summary

Location: Minneapolis, MN  
Date & Time: 07/12/2012, 0958 CDT  
Aircraft: MIKOYAN GUREVICH MIG 21MF  
Flight Conducted Under: Part 91: General Aviation - Personal

Analysis
The pilot established an appropriate speed during the approach and landed about 300 feet down the 5,000-foot-long runway. Within seconds of touching down, the pilot brought the throttle control to idle and deployed the drag chute. However, when the chute deployed, it did not fully inflate and then separated from the airplane. The pilot was not immediately aware the drag chute had failed and continued to try to deploy the chute. The pilot said that he used maximum braking to slow the airplane but was unable to stop the airplane on the runway. The pilot swerved to the left to avoid crossing a state highway, and the airplane struck a berm and a fence before it stopped. The pilot said that he had successfully tested the drag chute in preparation for this particular landing and had no previous problems deploying the chute before the accident. A review of performance data revealed that the pilot had sufficient runway length to land without use of the drag chute had he applied the wheel brakes immediately upon landing.

Flight Events
Landing-landing roll - Loss of control on ground  
Landing-landing roll - Miscellaneous/other

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's delayed application of wheel brakes to slow the airplane down on landing and the airplane's failed drag chute, which resulted in a runway overrun.

Findings
Aircraft-Aircraft systems-Equipment/furnishings-(general)-Failure - C  
Aircraft-Aircraft systems-Landing gear system-Brake-Incorrect use/operation - C  
Personnel issues-Task performance-Use of equip/info-Aircraft control-Pilot - C
## Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Airline Transport</th>
<th>Age:</th>
<th>52</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Multi-engine Land; Single-engine Land; Single-engine Sea</td>
<td>Instrument Rating(s):</td>
<td>Airplane</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>21000 hours (Total, all aircraft), 30 hours (Total, this make and model), 11000 hours (Pilot In Command, all aircraft), 65 hours (Last 90 days, all aircraft), 30 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>MIKOYAN GUREVICH</th>
<th>Registration:</th>
<th>N9307</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/series:</td>
<td>MIG 21MF</td>
<td>Engines:</td>
<td>1 Turbo Jet</td>
</tr>
<tr>
<td>Operator:</td>
<td>WARD WILLIAM E</td>
<td>Engine Manufacturer:</td>
<td>Tomansky</td>
</tr>
<tr>
<td>Operating Certificate(s)</td>
<td>None</td>
<td>Engine Model/series:</td>
<td>R-13-300</td>
</tr>
<tr>
<td>Held:</td>
<td></td>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Personal</td>
</tr>
</tbody>
</table>

## Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM, 906 ft msl</td>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>None</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>7 knots, 170°</td>
</tr>
<tr>
<td>Temperature:</td>
<td>20°C</td>
<td>Visibility:</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>Dekalb, IL (DKB)</td>
<td>Destination:</td>
<td>Minneapolis, MN (FCM)</td>
</tr>
</tbody>
</table>

## Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>Flying Cloud (FCM)</th>
<th>Runway Surface Type:</th>
<th>Asphalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>10R</td>
<td>Runway Surface Condition:</td>
<td>Dry</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>5000 ft / 100 ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>1 Minor</th>
<th>Aircraft Damage:</th>
<th>Substantial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>N/A</td>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
<tr>
<td>Latitude, Longitude:</td>
<td>44.823056, -93.455000 (est)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Analysis
The pilot reported that he performed a stabilized visual approach with a right crosswind. The airplane touched down on the centerline and subsequently drifted to the right. The pilot overcorrected for the drift and the airplane veered hard to the left. The airplane continued off the left side of the runway and skidded to a complete stop. The right main landing gear collapsed and the right wingtip hit the ground, which resulted in substantial damage to the fuselage and wing. A postaccident inspection of the airplane revealed no preimpact anomalies. The pilot additionally reported that there was no mechanical malfunction or failure.

Flight Events
Landing-landing roll - Loss of control on ground
Landing-landing roll - Landing gear collapse
Landing-landing roll - Runway excursion
Landing-landing roll - Collision with terr/obj (non-CFIT)

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inadequate compensation for the crosswind while landing, which resulted in a loss of directional control.

Findings
Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Directional control-Not attained/maintained - C
Personnel issues-Task performance-Use of equip/info-Aircraft control-Pilot - C
Environmental issues-Conditions/weather/phenomena-Wind-Crosswind-Contributed to outcome
# Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Commercial</th>
<th>Age: 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Multi-engine Land</td>
<td>Instrument Rating(s): Airplane</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s): None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>473 hours (Total, all aircraft), 217 hours (Total, this make and model), 268 hours (Pilot In Command, all aircraft), 74 hours (Last 90 days, all aircraft), 61 hours (Last 30 days, all aircraft)</td>
<td></td>
</tr>
</tbody>
</table>

# Flight Instructor Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Airline Transport; Commercial</th>
<th>Age: 43</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Multi-engine Land</td>
<td>Instrument Rating(s): Airplane</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s): None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>4659 hours (Total, all aircraft), 2480 hours (Total, this make and model), 3544 hours (Pilot In Command, all aircraft), 106 hours (Last 90 days, all aircraft), 67 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)</td>
<td></td>
</tr>
</tbody>
</table>

# Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>ROCKWELL INTERNATIONAL</th>
<th>Registration:</th>
<th>N51RF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>500-S</td>
<td>Engines:</td>
<td>2 Reciprocating</td>
</tr>
<tr>
<td>Operator:</td>
<td>UNITED STATES DEPARTMENT OF COMMERCE</td>
<td>Engine Manufacturer:</td>
<td>LYCOMING</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>TIO-540-E1B5</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Public Aircraft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM</td>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>Overcast / 5500 ft agl</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>14 knots, 170°</td>
</tr>
<tr>
<td>Temperature:</td>
<td>16°C</td>
<td>Visibility:</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td>No Precipitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>Eden Prairie, MN (FCM)</td>
<td>Destination:</td>
<td>Eden Prairie, MN (FCM)</td>
</tr>
</tbody>
</table>

# Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>Flying Cloud Airport (FCM)</th>
<th>Runway Surface Type:</th>
<th>Asphalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>10R</td>
<td>Runway Surface Condition:</td>
<td>Dry</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>5000 ft / 100 ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Wreckage and Impact Information

<table>
<thead>
<tr>
<th></th>
<th>Crew Injuries:</th>
<th>2 None</th>
<th>Aircraft Damage:</th>
<th>Substantial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>N/A</td>
<td></td>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
<td></td>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
<tr>
<td>Latitude, Longitude:</td>
<td>44.827222, -93.458333 (est)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Administrative Information

- **Investigator In Charge (IIC):** James P Silliman
- **Adopted Date:** 07/18/2011
- **Investigation Docket:** [http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=78838](http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=78838)

---

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Analysis
The student pilot and his certified flight instructor performed three takeoff and landings at the accident airport in preparation for the student pilot's second solo flight. During the takeoff and landings, the wind was from the northwest at 8 to 11 knots with no wind gusts. After approximately 0.7 hours of flight time, the certified flight instructor exited the airplane and the student pilot taxied to the runway for takeoff. About the time of departure, the wind began to gust to 17 knots. The student pilot stated that during the landing flare, he experienced a downwash and that the airplane ballooned and turned to the right. He added power and applied rudder, but the nosewheel hit the runway and the airplane veered off the runway. The certified flight instructor placed a maximum wind limitation of 15 knots on the student pilot's initial solo endorsement.

Flight Events
Landing-flare/touchdown - Other weather encounter
Landing-flare/touchdown - Attempted remediation/recovery
Landing-flare/touchdown - Abnormal runway contact

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be:
The student pilot's loss of airplane control while landing with gusting wind.

Findings

Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Landing flare-Not attained/maintained - C
Personnel issues-Task performance-Use of equip/info-Aircraft control-Student pilot - C
Pilot Information

- **Certificate:** None
- **Age:** 34
- **Airplane Rating(s):** None
- **Instrument Rating(s):** None
- **Other Aircraft Rating(s):** None
- **Instructor Rating(s):** None
- **Flight Time:** 71 hours (Total, all aircraft), 71 hours (Total, this make and model), 20 hours (Last 90 days, all aircraft), 7 hours (Last 30 days, all aircraft), 1 hour (Last 24 hours, all aircraft)

Aircraft and Owner/Operator Information

- **Aircraft Manufacturer:** BEECH
- **Model/Series:** C23 NO SERIES
- **Registration:** N92535
- **Engines:** 1 Reciprocating
- **Engine Manufacturer:** Lycoming
- **Engine Model/Series:** O-360-A4K
- **Operator:** Inflight Pilot Training LLC
- **Operating Certificate(s) Held:** None
- **Flight Conducted Under:** Part 91: General Aviation - Instructional

Meteorological Information and Flight Plan

- **Conditions at Accident Site:** Visual Conditions
- **Condition of Light:** Day
- **Weather Information Source:** Weather Observation Facility
- **Weather Observation Facility:** FCM
- **Lowest Ceiling:** None
- **Wind Speed/Gusts, Direction:** 10 knots / 17 knots, 320°
- **Temperature:** 27°C
- **Visibility:** 10 Miles
- **Precipitation and Obscuraton:** No Obscuration; No Precipitation
- **Departure Point:** Eden Prairie, MN (FCM)
- **Destination:** Eden Prairie, MN (FCM)

Airport Information

- **Airport:** Flying Cloud Airport (FCM)
- **Runway Surface Type:** Asphalt
- **Runway Used:** 28L
- **Runway Surface Condition:**
- **Runway Length/Width:** 5000 ft / 100 ft

Wreckage and Impact Information

- **Crew Injuries:** 1 None
- **Aircraft Damage:** Substantial
- **Passenger Injuries:** N/A
- **Aircraft Fire:** None
- **Ground Injuries:** N/A
- **Aircraft Explosion:** None
- **Latitude, Longitude:** 44.827500, -93.458611 (est)

Administrative Information

- **Investigator In Charge (IIC):** Mitchell F Gallo
- **Adopted Date:** 05/19/2011
- **Note:** This accident report documents the factual circumstances of this accident as described to the NTSB.
- **Investigation Docket:** [http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=76471](http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=76471)

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the
accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Analysis
The pilot stated that he had no recollection of the events leading up to the accident. The passenger reported that the airplanes' engines seemed to come up to full power during takeoff. The airplane lifted off about halfway down the runway; however, it didn't climb very well. The stall warning sounded just as the airplane was off the end of the runway, and the pilot's efforts to continue flight were unsuccessful. The right wing dropped, and the airplane descended and impacted the ground. A witness reported that the airplane's nose was pitched up 10 to 15 degrees and the wings appeared to be level, as it was flying in ground effect about 10 feet agl. He noted that the engines seemed to be running without any obvious problems. A postaccident examination revealed a lack of compression on the right engine No. 4 cylinder. Further investigation determined that the intake valve spring on the cylinder had fractured. Metallurgical examination noted that the fracture surfaces exhibited features indicative of fatigue progression initiated by corrosion pitting. Corrosion pits and red rust deposits were observed on many areas of the spring. The fatigue initiation also coincided with longitudinal tooling marks consistent with the original forming of the spring. Maintenance records indicated the right engine had been overhauled nearly 2 years prior to the accident. The cylinders were replaced with new non-original equipment manufacturer (OEM) assemblies at that time. The replacement cylinder assemblies were furnished with the valves and valve springs installed. According to the pilot, the right engine had accumulated 18 hours since overhaul.

Flight Events
Initial climb - Powerplant sys/comp malf/fail
Initial climb - Loss of engine power (partial)
Initial climb - Aerodynamic stall/spin
Initial climb - Loss of control in flight
Uncontrolled descent - Collision with terr/obj (non-CFIT)

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: The fatigue failure of an intake valve spring on the right engine, which resulted in a partial loss of engine power on takeoff.

Findings

Aircraft-Aircraft power plant-Engine (reciprocating)-Recip eng cyl section-Failure - C
Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Altitude-Attain/maintain not
possible Personnel issues-Task performance-Use of equip/info-Aircraft control-Pilot

### Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Airline Transport</th>
<th>Age: 56</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Multi-engine Land; Single-engine Land; Single-engine Sea</td>
<td>Instrument Rating(s): Airplane</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s): Airplane Multi-engine; Airplane Single-engine; Instrument Airplane</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>11320 hours (Total, all aircraft), 55 hours (Total, this make and model), 11220 hours (Pilot In Command, all aircraft), 60 hours (Last 90 days, all aircraft), 20 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)</td>
<td></td>
</tr>
</tbody>
</table>

### Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>BEECH</th>
<th>Registration:</th>
<th>N20FP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>95</td>
<td>Engines:</td>
<td>2 Reciprocating</td>
</tr>
<tr>
<td>Operator:</td>
<td>Fischer Air LLC</td>
<td>Engine Manufacturer:</td>
<td>LYCOMING</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>O&amp;VO-360 SER</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Personal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM, 906 ft msl</td>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>None</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>11 knots, 150°</td>
</tr>
<tr>
<td>Temperature:</td>
<td>26°C</td>
<td>Visibility:</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td>No Obscuration; No Precipitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>Minneapolis, MN (FCM)</td>
<td>Destination:</td>
<td>New Richmond, MN (RNH)</td>
</tr>
</tbody>
</table>

### Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>Flying Cloud Airport (FCM)</th>
<th>Runway Surface Type:</th>
<th>Asphalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>18</td>
<td>Runway Surface Condition:</td>
<td>Dry</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>2691 ft / 75 ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>1 Serious</th>
<th>Aircraft Damage:</th>
<th>Substantial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>1 Serious</td>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
<tr>
<td>Latitude, Longitude:</td>
<td>44.827500, -93.458611 (est)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Analysis
The pilot purchased the airplane approximately one year prior to the accident with the intention of restoring it for flight. The airplane had not been flown for approximately five years and had been used for spare parts. The pilot was flying the airplane to another airport to pick up passengers prior to returning. The pilot was cleared for takeoff and to circle the airport at 2,500 feet prior to departing the area. Witnesses reported that after taking off the airplane seemed to “wobble” at a slow airspeed in a nose-high attitude and that it never got higher than 500 feet. Some witnesses reported the engine(s) sputtering, and another stated that the airplane was loud and "didn't sound good," although other witnesses reported that the engines sounded normal. One witness reported seeing white smoke coming from the left engine and hearing the engine "popping" as the airplane took off. The airplane made three left turns and it appeared as if the pilot was attempting to return to land. Witnesses described the left wing rising prior to the airplane banking hard to the left and the nose dropping straight down. The airplane impacted the ground just northeast of the airport property and a postimpact fire ensued. Flight control continuity was established. The right side of the elevator/tailcone structure exhibited black rub marks and scrapes. Grass and nesting material was found inside the left wing. The left fuel valve was found in the OFF position and the right fuel valve was positioned to the rear auxiliary tank. Neither the fuel crossfeed valve nor the fuel boost pump switch was located. The left engine sustained substantial fire and impact damage. The right engine sustained heavy impact damage. The airplane was last fueled one month prior to the accident with 120 gallons of fuel. About 20 engine test runs in addition to high-speed taxi tests had been conducted since then. A Special Flight Permit had been obtained but had not been signed by the mechanic, who did not know that the pilot was going to fly the airplane on the day of the accident. The pilot reportedly did not have any Beech 18 flight experience.

Flight Events
Takeoff - Loss of engine power (partial)
Maneuvering - Loss of control in flight
Uncontrolled descent - Collision with terr/obj (non-CFIT)

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be:
The pilot’s lack of experience flying the accident make and model of airplane, which led to a loss of control while maneuvering to return to the airport. Contributing to the accident was a partial loss of engine power for undetermined reasons.

Findings
Aircraft - Aircraft power plant - (general) - (general) - Failure - F
Personnel issues - Experience/knowledge - Experience/qualifications - Total experience w/ equipment - Pilot - C
Personnel issues - Task performance - Use of equip/info - Aircraft control - Pilot - C

### Pilot Information

<table>
<thead>
<tr>
<th>Certificate</th>
<th>Commercial; Private</th>
<th>Age:</th>
<th>53</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Multi-engine Land; Single-engine Land</td>
<td>Instrument Rating(s):</td>
<td>Airplane</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>1150 hours (Total, all aircraft), 0 hours (Total, this make and model)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>BEECH</th>
<th>Registration:</th>
<th>N3038C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>E18S</td>
<td>Engines:</td>
<td>2 Reciprocating</td>
</tr>
<tr>
<td>Operator:</td>
<td>Wayne R. Monson</td>
<td>Engine Manufacturer:</td>
<td>Pratt &amp; Whitney</td>
</tr>
<tr>
<td>Operating Certificate(s)</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>R-985 SERIES</td>
</tr>
<tr>
<td>Held:</td>
<td></td>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Ferry</td>
</tr>
</tbody>
</table>

### Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site: Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation: FCM, 906 ft msl</td>
<td>Weather Information Source:</td>
<td>Unknown</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>None</td>
<td>Wind Speed/Gusts, Direction:</td>
</tr>
<tr>
<td>Temperature:</td>
<td>28°C</td>
<td>Visibility</td>
</tr>
<tr>
<td>Precipitation and Obscuratiation:</td>
<td>No Obscuration; No Precipitation</td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>Eden Prairie, MN (FCM)</td>
<td>Destination:</td>
</tr>
</tbody>
</table>

### Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>Eden Prairie (FCM)</th>
<th>Runway Surface Type:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>N/A</td>
<td>Runway Surface Condition:</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>1 Fatal</th>
<th>Aircraft Damage:</th>
<th>Substantial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>1 Fatal</td>
<td>Aircraft Fire:</td>
<td>On-Ground</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
<tr>
<td>Latitude, Longitude:</td>
<td>44.829722, -93.448611</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Administrative Information

<table>
<thead>
<tr>
<th>Investigator In Charge (IIC):</th>
<th>Pamela S Sullivan</th>
<th>Adopted Date:</th>
<th>01/07/2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigation Docket:</td>
<td><a href="http://dms.ntsb.gov/pubds/search/dockList.cfm?mKey=74510">Link</a></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
National Transportation Safety Board
Aviation Accident Data Summary

Location: Eden Prairie, MN
Date & Time: 07/15/2007, 0905 CDT
Aircraft: Mooney M20J
Flight Conducted Under: Part 91: General Aviation - Personal

Analysis
The pilot reported that upon reaching rotation speed, the airplane did not properly "develop lift" and the rudder seemed to be stuck in a full deflected position. The airplane yawed to the left at an altitude of 8 to 10 feet above the runway. The airplane then settled to the ground off the left side of the runway where it contacted an embankment. The nose gear sheared off, and the airplane continued up the embankment coming to rest when it contacted a fence. Post accident inspection of the airplane failed to reveal any anomalies with the flight control system. Winds at the time of the accident were reported as being calm.

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inability to maintain control of the airplane for undetermined reasons. Contributing to the accident were the embankment and the fence.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: TAKEOFF - INITIAL CLimb
Findings
1. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED
Findings
2. TERRAIN CONDITION - GROUND

Occurrence #3: ON GROUND/WATER ENCOUNTER WITH TERRAIN/WATER
Phase of Operation: OTHER
Findings
3. (F) TERRAIN CONDITION - DIRT BANK/RISING EMBANKMENT

Occurrence #4: NOSE GEAR COLLAPSED
Phase of Operation: OTHER
Findings
4. LANDING GEAR, NOSE GEAR ASSEMBLY - OVERLOAD

Occurrence #5: ON GROUND/WATER COLLISION WITH OBJECT
Phase of Operation: OTHER

Findings
5. (F) OBJECT - FENCE

Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Private</th>
<th>Age:</th>
<th>45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Single-engine Land</td>
<td>Instrument Rating(s):</td>
<td>Airplane</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>353 hours (Total, all aircraft), 256 hours (Total, this make and model), 11 hours (Last 90 days, all aircraft), 11 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>Mooney</th>
<th>Registration:</th>
<th>N4785H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>M20J</td>
<td>Engines:</td>
<td>1 Reciprocating</td>
</tr>
<tr>
<td>Operating Certificate(s)</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>IO-360-B</td>
</tr>
<tr>
<td>Held:</td>
<td></td>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Personal</td>
</tr>
</tbody>
</table>

Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM, 906 ft msl</td>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>None</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>Calm</td>
</tr>
<tr>
<td>Temperature:</td>
<td>23°C</td>
<td>Visibility:</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>Eden Prairie, MN (FCM)</td>
<td>Destination:</td>
<td>Gary, IN (GYY)</td>
</tr>
</tbody>
</table>

Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>Flying Cloud (FCM)</th>
<th>Runway Surface Type:</th>
<th>Asphalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>28L</td>
<td>Runway Surface Condition:</td>
<td>Dry</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>3909 ft / 75 ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
The tailwheel airplane sustained substantial damage when it exited the runway and impacted a runway sign. The pilot stated, "Set up for a wheel landing left wing low to compensate for crosswind. Encountered a slight bounce. When wheels touched down again, aircraft swerved left [and] towards edge of [runway]. I did not feel attempting a go-around at that point was prudent due to proximity to wind sock pole. Left runway, rolled through grass [and] onto [runway] 18. I understand a [runway] sign was hit [with horizontal stabilizer]." The pilot reported no mechanical malfunctions with the airplane in reference to the accident flight.

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot not maintaining directional control of the tailwheel airplane during the landing roll. A factor was the runway sign that was impacted.

Findings

Occurrence #1: LOSS OF CONTROL - ON GROUND/WATER
Phase of Operation: LANDING - ROLL

Findings
1. TERRAIN CONDITION - GROUND
2. (C) DIRECTIONAL CONTROL - NOT MAINTAINED - PILOT IN COMMAND

Occurrence #2: ON GROUND/WATER COLLISION WITH OBJECT
Phase of Operation: LANDING - ROLL

Findings
3. (F) OBJECT - SIGN
Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Private</th>
<th>Age:</th>
<th>39</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Single-engine Land</td>
<td>Instrument Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>201 hours (Total, all aircraft), 20 hours (Total, this make and model), 150 hours (Pilot in Command, all aircraft), 12 hours (Last 90 days, all aircraft), 4 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>Bellanca</th>
<th>Registration:</th>
<th>N57410</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>7ECA</td>
<td>Engines:</td>
<td>1 Reciprocating</td>
</tr>
<tr>
<td>Operator:</td>
<td>Hummingbird Aviation, LLC</td>
<td>Engine Manufacturer:</td>
<td>Lycoming</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>O-235-C1</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Personal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM</td>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>None</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>10 knots, 230°</td>
</tr>
<tr>
<td>Temperature:</td>
<td>12°C</td>
<td>Visibility:</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td>No Obscuration; No Precipitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>Eden Prairie, MN (FCM)</td>
<td>Destination:</td>
<td></td>
</tr>
</tbody>
</table>

Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>FLYING CLOUD (FCM)</th>
<th>Runway Surface Type:</th>
<th>Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>28R</td>
<td>Runway Surface Condition:</td>
<td>Dry</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>3599 ft / 75 ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>1 None</th>
<th>Aircraft Damage:</th>
<th>Substantial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>N/A</td>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
<tr>
<td>Latitude, Longitude:</td>
<td>44.827222, -93.457222</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Analysis
The airplane collided with a taxiway sign while landing on runway 28L. The pilot stated that as he approached the airport, he received the automated terminal information service (ATIS) and the winds were reported as being from 250 degrees at 5 knots. He stated the approach was normal, but as he approached the threshold he had difficulty correcting for the crosswind and the airplane drifted to the right edge of the runway. The pilot stated the airplane touched down and continued to the right. He stated the airplane "ballooned slightly" and the nose gear impacted a taxiway sign. The pilot stated the nose gear collapsed and they came to rest in the grass between runways 28L and 28R. The wind conditions reported at 1153 were from 240 degrees at 10 knots.

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inadequate compensation for wind conditions and his failure to maintain directional control. Factors associated with the accident were the crosswind and the taxiway sign.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
1. (F) WEATHER CONDITION - CROSSWIND
2. (C) COMPENSATION FOR WIND CONDITIONS - INADEQUATE - PILOT IN COMMAND
3. (C) DIRECTIONAL CONTROL - NOT MAINTAINED - PILOT IN COMMAND

----------

Occurrence #2: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
4. (F) OBJECT - SIGN

----------

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
5. TERRAIN CONDITION - GROUND
Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Private</th>
<th>Age:</th>
<th>51</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Single-engine Land</td>
<td>Instrument Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td></td>
</tr>
<tr>
<td>Flight Time:</td>
<td>340 hours (Total, all aircraft), 39 hours (Total, this make and model), 172 hours (Pilot in Command, all aircraft), 20 hours (Last 90 days, all aircraft), 13 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>Piper</th>
<th>Registration:</th>
<th>CGGJB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>PA-32-300</td>
<td>Engines:</td>
<td>1 Reciprocating</td>
</tr>
<tr>
<td>Operator:</td>
<td>Robert J. McMame</td>
<td>Engine Manufacturer:</td>
<td>Lycoming</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>IO-540-K1A5</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Personal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM</td>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>Broken / 25000 ft agl</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>10 knots, 250°</td>
</tr>
<tr>
<td>Temperature:</td>
<td>26°C</td>
<td>Visibility</td>
<td>10 Miles</td>
</tr>
</tbody>
</table>

Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>Runway Surface Type:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>Runway Surface Condition:</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td></td>
</tr>
</tbody>
</table>

Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>1 None</th>
<th>Aircraft Damage:</th>
<th>Substantial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>3 None</td>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
<td>Aircraft Explosion:</td>
<td></td>
</tr>
<tr>
<td>Latitude, Longitude:</td>
<td>44.827222, -93.457222</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Analysis
The experimental amateur-built helicopter sustained substantial damage on impact with terrain during an autorotation following an in-flight loss of engine power while on its base leg. The pilot stated in his accident report, "I was given clearance for the option and on the base leg I reached for, and pulled, the carburetor heat lever. After releasing the lever, I inadvertently bumped and threw the main battery switch. I felt the switch move. (These switches are located on the top of the center console, and they are hidden from view by the pilot's right leg due to cramped quarters). I then tried to find and reengage the switch and I threw the avionics switch. I immediately re-engaged the avionics switch. While searching for the battery switch, the engine stopped. ... Due to forward groundspeed, the helicopter slid forward and tipped forward. The rotor blades struck the ground in the front of the ship, which created torque forces, which tipped the machine onto its left side." The pilot reported that there were no mechanical malfunctions in reference to the helicopter on the flight. The pilot’s safety recommendation was that the "battery switch should be relocated or [guarded]."

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inadvertent deactivation of the battery switch leading to the helicopter's loss of engine power on base leg. A factor was the crops he encountered during the emergency landing.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - NONMECHANICAL
Phase of Operation: APPROACH - VFR PATTERN - BASE LEG/BASE TO FINAL
Findings
1. ELECTRICAL SYSTEM, ELECTRIC SWITCH - OTHER
2. (C) MISCELLANEOUS - INADVERTENT DEACTIVATION - PILOT IN COMMAND

Occurrence #2: FORCED LANDING
Phase of Operation: EMERGENCY DESCENT/LANDING

Occurrence #3: ON GROUND/WATER ENCOUNTER WITH TERRAIN/WATER
Phase of Operation: EMERGENCY LANDING
Findings
3. (F) TERRAIN CONDITION - CROP
4. TERRAIN CONDITION - GROUND
### Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Commercial</th>
<th>Age:</th>
<th>57</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>None</td>
<td>Instrument Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>Helicopter</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>228 hours (Total, all aircraft), 52 hours (Total, this make and model), 153 hours (Pilot In Command, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Aircraft and Owner/Operator Information

| Aircraft Manufacturer: | Buss | Registration: | N82DR |
| Model/Series: | Rotorway Exec | Engines: | 1 Reciprocating |
| Operator: | Richard S. Buss | Engine Manufacturer: | Rotorway |
| Operating Certificate(s) Held: | None | Engine Model/Series: | RW152 |
| Flight Conducted Under: | Part 91: General Aviation - Personal |

### Meteorological Information and Flight Plan

| Conditions at Accident Site: | Visual Conditions | Condition of Light: | Day |
| Observation Facility, Elevation: | FCM, 906 ft msl | Weather Information Source: | Weather Observation Facility |
| Lowest Ceiling: | Broken / 25000 ft agl | Wind Speed/Gusts, Direction: |
| Temperature: | 7°C | Visibility | 9 Miles |
| Precipitation and Obscuration: | |
| Departure Point: | Eden Prairie, MN (FCM) | Destination: |

### Airport Information

| Airport: | |
| Runway Used: | |
| Runway Length/Width: | |

### Wreckage and Impact Information

| Crew Injuries: | 1 None | Aircraft Damage: | Substantial |
| Passenger Injuries: | N/A | Aircraft Fire: | None |
| Ground Injuries: | N/A | Aircraft Explosion: | None |
| Latitude, Longitude: | 44.827222, -93.457222 | | |
Administrative Information

Investigator In Charge (IIC): Edward F Malinowski  Adopted Date: 12/03/2004

Note: This accident report documents the factual circumstances of this accident as described to the NTSB.

Investigation Docket: NTSB accident and incident dockets serve as permanent archival information for the NTSB’’s investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB’s Record Management Division at pubbing@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Analysis
The airplane was substantially damaged during a gear up forced landing after takeoff. The pilot reported that everything was normal during the preflight and engine run-up. The pilot reported that after being cleared for takeoff, he advanced the throttle to 1,270 pounds of torque before releasing the brakes and everything was normal. He stated that upon reaching 85 knots he rotated, achieved a positive rate of climb, and retracted the landing gear. The pilot continued, "Just after the wheels were up the engine shuddered with a very substantial loss of power. It felt like a car that was hitting on half its cylinders." He stated he brought the power back to idle and focused on getting the airplane back on the runway. The pilot reported that after the airplane touched down he "pulled the emergency fuel cutoff." The airplane traveled straight ahead, crossed a taxiway, and came to rest about 100 yards past the taxiway. The pilot then shut off the battery and exited the airplane via the rear door. The airplane had a total of 183 hours since new. The pilot reported having a propeller overspeed warning during the flight previous to the accident flight. The tach generator was replaced after this incident. The tach generator that was removed was tested and no discrepancies were found. A tear down inspection on the engine failed to reveal any malfunctions/failures which would have resulted in the loss of power. Both the primary and overspeed propeller governors were removed from the engine and tested. A visual inspection of the primary governor revealed lockwire found on the airbleed system reset-eccentric screw was non-standard for Woodward and the torque sealant had been removed. A visual inspection of the overspeed governor revealed the inside of the speed setting hex screw did not contain any torque sealant. The sealant on the outside threads of the screw was cracked near the base of the screw and the housing. Bench testing of both the primary and overspeed governors revealed the overspeed governor was set to a lower rpm than the primary governor. Therefore, the overspeed governor would have been controlling the system. Manufacturing flight test documents indicate four occasions when the maximum reverse rpm was adjusted. Flight tests conducted with the governors calibrated to the settings at the time of the accident were conducted. Data from the flight tests indicate the propeller rpm was limited between 96-97% and that changes in the rpm stabilized within seconds.

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be:
A loss of engine power for undetermined reasons.

Findings
Occurrence #1: LOSS OF ENGINE POWER
Phase of Operation: TAKEOFF

Findings
1. (C) REASON FOR OCCURRENCE UNDETERMINED
2. PROPELLER GOVERNOR CONTROL - OUT OF CALIBRATION
3. MAINTENANCE, ADJUSTMENT - IMPROPER - UNKNOWN

------------

Occurrence #2: FORCED LANDING
Phase of Operation: EMERGENCY LANDING AFTER TAKEOFF

-------------

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: EMERGENCY LANDING

Findings
4. TERRAIN CONDITION - RUNWAY
5. TERRAIN CONDITION - GROUND

Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Private</th>
<th>Age:</th>
<th>59</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Single-engine Land</td>
<td>Instrument Rating(s):</td>
<td>Airplane</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>765 hours (Total, all aircraft), 102 hours (Total, this make and model), 699 hours (Pilot In Command, all aircraft), 52 hours (Last 90 days, all aircraft), 15 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>Piper</th>
<th>Registration:</th>
<th>N1968W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>PA-46-500TP</td>
<td>Engines:</td>
<td>1 Turbo Prop</td>
</tr>
<tr>
<td>Operator:</td>
<td>Stephen E. Watson</td>
<td>Engine Manufacturer:</td>
<td>Pratt &amp; Whitney Canada</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>PT6-42A</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Personal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM, 906 ft msl</td>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>Broken / 10000 ft agl</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>3 knots</td>
</tr>
<tr>
<td>Temperature:</td>
<td>-13°C</td>
<td>Visibility</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>Minneapolis, MN (FCM)</td>
<td>Destination:</td>
<td>Sioux Falls, SD (FSD)</td>
</tr>
</tbody>
</table>
## Airport Information

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport:</td>
<td>Flying Cloud (FCM)</td>
</tr>
<tr>
<td>Runway Used:</td>
<td>28R</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>3599 ft / 75 ft</td>
</tr>
<tr>
<td>Runway Surface Type:</td>
<td>Asphalt</td>
</tr>
<tr>
<td>Runway Surface Condition:</td>
<td>Dry</td>
</tr>
</tbody>
</table>

## Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crew Injuries:</td>
<td>1 None</td>
</tr>
<tr>
<td>Passenger Injuries:</td>
<td>N/A</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
</tr>
<tr>
<td>Aircraft Damage:</td>
<td>Substantial</td>
</tr>
<tr>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
<tr>
<td>Latitude, Longitude:</td>
<td>44.827222, -93.457222</td>
</tr>
</tbody>
</table>

## Administrative Information

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigator In Charge (IIC):</td>
<td>Pamela S Sullivan</td>
</tr>
<tr>
<td>Adopted Date:</td>
<td>04/28/2005</td>
</tr>
</tbody>
</table>

NTSB accident and incident dockets serve as permanent archival information for the NTSB’s investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB’s Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
National Transportation Safety Board
Aviation Accident Data Summary

Location: Eden Prairie, MN
Date & Time: 07/02/2003, 2242 CDT
Aircraft: Debay Dragonfly Mark II
Flight Conducted Under: Part 91: General Aviation - Personal
Accident Number: CH103LA192
Registration: N25JD
Injuries: 1 Serious

Analysis
The pilot was seriously injured and the experimental amateur-built airplane was destroyed when it impacted trees and terrain during a forced landing following a loss of engine power after takeoff. The amateur-built airplane was powered by a Volkswagen derived automobile engine with capacitive discharge ignition and a slide type carburetor. According to the manufacturer, the carburetor is not susceptible to carburetor icing because it does not incorporate a venturi. During an interview, the pilot stated that he had aircraft control during the forced landing. He stated that he had previous problems with the carburetor, and his internet website also listed problems, repairs and modifications made to the carburetor. The website indicated that the carburetor needle had been replaced, the carburetor slide had been modified and the throttle cable had been replaced. The website indicated that the mixture was "sensitive" and leaning was required in cruise flight or the "engine sputters from being too rich!" The website also states that the mixture during landing rollout "seems quite rich and [the engine] likes to die out." A section of the website titled "Repairs / Improvements to be made but are not stopping flight", listed "Continue to refine mixture / carb settings" as a listed item.

Postaccident examination of the airplane revealed that the engine could be rotated, valve train continuity was confirmed and each cylinder produced "thumb compression." The ignition system was not tested. The linkages to the carburetor were damaged during the impact; however, no pre-impact defects could be found.

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's intentional operation of the airplane with a known deficiency with regard to an improper carburetor calibration that led to the loss of engine power. The improperly calibrated carburetor and the trees were contributing factors.

Findings

Occurrence #1: LOSS OF ENGINE POWER
Phase of Operation: TAKEOFF - INITIAL CLimb

Findings
1. (F) FUEL SYSTEM, CARBURETOR - OUT OF CALIBRATION
2. (C) OPERATION WITH KNOWN DEFICIENCIES IN EQUIPMENT - INTENTIONAL - PILOT IN COMMAND

Occurrence #2: FORCED LANDING
Phase of Operation: DESCENT - EMERGENCY

Page 1 of 3
Occurrence #3: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: EMERGENCY LANDING

Findings
3. (F) OBJECT - TREE(S)

----------

Occurrence #4: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: EMERGENCY LANDING

Findings
4. TERRAIN CONDITION - GROUND

Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Private</th>
<th>Age:</th>
<th>26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Single-engine Land</td>
<td>Instrument Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>79 hours (Total, all aircraft), 22 hours (Total, this make and model), 30 hours (Pilot In Command, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>Debay</th>
<th>Registration:</th>
<th>N25JD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>Dragonfly Mark II</td>
<td>Engines:</td>
<td>1 Reciprocating</td>
</tr>
<tr>
<td>Operator:</td>
<td>Mark Felling</td>
<td>Engine Manufacturer:</td>
<td>Revmaster</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>R2100D</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Personal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>KFCM, 906 ft msl</td>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>Overcast / 20000 ft agl</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>6 knots, 220°</td>
</tr>
<tr>
<td>Temperature:</td>
<td>13°C</td>
<td>Visibility</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>Eden Prairie, MN (FCM)</td>
<td>Destination:</td>
<td></td>
</tr>
</tbody>
</table>

Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>FLYING CLOUD (FCM)</th>
<th>Runway Surface Type:</th>
<th>Asphalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>18</td>
<td>Runway Surface Condition:</td>
<td>Dry</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>2691 ft / 75 ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>1 Serious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>N/A</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
</tr>
<tr>
<td>Aircraft Damage:</td>
<td>Substantial</td>
</tr>
<tr>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
</tbody>
</table>

Latitude, Longitude:

Administrative Information

<table>
<thead>
<tr>
<th>Investigator In Charge (IIC):</th>
<th>John M Brannen</th>
<th>Adopted Date:</th>
<th>12/03/2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigation Docket:</td>
<td>NTSB accident and incident dockets serve as permanent archival information for the NTSB’s investigations. Dockets released prior to June 1, 2005, are publicly available from the NTSB’s Record Management Division at <a href="mailto:pubinfo@ntsb.gov">pubinfo@ntsb.gov</a>, or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.ntsb.gov/pubdms/">http://dms.ntsb.gov/pubdms/</a>.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Analysis
The airplane was observed proceeding westbound from the airport at a low altitude. A witness said, "I watched and listened thinking he would soon apply power and climb. The engine noise was smooth sounding but low. The plane was not gaining altitude and slowly losing altitude." The witness said the airplane flew parallel to, and north of the road in front of her house. "As it crossed the point of my driveway, the plane banked slightly, hit the tree tops and crashed and exploded." Control tower communications revealed that shortly after being instructed to contact departure control, the pilot responded, "two hotel whiskey - engine failure". An examination of airframe records showed that a new engine was installed at the annual inspection on February 5, 2001. The airplane logged approximately 75.7 hours from the time of the annual inspection to the time of the accident. An examination of the airplane's engine revealed that three teeth from the camshaft gear were fractured. An additional eight teeth were crushed, in total rendering the camshaft unable to be driven. A Materials Laboratory examination of the camshaft gear and fractured gear teeth showed two of the three teeth indicating signs of fatigue. The third tooth showed evidence of overstress. Rockwell hardness measurements made on the gear portion of the camshaft gear showed an average hardness of Rockwell 64HR30-N. Specification drawings for the camshaft gear indicated that the gear teeth should be hardened by gas-nitride process to a hardness of Rockwell 69HR30-N, minimum.

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: The fractured camshaft gear and the pilot not maintaining aircraft control. Factors relating to this accident were metal fatigue in the camshaft gear teeth, the inadvertent stall, the low airspeed, and the trees.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: CLimb

Findings
1. (C) ENGINE ASSEMBLY,GEAR - FRACTURED
2. MATERIAL INADEQUATE - MANUFACTURER
3. (F) ENGINE ASSEMBLY,GEAR - FATIGUE
4. ENGINE ASSEMBLY,GEAR - OVERLOAD

----------

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: CLimb

Page 1 of 3
Findings
5. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND
6. (F) STALL - INADVERTENT - PILOT IN COMMAND
7. (F) AIRSPEED - LOW
8. ALTITUDE - LOW
---------

Occurrence #3: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: DESCENT - UNCONTROLLED

Findings
9. (F) OBJECT - TREE(S)
---------

Occurrence #4: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

---

**Pilot Information**

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Private</th>
<th>Age:</th>
<th>37</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Single-engine Land</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrument Rating(s):</td>
<td>Airplane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructor Rating(s):</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flight Time:</td>
<td>632 hours (Total, all aircraft), 382 hours (Total, this make and model), 487 hours (Pilot In Command, all aircraft), 13 hours (Last 90 days, all aircraft), 5 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Aircraft and Owner/Operator Information**

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>Mooney</th>
<th>Registration:</th>
<th>N2HW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>M-20R</td>
<td>Engines:</td>
<td>1 Reciprocating</td>
</tr>
<tr>
<td>Operator:</td>
<td>JOEL W. HOIUM &amp; MICHAEL J. HOLTE</td>
<td>Engine Manufacturer:</td>
<td>Continental</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>IO-550-G(6)</td>
</tr>
</tbody>
</table>

**Flight Conducted Under:** Part 91: General Aviation - Personal

---

**Meteorological Information and Flight Plan**

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM, 906 ft msl</td>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>None</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>3 knots, Variable</td>
</tr>
<tr>
<td>Temperature:</td>
<td>31°C</td>
<td>Visibility</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>EDEN PRAIRIE, MN (FCM)</td>
<td>Destination:</td>
<td>ABERDEEN, SD (ABR)</td>
</tr>
</tbody>
</table>
Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>Flying Cloud Airport (FCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>27L</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>3909 ft / 75 ft</td>
</tr>
</tbody>
</table>

Runway Surface Type: Concrete  
Runway Surface Condition: Dry

Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>1 Fatal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>N/A</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
</tr>
<tr>
<td>Aircraft Damage:</td>
<td>Destroyed</td>
</tr>
<tr>
<td>Aircraft Fire:</td>
<td>On-Ground</td>
</tr>
<tr>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
<tr>
<td>Latitude, Longitude:</td>
<td>44.823333, -93.491389</td>
</tr>
</tbody>
</table>

Administrative Information

Investigator In Charge (IIC): DAVID C BOWLING  
Adopted Date: 08/26/2002

NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009, are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Analysis
The student pilot said she was flying in the traffic pattern and was on a long final to perform a touch-and-go landing. She said that the visual approach slope indicator lights showed she was on the proper glide path. The student pilot said that when she was sure she was in a position to land on the runway, she lowered a third notch of flaps. She said she reduced the power to idle as she crossed over the threshold and tried to maintain her altitude. The student pilot said, "I touched down and ballooned up. Then the airplane returned to the runway and ballooned again. About the third bounce I lunged forward as the nosewheel had broken off." The student pilot said the airplane slid to a stop on the grass near the runway. An examination of the airplane revealed no anomalies.

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: The student pilot's failure to maintain aircraft control during the landing, her failure to recover from the bounced landing, and the nose gear overload.

Findings

Occurrence #1: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
1. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND
2. (C) RECOVERY FROM BOUNCED LANDING - NOT PERFORMED - PILOT IN COMMAND

Occurrence #2: NOSE GEAR COLLAPSED
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
3. (C) LANDING GEAR, NOSE GEAR - OVERLOAD
### Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age:</td>
<td>26</td>
</tr>
<tr>
<td>Airplane Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Instrument Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>47 hours (Total, all aircraft), 43 hours (Total, this make and model), 4 hours (Pilot In Command, all aircraft), 24 hours (Last 90 days, all aircraft), 3 hours (Last 30 days, all aircraft)</td>
</tr>
</tbody>
</table>

### Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>Beech</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>B19</td>
</tr>
<tr>
<td>Registration:</td>
<td>N3214L</td>
</tr>
<tr>
<td>Engines:</td>
<td>1 Reciprocating</td>
</tr>
<tr>
<td>Engine Manufacturer:</td>
<td>Lycoming</td>
</tr>
<tr>
<td>Engine Model/Series:</td>
<td>O-320-E2D</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Instructional</td>
</tr>
</tbody>
</table>

### Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM, 906 ft msl</td>
</tr>
<tr>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>None</td>
</tr>
<tr>
<td>Wind Speed/Gusts, Direction:</td>
<td>6 knots, 160°</td>
</tr>
<tr>
<td>Temperature:</td>
<td>32°C</td>
</tr>
<tr>
<td>Visibility:</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>EDEN PRAIRIE, MN (FCM)</td>
</tr>
<tr>
<td>Destination:</td>
<td></td>
</tr>
</tbody>
</table>

### Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>FLYING CLOUD AIRPORT (FCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>18</td>
</tr>
<tr>
<td>Runway Surface Type:</td>
<td>Asphalt</td>
</tr>
<tr>
<td>Runway Surface Condition:</td>
<td>Dry</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>2691 ft / 75 ft</td>
</tr>
</tbody>
</table>

### Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>1 Minor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft Damage:</td>
<td>Substantial</td>
</tr>
<tr>
<td>Passenger Injuries:</td>
<td>N/A</td>
</tr>
<tr>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
</tr>
<tr>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
<tr>
<td>Latitude, Longitude:</td>
<td>44.826667, -93.456667</td>
</tr>
</tbody>
</table>
The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
National Transportation Safety Board
Aviation Accident Data Summary

Location: EDEN PRAIRIE, MN
Date & Time: 10/20/2000, 1810 CDT
Aircraft: Piper PT-46
Flight Conducted Under: Part 91: General Aviation - Personal

Accident Number: CHI01LA028
Registration: N1RQ
Injuries: 1 None

Analysis
The pilot said that during the landing he noticed the airplane start to float up. 'When [the] plane came back down, it began to bounce up and down. On the third of maybe 5 or 6 bounces, the prop struck the ground.' An examination of the airplane revealed no anomalies.

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: the pilot misjudging the landing flare, and his failure to recover from the bounced landing.

Findings

Occurrence #1: HARD LANDING
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
1. (C) FLARE - MISJUDGED - PILOT IN COMMAND
2. (C) RECOVERY FROM BOUNCED LANDING - NOT PERFORMED - PILOT IN COMMAND

----------

Occurrence #2: GEAR COLLAPSED
Phase of Operation: LANDING - ROLL

Findings
3. LANDING GEAR, NOSE GEAR - COLLAPSED

Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Private</th>
<th>Age:</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Single-engine Land</td>
<td>Instrument Rating(s):</td>
<td>Airplane</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>981 hours (Total, all aircraft), 39 hours (Total, this make and model), 847 hours (Pilot In Command, all aircraft), 39 hours (Last 90 days, all aircraft), 23 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>Piper</th>
<th>Registration:</th>
<th>N1RQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>PT-46 PT-46</td>
<td>Engines:</td>
<td>1 Turbo Prop</td>
</tr>
<tr>
<td>Operator:</td>
<td>RANDALL RAYMOND QUAST</td>
<td>Engine Manufacturer:</td>
<td>P&amp;W</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>PT-6A-34</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Personal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM, 906 ft msl</td>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>None / 0 ft agl</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>5 knots, 320°</td>
</tr>
<tr>
<td>Temperature:</td>
<td>16°C</td>
<td>Visibility:</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>DOWAGIAC, MI (C91)</td>
<td>Destination:</td>
<td>(FCM)</td>
</tr>
</tbody>
</table>

Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>FLYING CLOUD AIRPORT (FCM)</th>
<th>Runway Surface Type:</th>
<th>Asphalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>27L</td>
<td>Runway Surface Condition:</td>
<td>Dry</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>3909 ft / 75 ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>1 None</th>
<th>Aircraft Damage:</th>
<th>Substantial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>N/A</td>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
<tr>
<td>Latitude, Longitude:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Administrative Information

<table>
<thead>
<tr>
<th>Investigator In Charge (IIC):</th>
<th>DAVID C BOWLING</th>
<th>Adopted Date:</th>
<th>07/02/2001</th>
</tr>
</thead>
</table>

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
National Transportation Safety Board
Aviation Accident Data Summary

<table>
<thead>
<tr>
<th>Location:</th>
<th>MINNEAPOLIS, MN</th>
<th>Accident Number:</th>
<th>CHI00LA154</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date &amp; Time:</td>
<td>06/08/2000, 1545 CDT</td>
<td>Registration:</td>
<td>N8189T</td>
</tr>
<tr>
<td>Aircraft:</td>
<td>Piper PA-28-161</td>
<td>Injuries:</td>
<td>2 Minor</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Instructional</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analysis
During initial climb after takeoff the engine crankshaft failed, resulting in a engine failure. The flight instructor took control of the aircraft and executed a forced landing into a swamp. Post-accident investigation revealed that the engine crankshaft had failed between the number three bearing journal and the number three connecting rod journal. According to the National Transportation Safety Board Materials Laboratory Factual Report, the fracture surface, on the forward piece of the crankshaft, "...appeared relatively smooth with curving crack arrest lines, features typical of fatigue." The report stated, "Fracture features for the fatigue region emanated from an origin...at the surface of the aft radius of the third main journal..." The factual report indicated that the fatigue cracking progressed through more than 80-percent of the check prior to the final separation. The factual report further added that that the inner and outer diameter surfaces of the number three main bearing halves were circumferentially rubbed. The report states, "One edge of each of these bearing halves was rubbed and worn in the approximate shape of the journal radius. In addition, the antirotation tabs for these bearing halves were worn away from the outside diameter surface." The factual report indicated that the number four main bearing halves were deformed and the inner diameter surface was gouged. The report states, "Also, some slight circumferential rubbing marks were observed on the inner diameter surface of the number 1 and 2 main bearing halves. No evidence of heat tinting was noted on any of the bearing halves."

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: the failure of the engine and the unsuitable terrain for landing encountered by the pilot-in-command. Factors to the accident were the fracture of the crankshaft due to fatigue, excessive main bearing wear, and the swampy terrain condition.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: TAKEOFF - INITIAL CLimb

Findings
1. (C) POWERPLANT - FAILURE,TOTAL
2. (F) ENGINE ASSEMBLY, CRANKSHAFT - FATIGUE
3. (F) ENGINE ASSEMBLY, CRANKSHAFT - FRACTURED
4. (F) ENGINE ASSEMBLY, BEARING - OTHER

Occurrence #2: FORCED LANDING
Phase of Operation: EMERGENCY DESCENT/LANDING

Page 1 of 3
Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: EMERGENCY DESCENT/LANDING

Findings
5. (F) TERRAIN CONDITION - SWAMPY
6. (C) UNSUITABLE TERRAIN OR TAKEOFF/LANDING/TAXI AREA - ENCOUNTERED - PILOT IN COMMAND(CFI)

Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Flight Instructor; Commercial Age: 26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Multi-engine Land; Single-engine Land Instrument Rating(s): Airplane</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
</tr>
</tbody>
</table>

Flight Time: 537 hours (Total, all aircraft), 104 hours (Total, this make and model), 472 hours (Pilot In Command, all aircraft), 185 hours (Last 90 days, all aircraft), 76 hours (Last 30 days, all aircraft), 8 hours (Last 24 hours, all aircraft)

Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>Piper Registration: N8189T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>PA-28-161 PA-28-161 Engines: 1 Reciprocating</td>
</tr>
<tr>
<td>Operator:</td>
<td>THUNDERBIRD AIRCRAFT COMPANY Engine Manufacturer: Lycoming</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
</tr>
</tbody>
</table>

Flight Conducted Under: Part 91: General Aviation - Instructional

Meteorological Information and Flight Plan

| Conditions at Accident Site: Visual Conditions Condition of Light: Day |
|-----------------------------|-----------------------------|
| Observation Facility, Elevation: FCM, 906 ft msl Weather Information Source: Weather Observation Facility |
| Lowest Ceiling: None / 0 ft agl Wind Speed/Gusts, Direction: 9 knots/18 knots, 160° |
| Temperature: 91°F Visibility 10 Miles |

Precipitation and Obscuration: |

Departure Point: (FCM) Destination: |

Airport Information

| Airport: FLYING CLOUD MUNICIPAL (FCM) Runway Surface Type: Asphalt |
|--------------------------|-----------------------------|
| Runway Used: 18 Runway Surface Condition: |
| Runway Length/Width: 2691 ft / 75 ft |
### Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>2 Minor</th>
<th>Aircraft Damage:</th>
<th>Substantial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>N/A</td>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
</tbody>
</table>

### Administrative Information

<table>
<thead>
<tr>
<th>Investigator In Charge (IIC):</th>
<th>ANDREW T FOX</th>
<th>Adopted Date:</th>
<th>10/02/2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigation Docket:</td>
<td>NTSB accident and incident dockets serve as permanent archival information for the NTSB’s investigations. Dockets released prior to June 1, 2005 are publicly available from the NTSB’s Record Management Division at <a href="mailto:pubing@ntsb.gov">pubing@ntsb.gov</a>, or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.ntsb.gov/pubdms/">http://dms.ntsb.gov/pubdms/</a>.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Analysis
During initial climb after takeoff the engine crankshaft failed, resulting in an engine failure. The flight instructor took control of the aircraft and executed a forced landing into a swamp. Post-accident investigation revealed that the engine crankshaft had failed between the number three bearing journal and the number three connecting rod journal. According to the National Transportation Safety Board Materials Laboratory Factual Report, the fracture surface, on the forward piece of the crankshaft, "...appeared relatively smooth with curving crack arrest lines, features typical of fatigue." The report stated, "Fracture features for the fatigue region emanated from an origin...at the surface of the aft radius of the third main journal...." The factual report indicated that the fatigue cracking progressed through more than 80-percent of the check prior to the final separation. The factual report further added that that the inner and outer diameter surfaces of the number three main bearing halves were circumferentially rubbed. The report states, "One edge of each of these bearing halves was rubbed and worn in the approximate shape of the journal radius. In addition, the antirotation tabs for these bearing halves were worn away from the outside diameter surface." The factual report indicated that the number four main bearing halves were deformed and the inner diameter surface was gouged. The report states, "Also, some slight circumferential rubbing marks were observed on the inner diameter surface of the number 1 and 2 main bearing halves. No evidence of heat tinting was noted on any of the bearing halves."

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: the failure of the engine and the unsuitable terrain for landing encountered by the pilot-in-command. Factors to the accident were the fracture of the crankshaft due to fatigue, excessive main bearing wear, and the swampy terrain condition.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: TAKEOFF - INITIAL CLimb

Findings

1. (C) POWERPLANT - FAILURE,TOTAL
2. (F) ENGINE ASSEMBLY,CRANKSHAFT - FATIGUE
3. (F) ENGINE ASSEMBLY,CRANKSHAFT - FRACUTURED
4. (F) ENGINE ASSEMBLY,BEARING - OTHER

Occurrence #2: FORCED LANDING
Phase of Operation: EMERGENCY DESCENT/LANDING

Page 1 of 3
Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: EMERGENCY DESCENT/LANDING

Findings
5. (F) TERRAIN CONDITION - SWAMPY
6. (C) UNSUITABLE TERRAIN OR TAKEOFF/LANDING/TAXI AREA - ENCOUNTERED - PILOT IN COMMAND(CFI)

Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Flight Instructor; Commercial</th>
<th>Age:</th>
<th>26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Multi-engine Land; Single-engine Land</td>
<td>Instrument Rating(s):</td>
<td>Airplane</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td>Airplane Multi-engine; Airplane Single-engine; Instrument Airplane</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>537 hours (Total, all aircraft), 104 hours (Total, this make and model), 472 hours (Pilot In Command, all aircraft), 185 hours (Last 90 days, all aircraft), 76 hours (Last 30 days, all aircraft), 8 hours (Last 24 hours, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>Piper</th>
<th>Registration:</th>
<th>N8189T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>PA-28-161 PA-28-161</td>
<td>Engines:</td>
<td>1 Reciprocating</td>
</tr>
<tr>
<td>Operator:</td>
<td>THUNDERBIRD AIRCRAFT COMPANY</td>
<td>Engine Manufacturer:</td>
<td>Lycoming</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>O-320-D3G</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Instructional</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM, 906 ft msd</td>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>None / 0 ft agl</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>9 knots / 18 knots, 160°</td>
</tr>
<tr>
<td>Temperature:</td>
<td>91° C</td>
<td>Visibility</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>(FCM)</td>
<td>Destination:</td>
<td></td>
</tr>
</tbody>
</table>

Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>FLYING CLOUD MUNICIPAL (FCM)</th>
<th>Runway Surface Type:</th>
<th>Asphalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>18</td>
<td>Runway Surface Condition:</td>
<td></td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>2691 ft / 75 ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>2 Minor</th>
<th>Aircraft Damage:</th>
<th>Substantial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>N/A</td>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
</tbody>
</table>

Latitude, Longitude:

Administrative Information

<table>
<thead>
<tr>
<th>Investigator In Charge (IIC):</th>
<th>ANDREW T FOX</th>
<th>Adopted Date:</th>
<th>10/02/2001</th>
</tr>
</thead>
</table>
| Investigation Docket: | NTSB accident and incident dockets serve as permanent archival information for the NTSB’s investigations. Dockets released prior to June 1, 2006 are publicly available from the NTSB’s Record Management Division at pubing@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
National Transportation Safety Board
Aviation Accident Data Summary

Location: EDEN PRAIRIE, MN
Date & Time: 08/30/1999, 1145 CDT
Aircraft: Piper PA-24-180
Flight Conducted Under: Part 91: General Aviation - Personal
Accident Number: CHI99LA315
Registration: N6606P
Injuries: 1 None

Analysis
The airplane made a gear up landing. Visual meteorological conditions prevailed at the time of the accident. In a written statement, the pilot said that he 'forgot to put the gear down.' At a postaccident examination, the airplane landing gear extended under its own power while the aircraft was supported on jacks.

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: the failure of the pilot to follow the landing checklist and his failure to extend the landing gear.

Findings

Occurrence #1: WHEELS UP LANDING
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
1. (C) CHECKLIST - NOT FOLLOWED - PILOT IN COMMAND
2. (C) GEAR EXTENSION - NOT PERFORMED - PILOT IN COMMAND

Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Private</th>
<th>Age:</th>
<th>61</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Single-engine Land</td>
<td>Instrument Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>2761 hours (Total, all aircraft), 528 hours (Total, this make and model), 2761 hours (Pilot In Command, all aircraft), 61 hours (Last 90 days, all aircraft), 12 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>Piper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration:</td>
<td>N6606P</td>
</tr>
<tr>
<td>Model/Series:</td>
<td>PA-24-180 PA-24-180</td>
</tr>
<tr>
<td>Engines:</td>
<td>1 Reciprocating</td>
</tr>
<tr>
<td>Operator:</td>
<td>AIR FLITE</td>
</tr>
<tr>
<td>Engine Manufacturer:</td>
<td>Lycoming</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
</tr>
<tr>
<td>Engine Model/series:</td>
<td>O-360</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Personal</td>
</tr>
</tbody>
</table>

Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM, 906 ft msl</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>Overcast / 4300 ft agl</td>
</tr>
<tr>
<td>Temperature:</td>
<td>18°C</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>FOND DU LAC, WI (FLD)</td>
</tr>
<tr>
<td>Condition of Light:</td>
<td>Day</td>
</tr>
<tr>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Wind Speed/Gusts, Direction:</td>
<td>11 knots, 130°</td>
</tr>
<tr>
<td>Visibility:</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Destination:</td>
<td>(FCM)</td>
</tr>
</tbody>
</table>

Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>FLYING CLOUD AIRPORT (FCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>27R</td>
</tr>
<tr>
<td>Runway Surface Type:</td>
<td>Asphalt</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>3599 ft / 75 ft</td>
</tr>
<tr>
<td>Runway Surface Condition:</td>
<td>Dry</td>
</tr>
</tbody>
</table>

Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>1 None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>N/A</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
</tr>
<tr>
<td>Aircraft Damage:</td>
<td>Substantial</td>
</tr>
<tr>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
</tbody>
</table>

Administrative Information

<table>
<thead>
<tr>
<th>Investigator In Charge (IC):</th>
<th>JOHN M BRANNEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adopted Date:</td>
<td>07/02/2001</td>
</tr>
</tbody>
</table>

Investigation Docket: NTSB accident and incident dockets serve as permanent archival information for the NTSB’s investigations. Dockets released prior to June 1, 2005 are publicly available from the NTSB’s Record Management Division at pubing@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Analysis
The pilot reported the flight was uneventful the left main landing gear 'broke' on touchdown. The airplane veered left where it contacted a taxiway information sign and the nose gear collapsed prior to the airplane coming to rest. The left main landing gear strut collapsed rearward damaging the left wing aft spar. Inspection of the left main gear revealed the upper and lower portions of the scissors link detached from each other allowing the lower portion of the strut to rotate within the upper portion of the strut. The bolt, washers, bushings, nut, and cotter pin remained attached to the upper link. There were three washers present near the head of the bolt. All three were painted white and had an outside diameter of 3/4 inch. There were four washer present at the castellated nut end of the bolt. None of these washers were painted and all of them had an outside diameter of 9/16 inch. This is the same outside diameter as the bushing and same inside diameter as the hole on the scissors link.

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: maintenance personnel installed washers which were not large enough in diameter to prevent the retraction/extension scissors links from separating from each other.

Findings

Occurrence #1: MAIN GEAR COLLAPSED
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
1. (C) MISCELLANEOUS,BOLT/NUT/FASTENER/CLAMP/SPRING - IMPROPER
2. (C) MAINTENANCE,INSTALLATION - IMPROPER - OTHER MAINTENANCE PERSONNEL
3. (C) LANDING GEAR,NORMAL RETRACTION/EXTENSION ASSEMBLY - DISCONNECTED

Occurrence #2: LOSS OF CONTROL - ON GROUND/WATER
Phase of Operation: LANDING - ROLL

Findings
4. DIRECTIONAL CONTROL - NOT POSSIBLE - PILOT IN COMMAND

Occurrence #3: ON GROUND/WATER COLLISION WITH OBJECT
Phase of Operation: LANDING - ROLL

Findings
5. OBJECT - AIRPORT SIGN/MARKER

Page 1 of 3
### Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Private</th>
<th>Age:</th>
<th>38</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Multi-engine Land; Single-engine Land</td>
<td>Instrument Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>475 hours (Total, all aircraft), 170 hours (Total, this make and model)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>Cessna</th>
<th>Registration:</th>
<th>N310DE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>310N 310N</td>
<td>Engines:</td>
<td>2 Reciprocating</td>
</tr>
<tr>
<td>Operator:</td>
<td>BAHRAM AKRADI</td>
<td>Engine Manufacturer:</td>
<td>Continental</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>IO-470-VO</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Personal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM, 906 ft msl</td>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>None / 0 ft agl</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>11 knots, 320°</td>
</tr>
<tr>
<td>Temperature:</td>
<td>26°C</td>
<td>Visibility</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departure Point:</td>
<td>(FCM)</td>
<td>Destination:</td>
<td>(FCM)</td>
</tr>
</tbody>
</table>

### Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>FLYING CLOUD (FCM)</th>
<th>Runway Surface Type:</th>
<th>Asphalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>27</td>
<td>Runway Surface Condition:</td>
<td>Dry</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td>3900 ft / 75 ft</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>1 None</th>
<th>Aircraft Damage:</th>
<th>Substantial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>1 None</td>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
<tr>
<td>Latitude, Longitude:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
National Transportation Safety Board
Aviation Accident Data Summary

Location: EDEN PRAIRIE, MN
Date & Time: 11/25/1998, 1839 CST
Aircraft: Piper PA-28-R200
Flight Conducted Under: Part 91: General Aviation - Personal

Accident Number: CHI99LA041
Registration: N2988R
Injuries: 3 None

Analysis
The pilot reported that she initiated the flare over the numbers of runway 27L. She reported the 'nose alignment drifted slightly left.' The left main gear touched down first and then the right main gear shortly after. The nose gear touched down 3 to 5 seconds after the right main gear. The airplane '...continued landing roll for less than 2 seconds after nose gear touched down before all steering was lost. Plane swerved hard left and initiated aircraft skidding with right side of aircraft turned slightly.' The right wingtip struck the VASI support stand, and the airplane spun 90 degrees clockwise before stopping. The pilot reported the VASI light fell on the right wing and collapsed the right main gear. The damage to the airplane included the right main gear was collapsed and punched through the wing spar.

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: the pilot misjudged the flare and did not maintain directional control during touchdown. A factor was the VASI lights.

Findings

Occurrence #1: HARD LANDING
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings
1. (C) FLARE - MISJUDGED - PILOT IN COMMAND
2. (C) DIRECTIONAL CONTROL - NOT OBTAINED/MAINTAINED - PILOT IN COMMAND

Occurrence #2: ON GROUND/WATER COLLISION WITH OBJECT
Phase of Operation: LANDING - ROLL

Findings
3. (F) OBJECT - VASI LIGHT/SYSTEM
## Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Private</th>
<th>Age:</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>Single-engine Land</td>
<td>Instrument Rating(s):</td>
<td>Airplane</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>None</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>242 hours (Total, all aircraft), 68 hours (Total, this make and model), 189 hours (Pilot In Command, all aircraft), 14 hours (Last 90 days, all aircraft), 11 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Aircraft and Owner/Operator Information

| Aircraft Manufacturer: | Piper | Registration: | N2988R |
| Model/Series: | PA-28-R200 PA-28-R200 | Engines: | 1 Reciprocating |
| Operator: | KATHLEEN SPILMAN | Engine Manufacturer: | Lycoming |
| Operating Certificate(s) Held: | None | Engine Model/Series: | IO-360-C1C |
| Flight Conducted Under: | Part 91: General Aviation - Personal |

## Meteorological Information and Flight Plan

| Conditions at Accident Site: | Visual Conditions | Condition of Light: | Night/Dark |
| Observation Facility, Elevation: | FCM, 906 ft msl | Weather Information Source: | Weather Observation Facility |
| Lowest Ceiling: | None / 0 ft agl | Wind Speed/Gusts, Direction: | 9 knots, 270° |
| Temperature: | 7°C | Visibility: | 10 Miles |
| Precipitation and Obscuration: | | | |
| Departure Point: | LANSING, MI (IGQ) | Destination: | (FCM) |

## Airport Information

| Airport: | FLYING CLOUD AIRPORT (FCM) | Runway Surface Type: | Asphalt |
| Runway Used: | 27 | Runway Surface Condition: | Dry |
| Runway Length/Width: | 3909 ft / 75 ft |

## Wreckage and Impact Information

| Crew Injuries: | 1 None | Aircraft Damage: | Substantial |
| Passenger Injuries: | 2 None | Aircraft Fire: | None |
| Ground Injuries: | N/A | Aircraft Explosion: | None |
| Latitude, Longitude: | | | |
NTSB accident and incident dockets serve as permanent archival information for the NTSB’s investigations. Dockets released prior to June 1, 2006 are publicly available from the NTSB’s Record Management Division at pubing@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Analysis
The kit-built helicopter was hover-taxiing for about ten minutes according to the pilot/builder. He said '...the engine stopped unexpectedly [and the helicopter] settled to the runway and rolled over.' The on-scene investigation revealed a silicon-type sealant had completely blocked the supply side of the fuel filter. The builder said he had used this material to seal the fuel tank filler neck's flange to the fuel tank. According to the manufacturer's instruction manual, the builder is to 'Place a 1/8-inch bead of MA300 from the adhesive kit around [the] hole circle through the centerline of [the mounting] holes.' MA300 is an epoxy-type glue/sealant that does not break down when contacted by gasoline. The silicon-type material dissolves when it comes in contact with gasoline, according to the helicopter's kit manufacturer.

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: a design change to the fuel tank filler neck sealant made by the owner/builder of the helicopter. Factors associated with this accident were an improper sealant material used by the owner/builder and an autorotation was not possible by the pilot due to the hover-taxi low altitude.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - NONMECHANICAL
Phase of Operation: TAXI - AERIAL

Findings
1. FUEL SYSTEM, FILTER - BLOCKED(TOTAL)
2. (C) MAINTENANCE, DESIGN CHANGE - PERFORMED - OWNER/BUILDER
3. (F) MATERIAL INADEQUATE, IMPROPER - OWNER/BUILDER
4. FUEL SYSTEM, FILTER - FOREIGN MATERIAL/SUBSTANCE
5. (F) SPIRAL - NOT POSSIBLE - PILOT IN COMMAND
6. FLUID, FUEL - STARVATION

 Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
7. TERRAIN CONDITION - GROUND

 Occurrence #3: ROLL OVER
Phase of Operation: OTHER
Pilot Information

<table>
<thead>
<tr>
<th>Certificate:</th>
<th>Private</th>
<th>Age:</th>
<th>43</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airplane Rating(s):</td>
<td>None</td>
<td>Instrument Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Other Aircraft Rating(s):</td>
<td>Helicopter</td>
<td>Instructor Rating(s):</td>
<td>None</td>
</tr>
<tr>
<td>Flight Time:</td>
<td>119 hours (Total, all aircraft), 9 hours (Total, this make and model), 59 hours (Pilot In Command, all aircraft)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>Culver-Revolution</th>
<th>Registration:</th>
<th>N6269R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>MINI 500 MINI 500</td>
<td>Engines:</td>
<td>1 Reciprocating</td>
</tr>
<tr>
<td>Operator:</td>
<td>RANDY N. CULVER</td>
<td>Engine Manufacturer:</td>
<td>Rotax</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>582</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Personal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Meteorological Information and Flight Plan

<table>
<thead>
<tr>
<th>Conditions at Accident Site:</th>
<th>Visual Conditions</th>
<th>Condition of Light:</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation Facility, Elevation:</td>
<td>FCM, 1000 ft msl</td>
<td>Weather Information Source:</td>
<td>Weather Observation Facility</td>
</tr>
<tr>
<td>Lowest Ceiling:</td>
<td>None / 0 ft agl</td>
<td>Wind Speed/Gusts, Direction:</td>
<td>5 knots, 140°</td>
</tr>
<tr>
<td>Temperature:</td>
<td>20°C</td>
<td>Visibility</td>
<td>10 Miles</td>
</tr>
<tr>
<td>Precipitation and Obscuration:</td>
<td>(FCM)</td>
<td>Destination:</td>
<td>(FCM)</td>
</tr>
</tbody>
</table>

Airport Information

<table>
<thead>
<tr>
<th>Airport:</th>
<th>FLYING CLOUD (FCM)</th>
<th>Runway Surface Type:</th>
<th>Asphalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway Used:</td>
<td>0</td>
<td>Runway Surface Condition:</td>
<td>Dry</td>
</tr>
<tr>
<td>Runway Length/Width:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wreckage and Impact Information

<table>
<thead>
<tr>
<th>Crew Injuries:</th>
<th>1 None</th>
<th>Aircraft Damage:</th>
<th>Substantial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Injuries:</td>
<td>N/A</td>
<td>Aircraft Fire:</td>
<td>None</td>
</tr>
<tr>
<td>Ground Injuries:</td>
<td>N/A</td>
<td>Aircraft Explosion:</td>
<td>None</td>
</tr>
<tr>
<td>Latitude, Longitude:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Analysis
The pilot reported he touched down further down the runway than he intended and the airplane porpoised twice during touchdown. The pilot reported he elected to go-around after the second porpoise as he was running out of runway. He reported that during the go-around he retracted the flaps from full to neutral, and he applied full power and right rudder. The pilot reported the airplane entered a left yaw/roll during the go-around. The airplane then contacted a hangar, a chain link fence, and a ditch prior to spinning 180 degrees and sliding to a stop.

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: the pilot's improper raising of flaps and not maintaining directional control of the aircraft during the go-around sequence.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: GO-AROUND (VFR)

Findings
1. (C) RAISING OF FLAPS - IMPROPER - PILOT IN COMMAND
2. (C) DIRECTIONAL CONTROL - NOT MAINTAINED - PILOT IN COMMAND

Occurrence #2: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: GO-AROUND (VFR)

Findings
3. OBJECT - HANGAR/AIRPORT BUILDING
4. OBJECT - FENCE

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
5. TERRAIN CONDITION - DITCH
Pilot Information

Certificate: Private
Airplane Rating(s): Single-engine Land
Other Aircraft Rating(s): None
Flight Time: 225 hours (Total, all aircraft), 112 hours (Total, this make and model), 225 hours (Pilot In Command, all aircraft), 2 hours (Last 90 days, all aircraft), 2 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)

Age: 44
Instrument Rating(s): None
Instructor Rating(s): None

Aircraft and Owner/Operator Information

Aircraft Manufacturer: Beech
Model/Series: C-23 C-23
Registration: N18766
Engine(s): 1 Reciprocating

Operator: GREAT LAKES AIRCRAFT, INC.
Engine Manufacturer: Lycoming
Operating Certificate(s) Held: None
Engine Model/Series: O-360-A4K

Flight Conducted Under: Part 91: General Aviation - Personal

Meteorological Information and Flight Plan

Conditions at Accident Site: Visual Conditions
Condition of Light: Day
Weather Information Source: Weather Observation Facility

Observation Facility, Elevation: FCM, 906 ft msl
Lowest Ceiling: Broken / 2500 ft agl
Wind Speed/Gusts, Direction: 9 knots, 190°

Temperature: 3°C
Visibility: 3 Miles

Precipitation and Obscuration:
Departure Point: (FCM)
Destination: (FCM)

Airport Information

Airport: FLYING CLOUD (FCM)
Runway Surface Type: Asphalt
Runway Used: 18
Runway Surface Condition: Dry
Runway Length/Width: 2691 ft / 75 ft

Wreckage and Impact Information

Crew Injuries: 1 Minor
Passenger Injuries: 3 Minor
Ground Injuries: N/A
Aircraft Damage: Substantial
Aircraft Fire: None
Aircraft Explosion: None

Latitude, Longitude:
The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
National Transportation Safety Board  
Aviation Accident Data Summary

Location: EDEN PRAIRIE, MN  
Date & Time: 11/20/1997, 1850 CST  
Aircraft: Mooney M20K  
Flight Conducted Under: Part 91: General Aviation - Personal

Accident Number: CHI98LA042  
Registration: N252A  
Injuries: 1 None

Analysis
The pilot was flying an ILS approach to runway 9R at Flying Cloud Airport, Eden Prairie, Minnesota. The weather was 300 feet overcast with a visibility of 1/2 mile in fog and mist. The pilot leveled off 'a few feet above decision height after flying the glideslope.' He said that he had trouble finding the runway lights due to the limited visibility. The pilot said that when he did see the lights, he was beyond the threshold of the runway and was not lined up properly with the center of the runway. The airplane touched down off the right edge of the runway striking several runway lights during the landing roll. Examination of the airplane revealed no anomalies.

Probable Cause
The National Transportation Safety Board determines the probable cause(s) of this accident to be: the pilot's improper decision to continue the approach beyond decision height, when he could not see the runway; and his attempt to land without being properly aligned on the runway. Factors relating to this accident were: darkness, fog and runway lights.

Findings

Occurrence #1: ON GROUND/WATER COLLISION WITH OBJECT  
Phase of Operation: LANDING - ROLL

Findings  
1. (F) LIGHT CONDITION - DARK NIGHT  
2. (F) WEATHER CONDITION - FOG  
3. (C) IN-FLIGHT PLANNING/DECISION - IMPROPER - PILOT IN COMMAND  
4. (F) OBJECT - RUNWAY LIGHT  
5. (C) PROPER ALIGNMENT - NOT ATTAINED - PILOT IN COMMAND

Pilot Information

Certificate: Private  
Airplane Rating(s): Single-engine Land  
Other Aircraft Rating(s): None  
Flight Time: 1700 hours (Total, all aircraft), 1244 hours (Total, this make and model), 1680 hours (Pilot In Command, all aircraft), 93 hours (Last 90 days, all aircraft), 39 hours (Last 30 days, all aircraft), 8 hours (Last 24 hours, all aircraft)

Age: 54  
Instrument Rating(s): Airplane  
Instructor Rating(s): None
Aircraft and Owner/Operator Information

<table>
<thead>
<tr>
<th>Aircraft Manufacturer:</th>
<th>Mooney</th>
<th>Registration:</th>
<th>N252A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model/Series:</td>
<td>M20K M20K</td>
<td>Engines:</td>
<td>1 Reciprocating</td>
</tr>
<tr>
<td>Operator:</td>
<td>WILLIAM &amp; MARILYN BALDWIN</td>
<td>Engine Manufacturer:</td>
<td>Continental</td>
</tr>
<tr>
<td>Operating Certificate(s) Held:</td>
<td>None</td>
<td>Engine Model/Series:</td>
<td>TSIO-520-NB17</td>
</tr>
<tr>
<td>Flight Conducted Under:</td>
<td>Part 91: General Aviation - Personal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Meteorological Information and Flight Plan

| Conditions at Accident Site: | Instrument Conditions | Condition of Light: | Night/Dark |
| Observation Facility, Elevation: | FCM, 906 ft msl | Weather Information Source: | Weather Observation Facility |
| Lowest Ceiling: | Overcast / 300 ft agl | Wind Speed/Gusts, Direction: | 5 knots, 210° |
| Temperature: | -5°C | Visibility | 0.5 Miles |
| Precipitation and Obscuration: | | Departure Point: | BUFFALO, NY (9G0) |
| | | Destination: | |

Airport Information

| Airport: | FLYING CLOUD (FCM) | Runway Surface Type: | Asphalt |
| Runway Used: | 9R | Runway Surface Condition: | Dry |
| Runway Length/Width: | 3909 ft / 75 ft |

Wreckage and Impact Information

| Crew Injuries: | 1 None | Aircraft Damage: | Substantial |
| Passenger Injuries: | N/A | Aircraft Fire: | None |
| Ground Injuries: | N/A | Aircraft Explosion: | None |
| Latitude, Longitude: | |

Administrative Information

| Investigator In Charge (IC): | DAVID C BOWLING | Adopted Date: | 01/30/1998 |
| Investigation Docket: | NTSB accident and incident dockets serve as permanent archival information for the NTSB’s investigations. Dockets released prior to June 1, 2005 are publicly available from the NTSB’s Record Management Division at pubings@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/ | |

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report.
Appendix 3: California Study Aircraft Accident Locations

<table>
<thead>
<tr>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Aviation Accident Locations – Figure F-4</td>
<td>3-1</td>
</tr>
<tr>
<td>General Aviation Accident Locations – Figure F-5</td>
<td>3-2</td>
</tr>
<tr>
<td>General Aviation Accident Locations – Figure F-6</td>
<td>3-3</td>
</tr>
<tr>
<td>General Aviation Accident Locations – Figure F-7</td>
<td>3-4</td>
</tr>
</tbody>
</table>
PAGE INTENTIONALLY LEFT BLANK
Notes:
153 arrival accidents in database — each dot represents one accident site.
Contours represent relative intensities (highest concentrations) of points in 20% increments.
FIGURE F5
General Aviation Accident Distribution Contours – Departure Accidents on Runways of Less than 4,000 Feet

Notes:
191 departure accidents in database—each dot represents one accident site.
Contours represent relative intensities (highest concentrations) of points in 20% increments.
Notes:
150 arrival accidents in database—each dot represents one accident site.
Contours represent relative intensities (highest concentrations) of points in 20% increments.

FIGURE F6
General Aviation Accident Distribution Contours – Arrival Accidents on Runways of 4,000 Feet to 5,999 Feet
Notes:
131 departure accidents in database—each dot represents one accident site.
Contours represent relative intensities (highest concentrations) of points in 20% increments.

FIGURE F7
General Aviation Accident Distribution Contours –
Departure Accidents on Runways of 4,000 to 5,999 Feet
## Appendix 4: FCM Aircraft Activity Forecast Documentation

<table>
<thead>
<tr>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCM Forecast Summary</td>
<td>4-1</td>
</tr>
</tbody>
</table>

Note: The complete *Minneapolis-St. Paul Reliever Airport: Activity Forecasts – Technical Report* that contains full forecast development documentation can be downloaded from the MAC website at:

1. Introduction

This chapter summarizes the LTCP activity forecast for Flying Cloud Airport (FCM). The base year is represented by the twelve months ending June 2015 and forecasts were prepared for 2020, 2025, 2030, and 2035. The forecasts for the airport are unconstrained, except for runway length, and assume that the necessary facilities will be in place to accommodate demand. The chapter begins with a description of the forecast approach, followed by a discussion of the forecasts for based aircraft and aircraft operations, and then concludes with a set of alternative forecast scenarios.

The assumptions inherent in the following calculations are based on data provided by the MAC, federal and local sources, and professional experience. Forecasting, however, is not an exact science. Departures from forecast levels in the local and national economy and in the aviation industry would have a significant effect on the forecasts presented herein.

2. Historical Trends

Table 1 shows historical based aircraft and aircraft operations recorded at FCM from 1990 through 2015.

<table>
<thead>
<tr>
<th>Year</th>
<th>Based Aircraft</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>485</td>
<td>227,410</td>
</tr>
<tr>
<td>1995</td>
<td>482</td>
<td>216,313</td>
</tr>
<tr>
<td>2000</td>
<td>485</td>
<td>186,078</td>
</tr>
<tr>
<td>2001</td>
<td>461</td>
<td>185,593</td>
</tr>
<tr>
<td>2002</td>
<td>473</td>
<td>176,408</td>
</tr>
<tr>
<td>2003</td>
<td>463</td>
<td>155,837</td>
</tr>
<tr>
<td>2004</td>
<td>456</td>
<td>159,648</td>
</tr>
<tr>
<td>2005</td>
<td>451</td>
<td>157,710</td>
</tr>
<tr>
<td>2006</td>
<td>447</td>
<td>144,178</td>
</tr>
<tr>
<td>2007</td>
<td>450</td>
<td>118,178</td>
</tr>
<tr>
<td>2008</td>
<td>413</td>
<td>119,139</td>
</tr>
<tr>
<td>2009</td>
<td>403</td>
<td>117,180</td>
</tr>
<tr>
<td>2010</td>
<td>403</td>
<td>94,984</td>
</tr>
<tr>
<td>2011</td>
<td>389</td>
<td>114,574</td>
</tr>
<tr>
<td>2012</td>
<td>403</td>
<td>84,773</td>
</tr>
<tr>
<td>2013</td>
<td>357</td>
<td>75,724</td>
</tr>
<tr>
<td>2014</td>
<td>363</td>
<td>73,634</td>
</tr>
<tr>
<td>2015</td>
<td>365</td>
<td>83,889(a)</td>
</tr>
</tbody>
</table>

(a) Twelve months ending June 2015. Includes operations when the control tower is not open.
Source: MAC and FAA OPSNET.
The total number of aircraft based in Flying Cloud Airport remained steady between 1990 and 2000 and then declined to 365 in 2015. Aircraft operations fell more rapidly than based aircraft over the same period, indicating reduced utilization for those aircraft that remained based at FCM. However, there was an upturn between 2014 and 2015. A number of factors have contributed to the recent declines including the slowing economy, increased fuel prices and other operating costs, and reduced interest in recreational flying by younger people.

3. Forecast Approach

The Minneapolis-St. Paul metropolitan area is served by a system of airports. These airports provide a variety of roles and therefore both complement and compete with each other. Since these airports operate as a system, they were forecast as a system so that the interrelationships between the airports could be properly captured. The forecast focused on five of the airports in the MAC system – Flying Cloud, Anoka County (ANE), Crystal (MIC), Airlake (LVN), and St. Paul Downtown (STP) – but also incorporated the other MAC airports – Minneapolis-St. Paul International (MSP) and Lake Elmo (21D) into the analysis. The details of the forecast approach are provided in the main forecast report, *Minneapolis-St. Paul Reliever Airport: Activity Forecasts – Technical Report*, and are summarized below:

1. Identify Catchment Areas – Flying Cloud Airport is located in Hennepin County and most of the based aircraft owners reside in Hennepin County. Although many based aircraft owners use the airport that is closest, there is some overlap between the airport catchment areas. Jet and turboprop aircraft owners that require longer runways and more extensive maintenance and fueling facilities tend to gravitate towards airports such as St. Paul Downtown (STP) and FCM. Likewise, operators of small single engine piston aircraft often shy away from larger more commercial airports because of congestion and costs, even though these airports may be closer to their place of residence. Aircraft registration data from the Minnesota Department of Transportation (MnDOT) and the Metropolitan Airports Commission (MAC) was used to identify the percentage of FCM based aircraft owners that resided in each county.

2. Develop Socioeconomic Projections – Population forecasts from the Metropolitan Council (Met Council) and per capita income forecasts from Woods & Poole Economics (W&P) were used to develop hybrid income forecasts for each county in the metropolitan area. The income forecasts were used to estimate the share of based aircraft growth accounted for by each county.

3. Project the number of based aircraft registered in each county by aircraft category based on the county income forecasts and the FAA Aerospace forecast adjusted for Minneapolis-St. Paul trends.

4. Allocate the projected based aircraft to each MAC-airport according to the existing distribution pattern for each aircraft category (piston, turboprop, jet, helicopter, etc.).

5. Estimate the number of aircraft on waiting list that would be added assuming airport capacity is unconstrained. MAC records indicated, FCM had 8 aircraft on their hangar waiting list in 2015. Based on consultation with MAC staff, it was assumed that 50 percent of the aircraft owners and operators who signed up on the waiting list since 2012 would base their aircraft at FCM under unconstrained conditions.

6. Redistribute aircraft from the constrained MAC airports (MSP) to the remaining unconstrained airports based on the existing distribution patterns to the airports. Although MSP has sufficient airfield capacity to accommodate growth, the facilities that can accommodate based general aviation (GA) aircraft are limited.
7. Identify base year aircraft operations. Operations counts for Flying Cloud were initially obtained from the FAA Air Traffic Control Tower. The air traffic control tower at FCM does not operate 24 hours per day; therefore late night operations were estimated based on the MAC’s noise monitoring data. To estimate operations by aircraft type, the FAA Traffic Flow Management System Counts (TFMSC) which provides aircraft information was used and supplemented with radar data from the MAC’s noise monitoring office.

8. Project future year aircraft operations. In each aircraft category, operations per active aircraft were projected to increase at the same rate as the FAA forecast of hours flown per based aircraft, implicitly assuming that the number of operations per hours flown remain constant. The percentage of touch and go operations in each aircraft category was assumed to remain constant.

Forecasts include based aircraft and operations for each major category: single engine piston, multi-engine piston, turboprop, jets, helicopters, sport aircraft, experimental, and other. It was assumed that the share of each county’s registered aircraft in every aircraft category based at all of the airports under study will remain constant.

4. Forecast Results

Table 2 shows the forecast of based aircraft for Flying Cloud. The number of based aircraft at FCM is projected to increase slightly, from 365 aircraft in 2015 to 378 aircraft in 2035. The dominant aircraft in the fleet, piston engine aircraft, are projected to decline, consistent with the FAA Aerospace Forecast Fiscal Years 2015-2035. All other categories, including jets and turboprops, are expected to increase sufficiently to offset the decline in the piston category.

Table 3 shows the forecast of aircraft operations at FCM. Total aircraft operations at Flying Cloud are forecast to decrease slightly from 83,889 in 2015 to 81,516 in 2020, and then increase to 93,255 by 2035. Increases are projected in all categories except single-engine piston aircraft, for which the anticipated decrease in the based aircraft offsets slightly higher utilization forecasted by FAA. Jet and sport aircraft operations are expected to increase the fastest.

The percentage of operations occurring in July, the peak month at Flying Cloud Airport, was estimated from FAA air traffic control tower records. Average Day Peak Month (ADPM) operations were estimated by dividing by 31 days. Peak hour operations were obtained from the FAA Distributed Operations Network (OPSNET). The peak hour percentage in the peak month over the past four years has averaged 13.4 percent. As shown in Table 4, peak hour operations are projected to fluctuate between 42 and 48 operations.
## Table 2: Summary of Based Aircraft Forecast (Flying Cloud).

<table>
<thead>
<tr>
<th>Year</th>
<th>Single Engine Piston</th>
<th>Multi-Engine Piston</th>
<th>Turboprop</th>
<th>Jets</th>
<th>Rotor</th>
<th>Sport</th>
<th>Experimental - Excluding Ultralights</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>256</td>
<td>29</td>
<td>25</td>
<td>17</td>
<td>11</td>
<td>4</td>
<td>22</td>
<td>1</td>
<td>365</td>
</tr>
<tr>
<td>2020</td>
<td>247</td>
<td>27</td>
<td>25</td>
<td>18</td>
<td>13</td>
<td>5</td>
<td>24</td>
<td>1</td>
<td>360</td>
</tr>
<tr>
<td>2025</td>
<td>240</td>
<td>27</td>
<td>26</td>
<td>21</td>
<td>15</td>
<td>6</td>
<td>26</td>
<td>1</td>
<td>362</td>
</tr>
<tr>
<td>2030</td>
<td>232</td>
<td>27</td>
<td>29</td>
<td>24</td>
<td>16</td>
<td>8</td>
<td>27</td>
<td>1</td>
<td>364</td>
</tr>
<tr>
<td>2035</td>
<td>229</td>
<td>28</td>
<td>33</td>
<td>31</td>
<td>18</td>
<td>9</td>
<td>29</td>
<td>1</td>
<td>378</td>
</tr>
</tbody>
</table>

**Average Annual Growth Rate**

-0.6%  -0.2%  1.4%  3.0%  2.5%  4.1%  1.4%  0.0%  0.2%

Table 3: Summary of Operations Forecast (Flying Cloud).

<table>
<thead>
<tr>
<th>Year</th>
<th>Single Engine Piston</th>
<th>Multi-Engine Piston</th>
<th>Turboprop</th>
<th>Jets</th>
<th>Rotor</th>
<th>Sport</th>
<th>Experimental - Excluding Ultralights</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>51,464</td>
<td>3,924</td>
<td>6,904</td>
<td>7,292</td>
<td>1,348</td>
<td>422</td>
<td>4,405</td>
<td>-</td>
<td>75,759</td>
</tr>
<tr>
<td>2015</td>
<td>57,937</td>
<td>4,300</td>
<td>6,856</td>
<td>7,898</td>
<td>1,477</td>
<td>462</td>
<td>4,959</td>
<td>-</td>
<td>83,889</td>
</tr>
<tr>
<td>2020</td>
<td>53,198</td>
<td>3,902</td>
<td>7,010</td>
<td>9,132</td>
<td>1,805</td>
<td>601</td>
<td>5,868</td>
<td>-</td>
<td>81,516</td>
</tr>
<tr>
<td>2025</td>
<td>51,740</td>
<td>3,901</td>
<td>7,328</td>
<td>11,159</td>
<td>2,103</td>
<td>751</td>
<td>6,641</td>
<td>-</td>
<td>83,623</td>
</tr>
<tr>
<td>2030</td>
<td>50,640</td>
<td>4,018</td>
<td>8,176</td>
<td>12,844</td>
<td>2,258</td>
<td>1,037</td>
<td>7,095</td>
<td>-</td>
<td>86,068</td>
</tr>
<tr>
<td>2035</td>
<td>51,307</td>
<td>4,401</td>
<td>9,304</td>
<td>16,635</td>
<td>2,562</td>
<td>1,212</td>
<td>7,834</td>
<td>-</td>
<td>93,255</td>
</tr>
</tbody>
</table>

**Average Annual Growth Rate**

-0.6% 0.1% 1.5% 3.8% 2.8% 4.9% 2.3% 0.5%

Table 4: Peak Activity Forecast (Flying Cloud).

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual Operations</th>
<th>Peak Month Operations</th>
<th>ADPM Operations</th>
<th>Peak Hour Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>75,759</td>
<td>9,759</td>
<td>315</td>
<td>42</td>
</tr>
<tr>
<td>2015</td>
<td>83,889</td>
<td>10,031</td>
<td>324</td>
<td>44</td>
</tr>
<tr>
<td>2020</td>
<td>81,516</td>
<td>9,748</td>
<td>314</td>
<td>42</td>
</tr>
<tr>
<td>2025</td>
<td>83,623</td>
<td>10,000</td>
<td>323</td>
<td>43</td>
</tr>
<tr>
<td>2030</td>
<td>86,068</td>
<td>10,292</td>
<td>332</td>
<td>45</td>
</tr>
<tr>
<td>2035</td>
<td>93,255</td>
<td>11,151</td>
<td>360</td>
<td>48</td>
</tr>
</tbody>
</table>


5 Scenarios

General aviation activity has historically been difficult to forecast, since the relationships with economic growth and pricing factors are more tenuous than in other aviation sectors, such as commercial aviation. This uncertainty is likely to carry over into the near future, given the volatility of fuel prices and the continued shift in GA from personal use to business use. To address these uncertainties, and to identify the potential upper and lower bounds of future activity at the study airports, detailed high and low scenarios are presented. These scenarios use the same forecast approach that was used in the base case, but alter the assumptions to reflect either a more aggressive or more conservative outlook.

The high forecast scenario is based on the assumption that income would grow 0.5 percent per year faster than in the base case. All other assumptions are the same as in the base case. The low forecast scenario is based on the assumption that income would grow 0.5 percent more slowly each year than under the base case. Table 5 compares the total number of aircraft and operations under different scenarios for Flying Cloud Airport and also includes the operations forecast from the FAA’s Terminal Area Forecast (TAF) for the airport.

Figure 1 provides a graphic comparison of the base, high and low operations forecasts, along with the TAF for the airport. As shown, the FCM LTCP forecasts are all higher than the TAF, but this is primarily because the LTCP forecasts use a more up-to-date base year number.
Table 5: Forecast Comparison by Scenario – Flying Cloud Airport.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Based Aircraft</th>
<th>Total Number of Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base Case</td>
<td>High Range</td>
</tr>
<tr>
<td>2015</td>
<td>365</td>
<td>365</td>
</tr>
<tr>
<td>2020</td>
<td>360</td>
<td>369</td>
</tr>
<tr>
<td>2025</td>
<td>362</td>
<td>379</td>
</tr>
<tr>
<td>2030</td>
<td>364</td>
<td>387</td>
</tr>
<tr>
<td>2035</td>
<td>378</td>
<td>413</td>
</tr>
</tbody>
</table>

Average Annual Growth Rate
0.2%  0.6%  -0.3%  0.5%  1.0%  0.0%  0.6%


Figure 1: Forecast Comparison by Scenario – Flying Cloud Airport
### Appendix 5: Aircraft Accident Probability Risk Calculation Tables

<table>
<thead>
<tr>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accident Probability Calculations by Runway End</td>
<td>5-1</td>
</tr>
<tr>
<td>Accident Probability Calculations by Runway End Occupant Areas</td>
<td>5-2</td>
</tr>
</tbody>
</table>
## Accident Probability Calculations by Runway End

### Runway End FCM Accident Rate

<table>
<thead>
<tr>
<th>Runway End</th>
<th>Total /100,000</th>
<th>Forecast Operations</th>
<th>Total Accident Locations</th>
<th>On-Airfield + RPZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>10R</td>
<td>19,731</td>
<td>0.19</td>
<td>619</td>
<td>499, 81% 0.1337 76% 67.7368</td>
</tr>
<tr>
<td>28L</td>
<td>19,376</td>
<td>0.19</td>
<td>639</td>
<td>483, 76% 0.1231 8 63.5134</td>
</tr>
<tr>
<td>10L</td>
<td>24,438</td>
<td>0.24</td>
<td>555</td>
<td>459, 83% 0.1699 6 69.5038</td>
</tr>
<tr>
<td>28R</td>
<td>20,818</td>
<td>0.20</td>
<td>676</td>
<td>544, 80% 0.1408 7 67.6158</td>
</tr>
<tr>
<td>10s</td>
<td>44,169</td>
<td>0.44</td>
<td>1,234</td>
<td>1,023, 83% 0.3077 3 69.6671</td>
</tr>
<tr>
<td>28s</td>
<td>40,194</td>
<td>0.40</td>
<td>1,565</td>
<td>1,214, 78% 0.2620 4 65.1905</td>
</tr>
<tr>
<td>18</td>
<td>7,517</td>
<td>0.07</td>
<td>662</td>
<td>533, 81% 0.0509 20 67.6648</td>
</tr>
<tr>
<td>36</td>
<td>9,162</td>
<td>0.09</td>
<td>733</td>
<td>584, 80% 0.0613 16 66.9400</td>
</tr>
<tr>
<td>All</td>
<td>101,042</td>
<td>1.01</td>
<td>4,235</td>
<td>3,391, 80% 0.6799 1 67.2841</td>
</tr>
</tbody>
</table>

### Runway End State Safety Zone A Beyond RPZ

<table>
<thead>
<tr>
<th>Runway End</th>
<th>Total /100,000</th>
<th>Forecast Operations</th>
<th>Total Accident Locations</th>
<th>State Safety Zone A Beyond RPZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>10R</td>
<td>19,731</td>
<td>0.19</td>
<td>619</td>
<td>8, 1% 0.0021 467 1.0864</td>
</tr>
<tr>
<td>28L</td>
<td>19,376</td>
<td>0.19</td>
<td>639</td>
<td>37, 6% 0.0094 106 4.8668</td>
</tr>
<tr>
<td>10L</td>
<td>24,438</td>
<td>0.24</td>
<td>555</td>
<td>44, 8% 0.0163 61 6.6592</td>
</tr>
<tr>
<td>28R</td>
<td>20,818</td>
<td>0.20</td>
<td>676</td>
<td>44, 7% 0.0114 88 5.4724</td>
</tr>
<tr>
<td>10s</td>
<td>44,169</td>
<td>0.44</td>
<td>1,234</td>
<td>47, 4% 0.0141 71 3.2000</td>
</tr>
<tr>
<td>28s</td>
<td>40,194</td>
<td>0.40</td>
<td>1,565</td>
<td>152, 10% 0.0328 30 8.1597</td>
</tr>
<tr>
<td>18</td>
<td>7,517</td>
<td>0.07</td>
<td>662</td>
<td>36, 5% 0.0034 291 4.5679</td>
</tr>
<tr>
<td>36</td>
<td>9,162</td>
<td>0.09</td>
<td>733</td>
<td>35, 5% 0.0037 272 4.0151</td>
</tr>
<tr>
<td>All</td>
<td>101,042</td>
<td>1.01</td>
<td>4,235</td>
<td>278, 7% 0.0557 18 5.5168</td>
</tr>
</tbody>
</table>

### Runway End Off Airport Beyond Safety Zones

<table>
<thead>
<tr>
<th>Runway End</th>
<th>Total /100,000</th>
<th>Forecast Operations</th>
<th>Total Accident Locations</th>
<th>Off Airport Beyond Safety Zones</th>
</tr>
</thead>
<tbody>
<tr>
<td>10R</td>
<td>19,731</td>
<td>0.19</td>
<td>619</td>
<td>12, 2% 0.0032 311 1.6296</td>
</tr>
<tr>
<td>28L</td>
<td>19,376</td>
<td>0.19</td>
<td>639</td>
<td>11, 2% 0.0028 357 1.4469</td>
</tr>
<tr>
<td>10L</td>
<td>24,438</td>
<td>0.24</td>
<td>555</td>
<td>4, 1% 0.0015 676 6.0554</td>
</tr>
<tr>
<td>28R</td>
<td>20,818</td>
<td>0.20</td>
<td>676</td>
<td>4, 1% 0.0010 966 0.4975</td>
</tr>
<tr>
<td>10s</td>
<td>44,169</td>
<td>0.44</td>
<td>1,234</td>
<td>19, 2% 0.0057 175 1.2936</td>
</tr>
<tr>
<td>28s</td>
<td>40,194</td>
<td>0.40</td>
<td>1,565</td>
<td>17, 1% 0.0037 273 0.9126</td>
</tr>
<tr>
<td>18</td>
<td>7,517</td>
<td>0.07</td>
<td>662</td>
<td>8, 1% 0.0008 1,311 1.0151</td>
</tr>
<tr>
<td>36</td>
<td>9,162</td>
<td>0.09</td>
<td>733</td>
<td>9, 1% 0.0009 1,057 1.0325</td>
</tr>
<tr>
<td>All</td>
<td>101,042</td>
<td>1.01</td>
<td>4,235</td>
<td>59, 1% 0.0118 85 1.1708</td>
</tr>
</tbody>
</table>

### Runway End On-Airfield + RPZ

<table>
<thead>
<tr>
<th>Runway End</th>
<th>Total /100,000</th>
<th>Forecast Operations</th>
<th>Total Accident Locations</th>
<th>On-Airfield + RPZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>10R</td>
<td>19,731</td>
<td>0.19</td>
<td>619</td>
<td>619, 100% 0.1658 6 84.0329</td>
</tr>
<tr>
<td>28L</td>
<td>19,376</td>
<td>0.19</td>
<td>639</td>
<td>639, 100% 0.1629 6 84.0329</td>
</tr>
<tr>
<td>10L</td>
<td>24,438</td>
<td>0.24</td>
<td>555</td>
<td>555, 100% 0.2054 5 84.0329</td>
</tr>
<tr>
<td>28R</td>
<td>20,818</td>
<td>0.20</td>
<td>676</td>
<td>676, 100% 0.1749 6 84.0329</td>
</tr>
<tr>
<td>10s</td>
<td>44,169</td>
<td>0.44</td>
<td>1,234</td>
<td>1,234, 100% 0.3712 3 84.0329</td>
</tr>
<tr>
<td>28s</td>
<td>40,194</td>
<td>0.40</td>
<td>1,565</td>
<td>1,565, 100% 0.3378 3 84.0329</td>
</tr>
<tr>
<td>18</td>
<td>7,517</td>
<td>0.07</td>
<td>662</td>
<td>662, 100% 0.0632 16 84.0329</td>
</tr>
<tr>
<td>36</td>
<td>9,162</td>
<td>0.09</td>
<td>733</td>
<td>733, 100% 0.0770 13 84.0329</td>
</tr>
<tr>
<td>All</td>
<td>101,042</td>
<td>1.01</td>
<td>4,235</td>
<td>4,235, 100% 0.8491 1 84.0329</td>
</tr>
</tbody>
</table>

---

**FCM Zoning Ordinance Update**  
**Appendix 5**  
**Page 5-1**
## Flying Cloud Airport (FCM)

### Accident Probability Calculations by Runway End Occupant Areas

<table>
<thead>
<tr>
<th>Runway End</th>
<th>Forecast Operations</th>
<th>FCM Accident Rate</th>
<th>Occupant Area Accident Locations</th>
<th>Total Accident Locations</th>
<th>SSZ A Beyond RPZ Occupant Areas</th>
<th>Years</th>
<th>Between</th>
<th>Per 10m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total /100,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10R</td>
<td>19.731 0.197</td>
<td>2 4 6 6 619</td>
<td>0.0005 1.866 0.2716</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28L</td>
<td>19.376 0.194</td>
<td>2 5 7 639</td>
<td>0.0005 1.962 0.2631</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10L</td>
<td>24.438 0.244</td>
<td>0 1 1 555</td>
<td>0.0000 0.000 0.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28R</td>
<td>20.818 0.208</td>
<td>1 2 3 676</td>
<td>0.0003 3.862 0.1244</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10s</td>
<td>44.169 0.442</td>
<td>2 8 10 1,234</td>
<td>0.0006 1.863 0.1362</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28s</td>
<td>40.194 0.402</td>
<td>5 9 14 1,565</td>
<td>0.0011 927 0.2684</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>7.517 0.075</td>
<td>0 0 0 662</td>
<td>0.0000 0.000 0.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>9.162 0.092</td>
<td>0 0 0 733</td>
<td>0.0000 0.000 0.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>101.042 1.010</td>
<td>7 20 27 4,235</td>
<td>0.0014 712 0.1389</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Runway End</th>
<th>Forecast Operations</th>
<th>FCM Accident Rate</th>
<th>Occupant Area Accident Locations</th>
<th>Total Accident Locations</th>
<th>SSZ B Beyond RPZ Occupant Areas</th>
<th>Years</th>
<th>Between</th>
<th>Per 10m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total /100,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10R</td>
<td>19.731 0.197</td>
<td>2 4 6 619</td>
<td>0.0011 933 0.5432</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28L</td>
<td>19.376 0.194</td>
<td>2 5 7 639</td>
<td>0.0013 785 0.6577</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10L</td>
<td>24.438 0.244</td>
<td>0 1 1 555</td>
<td>0.0004 2.704 0.1513</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28R</td>
<td>20.818 0.208</td>
<td>1 2 3 676</td>
<td>0.0005 1.931 0.2487</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10s</td>
<td>44.169 0.442</td>
<td>2 8 10 1,234</td>
<td>0.0024 416 0.5447</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28s</td>
<td>40.194 0.402</td>
<td>5 9 14 1,565</td>
<td>0.0019 515 0.4831</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>7.517 0.075</td>
<td>0 0 0 662</td>
<td>0.0000 0.000 0.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>9.162 0.092</td>
<td>0 0 0 733</td>
<td>0.0000 0.000 0.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>101.042 1.010</td>
<td>7 20 27 4,235</td>
<td>0.0040 249 0.3969</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Runway End</th>
<th>Forecast Operations</th>
<th>FCM Accident Rate</th>
<th>Occupant Area Accident Locations</th>
<th>Total Accident Locations</th>
<th>SSZ A Beyond RPZ + SSZ B Occupant Areas</th>
<th>Years</th>
<th>Between</th>
<th>Per 10m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total /100,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10R</td>
<td>19.731 0.197</td>
<td>2 4 6 619</td>
<td>0.0016 622 0.6148</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28L</td>
<td>19.376 0.194</td>
<td>2 5 7 639</td>
<td>0.0018 561 0.9207</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10L</td>
<td>24.438 0.244</td>
<td>0 1 1 555</td>
<td>0.0004 2.704 0.1513</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28R</td>
<td>20.818 0.208</td>
<td>1 2 3 676</td>
<td>0.0008 1.287 0.3731</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10s</td>
<td>44.169 0.442</td>
<td>2 8 10 1,234</td>
<td>0.0030 333 0.6808</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28s</td>
<td>40.194 0.402</td>
<td>5 9 14 1,565</td>
<td>0.0030 331 0.7516</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>7.517 0.075</td>
<td>0 0 0 662</td>
<td>0.0000 0.000 0.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>9.162 0.092</td>
<td>0 0 0 733</td>
<td>0.0000 0.000 0.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>101.042 1.010</td>
<td>7 20 27 4,235</td>
<td>0.0054 185 0.5358</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Appendix 6: Economic Impact Analysis Detail Tables

<table>
<thead>
<tr>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Development Economic Impact Results With Low and High Range Details</td>
<td>6-1</td>
</tr>
<tr>
<td>Combined Residential and Commercial Economic Impact Results With Low and High Range Details</td>
<td>6-2</td>
</tr>
<tr>
<td>Impacts to Employment Potential Results With Low and High Range Details</td>
<td>6-3</td>
</tr>
</tbody>
</table>
### Table 3-3A
Commercial Development Economic Impact Results With Low and High Range Details

<table>
<thead>
<tr>
<th>Commercial Development Scenario</th>
<th>Acres</th>
<th>Building SF</th>
<th>Value/SF</th>
<th>Total Commercial Value</th>
<th>Annual Real Estate Tax Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JAZB Scenario Case 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>15.8</td>
<td>190,879</td>
<td>$153</td>
<td>$29,221,190</td>
<td>$70,705</td>
</tr>
<tr>
<td>High Range</td>
<td>15.8</td>
<td>327,004</td>
<td>$154</td>
<td>$50,273,830</td>
<td>$124,738</td>
</tr>
<tr>
<td><strong>State Model Scenario Case 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>2.4</td>
<td>13,322</td>
<td>$150</td>
<td>$1,998,285</td>
<td>$8,233</td>
</tr>
<tr>
<td>High Range</td>
<td>2.4</td>
<td>13,322</td>
<td>$150</td>
<td>$1,998,285</td>
<td>$8,233</td>
</tr>
<tr>
<td><strong>Differential Case 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>13.4</td>
<td>177,557</td>
<td>$3</td>
<td>$27,222,905</td>
<td>$62,472</td>
</tr>
<tr>
<td>High Range</td>
<td>13.4</td>
<td>313,682</td>
<td>$4</td>
<td>$48,275,545</td>
<td>$116,505</td>
</tr>
<tr>
<td><strong>JAZB Scenario Case 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>26.9</td>
<td>335,934</td>
<td>$152</td>
<td>$50,979,440</td>
<td>$209,477</td>
</tr>
<tr>
<td>High Range</td>
<td>26.9</td>
<td>568,762</td>
<td>$152</td>
<td>$86,537,530</td>
<td>$355,923</td>
</tr>
<tr>
<td><strong>State Model Scenario Case 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>13.5</td>
<td>73,707</td>
<td>$150</td>
<td>$11,056,084</td>
<td>$45,551</td>
</tr>
<tr>
<td>High Range</td>
<td>13.5</td>
<td>73,707</td>
<td>$150</td>
<td>$11,056,084</td>
<td>$45,551</td>
</tr>
<tr>
<td><strong>Differential Case 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>13.4</td>
<td>262,227</td>
<td>$2</td>
<td>$39,923,356</td>
<td>$163,926</td>
</tr>
<tr>
<td>High Range</td>
<td>13.4</td>
<td>495,055</td>
<td>$2</td>
<td>$75,481,446</td>
<td>$310,372</td>
</tr>
</tbody>
</table>

**Notes:**
- Value per SF of development ranged from $80/SF to $200/SF; includes industrial land use.
- Annual real estate tax value assigned by City of Eden Prairie.
- Includes office, commercial, and industrial development.
- Case 1 assumes residential development on the MAC-owned undefined parcel.
- Case 2 assumes office development on MAC-owned undefined parcel.
- Low range assumes floor-to-area ratio for single-story building.
- High range considers assumes floor-to-area ratio for multi-story building.
- Building SF based on floor-to-area ratios assigned by City of Eden Prairie.

**Source:** Eden Prairie analysis.
<table>
<thead>
<tr>
<th>Development Scenario</th>
<th>Total Development Value</th>
<th>Total Annual Real Estate Tax Value</th>
<th>20-Year Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JAZB Scenario Case 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>$46,156,230</td>
<td>$126,931</td>
<td>$48,694,853</td>
</tr>
<tr>
<td>High Range</td>
<td>$67,208,870</td>
<td>$180,964</td>
<td>$70,828,153</td>
</tr>
<tr>
<td><strong>State Model Scenario Case 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>$3,925,758</td>
<td>$14,632</td>
<td>$4,218,405</td>
</tr>
<tr>
<td>High Range</td>
<td>$3,925,758</td>
<td>$14,632</td>
<td>$4,218,405</td>
</tr>
<tr>
<td><strong>Differential Case 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>$42,230,472</td>
<td>$112,299</td>
<td>$44,476,448</td>
</tr>
<tr>
<td>High Range</td>
<td>$63,283,112</td>
<td>$166,332</td>
<td>$66,609,748</td>
</tr>
<tr>
<td><strong>JAZB Scenario Case 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>$57,463,032</td>
<td>$231,003</td>
<td>$62,083,096</td>
</tr>
<tr>
<td>High Range</td>
<td>$93,021,122</td>
<td>$377,449</td>
<td>$100,570,106</td>
</tr>
<tr>
<td><strong>State Model Scenario Case 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>$11,583,668</td>
<td>$47,303</td>
<td>$12,529,722</td>
</tr>
<tr>
<td>High Range</td>
<td>$11,583,668</td>
<td>$47,303</td>
<td>$12,529,722</td>
</tr>
<tr>
<td><strong>Differential Case 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>$45,879,364</td>
<td>$183,701</td>
<td>$49,553,374</td>
</tr>
<tr>
<td>High Range</td>
<td>$81,437,454</td>
<td>$330,147</td>
<td>$88,040,384</td>
</tr>
</tbody>
</table>

Notes:

Scenario 1 assumes residential development on the MAC-owned undefined parcel
Scenario 2 assumes office development on the MAC-owned undefined parcel
20-year value sums one-time development value plus recurring annual real estate tax value

Source: Eden Prairie analysis
### Table 3-5A
Impacts to Employment Potential Results With Low and High Range Details

<table>
<thead>
<tr>
<th>Development Scenario</th>
<th>Employment Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JAZB Scenario Case 1</strong></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>476</td>
</tr>
<tr>
<td>High Range</td>
<td>805</td>
</tr>
<tr>
<td><strong>State Model Scenario Case 1</strong></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>37</td>
</tr>
<tr>
<td>High Range</td>
<td>37</td>
</tr>
<tr>
<td><strong>Differential Case 1</strong></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>439</td>
</tr>
<tr>
<td>High Range</td>
<td>768</td>
</tr>
<tr>
<td><strong>JAZB Scenario Case 2</strong></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>875</td>
</tr>
<tr>
<td>High Range</td>
<td>1,470</td>
</tr>
<tr>
<td><strong>State Model Scenario Case 2</strong></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>203</td>
</tr>
<tr>
<td>High Range</td>
<td>203</td>
</tr>
<tr>
<td><strong>Differential Case 2</strong></td>
<td></td>
</tr>
<tr>
<td>Low Range</td>
<td>673</td>
</tr>
<tr>
<td>High Range</td>
<td>1,268</td>
</tr>
</tbody>
</table>

**Notes:**
- Scenario 1 assumes residential development on the MAC-owned undefined parcel
- Scenario 2 assumes office development on the MAC-owned undefined parcel
- Employment potential for JAZB Scenario estimated by Eden Prairie
- Employment potential for State Model Scenario based on site density restrictions

**Source:** Eden Prairie analysis
Appendix 7: FCM Zoning Ordinance Language and Exhibits

<table>
<thead>
<tr>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft FCM Zoning Ordinance Language (with markup from 2010 draft)</td>
<td>7-1</td>
</tr>
<tr>
<td>Exhibit A, Airport Boundary</td>
<td>7-28</td>
</tr>
<tr>
<td>Exhibit B, Residential Permitted Parcels In JAZB Zone B</td>
<td>7-29</td>
</tr>
<tr>
<td>Exhibit C, Permitted Residential Areas</td>
<td>7-32</td>
</tr>
<tr>
<td>Exhibit D, Airport Boundary and Airspace Zoning Limits</td>
<td>7-33</td>
</tr>
<tr>
<td>Exhibit E, Airport Boundary and Airspace Contours</td>
<td>7-34</td>
</tr>
<tr>
<td>Exhibit F, Airport Boundary and Safety Zoning Limit</td>
<td>7-35</td>
</tr>
</tbody>
</table>
Flying Cloud Airport
Zoning Ordinance

Adopted __________, 2018

Adopted by the
Flying Cloud Airport Joint Airport Zoning Board

Contact Person:
Flying Cloud Joint Airport Zoning Board
c/o JAZB Secretary
Metropolitan Airports Commission
6040 28th Avenue South
Minneapolis, Minnesota  55450
# TABLE OF CONTENTS

SECTION I.  PURPOSE AND AUTHORITY ..............................................................................1
SECTION II. TITLE AND SHORT TITLE .................................................................................2
SECTION III. DEFINITIONS AND RULES OF CONSTRUCTION.................................................2
   A. Definitions ...................................................................................................................2
   B. Rules Of Construction.................................................................................................7
SECTION IV.  AIRSPACE OBSTRUCTION ZONING .................................................................78
   A. Airspace Surfaces And Zones .........................................................................................7
   B. Height Restrictions..........................................................................................................9
SECTION V.  LAND USE SAFETY ZONING ............................................................................11
   A. Safety Zones ...............................................................................................................11
   B. Land Use Restrictions...................................................................................................12
SECTION VI.  AIRPORT ZONING LIMITS AND FCM ZONING MAP ...........................................14
   A. Airspace Zoning Limits .................................................................................................14
   B. Safety Zoning Limits ....................................................................................................14
   C. FCM Zoning Map ..........................................................................................................14
SECTION VII.  NONCONFORMING USES ..............................................................................15
   A. FCM Zoning Ordinance ...............................................................................................15
SECTION VIII.  AIRPORT ZONING PERMITS ............................................................................15
   A. Permit Required ..........................................................................................................15
   B. Exception To Permit Requirement ................................................................................15
   C. Permit Application ........................................................................................................16
   D. Permit Standard ..........................................................................................................16
   E. Abandoned Or Deteriorated Nonconforming Uses .....................................................16
SECTION IX.  VARIANCES .....................................................................................................17
   A. Variance Application ....................................................................................................17
   B. Failure Of Board To Act ..............................................................................................18
   C. Variance Standard .......................................................................................................18
SECTION X.  HAZARD MARKING AND LIGHTING .................................................................18
   A. Nonconforming Uses ..................................................................................................18
   B. Permits And Variances ...............................................................................................18
SECTION XI.  ZONING ADMINISTRATOR ..............................................................................19
A. Duties........................................................................................................................ 19
B. Designated Zoning Administrators................................................................................ 19

SECTION XII. BOARD OF ADJUSTMENT ............................................................................. 19
A. Establishment Of Board And Selection Of Chair ............................................................ 19
B. Board Powers ............................................................................................................. 20
C. Board Procedures ....................................................................................................... 20

SECTION XIII. APPEALS ........................................................................................................ 21
A. Who May Appeal ........................................................................................................ 21
B. Commencement Of Appeals ........................................................................................ 21
C. Stay Of Proceedings ................................................................................................... 21
D. Appeal Procedures ...................................................................................................... 21
E. Decision..................................................................................................................... 22

SECTION XIV. JUDICIAL REVIEW .......................................................................................... 22

SECTION XV. PENALTIES AND OTHER REMEDIES ................................................................. 22

SECTION XVI. RELATION TO OTHER LAWS, REGULATIONS, AND RULES ....................... 22
A. Compliance Required .................................................................................................. 22
B. Conflicts With Other Regulations. ................................................................................ 23
C. Current Versions And Citations. ................................................................................... 23

SECTION XVII. SEVERABILITY ............................................................................................... 23
A. Effect Of Taking .......................................................................................................... 23
B. Validity Of Remaining Provisions .................................................................................. 23

SECTION XVIII. EFFECTIVE DATE .......................................................................................... 24

Flying Cloud Airport Zoning Map
Airspace Zones, Index Sheet and Plates A A-1 to A F6-24
Safety Zones, Index Sheet and Plates SZ_A1 to SZ F6-24
Maximum Construction Heights Without Permit, Index Sheet and Plates MCH_A1 to MCH-24
F6

Exhibit A – Airport Boundary
Exhibit B – Legal Descriptions of Parcels in Permitted Residential Areas
Exhibit C – Map of Permitted Residential Areas
Exhibit D – Airport Boundary and Airspace Zoning Limits
Exhibit E – Airport Boundary and Airspace Contours
Exhibit F - Airport Boundary and Safety Zoning Limits
FLYING CLOUD AIRPORT
ZONING ORDINANCE
ADOPTED BY THE
FLYING CLOUD AIRPORT JOINT AIRPORT ZONING BOARD

AN ORDINANCE REGULATING AND RESTRICTING THE HEIGHT OF STRUCTURES AND OBJECTS OF NATURAL GROWTH, AND OTHERWISE REGULATING THE USE OF PROPERTY, IN THE VICINITY OF THE FLYING CLOUD AIRPORT BY CREATING THE APPROPRIATE ZONES AND ESTABLISHING THE BOUNDARIES THEREOF; PROVIDING FOR CHANGES IN THE RESTRICTIONS AND BOUNDARIES OF SUCH ZONES; DEFINING CERTAIN TERMS; REFERRING TO THE FLYING CLOUD AIRPORT ZONING MAP; PROVIDING FOR ENFORCEMENT; ESTABLISHING A BOARD OF ADJUSTMENT; AND IMPOSING PENALTIES.

THEREFORE, IT IS HEREBY ORDAINED BY THE FLYING CLOUD AIRPORT JOINT AIRPORT ZONING BOARD PURSUANT TO THE AUTHORITY CONFERRED BY MINNESOTA STATUTES §§ 360.061 – 360.074, THAT THE FLYING CLOUD AIRPORT ZONING ORDINANCE BE EFFECTIVE AS FOLLOWS:

SECTION I. PURPOSE AND AUTHORITY

The FLYING CLOUD Airport Joint Airport Zoning Board, created and established by joint action of the Metropolitan Airports Commission and the Cities of Eden Prairie, Bloomington, Shakopee, and Chanhassen, pursuant to the provisions and authority of Minnesota Statutes § 360.063, hereby finds and declares that:

A. An Airport Hazard endangers the lives and property of users of the Airport and property or occupants of land in its vicinity, and also, if of the obstructive type, in effect reduces the size of the area available for the landing, takeoff, and maneuvering of aircraft, thus tending to destroy or impair the utility of the Airport and the public investment therein.

B. The creation or establishment of an Airport Hazard is a public nuisance and an injury to the region served by the Airport.
C. For the protection of the public health, safety, order, convenience, prosperity, and general welfare, and for the promotion of the most appropriate use of land, it is necessary to prevent the creation or establishment of Airport Hazards.

D. The social and economic costs of disrupting land uses around the Airport, however, often outweigh the benefits of a reduction in Airport Hazards requiring a balance between the social and economic costs to surrounding communities and the benefits of strict regulation.

E. The prevention of these Airport Hazards should be accomplished, to the extent legally possible, by the exercise of the police power without compensation.

F. Preventing the creation or establishment of Airport Hazards and eliminating, removing, altering, mitigating, or marking and lighting of existing Airport Hazards are public purposes for which political subdivisions may raise and expend public funds, levy assessments against land, and acquire land and property interests therein.

SECTION II. TITLE AND SHORT TITLE

This ordinance shall be known as the “Flying Cloud Airport Zoning Ordinance” or the “FCM Zoning Ordinance.”

SECTION III. DEFINITIONS AND RULES OF CONSTRUCTION

A. Definitions. As used in this Flying Cloud Airport Zoning Ordinance, unless otherwise expressly stated, or unless the context clearly indicates a different meaning, the words and phrases in the following list of definitions shall have the meanings indicated. All words and phrases not defined shall have their common meaning.

1. Above-ground Fuel Tank. “Above-ground Fuel Tank” means a container, vessel, or other enclosure designed to contain or dispense fuel that is located above the ground surface, that is not contained within a building or structure, and that is not part of or connected to a boat, motor vehicle, or rail car.

2. Airport. “Airport” means Flying Cloud Airport located in Hennepin County, Minnesota.

3. Airport Boundary. “Airport Boundary” means the boundary shown on Exhibit A – Airport Boundary, attached hereto and made a part hereof.
4. **Airport Hazard.** “Airport Hazard” means any Structure, Tree, or use of land that obstructs the airspace required for, or is otherwise hazardous to, the flight of aircraft in landing or taking off at the Airport; and any use of land that is hazardous to Persons or property because of its proximity to the Airport.

5. **Airport Zoning Permit.** “Airport Zoning Permit” means zoning permits as required under Section IX.

6. **Airspace Surfaces.** “Airspace Surfaces” means the surfaces established in Section IV.A.

7. **Airspace Zones.** “Airspace Zones” means the land use zones established in Section IV.A.

8. **Board of Adjustment.** “Board of Adjustment” means the body established in Section XIII.A.

9. **Bluff.** “Bluff” means a steep cliff, embankment, hill, or outcropping along a river or stream, with an average slope of eighteen (18) percent or greater measured over a horizontal distance of fifty (50) feet or more, and that rises at least twenty-five (25) feet above the ordinary high water mark of the river or stream.

10. **Commissioner.** “Commissioner” means the Commissioner of the Minnesota Department of Transportation or, if either the position of Commissioner or the Minnesota Department of Transportation shall no longer exist or serve its present functions, such successor state official or officials or entity or entities as shall either singularly or collectively perform or serve such functions.

11. **Dwelling.** “Dwelling” means any building or portion thereof designed or used as a residence or sleeping place of one or more Persons.

12. **Effective Date.** “Effective Date” means the effective date set forth in Section XIX.

13. **Permitted Residential Areas.** “Permitted Residential Areas” means the areas listed on Exhibit B – Legal Descriptions of Parcels in Permitted Residential Areas and shown on Exhibit C – Map of Permitted Residential Areas, both attached hereto and made a part hereof, all of which have been designated based on the following criteria/findings related to each listed neighborhood:
   a. Low accident probability;
b. Aircraft accident and site characteristics;
c. Adjacency to large open areas;
d. Economic effects of residential use restrictions and/or designation of existing residential uses as non-conforming; and
l. Other material factors deemed relevant by the governmental unit in distinguishing the area in question as a Permitted Residential Area.

14. FAA. “FAA” means the Federal Aviation Administration or, if the Federal Aviation Administration shall no longer exist or serve its present functions, such successor federal entity or entities as shall either singularly or collectively perform or serve such functions.

15. FAA 7460 Obstruction Evaluation. Established FAA process for conducting aeronautical studies conducted under the provisions of Title 14 CFR, Part 77 (for proposed construction or alteration) or Federal Aviation Act of 1958 (for existing structures), or any successor to this process.

16. FCM Zoning Map. “FCM Zoning Map” means the Flying Cloud Airport Zoning Map as defined in Section VI.C.

17. Fuel. “Fuel” means any petroleum product, including natural gas, used to produce heat or power by burning.

18. Lot. [For JAZB Ordinance: “Lot” means a designated parcel, tract, or area of land established by plat or subdivision, or otherwise permitted by law.] [For Eden Prairie Ordinance: “Lot” means one unit of a recorded plat, subdivision, or registered land survey, or a recorded parcel described by metes and bounds.]


20. Low Density Residential Lot. “Low Density Residential Lot” means a single Lot located in an area which is zoned for single-family, two-family residences, or multifamily-residential use and in which the predominant land use is such type of residences.

21. Nonconforming Use. “Nonconforming Use” means any pre-existing Structure or use of land which is inconsistent with the provisions of this FCM Zoning Ordinance or an amendment hereto.
22. **Nursing Home.** "Nursing Home" means a facility or that part of a facility which provides nursing care to five or more persons. "Nursing home" does not include a facility or that part of a facility which is a hospital, a hospital with approved swing beds as defined in section 144.562, clinic, doctor's office, diagnostic or treatment center, or a residential program licensed pursuant to sections 245A.01 to 245A.16 or 252.28.

23. **Person.** "Person" means any individual, firm, partnership, corporation, company, association, joint stock association, or body politic, and includes a trustee, receiver, assignee, administrator, executor, guardian, or other representative.

24. **Planned.** "Planned" means proposed future Airport developments and improvements indicated on a planning document having the approval of the FAA, the Minnesota Department of Transportation, Office of Aeronautics, and the Metropolitan Airports Commission.

25. **Precision Instrument Runway.** “Precision Instrument Runway” means a Runway having an existing instrument approach procedure utilizing an instrument landing system (ILS), or a precision approach radar (PAR), and a Runway for which a precision instrument approach procedure is Planned.

26. **Runway.** "Runway" means any existing or Planned paved surface of the Airport which is specifically designated and used or Planned to be used for the landing and/or taking off of aircraft. The individual Runways at the Airport are defined in this FCM Zoning Ordinance based on the compass heading of landing aircraft.

27. **Runway 10R-28L.** "Runway 10R-28L” means the 5,000-foot runway. Runway 10R is a Precision Instrument Runway and Runway 28L is a Non-precision Runway. Both the Runway 10R and 28L ends are within the City of Eden Prairie.


29. **Runway 18-36.** "Runway 18-36" means the 2,691-foot runway (planned for extension to 2,800 feet). Runway 18 is a Visual Runway (planned future Non-Precision) and Runway 36 is a Non-Precision Runway. Both the Runway 18 and 36 Ends are within the City of Eden Prairie.
30. **Runway Protection Zone.** “Runway Protection Zone” means a zone mandated by FAA regulations that is longitudinally centered on the extended centerline at each end of Runways 10R-28L, 10L-28R, 18-36, whose inner edge is at the same width and elevation as, and coincides with, the end of the Primary Surfaces for Runways s-10L-28R and 10R; starts at a width of 500 feet for Runway 28L and 250 feet for Runways 10L-28R and 18-36; and that extends outward a horizontal distance of 1,000 feet expanding uniformly to a width of 700 feet for Runways 10L-28R and 28L; extends outward a horizontal distance of 1,000 feet expanding uniformly to a width of 450 feet for Runways 10L-28R and 18-36; extends outward a horizontal distance of 2,500 feet expanding uniformly to a width of 1,750 feet for Runway 10R.

31. **Safety Zones.** “Safety Zones” means the land use zones established in Section V.A.

32. **School.** “School” means any private or public educational institution for people in kindergarten through grade twelve (12) and any private or public day care or pre-school facility that enrolls more than fifty (50) children.

33. **Slope.** “Slope” means an incline from the horizontal expressed in an arithmetic ratio of horizontal magnitude to vertical magnitude.

\[
\text{Slope} = \frac{3\text{ ft. horizontal}}{1\text{ ft. vertical}} = 3:1
\]

34. **Structure.** “Structure” means anything anchored, attached, built, constructed, erected, gathered, located, placed, or piled on the ground or in or over a water body, whether temporary or permanent, moveable or immovable, including antennae, buildings, canopies, cranes, decks, derricks, docks, edifices, equipment, fences, overhead transmission lines, patios, piers, piles, ponds, posts, roadways, signs, smokestacks, towers, utility poles, wires, and anything attached to any of the foregoing either temporarily or permanently.

35. **Tree.** “Tree” means any object of natural growth.

36. **Zoning Administrator.** “Zoning Administrator” means the public official in each affected municipality and at the Metropolitan Airports Commission as set forth in Section XII.B.
B. Rules Of Construction. In the construction of this FCM Zoning Ordinance, the following rules shall be observed and applied, except where the context clearly indicates otherwise.

1. Computing Time. In computing the period of time within which an act may or must be done, the first calendar day from which the designated period of time begins to run shall not be included. The last day of the period shall be included, unless it is a Saturday, a Sunday, or a legal holiday, in which case the period shall run until the end of the next day which is not a Saturday, Sunday, or legal holiday.

2. Conflicts Between Ordinance Provisions. If a provision of this FCM Zoning Ordinance conflicts with any other provision of this FCM Zoning Ordinance, the more restrictive provision shall prevail.

3. Height. “Height” shall be expressed as elevation in feet above Mean Sea Level, North American Vertical Datum, 1988 Adjustment, except in reference to maximum construction height without an Airport Zoning Permit when it shall be expressed as distance in feet above curb level or above natural grade, as the context and Section IX.B.1. require, or as distance in feet above ground shown on the Maximum Construction Heights Without Permit Plates in the FCM Zoning Map.

4. Including, Not Limited To. The word “including” means including but not limited to.

5. Land To Include Water Surfaces And Bodies. The word “land” shall include water bodies and surfaces for the purpose of establishing Airspace Zones and Safety Zones.

6. May, Permissive. The word “may” is permissive.

7. Shall, Mandatory. The word “shall” is mandatory and not discretionary.

8. Singular And Plural. The singular shall include the plural, and the plural the singular.

9. Tense. The present tense shall include the future.

SECTION IV. AIRSPACE OBSTRUCTION ZONING

A. Airspace Surfaces And Zones. In order to carry out the purpose of this FCM Zoning Ordinance as set forth in Section I., the following Airspace Surfaces and Airspace Zones are hereby established, subject to the airspace zoning limits in Section VI.A.
1. **Primary Surface.** An imaginary surface longitudinally centered on each Runway extending two hundred (200) feet beyond each end of Runways 10L-28R, 10R-28L, 18-36, and having a width of five hundred (500) feet for Runways 10L-28R, and 18-36 and one thousand (1,000) feet for Runway 10R-28L. The elevation of any point on the Primary Surface is the same as the elevation of the nearest point on the Runway centerline.

2. **Primary Zone.** All that land which lies directly under a Primary Surface.

3. **Horizontal Surface.** An imaginary surface that is one thousand fifty-six (1,056) feet above mean sea level, the perimeter of which is constructed by swinging arcs of specified radii from the center of each end of the Primary Surface of each Runway and connecting the adjacent arcs by lines tangent to those arcs. The radius of each arc is five thousand (5,000) feet for Runways 18-36 and 10L-28R and ten thousand (10,000) feet for Runways 10L-28R and 10R-28L.

4. **Horizontal Zone.** All that land which lies directly under the Horizontal Surface.

5. **Conical Surface.** An imaginary surface extending upward and outward from the periphery of the Horizontal Surface at a Slope of twenty (20) to one (1) for a horizontal distance of four thousand (4,000) feet as measured radially outward from the periphery of the Horizontal Surface.

6. **Conical Zone.** All that land which lies directly under the Conical Surface.

7. **Precision Instrument Approach Surface.** An imaginary surface longitudinally centered on the extended centerline at the end of Runway 10R. The inner edge of this surface is at the same width and elevation as, and coincides with, the end of the Primary Surface. This surface inclines upward and outward at a Slope of fifty (50) to one (1) for a horizontal distance of ten thousand (10,000) feet expanding uniformly to a width of four thousand (4,000) feet, then continues upward and outward for an additional horizontal distance of forty thousand (40,000) feet at a Slope of forty (40) to one (1) expanding uniformly to an ultimate width of sixteen thousand (16,000) feet.

8. **Precision Instrument Approach Zone.** All that land which lies directly under a Precision Instrument Approach Surface.
9. **Approach Surface.** An imaginary surface longitudinally centered on the extended centerline at each end of Runways 10L-28R, 28L and 18-36. The inner edge of this surface is at the same width and elevation as, and coincides with, the end of the Primary Surface. For Runways **10L-28R and 28L**, this surface inclines upward and outward at a Slope of thirty-four (34) to one (1) for a horizontal distance of ten thousand (10,000) feet expanding uniformly to a width of three thousand five hundred (3,500) feet. For Runways **10L-28R and 18-36**, this surface inclines upward and outward at a Slope of twenty (20) to one (1) for a horizontal distance of five thousand (5,000) feet expanding uniformly to a width of one thousand two hundred and fifty (1,250) feet for Runway 18 and two thousand (2,000) feet for Runway 36.

10. **Approach Zone.** All that land which lies directly under an Approach Surface.

11. **Transitional Surface.** An imaginary surface extending upward and outward at right angles to the centerline and extended centerline of Runways 10L-28R, 10R-28L, 18-36 at a Slope of seven (7) to one (1) from both sides of each Primary Surface and from both sides of each Precision Instrument Approach Surface for 10R and the Approach Surfaces of 10L-28R, 28L, and 18-36 until it intersects the Horizontal Surface or the Conical Surface.

12. **Transitional Zone.** All that land which lies directly under a Transitional Surface.

B. **Height Restrictions:** Except as otherwise provided in this FCM Zoning Ordinance, and except as necessary and incidental to Airport operations, the following height restrictions shall apply. Where a Lot is beneath more than one Airspace Surface, the height of the more restrictive (lower) Airspace Surface shall control.

1. **Structures.** No new Structure shall be constructed or established; and no existing Structure shall be altered, changed, rebuilt, repaired, or replaced in any Airspace Zone so as to project above any Airspace Surface. Nor shall any equipment used to accomplish any of the foregoing activities be allowed to project above any Airspace Surface, except upon analysis as part of an FAA 7460 Obstruction Evaluation and determination by FAA that the structure or equipment would not be a hazard to air navigation and would not require changes to airport or aircraft operations.
2. **Trees.** No Tree shall be allowed to grow or be altered, repaired, replaced, or replanted in any Airspace Zone so as to project above any Airspace Surface. Nor shall any equipment used to accomplish any of the foregoing activities be allowed to project above any Airspace Surface, except upon analysis as part of an FAA 7460 Obstruction Evaluation and determination by FAA that the tree or equipment would not be a hazard to air navigation and would not require changes to airport or aircraft operations.

   a. Public Nuisance; Order. If the whole or any part of any Tree shall be determined to be an Airport Hazard by the FAA, or any successor entity, after proper investigation, the Metropolitan Airports Commission’s Executive Director or his designee may issue an order in writing for the owner or owners, agent or occupant of the property upon which such hazardous tree is located, to forthwith cause such hazardous tree, or portion thereof if the removal of a portion will remove the hazard, to be taken down and removed.

   b. Notice. Said order is to be mailed to the last known address of the owner, agent or occupant and shall be accompanied by a notice setting forth said Executive Director’s authority to remove such hazardous Tree at such owner’s, agent’s or occupant’s expense in the event such owner, agent or occupant fails to comply with or file a notice of appeal from said order within ten (10) days of mailing. The notice shall include instructions for filing a notice of appeal from said order.

   c. Removal. If within ten (10) days after said order has been mailed, as above provided for, the owner or owners, agent or occupant of the property upon which such hazardous Tree is located neglects or refuses to comply with said order, or has failed to file a notice of appeal from said order with said Executive Director, then said Executive Director or his designee(s) may enter upon said premises and take down or remove said tree or portion thereof declared to be hazardous, and to do any and all things which in his opinion may be necessary for the protection of life, limb or property.

   d. Assessment of Expense. If, after the notice hereinbefore provided for has been given, the owner, agent or occupant has failed to remove such hazardous tree or portion thereof, and it becomes necessary for the Metropolitan Airports Commission to remove same, said Executive Director or his designee shall mail a statement of the expense of such removal to the owner, agent or occupant of the property from which such tree or portion thereof has been removed, and if within
thirty (30) days therefrom the owner, agent or occupant has not remitted to the
Commission for the expense incurred by the Commission in said removal, the
Executive Director or his designee may forthwith recover the amount of such
expense from the owner or owners of said property in any civil court of competent
jurisdiction, in the manner provided by law.

SECTION V. LAND USE SAFETY ZONING

A. Safety Zones. In order to carry out the purpose of this FCM Zoning Ordinance, as set forth
in Section I., the following Safety Zones are hereby established, subject to the safety zoning
limits in Section VI.B.

1. Safety Zone A. All land in that portion of the Precision Instrument Approach Zones of
Runways 10R and the Approach Zones of 10L-28R, 18-36, and 28L, beginning at, and
coinciding with, the end of the Primary Surfaces for Runways 10R, 10L-28R; and that
starts at a width of 500 feet and that extends outward a horizontal distance of 1,000
feet expanding uniformly to a width of 700 feet for Runways 10L, 28L and 28R starting
at a width of 500 feet for Runway 28L; -and that starts at a width of 1,000 feet extends
outward a horizontal distance of 2,500 feet expanding uniformly to a width of 1,750 feet
for Runway 10R; and that starts at a width of 250 feet and extends outward a horizontal
distance of 1,000 feet expanding uniformly to a width of 450 feet for Runways 18-36
and 10L-28R (which is coincident with the Runway Protection Zone).

2. Safety Zone B. All land in that portion of the Precision Instrument Approach Zone of
Runway 10R and Approach Zone of Runway 28L beginning at and coinciding with the
Primary Surface of the Runway at a width of 1,000 feet, extending outward a distance
of five thousand (5,000) feet and expanding uniformly to an ultimate width of two
thousand five hundred (2,500) feet, less the area encompassing State-Safety Zone A
(RPZ); and is all land in that portion of the Approach Zone of Runway 10L--and Runway
28R beginning at and coinciding with the Primary Surface of the Runway at a width of
500 feet, extending outward a distance of three thousand nine hundred (3,900) feet and
expanding uniformly to an ultimate width of one thousand six hundred seventy (1,670)
feet less the area encompassing State-Safety Zone A (RPZ); and is all land in that
portion of the Approach Zone of Runways 18-36 beginning at and coinciding with the
end of the Primary Surface of the Runway at a width of 500 feet, extending outward a
distance of two thousand eight-six-hundred ninety one hundred (2,800691) feet and
expanding uniformly to an ultimate width of one thousand three hundred forty-seven
(1,30740) feet less the area encompassing State-Safety Zone A (RPZ).

3. Safety Zone C. All land enclosed within the perimeter of the Horizontal Zone, except
that land within Safety Zone A and Safety Zone B.

B. Land Use Restrictions

1. General Restrictions. Subject at all times to the height restrictions set forth in
Section IV.B., no use shall be made of any land in any of the Safety Zones that creates
or causes interference with the operations of radio or electronic facilities on the Airport
or with radio or electronic communications between Airport and aircraft, makes it
difficult for pilots to distinguish between Airport lights and other lights, results in glare in
the eyes of pilots using the Airport, impairs visibility in the vicinity of the Airport, or
otherwise endangers the landing, taking off, or maneuvering of aircraft.

2. Safety Zone A Restrictions. Subject at all times to the height restrictions set forth in
Section IV.B. and to the general restrictions contained in Section V.B.1., areas
designated as Safety Zone A for each end of Runways 10R-28L, 10L-28R, 18-36 shall
contain no Structures or Trees, except Structures related to Airport operations or air
navigation as allowed in a Runway Protection Zone by Federal laws and regulations or
by FAA advisory circulars shall be permitted.

3. Safety Zone B Restrictions. Subject at all times to the height restrictions in
Section IV.B. and to the general restrictions in Section V.B.1., all land uses shall be
permitted in Safety Zone B for each end of Runways 10R-28L, 10L-28R, 18-36, except
for the following uses which shall be specifically prohibited: amphitheaters,
campgrounds, churches, fuel storage tank farms and Above-ground Fuel Tanks, gasoline
stations, hospitals, Nursing Homes, residential uses (including low, medium, and high
density residential uses), Schools, stadiums, theaters, trailer courts, and ponds or other
uses that might attract waterfowl or other birds such as putrescible waste disposal
operations, wastewater treatment facilities and associated settling ponds, and dredge
spoil containment areas; provided, however, the prohibition on ponds or other uses that
might attract waterfowl or other birds shall not apply to areas below an elevation of
eight hundred sixty five (865) feet above mean sea level along any Bluff of the Minnesota River.

In Safety Zone B for each end of Runways 10R-28L, 10L-28R, 36-18, a minimum of 20% of the total Zone B acreage or 20 acres, whichever is greater, shall be maintained as contiguous open space.

4. **Safety Zone C Restrictions.** No land use in Safety Zone C shall violate the height restrictions set forth in Section IV.B. or the general restrictions contained in Section V.B.1.

5. **Permitted Residential Areas**
   a. Property located in the permitted Residential Areas shall be subject to the height restrictions of Section IV.B. and the general restrictions of Section V.B.1. but shall not be subject to the Safety Zone A restrictions of Section V.B.2. or the Safety Zone B restrictions of Section V.B.3. In addition, such Structure, Lot, or use shall be deemed a conforming use that shall not be prohibited under this FCM Zoning Ordinance.
   b. In Safety Zone B in Permitted Residential Areas, existing low, medium, and high density residential uses may be improved and expanded, and new low, medium, and high density residential uses may be developed, all subject to the height restrictions of Section IV.B. and the general restrictions of Section V.B.1.
   c. Land uses in Permitted Residential Areas that violate any of the following restrictions are prohibited as safety hazards and must be acquired, altered, or removed at public expense, provided such expense shall not be the responsibility of any of the cities adopting this ordinance:
      i. any Structure which a Person customarily uses as a principal residence and which is located entirely inside Safety Zone A within 1,000 feet of the end of a Primary Zone;
      ii. any Structure which a Person customarily uses as a principal residence and which is located entirely within Safety Zones A or B and which penetrates a Precision Instrument Approach Surface;
      iii. any land use in Safety Zone A or B which violates any of the following standards:
(1) the land use must not create or cause interference with the operation of radio or electronic facilities on the Airport or with radio or electronic communications between the Airport and aircraft;

(2) the land use must not make it difficult for pilots to distinguish between Airport lights and other lights; or

(3) the land use must not result in glare in the eyes of pilots using the Airport or impair visibility in the vicinity of the Airport;

iv. any isolated Low Density Residential Lot on which any Structure, if built, would be prohibited by Section V.B.5.c., subsections i., ii., or iii.; and

v. any other land use that the Commissioner determines, pursuant to Minnesota Rules 8800.2400, subp. 6.E.(5)(e), constitutes a material danger to the landing, taking off, or maneuvering of aircraft or to the safety of Persons on the ground.

SECTION VI. AIRPORT ZONING LIMITS AND FCM ZONING MAP

A. Airspace Zoning Limits. No Airspace Zone shall extend more than two miles from the Airport Boundary under the Precision Instrument Approach Surfaces or more than one and one-half miles from the Airport Boundary outside the Precision Instrument Approach Surfaces. Exhibit D – Airport Boundary and Airspace Zoning Limits and Exhibit E – Airport Boundary and Airspace Contours, attached hereto and made a part hereof, show these limits.

B. Safety Zoning Limits. The Safety Zoning Limits shall not extend beyond one (1) mile from the airport boundary. Safety Zone B will define the extent of the zoning limits in areas where Safety Zone B extends beyond one (1) mile from the airport boundary. Exhibit F – Airport Boundary and Safety Zoning Limits, attached hereto and made a part hereof, shows these limits.

the Metropolitan Airports Commission, attached hereto and made a part hereof. These
plates, together with such amendments thereto as may from time to time be made, and all
notations, references, elevations, heights, data, surface and zone boundaries, and other
information thereon, shall be and the same are hereby adopted as part of this FCM Zoning
Ordinance.

SECTION VII. NONCONFORMING USES

A. FCM Zoning Ordinance. The provisions of this FCM Zoning Ordinance shall not be
construed to require the removal, lowering, other change, or alteration of any Structure, or
otherwise interfere with the continuance of any Nonconforming Use in existence but not
conforming to the provisions of this FCM Zoning Ordinance on the Effective Date. Nothing
herein contained shall require any change in the construction, alteration, or intended use of
any Structure, the construction or alteration of which was begun prior to the Effective Date,
and was diligently prosecuted and completed within two (2) years of the Effective Date.

SECTION VIII. AIRPORT ZONING PERMITS

A. Permit Required. The following activities shall not take place on a Lot in any Airspace Zone
or Safety Zone unless an Airport Zoning Permit shall have been granted therefore by the
Zoning Administrator for the jurisdiction in which the Lot is located.

1. Existing Structures. Except as specifically provided in Section IX.B., no existing
   Structure shall be altered, changed, rebuilt, repaired, or replaced.

2. New Structures. Except as specifically provided in Section IX.B., no Structure shall be
   newly constructed or otherwise established.

3. Nonconforming Structures. No nonconforming Structure shall be altered, changed,
   rebuilt, repaired, or replaced.

5. Nonconforming Use. No Nonconforming Use shall be changed or converted to
   another Nonconforming Use.
B. Exception To Permit Requirement.

1. **Maximum Construction Height Without A Permit.** No Airport Zoning Permit shall be required for an existing Structure to be altered, changed, rebuilt, repaired, or replaced on a Lot or for a new Structure to be constructed or otherwise established on a Lot, if the highest point on the Structure or on any equipment used to accomplish any of the foregoing activities, whichever is higher, measured in feet from curb level or from natural grade at a point ten (10) feet away from the front center of the Structure, whichever is lower, does not exceed the maximum construction height above ground without an Airport Zoning Permit shown for the Lot on the applicable Maximum Construction Heights Without Permit Plate in the FCM Zoning Map. The permitting process will require an FAA 7460 Obstruction Evaluation for all structures with proposed heights in excess of the maximum allowable construction height without a permit.

2. **No Violation Of Height Or Land Use Restriction Permitted.** Nothing in this Section IX.B. shall be construed as permitting or intending to permit a violation or a greater violation of any provision of this FCM Zoning Ordinance.

C. **Permit Application.** An Airport Zoning Permit application for activities on a Lot shall be made in the manner and on the form established by the Zoning Administrator of the jurisdiction in which the Lot is located as designated in Section XII.B.

D. **Permit Standard.** An Airport Zoning Permit shall be granted unless the Zoning Administrator determines that granting the permit (1) would allow a conforming Structure or use to violate any provision of this FCM Zoning Ordinance or (2) would permit a nonconforming Structure or a Nonconforming Use to become a greater violation of any provision of this FCM Zoning Ordinance. Any Airport Zoning Permit granted may be granted subject to any reasonable conditions that the Zoning Administrator may deem necessary to effectuate the purpose of this FCM Zoning Ordinance. In making any determination, the Zoning Administrator need not give public notice of, or hold a public hearing on, the Airport Zoning Permit application or the determination.

E. **Abandoned Or Deteriorated Nonconforming Uses.** Whenever a Zoning Administrator determines that a nonconforming Structure has been abandoned or more than eighty percent (80%) torn down, deteriorated, or decayed, no Airport Zoning Permit shall be granted that
would allow such Structure to exceed the height restrictions of Section IV.B. or otherwise violate any provision of this FCM Zoning Ordinance. Whether application is made for an Airport Zoning Permit or not, a Zoning Administrator may order the owner of a nonconforming Structure, at the owner’s expense, to lower, remove, reconstruct, or equip the same in the manner necessary to conform to the provisions of this FCM Zoning Ordinance. Prior to issuing such an order, the city Zoning Administrator shall consult with the Metropolitan Airports Commission and obtain its consent to the proposed order. Further, prior to the issuance of any such order, the affected City and the Metropolitan Airports Commission shall enter into an agreement as to which party is responsible for issuance and enforcement of the order. In the event the owner of the nonconforming Structure shall neglect or refuse to comply with such order for ten (10) days after receipt of written notice of such order, the Zoning Administrator may, by appropriate legal action, proceed to have the nonconforming Structure lowered, removed, reconstructed, or equipped and assess the cost and expense thereof against the land on which the Structure is, or was, located. Unless such an assessment is paid within ninety (90) days from the service of notice thereof on the owner of the land, the sum shall bear interest at the rate of eight percent (8%) per annum from the date the cost and expense is incurred until paid, and shall be collected in the same manner as are general taxes, all as authorized by Minnesota Statutes § 360.067.

SECTION IX. VARIANCES

A. FAA 7460 Obstruction Evaluation. Any proposed structure with a height in excess of the maximum allowable building height without a permit that has been analyzed by the FAA as part of a 7460 Obstruction Evaluation and has been determined by the FAA not to be a hazard to air navigation and not requiring changes to airport or aircraft operations will not require a variance.

B. Variance Application. Any Person desiring to construct or establish a new Structure; to alter, change, rebuild, repair, or replace an existing Structure, to allow a Tree to grow higher; to alter, repair, replace, or replant a Tree, or to use his or her property in violation of any provision of this FCM Zoning Ordinance may apply to the Board of Adjustment for a variance from such provision. A variance application shall be made by sending the application on the form provided by the Board of Adjustment by certified United States Mail to (1) the members
of the Board of Adjustment and (2) the Board of Adjustment at the mailing address specified
in Section XIII.C. The applicant shall also mail a copy of the application by regular United
States Mail to the Zoning Administrator of the jurisdiction in which the Structure or property is
located, as designated in Section XII.B. The Board of Adjustment may charge a fee for
processing the application.

C. Failure Of Board To Act. If the Board of Adjustment fails to grant or deny the variance
within four (4) months after the last Board member receives the variance application, the
variance shall be deemed to be granted by the Board of Adjustment, but not yet effective.
When the variance is granted by reason of the failure of the Board of Adjustment to act on
the variance, the Person receiving the variance shall send notice that the variance has been
granted by certified United States Mail to (1) the Board of Adjustment at the mailing address
specified in Section XIII.C. and (2) the Commissioner. The applicant shall include a copy of
the original application for the variance with the notice to the Commissioner. The variance
shall be effective sixty (60) days after this notice is received by the Commissioner, subject to
any action taken by the Commissioner pursuant to Minnesota Statutes § 360.063, subd. 6.a.

D. Variance Standard. A variance shall be granted where it is found that a literal application
or enforcement of the provisions of this FCM Zoning Ordinance would result in practical
difficulty or unnecessary hardship and relief granted would not be contrary to the public
interest but do substantial justice and be in accordance with the spirit of this FCM Zoning
Ordinance and Minnesota Statutes Chapter 360. Any variance granted may be granted
subject to any reasonable conditions that the Board of Adjustment, or the Commissioner
acting under Section XI.B., may deem necessary to effectuate the purpose of this FCM Zoning
Ordinance.

SECTION X. HAZARD MARKING AND LIGHTING

A. Nonconforming Uses. The Metropolitan Airports Commission may require the owner of any
nonconforming Structure to permit the installation, operation, and maintenance thereon of
such markers and lights as shall be deemed necessary by the Metropolitan Airports
Commission to indicate to the operators of aircraft in the vicinity of the Airport the presence
of such Airport Hazards. Such markers and lights shall be installed, operated, and maintained
at the expense of the Metropolitan Airports Commission.
B. Permits And Variances. Any Airport Zoning Permit or variance granted by a Zoning Administrator or the Board of Adjustment may, if such action is deemed advisable to effectuate the purpose of this FCM Zoning Ordinance and be reasonable in the circumstances, be granted subject to a condition that the owner of the Structure in question, at the owner’s expense, install, operate, and maintain thereon such markers and lights as may be necessary to indicate to pilots the presence of an Airport Hazard.

SECTION XI. ZONING ADMINISTRATOR

A. Duties. It shall be the duty of each Zoning Administrator to administer and enforce the provisions of this FCM Zoning Ordinance. Applications for Airport Zoning Permits shall be made to a Zoning Administrator as provided herein. A Zoning Administrator may charge a fee for processing the application. Airport Zoning Permit applications shall be considered and acted upon by the Zoning Administrator in accordance with the provisions of this FCM Zoning Ordinance and within the timelines established by Minnesota Statutes § 15.99, as it may be amended. The Zoning Administrator shall remind each applicant that it is the responsibility of the applicant to record any conditions of an Airport Zoning Permit, if required by law.

B. Designated Zoning Administrators. For the purpose of this FCM Zoning Ordinance, the Zoning Administrator shall be the official entitled as follows: the Eden Prairie Zoning Administrator for lands located in the City of Eden Prairie; the Shakopee Zoning Administrator for lands located in the City of Shakopee; and the Chanhassen Zoning Administrator for lands located in the City of Chanhassen. In the event that one (1) or more of the above described Zoning Administrators does not administer this FCM Zoning Ordinance, the Flying Cloud Airport Joint Airport Zoning Board hereby appoints the Executive Director, Metropolitan Airports Commission, (or his or her designee) to administer this FCM Zoning Ordinance in the municipality or municipalities. If any official position designated above as a Zoning Administrator ceases to exist or to perform or serve its present function, the successor position as designated by the applicable entity shall become the Zoning Administrator for that entity and shall perform or serve such functions.
SECTION XII. BOARD OF ADJUSTMENT

A. Establishment Of Board And Selection Of Chair. There is hereby established a Board of Adjustment that shall consist of five (5) members appointed by the Metropolitan Airports Commission, and each shall serve for a term of three (3) years and until a successor is duly appointed and qualified. Of the members first appointed, one (1) shall be appointed for a term of one (1) year, two (2) for a term of two (2) years, and two (2) for a term of three (3) years. Upon their appointment, the members shall select a chair to act at the pleasure of the Board of Adjustment. Members shall be removable by the Metropolitan Airports Commission for cause, upon written charges, after a public hearing.

B. Board Powers. The Board of Adjustment shall have the power to hear and decide appeals from any order, requirement, decision, or determination made by any Zoning Administrator or the Metropolitan Airports Commission’s Executive Director in the enforcement of this FCM Zoning Ordinance and to hear and grant or deny variances.

C. Board Procedures

1. Rules, Meetings, And Records. The Board of Adjustment shall adopt rules for its governance and procedure in harmony with the provisions of this FCM Zoning Ordinance. Meetings of the Board of Adjustment shall be held at the call of the chair and at such other times as the Board of Adjustment may determine. The chair, or in his or her absence the acting chair, may administer oaths and compel the attendance of witnesses. All hearings of the Board of Adjustment shall be public. The Board of Adjustment shall keep minutes of its proceedings showing the vote of each member upon each question or, if absent or failing to vote, indicating such fact, and shall keep records of its examinations and other official actions, all of which shall immediately be filed in the offices of the Executive Director, Metropolitan Airports Commission, and the Zoning Administrator of the jurisdiction in which the affected Structure or Lot is located.

2. Written Findings And Conclusions. The Board of Adjustment shall make written findings of fact and conclusions of law giving the facts upon which it acted and its legal conclusions from such facts in affirming, modifying, or reversing an order, requirement, decision, or determination of a Zoning Administrator or the Metropolitan Airports Commission’s Executive Director and in granting or denying a variance.
3. **Majority Vote Required.** The concurring vote of a majority of the members of the Board of Adjustment shall be sufficient to affirm, modify, or reverse an order, requirement, decision, or determination of a Zoning Administrator or the Metropolitan Airports Commission’s Executive Director, to decide to grant or deny a variance, or to act on any other matter upon which the Board of Adjustment is required to pass under this FCM Zoning Ordinance.

4. **Mailing Address.** The mailing address for the Board of Adjustment is:

   FCM Zoning Ordinance Board of Adjustment  
   c/o Executive Director  
   Metropolitan Airports Commission  
   6040 28th Avenue South  
   Minneapolis, MN  55450

**SECTION XIII. APPEALS**

A. **Who May Appeal.** Any Person aggrieved, or any taxpayer affected by any order, requirement, decision, or determination of a Zoning Administrator made in administration of this FCM Zoning Ordinance may appeal to the Board of Adjustment. Such appeals may also be made by any governing body of a municipality or county, or any joint airport zoning board, which is of the opinion that an order, requirement, decision, or determination of a Zoning Administrator is an improper application of this FCM Zoning Ordinance as it concerns such governing body or board.

B. **Commencement Of Appeals.** All appeals hereunder must be commenced within thirty (30) days of a Zoning Administrator’s decision by filing with the Zoning Administrator a notice of appeal specifying the grounds thereof. The Zoning Administrator shall forthwith transmit to the Board of Adjustment the notice of appeal and all papers constituting the record upon which the order, requirement, decision, or determination appealed from was taken.

C. **Stay Of Proceedings.** An appeal shall stay all proceedings in furtherance of the order, requirement, decision, or determination appealed from, unless the Zoning Administrator certifies to the Board of Adjustment, after the notice of appeal has been filed with it, that by reason of the facts stated in the certificate a stay would, in the Zoning Administrator’s opinion, cause imminent peril to life or property. In such case, proceedings shall not be
D. **Appeal Procedures.** The Board of Adjustment shall fix a reasonable time for hearing an appeal, give public notice and due notice to the parties in interest, and decide the same within a reasonable time. At the hearing, any party may appear in Person, by agent, or by attorney.

E. **Decision.** The Board of Adjustment may, in conformity with the provisions of this FCM Zoning Ordinance, affirm or reverse, in whole or in part, or modify the order, requirement, decision, or determination appealed from and may make such order, requirement, decision, or determination, as may be appropriate under the circumstances and, to that end, shall have all the powers of a Zoning Administrator.

**SECTION XIV. JUDICIAL REVIEW**

Any Person aggrieved, or any taxpayer affected by, any decision of the Board of Adjustment or any action of the Commissioner, or any governing body of a municipality or county, or any joint airport zoning board, or order of the Commissioner which is of the opinion that an order, requirement, decision, or determination of the Board of Adjustment or action of the Commissioner is illegal, may seek judicial review as provided in Minnesota Statutes § 360.072. The petitioner must exhaust the remedies provided in this FCM Zoning Ordinance before availing himself or herself of the right to seek judicial review as provided by this Section XV.

**SECTION XV. PENALTIES AND OTHER REMEDIES**

Every Person who violates any provision of this FCM Zoning Ordinance, any zoning approval granted hereunder, any condition of any zoning approval granted hereunder, or any order, requirement, decision, or determination of a Zoning Administrator or the Board of Adjustment shall be guilty of a misdemeanor and shall be punished by a fine, imprisonment, or both of not more than the fine and imprisonment established for misdemeanors by state law. Each day a violation continues to exist shall constitute a separate offense for purpose of the penalties and remedies specified in this section. This FCM Zoning Ordinance may also be enforced through such proceedings for injunctive relief and other relief as may be proper under Minnesota Statutes § 360.073, as it may be amended, and other applicable law.
SECTION XVI. RELATION TO OTHER LAWS, REGULATIONS, AND RULES

A. Compliance Required. In addition to the requirements of this FCM Zoning Ordinance, all Structures, Trees, and uses shall comply with all other applicable city, local, regional, state, or federal laws, regulations, and rules, including Minnesota Statutes §§ 360.81-360.91 – Regulation Of Structure Heights, Minnesota Rules 8800.1100 – Regulation Of Structure Heights, and 14 Code of Federal Regulations Part 77 – Objects Affecting Navigable Airspace.

B. Conflicts With Other Regulations. Where a conflict exists between any provision of this FCM Zoning Ordinance and any city, local, regional, state, or federal law, regulation, or rule applicable to the same area, whether the conflict be with respect to the height of Structures or Trees, the use of land, or any other matter, the more stringent law, regulation, or rule shall govern and prevail.

C. Current Versions And Citations. All references to city, local, regional, state, and federal laws, regulations, and rules in this FCM Zoning Ordinance are intended to refer to the most current version and citation. If such references are no longer valid due to repeal or renumbering, the new laws, regulations, or rules intended to replace those cited, regardless of the citation, shall govern.

SECTION XVII. SEVERABILITY

A. Effect Of Taking. In any case in which the provisions of this FCM Zoning Ordinance, although generally reasonable, are held by a court to interfere with the use or enjoyment of a particular Structure, Lot, or Tree to such an extent, or to be so onerous in their application to such a Structure, Lot, or Tree, as to constitute a taking or deprivation of that property in violation of the constitution of this state or the constitution of the United States, such holding shall not affect the application of this FCM Zoning Ordinance as to other Structures, Lots, and Trees, and, to this end, the provisions of this FCM Zoning Ordinance are declared to be severable.

B. Validity Of Remaining Provisions. Should any section or provision of this FCM Zoning Ordinance be declared by the courts to be unconstitutional or invalid, such decision shall not affect the validity of this FCM Zoning Ordinance as a whole or any part thereof other than the parts so declared to be unconstitutional or invalid.
SECTION XVIII. EFFECTIVE DATE
This FCM Zoning Ordinance shall take effect on the ____ day of ____, 2018. Copies thereof shall be filed with the Commissioner and the Registers of Deeds for Hennepin County, Minnesota.
Passed and adopted after public hearings by the Flying Cloud Airport Joint Airport Zoning Board this day of ____, 2018.

I hereby certify that this is a complete, true, and correct copy of the Flying Cloud Airport Zoning Ordinance as adopted by the Flying Cloud Airport Joint Airport Zoning Board on ____, 2018.

____________________________________________
Jenn Felger Shelly Cambridge, Secretary
Flying Cloud Airport Joint Airport Zoning Board

Date: ____, 2018

Subscribed and sworn to before me this ____ day of _______, 2018 by Shelly Cambridge, Secretary of the Flying Cloud Airport Joint Airport Zoning Board.

____________________________________________
Notary Public
FCM Zoning Ordinance
Exhibit A - Airport Boundary
EXHIBIT B: PARCELS IN PERMITTED RESIDENTIAL AREAS
PIN
053‐2011622430008
053‐2011622430009
053‐2011622430010
053‐2011622430026
053‐2011622430027
053‐2011622430028
053‐2011622430029
053‐2011622430030
053‐2011622430031
053‐2011622430032
053‐2011622430033
053‐2011622430034
053‐2011622430035
053‐2011622430036
053‐2011622430057
053‐2011622430058
053‐2011622430062
053‐2011622430063
053‐2011622430064
053‐2011622430065
053‐2011622430066
053‐2011622430067
053‐2011622440026
053‐2011622440028
053‐2011622440029
053‐2011622440030
053‐2011622440031
053‐2611622230005
053‐2611622230018
053‐2611622230019
053‐2611622230020
053‐2611622230021
053‐2611622230022
053‐2611622230023
053‐2611622230024
053‐2611622230025
053‐2611622230026
053‐2611622230027
053‐2611622230028
053‐2611622230029
053‐2611622230030
053‐2611622230031
053‐2611622230032
053‐2611622230033
053‐2611622230046
053‐2611622230047
053‐2611622230048
053‐2611622230049
053‐2611622230050
053‐2611622230051
053‐2611622230052
053‐2611622230053
053‐2611622230054
053‐2611622230055
053‐2611622230056
053‐2611622230057
053‐2611622230058
053‐2611622230059
053‐2611622230060
053‐2611622230061
053‐2611622240056
053‐2611622240057
053‐2611622240058
053‐2611622240059

BLDG NUM
16555
16403
16501
9281
9293
9305
9317
9329
9341
9353
9365
9377
9389
16580
16697
9300
9332
9346
9360
9374
9388
9402
16101
16333
16301
16275
16199
12701
9699
9715
9731
9747
9763
9779
9795
9811
9788
9772
9756
9740
9724
9708
9692
9676
9708
9726
9744
9762
9778
9794
9810
9826
9791
9775
9759
9743
9727
9711
9695
9679
12295
12315
12335
12355

STREETNAME
HILLTOP RD
VALLEY RD
VALLEY RD
SHETLAND RD
SHETLAND RD
SHETLAND RD
SHETLAND RD
SHETLAND RD
SHETLAND RD
SHETLAND RD
SHETLAND RD
SHETLAND RD
SHETLAND RD
VALLEY RD
STIRRUP LA
SHETLAND RD
SHETLAND RD
SHETLAND RD
SHETLAND RD
SHETLAND RD
SHETLAND RD
SHETLAND RD
VALLEY RD
VALLEY RD
VALLEY RD
VALLEY RD
VALLEY RD
PIONEER TR
WOODRIDGE DR
WOODRIDGE DR
WOODRIDGE DR
WOODRIDGE DR
WOODRIDGE DR
WOODRIDGE DR
WOODRIDGE DR
WOODRIDGE DR
TREE FARM RD
TREE FARM RD
TREE FARM RD
TREE FARM RD
TREE FARM RD
TREE FARM RD
TREE FARM RD
TREE FARM RD
WOODRIDGE DR
WOODRIDGE DR
WOODRIDGE DR
WOODRIDGE DR
WOODRIDGE DR
WOODRIDGE DR
WOODRIDGE DR
WOODRIDGE DR
TREE FARM RD
TREE FARM RD
TREE FARM RD
TREE FARM RD
TREE FARM RD
TREE FARM RD
TREE FARM RD
TREE FARM RD
OXBOW DR
OXBOW DR
OXBOW DR
OXBOW DR

FCM Zoning Ordinance Update

CITY
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE
EDEN PRAIRIE

ZIP
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347
55347

Appendix 7

LEGAL DESCRIPTION
EDEN HEIGHTS
EDEN HEIGHTS
EDEN HEIGHTS
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
RILEY CREEK RIDGE
EDEN HEIGHTS
EDEN HEIGHTS
EDEN HEIGHTS
EDEN HEIGHTS
EDEN HEIGHTS
UNPLATTED 26 116 22
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
THE TREE FARM
HILLSBOROUGH 2ND ADDN
HILLSBOROUGH 2ND ADDN
HILLSBOROUGH 2ND ADDN
HILLSBOROUGH 2ND ADDN

USE DESC
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential
Residential

Page 7-29


## EXHIBIT B: PARCELS IN PERMITTED RESIDENTIAL AREAS

<table>
<thead>
<tr>
<th>PIN</th>
<th>BLDG NUM</th>
<th>STREETNAME</th>
<th>CITY</th>
<th>ZIP</th>
<th>LEGAL DESCRIPTION</th>
<th>USE DESC</th>
</tr>
</thead>
<tbody>
<tr>
<td>503-261162240060</td>
<td>12375</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240061</td>
<td>12395</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240062</td>
<td>12415</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240064</td>
<td>12390</td>
<td>SURREY ST</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240065</td>
<td>12226</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240066</td>
<td>12246</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240067</td>
<td>12266</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240068</td>
<td>12286</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240069</td>
<td>12306</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240070</td>
<td>12326</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240072</td>
<td>12213</td>
<td>TRAVOIS RD</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240073</td>
<td>12193</td>
<td>TRAVOIS RD</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240074</td>
<td>12173</td>
<td>TRAVOIS RD</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240075</td>
<td>9732</td>
<td>PALLISADES CIR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240076</td>
<td>9742</td>
<td>PALLISADES CIR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240077</td>
<td>9755</td>
<td>PALLISADES CIR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240078</td>
<td>9745</td>
<td>PALLISADES CIR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162240079</td>
<td>9735</td>
<td>PALLISADES CIR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162231009</td>
<td>12315</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162231010</td>
<td>12155</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162231011</td>
<td>12175</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162231012</td>
<td>12195</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162231013</td>
<td>12215</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162231014</td>
<td>12335</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162231016</td>
<td>12275</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162231022</td>
<td>12126</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162231023</td>
<td>12146</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162231024</td>
<td>12166</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162231025</td>
<td>12186</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162231026</td>
<td>12206</td>
<td>OXBOW DR</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>503-261162231028</td>
<td>61</td>
<td>ADDRESS UNASSIGNED</td>
<td>EDEN PRAIRIE</td>
<td>00000</td>
<td>HILLSBOROUGH 2ND ADDN</td>
<td>Vacant Land - Residential</td>
</tr>
<tr>
<td>PIN</td>
<td>BLDG NUM</td>
<td>STREETNAME</td>
<td>CITY</td>
<td>ZIP</td>
<td>LEGAL DESCRIPTION</td>
<td>USE DESC</td>
</tr>
<tr>
<td>-----------</td>
<td>----------</td>
<td>-------------</td>
<td>------------</td>
<td>--------</td>
<td>---------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>053-261162330005</td>
<td>12426</td>
<td>CHESHOLM LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330007</td>
<td>12359</td>
<td>CHESHOLM LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330008</td>
<td>12393</td>
<td>CHESHOLM LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330009</td>
<td>10087</td>
<td>KIERSTEN PL</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330033</td>
<td>10088</td>
<td>KIERSTEN PL</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330034</td>
<td>10063</td>
<td>KIERSTEN PL</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330035</td>
<td>10075</td>
<td>KIERSTEN PL</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330036</td>
<td>10027</td>
<td>KIERSTEN PL</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330037</td>
<td>10039</td>
<td>KIERSTEN PL</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330038</td>
<td>10051</td>
<td>KIERSTEN PL</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330039</td>
<td>12460</td>
<td>CHESHOLM LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330040</td>
<td>12494</td>
<td>CHESHOLM LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330041</td>
<td>12510</td>
<td>CHESHOLM LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330042</td>
<td>12495</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330043</td>
<td>12385</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330044</td>
<td>12367</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330045</td>
<td>12349</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162330046</td>
<td>12321</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340044</td>
<td>12222</td>
<td>CHESHOLM LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340045</td>
<td>12256</td>
<td>CHESHOLM LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340046</td>
<td>12290</td>
<td>CHESHOLM LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340047</td>
<td>12324</td>
<td>CHESHOLM LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340048</td>
<td>12358</td>
<td>CHESHOLM LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340055</td>
<td>12350</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340056</td>
<td>12322</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340057</td>
<td>12994</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340058</td>
<td>12666</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340059</td>
<td>12238</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340060</td>
<td>12210</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340065</td>
<td>12293</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340066</td>
<td>12265</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340067</td>
<td>12237</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-261162340068</td>
<td>12209</td>
<td>JASPER LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>NORTH BLUFF 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-271162140035</td>
<td>61</td>
<td>ADDRESS UNASSIGNED</td>
<td>EDEN PRAIRIE</td>
<td>00000</td>
<td>FRASER CHARLSON</td>
<td>Vacant Land - Residential</td>
</tr>
<tr>
<td>053-2911622120005</td>
<td>9610</td>
<td>EDEN PRAIRIE RD</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>UNPLATTED 29 116 22</td>
<td>Residential</td>
</tr>
<tr>
<td>053-2911622120008</td>
<td>9416</td>
<td>SHETLAND RD</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>RILEY CREEK RIDGE</td>
<td>Residential</td>
</tr>
<tr>
<td>053-2911622120009</td>
<td>9425</td>
<td>SHETLAND RD</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>RILEY CREEK RIDGE</td>
<td>Residential</td>
</tr>
<tr>
<td>053-2911622120011</td>
<td>9401</td>
<td>SHETLAND RD</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>RILEY CREEK RIDGE</td>
<td>Residential</td>
</tr>
<tr>
<td>053-2911622130010</td>
<td>9640</td>
<td>EDEN PRAIRIE RD</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>UNPLATTED 29 116 22</td>
<td>Vacant Land - Commercial</td>
</tr>
<tr>
<td>053-2911622210069</td>
<td>9507</td>
<td>SKY LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>THE RIDGE AT RILEY CREEK 2ND ADDN</td>
<td>Vacant Land - Residential</td>
</tr>
<tr>
<td>053-2911622210070</td>
<td>9527</td>
<td>SKY LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>THE RIDGE AT RILEY CREEK 2ND ADDN</td>
<td>Vacant Land - Residential</td>
</tr>
<tr>
<td>053-2911622210071</td>
<td>9547</td>
<td>SKY LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>THE RIDGE AT RILEY CREEK 2ND ADDN</td>
<td>Vacant Land - Residential</td>
</tr>
<tr>
<td>053-2911622210072</td>
<td>9567</td>
<td>SKY LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>THE RIDGE AT RILEY CREEK 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-2911622240067</td>
<td>9587</td>
<td>SKY LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>THE RIDGE AT RILEY CREEK 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-2911622240068</td>
<td>9607</td>
<td>SKY LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>THE RIDGE AT RILEY CREEK 2ND ADDN</td>
<td>Residential</td>
</tr>
<tr>
<td>053-2911622240069</td>
<td>9627</td>
<td>SKY LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>THE RIDGE AT RILEY CREEK 2ND ADDN</td>
<td>Vacant Land - Residential</td>
</tr>
<tr>
<td>053-2911622240070</td>
<td>9647</td>
<td>SKY LA</td>
<td>EDEN PRAIRIE</td>
<td>55347</td>
<td>THE RIDGE AT RILEY CREEK 2ND ADDN</td>
<td>Vacant Land - Residential</td>
</tr>
</tbody>
</table>
FCM Zoning Ordinance
Exhibit C - Permitted Residential Areas
FCM Zoning Ordinance
Exhibit F - Airport Boundary and Safety Zoning Limit
Appendix 8: FCM Airspace Zoning Grid Maps

<table>
<thead>
<tr>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCM Airspace Zones Within Zoning Limits - Index</td>
<td>8-1</td>
</tr>
<tr>
<td>FCM Airspace Zones Within Zoning Limits – Grid Maps A1 through F6</td>
<td>8-2</td>
</tr>
</tbody>
</table>
FCM Airspace Zones Within Zoning Limits

A - Index Sheet

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones
Within Zoning Limits

A - A1

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones Within Zoning Limits

A - A2

FCM Property Line
Airspace Zoning Limit
Part 77 Contours
FCM Zoning Ordinance Update
FCM Airspace Zones
Within Zoning Limits

A - A3

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones
Within Zoning Limits

A - A4

FCM Property Line
Airspace Zoning Limit
Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones Within Zoning Limits

A - A5

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones
Within Zoning Limits

A - B1

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones
Within Zoning Limits
A - B2

- FCM Property Line
- Airspace Zoning Limit
- --- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones Within Zoning Limits

A - B3

FCM Property Line

Airspace Zoning Limit

Part 77 Contours

FCM Zoning Ordinance Update
FCM Airspace Zones
Within Zoning Limits

A - B4

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones
Within Zoning Limits

A - B5

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update
Appendix 8
FCM Airspace Zones
Within Zoning Limits

A - B6

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones Within Zoning Limits

A - C1

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones
Within Zoning Limits

A - C2

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update
FCM Airspace Zones
Within Zoning Limits

A - C6

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones within Zoning Limits

A - D1

- **FCM Property Line**
- **Airspace Zoning Limit**
- **Part 77 Contours**

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones
Within Zoning Limits

A - D2

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones
Within Zoning Limits

A - D3

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update
FCM Airspace Zones
Within Zoning Limits

A - D4

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones
Within Zoning Limits

A - D5

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones
Within Zoning Limits
A - D6

FCM Property Line
Airspace Zoning Limit
Part 77 Contours

FCM Zoning Ordinance Update
Appendix 8
FCM Airspace Zones
Within Zoning Limits

A - E1

FCM Property Line
Airspace Zoning Limit

Part 77 Contours

FCM Zoning Ordinance Update
FCM Airspace Zones
Within Zoning Limits

A - E2

FCM Property Line
Airspace Zoning Limit

Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones
Within Zoning Limits

A - E3

FCM Property Line
Airspace Zoning Limit
Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones Within Zoning Limits

A - E4

FCM Property Line
Airspace Zoning Limit

Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8

Page 8-28
FCM Airspace Zones Within Zoning Limits

A - E5

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones
Within Zoning Limits
A - E6

FCM Property Line
Airspace Zoning Limit
Part 77 Contours

FCM Zoning Ordinance Update
Appendix 8
FCM Airspace Zones
Within Zoning Limits

A - F2

- - - FCM Property Line
- - - Airspace Zoning Limit
- - - Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8

Page 8-31
FCM Airspace Zones
Within Zoning Limits

A - F3

FCM Property Line
Airspace Zoning Limit
Part 77 Contours

FCM Zoning Ordinance Update
Appendix 8
FCM Airspace Zones Within Zoning Limits

A - F4

FCM Property Line
Airspace Zoning Limit

Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones Within Zoning Limits

A - F5

- FCM Property Line
- Airspace Zoning Limit
- Part 77 Contours

FCM Zoning Ordinance Update

Appendix 8
FCM Airspace Zones
Within Zoning Limits

A - F6

- FCM Property Line
- Airspace Zoning Limit

--- Part 77 Contours

FCM Zoning Ordinance Update
# Appendix 9: FCM Safety Zone Grid Maps

<table>
<thead>
<tr>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCM Airspace Zones Within Zoning Limits - Index</td>
<td>9-1</td>
</tr>
<tr>
<td>FCM Airspace Zones Within Zoning Limits – Grid Maps A1 through F6</td>
<td>9-2</td>
</tr>
</tbody>
</table>
PAGE INTENTIONALLY LEFT BLANK
FCM Safety Zones
Within Zoning Limits

SZ - A3

- FCM Property Line
- JAZB Zone A
- Safety Zoning Limit
- JAZB Zone B
- JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - A4

- FCM Property Line
- JAZB Zone A
- Safety Zoning Limit
- JAZB Zone B
- JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9

Page 9-5
FCM Safety Zones
Within Zoning Limits

SZ - A5
FCM Safety Zones
Within Zoning Limits

SZ - B1

- FCM Property Line
- JAZB Zone A
- Safety Zoning Limit
- JAZB Zone B
- JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - B2

- FCM Property Line
- Safety Zoning Limit
- JAZB Zone A
- JAZB Zone B
- JAZB Zone C

FCM Zoning Ordinance Update
Appendix 9
Page 9-8
FCM Safety Zones
Within Zoning Limits

SZ - B3

FCM Property Line  JAZB Zone A
Safety Zoning Limit  JAZB Zone B
JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - B4

FCM Property Line  JAZB Zone A

Safety Zoning Limit  JAZB Zone B

JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - B5

FCM Property Line
JAZB Zone A
JAZB Zone B
JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - C1

<table>
<thead>
<tr>
<th>FCM Property Line</th>
<th>JAZB Zone A</th>
<th>JAZB Zone B</th>
<th>JAZB Zone C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FCM Zoning Ordinance Update</td>
<td>Appendix 9</td>
<td>Page 9-13</td>
</tr>
</tbody>
</table>
FCM Safety Zones
Within Zoning Limits

SZ - C2

FCM Property Line  JAZB Zone A
Safety Zoning Limit  JAZB Zone B
JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - C6

- FCM Property Line
- JAZB Zone A
- Safety Zoning Limit
- JAZB Zone B
- JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - D1

| FCM Property Line | JAZB Zone A | Safety Zoning Limit | JAZB Zone B | JAZB Zone C |

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - D2

FCM Property Line  JAZB Zone A
Safety Zoning Limit  JAZB Zone B
JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - D4

FCM Property Line  JAZB Zone A
Safety Zoning Limit  JAZB Zone B
                      JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - D6

FCM Property Line  JAZB Zone A
Safety Zoning Limit  JAZB Zone B
JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - E1

- FCM Property Line
- JAZB Zone A
- Safety Zoning Limit
- JAZB Zone B
- JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - E3
FCM Safety Zones
Within Zoning Limits

SZ - E4

FCM Property Line

JAZB Zone A

Safety Zoning Limit

JAZB Zone B

JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - E5

- FCM Property Line
- JAZB Zone A
- Safety Zoning Limit
- JAZB Zone B
- JAZB Zone C
FCM Safety Zones
Within Zoning Limits

SZ - E6

- FCM Property Line
- Safety Zoning Limit
- JAZB Zone A
- JAZB Zone B
- JAZB Zone C

FCM Zoning Ordinance Update
Appendix 9
Page 9-30
FCM Safety Zones
Within Zoning Limits

SZ - F2

FCM Property Line  JAZB Zone A
Safety Zoning Limit  JAZB Zone B
                     JAZB Zone C
FCM Safety Zones
Within Zoning Limits

SZ - F3
FCM Safety Zones
Within Zoning Limits

SZ - F4

<table>
<thead>
<tr>
<th>FCM Property Line</th>
<th>JAZB Zone A</th>
<th>Safety Zoning Limit</th>
<th>JAZB Zone B</th>
<th>JAZB Zone C</th>
</tr>
</thead>
</table>

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - F5

FCM Property Line  JAZB Zone A
Safety Zoning Limit  JAZB Zone B
JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9
FCM Safety Zones
Within Zoning Limits

SZ - F6

FCM Property Line  JAZB Zone A
Safety Zoning Limit  JAZB Zone B
JAZB Zone C

FCM Zoning Ordinance Update

Appendix 9
Appendix 10: FCM Maximum Construction Height Without Permit Grid Maps

<table>
<thead>
<tr>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCM Maximum Construction Heights Without Permit – Index</td>
<td>10-1</td>
</tr>
<tr>
<td>FCM Maximum Construction Heights Without Permit – Grid Maps A1 through F6</td>
<td>10-2</td>
</tr>
</tbody>
</table>
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - Index Sheet
FCM Maximum Construction Heights Without Permit Within Zoning Limits
MCH - A1
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - A2

FCM Zoning Ordinance Update

Appendix 10
FCM Maximum Construction Heights Without Permit
Within Zoning Limits

MCH - A3

[Map showing maximum construction heights in feet within zoning limits]
FCM Maximum Construction Heights Without Permit
Within Zoning Limits

MCH - A4

FCM Zoning Ordinance Update
Appendix 10
Page 10-5
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - A5
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - B1
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - B2
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - B3
FCM Maximum Construction Heights Without Permit
Within Zoning Limits

MCH - B4
FCM Maximum Construction Heights Without Permit
Within Zoning Limits

MCH - B5
FCM Maximum Construction Heights Without Permit
Within Zoning Limits

MCH - B6
### FCM Maximum Construction Heights Without Permit Within Zoning Limits

**MCH - C2**

<table>
<thead>
<tr>
<th>Height Range (Feet)</th>
<th>Map Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 50</td>
<td></td>
</tr>
<tr>
<td>51 - 100</td>
<td></td>
</tr>
<tr>
<td>101 - 150</td>
<td></td>
</tr>
<tr>
<td>151 - 200</td>
<td></td>
</tr>
<tr>
<td>201 - 250</td>
<td></td>
</tr>
<tr>
<td>251 - 300</td>
<td></td>
</tr>
<tr>
<td>301 - 350</td>
<td></td>
</tr>
<tr>
<td>351 - 400</td>
<td></td>
</tr>
<tr>
<td>401 - 450</td>
<td></td>
</tr>
<tr>
<td>451 - 500</td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- Red: 0 - 50 feet
- Orange: 51 - 100 feet
- Yellow: 101 - 150 feet
- Green: 151 - 200 feet
- Blue: 201 - 250 feet
- Purple: 251 - 300 feet
- Brown: 301 - 350 feet
- Black: 351 - 400 feet
- Gray: 401 - 450 feet
- Beige: 451 - 500 feet

**Map Key:**
- A1, A2, A3, A4, A5
- B1, B2, B3, B4, B5, B6
- C1, C2, C3, C4, C5, C6
- D1, D2, D3, D4, D5, D6
- E1, E2, E3, E4, E5, E6
- F1, F2, F3, F4, F5, F6

---

*FCM Zoning Ordinance Update Appendix 10*
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - C3
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - C4
FCM Maximum Construction Heights Without Permit
Within Zoning Limits

MCH - C5

FCM Zoning Ordinance Update
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - C6
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - D1
FCM Maximum Construction Heights Without Permit
Within Zoning Limits

MCH - D2
FCM Maximum Construction Heights Without Permit
Within Zoning Limits

MCH - D4

FCM Zoning Ordinance Update
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - D5

<table>
<thead>
<tr>
<th>Feet</th>
<th>0 - 50</th>
<th>51 - 100</th>
<th>101 - 150</th>
<th>151 - 200</th>
<th>201 - 250</th>
<th>251 - 300</th>
<th>301 - 350</th>
<th>351 - 400</th>
<th>401 - 450</th>
<th>451 - 500</th>
</tr>
</thead>
</table>

FCM Zoning Ordinance Update

Appendix 10
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - E1

FCM Zoning Ordinance Update
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - E2
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - E3

FCM Zoning Ordinance Update

Appendix 10
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - E4

FCM Zoning Ordinance Update

Appendix 10
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - E5
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - E6
FCM Maximum Construction Heights Without Permit
Within Zoning Limits

MCH - F2

<table>
<thead>
<tr>
<th>Height Range</th>
<th>FCM Maximum Construction Heights Without Permit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 50</td>
<td></td>
</tr>
<tr>
<td>51 - 100</td>
<td></td>
</tr>
<tr>
<td>101 - 150</td>
<td></td>
</tr>
<tr>
<td>151 - 200</td>
<td></td>
</tr>
<tr>
<td>201 - 250</td>
<td></td>
</tr>
<tr>
<td>251 - 300</td>
<td></td>
</tr>
<tr>
<td>301 - 350</td>
<td></td>
</tr>
<tr>
<td>351 - 400</td>
<td></td>
</tr>
<tr>
<td>401 - 450</td>
<td></td>
</tr>
<tr>
<td>451 - 500</td>
<td></td>
</tr>
</tbody>
</table>

FCM Zoning Ordinance Update

Appendix 10
FCM Maximum Construction Heights Without Permit
Within Zoning Limits

MCH - F3
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - F4

FCM Zoning Ordinance Update
FCM Maximum Construction Heights Without Permit Within Zoning Limits

MCH - F6
## Appendix 11: Public Hearing Report

<table>
<thead>
<tr>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Hearing Summary</td>
<td>11-1</td>
</tr>
<tr>
<td>Notice of Public Comment Period and Public Hearing</td>
<td>11-3</td>
</tr>
<tr>
<td>Public Hearing Attendance Sheets</td>
<td>11-7</td>
</tr>
<tr>
<td>Public Hearing Transcript</td>
<td>11-11</td>
</tr>
<tr>
<td>Public Presentation Slides</td>
<td>11-47</td>
</tr>
<tr>
<td>List of Exhibits Entered into the Public Hearing Record</td>
<td>11-75</td>
</tr>
<tr>
<td>Written Public Comments and Responses</td>
<td>11-77</td>
</tr>
</tbody>
</table>
A public hearing was conducted at 6:30 p.m. on February 27, 2018 at the Eden Prairie City Center, City Council Chambers, to receive verbal and written comments about the draft Airport Zoning Ordinance for Flying Cloud Airport. Public notice of the hearing was provided (Item A).

Present at the public hearing were the following Joint Airport Zoning Board (JAZB) members, who served as Hearing Officers: Brad Aho (Chair, Eden Prairie), Kate Aanenson (Chanhassen), Keith Tschohl (Eden Prairie), Julie Klima (Eden Prairie), Michael Beard (Shakopee), Eric Weiss (Shakopee), Rick King (MAC), and Katie Clark Sieben (MAC). MAC staff present at the public hearing included Bridget Rief (Vice President, Planning and Development), Neil Ralston (Airport Planner), Evan Wilson (Senior Attorney), Shelly Cambridge (Administrative Assistant and JAZB Board Secretary), Mike Wilson (FCM Airport Manager), Gary Schmidt (Director of Reliever Airports), and Jenn Felger (Planning and Environment Coordinator).

Twelve people signed in on the attendance sheets (Item B).

The proceedings of the Public Hearing were transcribed by a qualified court reporter (Item C).

Neil Ralston, Airport Planner, provided an overview presentation of the draft Airport Zoning Ordinance for Flying Cloud Airport (Item D). Several members of the public asked verbal questions about the proposed airport zoning ordinance after the presentation but before the start of the public hearing. These comments are recorded on the official Public Hearing Transcript.

Exhibits A through I were entered into the record by MAC during the public meeting. Exhibits A through I are listed as Item E and are available upon request to Shelly Cambridge, JAZB Secretary, at 612-726-8144 or via email at Shelly.Cambridge@mspmac.org.

All persons in attendance and wishing to do so were given the opportunity to testify and introduce evidence regarding the issues set forth in the Notice of Public Hearing. No testimony was given.

The public hearing record was kept open until 5:00 p.m. on Wednesday, March 14, 2018, to receive written comments from interested parties. Four (4) written comments were received during the public comment period. These comments, along with responses, are included as Item F.
Item A –
Notice of Public Comment Period and Public Hearing
for Draft Flying Cloud Airport Zoning Ordinance
NOTICE OF PUBLIC COMMENT PERIOD AND PUBLIC HEARING FOR
DRAFT FLYING CLOUD AIRPORT (FCM) ZONING ORDINANCE

The Joint Airport Zoning Board (JAZB) for Flying Cloud Airport (FCM) is developing an Airport Zoning Ordinance for land uses around FCM. This is a continuation of the airport zoning effort started in 2009-2010 but not finalized. Similar to the previous zoning proposal, the Draft FCM Zoning Ordinance (Zoning Ordinance) limits the height of structures and vegetation and prohibits certain land uses in an area extending approximately 2 miles from the outer boundaries of FCM. The zoning is being conducted as required by Minnesota Statutes 360.061 – 360.074 and Minnesota Rules 8800.1200 and 8800.2400. Maps that are part of the proposed Zoning Ordinance show the precise boundaries for application of the Zoning Ordinance and the associated proposed restrictions. A summary map showing the proposed Safety Zones is shown on the reverse side of this notice.

The proposed Zoning Ordinance would:

- Limit the height of structures and vegetation out to approximately 2 miles to the west of FCM, and out to approximately 1.5 miles in all other areas around the airport. In most cases, however, the airport zoning height limitations would be less restrictive than maximum heights allowed in the municipal zoning code;
- Prohibit the development of structures in Safety Zone A, which is mostly contained to airport-owned property;
- Prohibit, in Safety Zone B, the construction of amphitheaters, hospitals, nursing homes, residential uses, schools, stadiums and ponds or other features which might attract waterfowl or other birds, with the exception that the proposed restrictions in Safety Zone B do not affect additions to existing residences, residential redevelopment or future residential development in certain Permitted Residential Areas;
- Require a contiguous open space within Safety Zone B of either 20% of the total Safety Zone B acreage or 20 acres, which ever is larger; and
- Prohibit, in Safety Zones A, B and C, the use of land that creates or causes interference with the operations of radio or electronic facilities on FCM or with radio or electronic communications between FCM and aircraft, makes it difficult for pilots to distinguish between Airport lights and other lights, results in glare in the eyes of pilots using FCM, impairs visibility in the vicinity of FCM, or otherwise endangers the landing, taking off, or maneuvering of aircraft in the runway approach areas.

THE PUBLIC COMMENT PERIOD ON THE PROPOSED ZONING ORDINANCE WILL COMMENCE AT 8:00 A.M. ON MONDAY, FEBRUARY 12, 2018, AND CLOSE AT 5:00 P.M. ON WEDNESDAY, MARCH 14, 2018. During this period, written comments will be accepted and must be addressed to:

Secretary to the FCM Joint Airport Zoning Board
Metropolitan Airports Commission
6040 28th Avenue South
Minneapolis, MN  55450

Comments can also be emailed to fcm.zoning@mspmac.org

A PUBLIC HEARING ON THE PROPOSED ZONING ORDINANCE IS SCHEDULED FOR TUESDAY, FEBRUARY 27, 2018, AT THE EDEN PRAIRIE CITY HALL COUNCIL CHAMBERS, 8080 MITCHELL ROAD, EDEN PRAIRIE, MN. THE PUBLIC HEARING WILL BEGIN AT 6:30 P.M. AND LAST UNTIL ALL PERSONS WISHING TO ADDRESS THE BOARD HAVE BEEN HEARD. AN OPEN HOUSE WILL BE HELD PRIOR TO THE PUBLIC HEARING STARTING AT 5:00 P.M. FOLLOWED BY A PUBLIC PRESENTATION FROM 6:00 P.M. TO 6:30 P.M.

Copies of the proposed Zoning Ordinance will be available for review beginning on Monday, February 12, 2018, at the following locations: the Metropolitan Airports Commission’s Main Office, 6040 28th Avenue South, Minneapolis; the City Halls of the cities of Eden Prairie, Shakopee, and Chanhassen; and the Eden Prairie Library, 565 Prairie Center Drive, Eden Prairie. The proposed Zoning Ordinance will also be available for review beginning February 12, 2018 on the MAC website at:


For further information about the public comment period, the open house or the public hearing, please call Shelly Cambridge, Secretary to the FCM Joint Airport Zoning Board, at (612) 726-8144.
Item B –
Public Hearing Attendance Sheets
## Please Sign In

Flying Cloud Airport (FCM) Joint Airport Zoning Board
Draft Airport Zoning Ordinance

Open House and Public Hearing
Eden Prairie City Hall Council Chambers
Tuesday, February 27, 2018
5:00 – 8:00 p.m.

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>E-Mail Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ken Reinecke</td>
<td>12100 Pioneer Trail EP 55347</td>
<td><a href="mailto:kreinecke@projectdevelopersinc.com">kreinecke@projectdevelopersinc.com</a></td>
</tr>
<tr>
<td>Terry Schneider</td>
<td>15383 Boulder Co. Dr Wthk.</td>
<td><a href="mailto:terry2@projectdevelopersinc.com">terry2@projectdevelopersinc.com</a></td>
</tr>
<tr>
<td>John Fedura</td>
<td>9820 Free Farm Rd</td>
<td><a href="mailto:jfedura@icloud.com">jfedura@icloud.com</a></td>
</tr>
<tr>
<td>Mary Stoecker</td>
<td>18107 Cartway Cir 55307</td>
<td><a href="mailto:m.stoecker@comcast.net">m.stoecker@comcast.net</a></td>
</tr>
<tr>
<td>Maciej Misiek</td>
<td>95236 N Willow Place</td>
<td>mmisiek.qmark.com</td>
</tr>
<tr>
<td>David Kraemer</td>
<td>9017 Victoria Dr</td>
<td></td>
</tr>
<tr>
<td>John Kutz</td>
<td>15365 Village Wood Dr El</td>
<td></td>
</tr>
<tr>
<td>Mark Umholzer</td>
<td>1399 6thavenue Dr 55305</td>
<td><a href="mailto:mark.umholzer@state.mn.us">mark.umholzer@state.mn.us</a></td>
</tr>
<tr>
<td>Tom Traugtheden</td>
<td>8500 Montgomery St</td>
<td><a href="mailto:tptraug@gmail.com">tptraug@gmail.com</a></td>
</tr>
<tr>
<td>Mark Freberg</td>
<td>10425 Buckingham Dr El 55347</td>
<td><a href="mailto:protyme@aol.com">protyme@aol.com</a></td>
</tr>
<tr>
<td>Randy Langsdorf</td>
<td>10291 Winter Pk</td>
<td></td>
</tr>
</tbody>
</table>
PLEASE SIGN IN

Flying Cloud Airport (FCM) Joint Airport Zoning Board
Draft Airport Zoning Ordinance

Open House and Public Hearing
Eden Prairie City Hall Council Chambers
Tuesday, February 27, 2018
5:00 – 8:00 p.m.

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>E-Mail Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steve Wingard</td>
<td>14478 Boulder Pkwy</td>
<td>Steve.movingup.com</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Item C –
Public Hearing Transcript
METROPOLITAN AIRPORTS COMMISSION

PUBLIC HEARING

RE:

DRAFT FLYING CLOUD AIRPORT (FCM)

ZONING ORDINANCE

ORIGINALLY

HELD ON

FEBRUARY 27, 2018

6:00 p.m.

EDEN PRAIRIE CITY HALL COUNCIL CHAMBERS

8080 MITCHELL ROAD, EDEN PRAIRIE, MINNESOTA

REPORTED BY: CAITLIN J. ALBRECHT

800-545-9668
612-339-0545
Paradigm Reporting & Captioning
www.paradigmreporting.com

#113121
APPEARANCES

FLYING CLOUD AIRPORT

JOINT AIRPORT ZONING BOARD MEMBERS:

Brad Aho, JAZB Chair
Kate Aanenson, Chanhassen
Keith Tschohl, Eden Prairie
Julie Klima, Eden Prairie
Michael Beard, Shakopee
Eric Weiss, Shakopee
Rick King, Metropolitan Airports Commission
Katie Clark Sieben, Metropolitan Airports Commission

METROPOLITAN AIRPORTS COMMISSION STAFF:

Bridget Rief, Vice President - Planning & Development
Neil Ralston, Airport Planner
Evan Wilson, Senior Attorney
Shelly Cambridge, Board Secretary
CHAIR AHO: I'll call the meeting to order, then. My name is Brad Aho and I am the chair of the Flying Cloud Airport Joint Airport Zoning Board, and I welcome all of you to tonight's meeting. This is a public meeting, and it's a public hearing on the proposed airport zoning ordinance.

Board members, why don't we go around and introduce ourselves. We'll start down here with Katie.

MS. SIEBEN: I'm Katie Clark Sieben. Do I need to --

CHAIR AHO: So make sure that your microphone says live and that's green.

MS. SIEBEN: Thank you.

Katie Clark Sieben with Metropolitan Airports Commission.

MR. WEISS: Eric Weiss, long-range planner, City of Shakopee.

MR. BEARD: I'm Mike Beard, Scott County Commissioner. I'm here representing Shakopee this evening.

CHAIR AHO: So I serve on the city council in Eden Prairie and am currently chair.

MR. KING: Rick King. I'm on the Metropolitan Airports Commission, and my area includes Eden Prairie, and I live here.
MR. TSCHOHL: I'm Keith Tschohl. I'm chair of the Flying Cloud Airport Advisory Commission for the City of Eden Prairie.

MS. KLIMA: I'm Julie Klima. I'm the city planner for the City of Eden Prairie.

MS. AANENSON: Kate Aanenson. I'm the community development director for the City of Chanhassen.

MS. RIEF: And I am Bridget Rief with the Metropolitan Airports Commission. I am the staff liaison at the airport.

CHAIR AHO: Great. Well, thank you, all.

So the structure of the Board meeting and the public hearing is going to be as follows this evening:

So, first, we're going to have -- Neil Ralston, who is the planner for the Metropolitan Airports Commission, is going to provide an overview of the Flying Cloud Airport Zoning Ordinance.

Second, we're going to have exhibits for the hearing entered into the record starting at 6:30.

And, third, the Board will take testimony from the public on the proposed Flying Cloud Airport Zoning Ordinance. So if anyone has a prepared statement or document, you may read it into the record or submit it or both, and we'll make it part of the record. And the
Board just asks that you limit your statement to no more than 5 minutes so that everyone gets a chance to speak. I don't think it's going to be a problem tonight. But if you wish to testify, please fill out a speaker card and hand it to the Board secretary, Ms. Shelly Cambridge.

And, Shelly, do you want to stand so everyone can see? Is she -- where is she?

MS. RIEF: She's in the back, standing by the table.

CHAIR AHO: She's in the back. Okay.

All right. So if you have any questions, go back there and fill out a card, please. And -- let's see.

So this is a public hearing about zoning and not about airport noise -- I just want to make that very clear so that everyone understands why we're here tonight -- and adoption of the zoning ordinance will not alter the number, frequency, or noise level of traffic at the airport. Any zoning ordinance would affect the land use surrounding the airport.

And we will have a -- we have a court reporter here tonight who is going to take notes on all the proceedings. Other than that, the meeting is not televised, nor is it recorded.
So, Mr. Ralston, will you take it away, please, and give us the presentation.

MR. RALSTON: Thank you, Chair Aho. And good evening, everyone. Thank you for taking the time to join us tonight.

As I said, my name's Neil Ralston. I'm the airport planner for the airport's commission.

Can everybody hear me okay? Excellent.

CHAIR AHO: Those microphones should work. Just make sure that they're on.

MR. RALSTON: Yeah, I think we're good.

CHAIR AHO: Okay. Good.

MR. RALSTON: Excellent.

I'm here tonight to give a brief overview of the draft airport zoning ordinance that is being developed for Flying Cloud Airport. I'm going to begin with presenting the purpose and goals for the Joint Airport Zoning Board, along with the timeline of this Board's activity going back to 2009.

Then I'll move into a summary of the draft airport zoning ordinance itself.

And finally, we'll talk about the next steps in the process to advance the draft ordinance towards approval and final adoption.

Before going any further, however, I'd like to
define a few of the terms and acronyms that I'll be using tonight both in my presentation and that you'll see on the slides.

First, the three letters "FCM" refer to Flying Cloud Airport. That is the official airport identifier that pilots use when they're flying into the airport.

Second, the term "JAZB," which I'll pronounce as JAZB (pronounced JAZZ-bee), that refers -- that's the shorthand version of Joint Airport Zoning Board.

Next, "MnDOT" refers to the Minnesota Department of Transportation, Office of Aeronautics.

And finally, "FAA" is used to reference the Federal Aviation Administration.

So why is it important for the JAZB to pursue airport zoning for Flying Cloud Airport now? First, and perhaps foremost, zoning remains a requirement of state law. MnDOT's expectation is that the JAZB will successfully develop zoning for the airport in order to avoid potential airport improvement grant funding implications.

Second, the pace of development around Flying Cloud Airport is only increasing, and the lack of an adopted airport zoning ordinance is creating uncertainty and some level of confusion about possible land use controls in the area of the airport.
Third, the Metropolitan Airports Commission would like to continue to pursue non-aeronautical commercial use of some airport parcels of land that are within the designated safety zones. Uncertainty regarding zoning is holding up the approval process for these parcels, and that's a hurdle that we'd like to remove.

Last but not least, it is time to finish what was started back in 2009, to provide a level of certainty to all stakeholders about airport zoning requirements around the airport.

So at a high level, this group, the JAZB's purpose, is to collaboratively develop an airport zoning ordinance that achieves a balance between providing for a reasonable level of public safety while allowing for compatible community development to occur. To achieve this, Minnesota state statutes provide guidance to consider the social and economic cost of restricting land uses versus the benefits that would be derived from a strict application of the state's model airport zoning ordinance. The state's model zoning ordinance is a template provided by MnDOT that provides a common approach to developing zoning for all airports in Minnesota.

The overarching goal for this JAZB is to
develop an airport zoning ordinance for review and approval by the MnDOT Commissioner of Transportation that would subsequently be adopted by the Board, and then by local communities.

Supporting goals for this JAZB include updating the relevant sections of the draft ordinance to reflect current conditions and trends, and to ensure that an appropriate level of stakeholder and community engagement occurs. Tonight's hearing, of course, is an important step in achieving that goal.

Next, I'd like to take a quick trip down memory lane to help provide some context for where we are headed next. This Joint Airport Zoning Board was stood up back in 2009 and first met in July of that year. By April of 2010, the group had done a lot of heavy lifting and developed a draft airport zoning ordinance that was ready for public review.

A public hearing, much like this one, for the ordinance was held on April 29th of 2010. The draft airport zoning ordinance was then finalized and submitted to the MnDOT Commissioner of Transportation for review and action in December 2010. However, in early 2011, MAC requested on behalf of the JAZB that MnDOT temporarily suspend review of the draft ordinance due to legal uncertainties surrounding airport
zoning-related litigation that was pending in the state at the time.

Fast-forwarding to 2016, that litigation had been settled, and it was becoming increasingly apparent that there was a need to move forward with completing the zoning effort due to the pace of development activity around the airport. Based on coordination with MnDOT, it was determined that too much time had passed just to pick up where we had left off in early 2011 without reconvening the Board and reengaging with stakeholders.

To accomplish this, the first meeting of the reconvened Joint Airport Zoning Board was held in September of 2017. Between then and now, the JAZB has been working to update the draft airport zoning ordinance and supporting studies, which include a safety/risk study and an economic impact analysis. These updates validate the original JAZB recommendations pertaining to the major elements of the proposed zoning ordinance, so only minor updates are being proposed at this time, and we'll go through what those are here in a few moments.

At its meeting a few weeks ago on January 18th, the JAZB formally approved an updated version of the zoning ordinance for formal public review and comment,
and that is serving as the basis for this public hearing tonight.

So moving into the ordinance itself. This slide shows the airfield configuration that served as the basis for the updated draft ordinance. Runway 18-36, which is the north-south crosswind runway -- if you can see the cursor moving here -- was incorporated into the ordinance at its current length of 2,691 feet. In the previous version of the ordinance, this runway was shown to be extended to a slightly longer length.

Meanwhile, the north parallel runway 10L-28R here was incorporated as a utility category runway, whereas in the previous ordinance, it had a different designation. The distinction between the designations has to do with the types and the weights of aircraft that use the runway on a regular basis. Since the north parallel runway does not accommodate a lot of larger, heavier aircraft types, the utility runway designation is appropriate. The length, width, and operational characteristics of the north parallel runway are not affected by the change.

From a zoning and land use perspective, the change results in a smaller protection zone at the end of the north parallel runway -- at each end of the north parallel runway. From an airspace and height...
limitation perspective, it also results in a steeper or less restrictive approach surface slope. As noted on the slide, these configuration changes from the 2010 draft ordinance result in less restrictive zoning areas.

The draft airport zoning ordinance continues to have two primary components: Height limitations and land use limitations. We'll cover both, starting with the height limitations item.

The draft zoning ordinance establishes an airspace zone to limit the height of structures and vegetation out to approximately 2 miles to the west of the airport and out to approximately 1 1/2 miles around the airport and other areas. The airspace zone heights are based on the FAA's airspace criteria.

If a proposed development seeks to penetrate the height limitations stipulated by an airspace zone, a variance will have to be granted for that penetration by a Board of Adjustment. The Board of Adjustment is proposed to be comprised of members of the Metropolitan Airports Commission.

The ordinance does provide for an exception from seeking a variance for an airspace surface penetration. If the applicant submits an aeronautical study review case to the FAA and the FAA determines
that the object penetrating the surface would not be a hazard to air navigation and would not require changes to airport operations, and the proponent complies with any conditions included in the FAA's determination, then no variance would be required.

Now, the draft ordinance includes a set of grid maps that show the airspace zone heights in 10-foot intervals for areas surrounding the airport. As an example, what's on the slide shows grid location C3, which is on the northwest side of the airport. Just for orientation purposes, each of the graphics in the zoning ordinance has an index at the bottom that shows the geographic grid of the spreads -- geographic spread of the grids -- I'm sorry -- each of which has its own grid map in the document. The heights on these grid maps are expressed as above mean sea level, not above ground level, so to calculate the height above the ground of this airspace zone, one must subtract the ground elevation from the airspace elevation.

To provide more specificity and perhaps clarity on the allowable heights for each parcel, we have created another set of grid maps called "Maximum Construction Heights Without Permit." These maps establish a height per parcel up to which an airport zoning permit is not needed.
Now, as a point of clarification, an airport zoning permit is different than a variance issued by the Board of Adjustment. For example, if a proposed development does not exceed the maximum construction height without permit elevation, no zoning permit or variance is needed; however, an FAA airspace review may still be required. If a proposed development exceeds the maximum construction height without permit elevation, but does not penetrate an airspace zone, the applicant will need to obtain an airport zoning permit from the city zoning administrator, but not a variance.

The maximum construction heights without permit are intended to provide a buffer below the airspace surfaces -- I'm sorry -- the airspace zones, and we think it's prudent for the city zoning professionals to review proposed developments that are getting close to penetrating the airspace zones. If a proposed development exceeds both the maximum construction height without permit elevation and penetrates the airspace zone, then both an airport zoning permit and a variance would be needed.

The draft ordinance also contains a series of grid maps showing the maximum construction heights without a permit that have been calculated for each parcel within the zoning area. This example continues...
to use the grid section C3, again, on the northwest side of the airport. Each of the heights shown is expressed as above ground level, making it easier to interpret views in the previous airspace zone grid maps.

These heights were calculated by identifying the location of each parcel where the highest ground level was under the lowest airspace zone elevation. We then subtracted the ground elevation from the airspace height and then rounded it down to the nearest 10-foot interval. In the vast majority of cases, we found that the airport zoning height limitations would be less restrictive than the maximum structure heights allowed in municipal zoning codes.

Next we'll move on to the land use safety zones. The draft ordinance provides three safety zones, Zones A, B, and C. JAZB Safety Zone A is the most restrictive zone, and that's located immediately off the ends of the runways and prohibits structures and trees.

JAZB Safety Zone B is a less restrictive zone, located further off the runway ends, that contains prohibitions against certain land uses. Residential development is allowed in permanent residential areas within JAZB Safety Zone B.
JAZB Safety Zone C is the least restrictive zone and contains general land use restrictions against interfering with flight activity at Flying Cloud Airport.

Next, I'm going to go into a little more detail on each of those zones, starting with Zone C and then working back in towards Zone A.

JAZB Safety Zone C is shown by the black ellipsoid line on the slide. It's established by drawing radiuses of specified distances from the runway ends. Again, it is the least restrictive safety zone in that it calls for general prohibitions that would interfere with flight activity at Flying Cloud Airport.

Even though the language here may seem a bit technical, the uses prohibited in Zone C are generally commonsense items that the vast majority of people wouldn't partake in anyway. For example, use of a high-powered radio transmitter that would interfere with navigational aids at the airport or would interfere with communications between aircraft and air traffic controllers would be a use that we would be trying to prevent. Another example of an undesirable use would be bright uplighting, like searchlights or lasers pointed into the sky that could blind pilots.

We did receive a question via e-mail from an
area resident asking if we were seeking to prohibit the use of rooftop solar panels on homes within Zone C due to glare concerns. In response, we want to clarify that the draft ordinance does not seek to prohibit residential solar installations. If a particular solar installation is determined to cause glare issues for pilots, using the airport, we would want to work with that property owner to mitigate to the extent practical that visual impairment. However, based on operational experience, the likelihood of a typical residential rooftop solar installation to cause a glare problem is expected to be a very rare occasion.

In the event that a property owner wishes to be proactive about the potential of glare concerns from a specific solar installation, there is an option of submitting an airspace review case to the appropriate agencies to take a look at it in advance.

And finally, the land use controls established for JAZB Zone C apply to the other two JAZB safety zones as well.

Next, we'll move inward to Safety Zone B, which is shown on this graphic as green trapezoids. JAZB Safety Zone B is more restrictive than C but less restrictive than A. It prohibits certain land uses, such as amphitheaters and theaters, churches,
hospitals, nursing homes, schools, stadiums, and
wildlife attractants, particularly those attractants
that would attract waterfowl like the Canada goose.

The length and outer width of the proposed JAZB
Safety Zone B is based on MnDOT's state model zone
dimensions; however, the draft JAZB ordinance is
proposing less stringent land use controls than those
prescribed by MnDOT's state model. For example, JAZB
Safety Zone B does not prescribe a minimum parcel size
for development, nor does it limit site populations
based on site acreage. These limitations were relaxed
in the JAZB ordinance based on the results of a
detailed safety/risk study and economic impact analysis
that were specific to the conditions at Flying Cloud
Airport.

As another feature, the proposed JAZB Safety
Zone B allows for the improvement, expansion of
existing, and development of new residential uses in
areas guided for residential development and designated
in the ordinance as permitted residential areas. These
permitted residential areas, as shown with green
shading on this slide, are recognized and treated as
conforming land uses in the draft ordinance.

Finally, JAZB Safety Zone B contains a
requirement to provide a minimum of 20 percent of the
total Zone B acreage or 20 acres, whichever is greater, to remain as continuous open space. The purpose for the open space is to provide an extra margin of safety by providing a large area for the pilot of a disabled aircraft to be able to make an emergency landing, should that be needed. The open space requirement applies to the totality of the proposed JAZB Safety Zone B area and does not apply to each parcel within the zone.

As shown on the yellow shading on the slide, the Zone B open space requirement is easily met by existing airport-owned land, along with other off-airport property guided to remain as open space or otherwise not expected to be regularly occupied.

Lastly, JAZB Safety Zone A is shown by the blue trapezoid on the slide. As mentioned before, it's the most restrictive safety zone, that structures are prohibited unless needed for aviation purposes.

JAZB Safety Zone A is the same shape and size as the FAA-defined runway protection zone, or RPZ, off the ends of each runway. The runway protection zone has very similar land use restrictions mandated by the FAA, so it makes sense to pair the RPZ and Safety Zone A together.

The joint runway protection zone in Safety
Zone A are smaller than the Zone A prescribed in MnDOT's state model. Again, the results of the detailed safety/risk study and economic impact analysis suggests that the draft JAZB ordinance provides the reasonable level of safety that we are seeking.

Regarding the actual ordinance itself, we reviewed the draft language from 2010 to see if any elements needed to be updated. We did make a few minor text updates, primarily to update the zone descriptions and dimensions that changed the airfield configuration items that we previously discussed.

We also made a few other minor edits, such as removing the City of Bloomington from the list of JAZB participants since the proposed zoning surfaces do not extend into the municipal boundary, and also clarified a few items related to airspace evaluations and judicial review procedures. Other than these minor edits and clarifications, there were no substantial differences between the draft ordinance moving forward now and the one that moved forward back in 2010. We do have a track-changed version of the draft ordinance language available, so anyone interested to see the exact edits that have been made to the previous version of the ordinance can see them.

Which brings us to the next steps for the
process. This public comment period is open until Wednesday, March 14th. If you would like to provide written comments beyond any verbal testimony that you make here tonight, you can either fill out a comment form before you leave -- and Shelly in the back can point you to those if you're interested in that -- you can mail comments to us at the address in the notice or on the slide, or you can send them via e-mail as well. The e-mail address is in the notice for your use.

After the public comment period closes, the JAZB will review all testimony and comments submitted, then it will schedule its next meeting to discuss any proposed changes to the draft ordinance based on public input and the timeline for submittal to MnDOT.

After submitting the draft ordinance to MnDOT, the Board will await their comments and then work to address any feedback items that they have. We do expect that MnDOT will provide comments relative to areas where the draft JAZB ordinance deviates from the state model, and we look forward to productive dialogue with them about the justifications for those deviations based on the robust technical work of this group.

After MnDOT approves the airport zoning ordinance, we will hold another public hearing to present the final version to interested community
members, then the JAZB will take action to formally adopt the final ordinance, to be followed by formal adoption and implementation by the participating municipalities. We hope to finalize these steps yet during 2018.

So, Chair Aho, that concludes my presentation, but I would be happy for a few minutes to take questions until the public hearing starts at 6:30, if that would be something you would like to do.

CHAIR AHO: Yeah. So that gives about 5 minutes. So if anyone has questions, now would be a good time, because during the public testimony, we're really just receiving testimony. We're not here to answer questions as part of this. We're just going to read -- or hear the testimony and read it into the record.

So if anyone has a question for Mr. Ralston, now would be a great time to do that.

MR. TRAUGHER: Hi. My name is Tom Traughber. I live on Red Rock Lake, and I have a federally licensed amateur radio station with a 60-foot radio tower, and I do emit electronic emissions. It seems like this --

(Interruption in proceedings.)

MR. TRAUGHER: So I'm wondering, given
that my station has a federal license, how is this Zone C going to impact my operation?

MR. RALSTON: Sir, it will not. If you have a federal license and it doesn't have any -- your activity does not have any adverse impact on flight activity at the airport, which if you've been doing this for a while, it sounds like --

MR. TRAUGHBER: Twenty years.

MR. RALSTON: -- it hasn't, it's not going to impact it.

MR. TRAUGHBER: Thank you.

MR. RALSTON: You're welcome.

CHAIR AHO: Anyone else have any questions that they'd like to ask?

MS. LANGSDORF: Does it affect any cellular towers or radio station -- you know, us getting service?

MR. RALSTON: No. No. I mean, we're trying to protect against things that would interfere with the use of the existing equipment on the airport or the communications between pilots and air traffic controllers, and, I mean, these things are all going on today. So cell phones' frequencies tend to be on a completely different frequency spectrum than aviation frequencies. There's not going to be any changes. We
just want to be able to address any issues that come up with somebody using some very specialized equipment that would start having interference. It's highly unlikely to happen, but it's one of those things we want to protect against.

MS. LANGSDORF: Thank you.

MR. RALSTON: You're welcome.

CHAIR AHO: Any other questions?

(No response.)

CHAIR AHO: It looks like you did a great job and you've answered all the questions, and I think everyone is happy.

So at this time -- well, at 6:30, we've got 2 minutes left, then we'll start taking public testimony.

Mr. Beard.

MR. BEARD: Well, Mr. Chairman, as long as we're kind of running in place waiting for the clock to wind down ...

CHAIR AHO: Yep.

MR. BEARD: Neil, I'm interested in Safety Zone A. It's smaller than MnDOT's -- what MnDOT likes to see. Can you talk about how the commissioners are going to react to that, or have we had any experience with dealing with that? I've had some past experience
with that thousand-foot RPZ, they're pretty proud of
that, and we're asking, I think, for a variance from
that, if I'm not mistaken.

MR. RALSTON: Yeah, Commissioner, Board
members, we are proposing that the Safety Zone A in the
JAZB ordinance is a concurrent full size and shape with
the FAA's runway protection zone. We do have that in
place at MSP. That was part of the zoning ordinance at
the Minneapolis-St. Paul International Airport. We
believe that, you know, the FAA's criteria related to
the RPZ is very consistent with what MnDOT would have
in Zone A, and that it makes a lot of sense to pair
them together. We hope MnDOT agrees that it's
reasonable to make that correlation.

MR. BEARD: So, Mr. Chairman, then to be
clear, Neil, what you're proposing in this revised
zoning ordinance here comports with the FAA's
protection zone; MnDOT's is a little more expansive
than what the FAA is subscribing -- or prescribing?

MR. RALSTON: That's --

MR. BEARD: Okay.

MR. RALSTON: Sir, that is correct.

MR. BEARD: Thanks.

CHAIR AHO: Great. Thank you.

Any other questions from commissioners or
anyone in the audience?

Go ahead, sir.

MR. WINGERT: I have a question. I apologize, I was late.

You know, when we had the Super Bowl here, we had planes everywhere in Flying Cloud and there was a lot of noise. Do you -- is this a proposal to expand the runways and have bigger aircraft?

MR. RALSTON: No, sir. This has to do with -- the zoning ordinance has to do with land use and height restrictions around the airport to provide a balance between protecting pilots and people on the ground. It has nothing to do with expanding the airport.

MR. WINGERT: Larger aircraft coming here? It has nothing to do with larger aircraft?

MR. RALSTON: That is correct.

MR. WINGERT: Okay.

MR. RALSTON: This is purely to protect the existing infrastructure.

MR. TSCHOHL: Mr. Chair?

CHAIR AHO: Yes.

MR. TSCHOHL: One more question. There were two questions from the public about radio transmitters, other sources of interference. Just for
the record, would anything licensed by the FCC not be affected by this? Is that your understanding?

MR. RALSTON: My understanding is anything licensed by the FCC would have that review built in to make sure that it would not interfere with aviation frequencies.

MR. TSCHOHL: Thank you.

CHAIR AHO: All right. Well, it is 6:30 now, so now I'd like to open the floor up to comments by the public.

So we'll now take public testimony. Again, speaker cards are located at the entrance to this room, so if you've not filled out a card but would like to speak, please raise your hand and a card will be brought to you. We will not be answering any more public questions tonight. Really, this is just about hearing from the public on the Joint Airport Zoning Board proposed zoning.

And so we are not going to be taking any action or making any recommendation tonight. All of the verbal and written comments will be taken into consideration before taking final action at a future meeting of the Joint Airport Zoning Board.

So a reminder to all of the JAZB members, tonight's hearing is primarily for the public to
provide comments. Once the hearing is complete and all comments are received, we, the JAZB members, will have our chance to review the public record and deliberate before voting. While the chair does not wish to discourage JAZB members' questions or discussion today, it might be better to hold them for a later meeting when we have the benefit of the full public record.

And again, the public record is open, as Mr. Neil said, until 5 p.m. on Wednesday, March 14th, 2018. So there's a few weeks for people to get their notes into the public record, and if you want to -- oh, entering -- so, yeah. Let's see here.

If you want to deliver materials, you may make it a part of the record. Deliver them to the Board secretary at the Metropolitan Airports Commission, which is located at 6040 28th Avenue South, Minneapolis, Minnesota 55450, or you may transmit them by e-mail to fcm.zoning@mspamc.org [sic]. And if you need that again, talk to someone and we'll get that for you.

But finally, the Board requests that the public testimony focus on the proposed Flying Cloud Airport Zoning Ordinance. And again, let me note that this is not a public hearing on airport noise.

So at this time I don't have any cards for
requested speakers. I see we do have some back in the
back. Would you mind bringing those forward, and then
I will call the people forward as --

MS. CAMBRIDGE: These are blanks.

MR. RALSTON: Mr. Chair, while we're doing
that, I have a couple exhibits I'd like to enter into
the formal public meeting record, if that would be
okay.

CHAIR AHO: Okay. Oh, I see.

I'm sorry, say that again.

MR. RALSTON: I have a couple exhibits
that I'd like to enter into the public record before we
go into public testimony, so --

CHAIR AHO: Yes, I see that. I skipped
that part. I apologize.

MR. RALSTON: It's okay. Not to worry.

CHAIR AHO: So, yes, please -- at this
time, Mr. Ralston, please proceed with entering those
into the public record.

MR. RALSTON: All right. Thank you, Chair
Aho.

Notice of this public hearing was published in
several places: First of all, the Star Tribune
newspaper on February 12th and February 19th, 2018; it
was published in the Eden Prairie News newspaper on
February 15th; and in the State Register on February 12th. In addition, notices were mailed to the governing boards of the JAZB members' cities, Hennepin and Scott Counties, to property owners within approximately 1 mile of the Flying Cloud Airport boundary as determined by the City of Eden Prairie, and distributed electronically to persons subscribing to the Metropolitan Airports Commission GovDelivery news service.

Notice was also posted on the Flying Cloud Airport JAZB page of the MAC website. The notice and proposed Flying Cloud Airport Zoning Ordinance were made available for public inspection at the following locations: The Metropolitan Airports Commission main office, the city halls of the cities of Eden Prairie, Shakopee, and Chanhassen, and at the Eden Prairie Library.

The following exhibits that are part of the public hearing record at this point in time will be entered into the formal record.

First is Exhibit A, which is the Draft Flying Cloud Airport Zoning Ordinance that's dated January 18th, 2018.

Exhibit B is the Draft Flying Cloud Airport Zoning Ordinance Technical Report, dated January 18th,

Exhibit C is the public presentation that I made this evening here at the public hearing.

Exhibit D is the notice of public comment period and public hearing for the Draft Flying Cloud Airport Zoning Ordinance. That's the letter that most of you should have received in the mail.

Exhibit E is the affidavits of publication on the public notice -- of the public notice in the Star Tribune, Eden Prairie News, and State Register, dated February 23rd, February 21st, and February 12th, 2018, respectively.

Exhibit F is the affidavit of mailing of the public notice, dated February 12th, 2018.

Exhibit G is the affidavit of web posting of the public notice, dated February 26th, 2018.

Exhibit H is the affidavit of GovDelivery distribution of the public notice, dated February 26th, 2018.

And last but certainly not least, Exhibit I is the Flying Cloud Airport Joint Airport Zoning Board record for the meeting held on January 18th, 2018.

CHAIR AHO: All right. Thank you, Mr. Ralston, for reading that into the record. Sorry I missed you the first time.
Okay. Now we are open to comments by the public. So is there anyone that wishes to speak and make comments on the proposed Flying Cloud Airport Zoning Ordinance?

(No response.)

CHAIR AHO: And again, if you don't want to make them tonight formally at this meeting, you have until March 14th to do so, and that can be through e-mail, and the e-mail address was in the presentation. What I read just a moment ago was incorrect. It should be fcm.zoning@mspmac.org, mspmac.org. So that's the correct e-mail address. So if anyone wants to -- wishes to do that, you can do it by e-mail or you can do it by mailing it in or stopping in at the commission.

So is there any -- I'll give you another opportunity. Anyone that wishes to make public comment on the proposed zoning?

(No response.)

CHAIR AHO: All right. I'll ask one more time. Any further comments? Anyone like to make any comments?

(No response.)

CHAIR AHO: Seeing none, I will close the public hearing, and I'd like to remind everyone that
the hearing record will remain open until 5 p.m., Wednesday, March 14th, 2018. You may mail or deliver the materials that you wish to make a part of the record to the Board secretary at the Metropolitan Airports Commission, located at 6040 28th Avenue South, Minneapolis, Minnesota 55450, or you may transmit them by e-mail to fcm.zoning@mspmac.org.

Under state law, there's a number of additional steps that must take place prior to the adoption of a zoning ordinance, and Mr. Ralston went over those steps just previously. After the close of the comment period, this JAZB Board will meet again and we will review those public comments and decide whether to make any changes to this draft zoning airport -- airport zoning ordinance.

This ordinance would then be submitted to the commissioner for the Minnesota Department of Transportation for review and approval. After the commissioner's review, the JAZB will hold a second public hearing and submit the proposed ordinance to the Commissioner of Transportation a second time prior to adopting a zoning ordinance at the subsequent meeting.

So I'd like to just take this opportunity to thank everyone for your attention, thank you for coming out and participating, and we appreciate the interest.
in our airport and the zoning around it.

So thank you for attending, and the public hearing is now closed, and the meeting of the Joint Airport Zoning Board is adjourned.

Thank you.

(Proceedings concluded at 6:40 p.m.)
REPORTER'S CERTIFICATE

I, Caitlin J. Albrecht, Notary Public of and for the State of Minnesota, do hereby certify that the foregoing pages of typewritten material constitutes an accurate verbatim stenographic record taken by me of the Arbitration Proceedings aforementioned on the 27th day of February, 2018, at the times and place specified.

DATED: March 8, 2018.

Caitlin J. Albrecht
Item D –
Public Presentation Slides
Flying Cloud Airport
Joint Airport Zoning Board

27 February 2018
Public Hearing #1 – Overview of Proposed Airport Zoning Ordinance
Presentation Agenda

- Purpose & Goals
- Review of FCM Zoning Historical Timeline
- Summary of Draft FCM Airport Zoning Ordinance
- Next Steps

Terminology Key:
- Flying Cloud Airport = FCM
- Joint Airport Zoning Board = JAZB
- Minnesota Department of Transportation, Office of Aeronautics = MnDOT
- Federal Aviation Administration = FAA
Presentation Agenda

• Purpose & Goals
• Review of FCM Zoning Historical Timeline
• Summary of Draft FCM Airport Zoning Ordinance
• Next Steps
JAZB Purpose & Goals

Why is airport safety zoning important now?

• State requirements/expectations and funding implications
• Pace of development in the vicinity of Flying Cloud Airport is increasing
• Revenue-generating use opportunities on airport property
• Certainty for surrounding community
• Finish what was started in 2009
JAZB Purpose & Goals

Through a collaborative process, the JAZB seeks to develop an airport zoning ordinance that achieves a balance between a reasonable level of public safety and compatible community development.

In determining what minimum airport zoning regulations to adopt, Minnesota State Statutes guide the JAZB to consider the social and economic costs of restricting land uses versus the benefits derived from a strict application of the standards of the commissioner (the State Model Zoning Ordinance).
JAZB Purpose & Goals

Goals for the FCM JAZB include:

- Develop an FCM zoning ordinance for review and approval by the Commissioner of Transportation for subsequent adoption by the Board and then by local communities
- Update relevant sections of 2010 draft Zoning Ordinance to reflect current conditions
- Ensure appropriate level of stakeholder/community engagement

JAZB Participants

<table>
<thead>
<tr>
<th>City of Eden Prairie</th>
<th>City of Chanhassen</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Shakopee</td>
<td>Metropolitan Airports Commission</td>
</tr>
</tbody>
</table>
Presentation Agenda

- Purpose & Goals
- Review of FCM Zoning Historical Timeline
- Summary of Draft FCM Airport Zoning Ordinance
- Next Steps
JAZB Historical Timeline and Accomplishments

- **July 2009**: First FCM JAZB meeting
- **August 2009 – April 2010**: JAZB develops Draft Airport Zoning Ordinance
- **April 2010**: First Public Hearing for the draft Ordinance
- **December 2010**: JAZB approves submittal of Draft Airport Zoning Ordinance to MnDOT Commissioner
- **Early 2011**: MAC requests that MnDOT temporarily suspend Ordinance review due to legal uncertainties surrounding airport zoning related litigation pending at the time
- **2011 – 2015**: Court cases resolved
- **2016**: Decision made to re-convene FCM JAZB to move forward with the Draft Airport Zoning Ordinance
JAZB Historical Timeline and Accomplishments

- **September 2017:** First meeting of the re-convened FCM JAZB
- **October 2017 – January 2018:** JAZB reviews/updates Draft Airport Zoning Ordinance
  - Included updates to supporting studies: Safety/Risk Study and Economic Impact Analysis
- **January 18, 2018:** FCM JAZB formally approves updated Draft FCM Airport Zoning Ordinance for public review, comment, and hearing
- **February 27, 2018:** Public Hearing for updated Draft Airport Zoning Ordinance
Presentation Agenda

- Purpose & Goals
- Review of FCM Zoning Historical Timeline
- Summary of Draft FCM Airport Zoning Ordinance
- Next Steps
FCM Airfield Configuration

Runway 18-36 Length
- Updated Zoning Ordinance – 2,691 feet (existing length)
  - 2010 Draft Zoning Ordinance – 2,800 feet

Runway 10L–28R (north parallel)
- Updated Zoning Ordinance – “Utility” designation
  - 2010 Draft Zoning Ordinance – “Other Than Utility” designation
  - No change to length or width

Runway 10R–28L (south parallel)
- No change

Airfield configuration changes from the 2010 Draft Zoning Ordinance result in less restrictive zoning areas
Airport Zoning Ordinance Overview

Two primary components

Height Limitations

Land Use Limitations
FCM Airspace Zones (Height)

Height limitations imposed by Zoning Ordinance
Based on FAA Airspace criteria

• Limits the height of structures and vegetation under FCM airspace surfaces.
• Penetrations to the Airspace Zones will require a variance issued by a Board of Adjustment
  ▪ Exception – no variance required if the FAA issues a No Hazard airspace determination
FCM Airspace Zones (Height)

Height limitations imposed by Zoning Ordinance
Based on FAA Airspace criteria

- Grid maps in the Draft Ordinance show airspace surface heights in 10-foot intervals
- Heights are expressed as mean sea level, not above ground level
- More specificity provided on Maximum Construction Height Without Permit maps
FCM Maximum Construction Height Without Permit (Height)

Establishes a height per parcel up to which an airport zoning permit is not needed

- Used updated 1-foot airspace contours and more precise ground elevation contours
- Provides a buffer to Airspace Zones
- Exceeding the Maximum Construction Height Without Permit will require an Airport Zoning Permit from the City Zoning Administrator
FCM Maximum Construction Height Without Permit (Height)

Establishes a height per parcel up to which an airport zoning permit is not needed

- Grid maps in the Draft Ordinance show Maximum Construction Heights Without Permit for each parcel
- Heights are expressed above ground level
- In most cases, the airport zoning height limitations would be less restrictive than maximum heights allowed in the municipal zoning code.
FCM Safety Zones (Land Use)

JAZB Safety Zones Overview

JAZB Safety Zone A
- Most restrictive safety zone
- Prohibits the development of structures

JAZB Safety Zone B
- Less restrictive zone
- Prohibits certain land uses
- Allows residential development in Permitted Residential Areas
- Requires contiguous open space

JAZB Safety Zone C
- Least restrictive zone
- General land use restrictions against flight interference
FCM Safety Zones (Land Use)

JAZB Safety Zone C

- Least restrictive safety zone
- General prohibitions against land uses that would:
  - Create or cause interference with the operations of radio or electronic facilities
  - Create or causes interference with radio or electronic communications between FCM and aircraft
  - Make it difficult for pilots to distinguish between Airport lights and other lights
  - Result in glare in the eyes of pilots using FCM
  - Impair visibility in the vicinity of FCM
  - Otherwise endanger the landing, taking off, or maneuvering of aircraft in the runway approach areas.
- These apply to Zones A & B as well
FCM Safety Zones (Land Use)

JAZB Safety Zone B

Green trapezoid

- More restrictive safety zone
- Prohibits certain land uses
  - Amphitheaters, churches, hospitals, nursing homes, schools, stadiums, theaters, wildlife attractants
- Based on State Model Zone dimensions
- Less restrictive land use controls than State Model Zone B
  - No minimum parcel size for development
  - No site population restrictions based on site acreage
  - Based on detailed safety/risk study and economic impact analysis
FCM Safety Zones (Land Use)

JAZB Safety Zone B

Green trapezoid

Permitted Residential Areas

- Allows for the improvement, expansion, and development of new residential uses in areas guided for residential development
- These Permitted Residential Areas are recognized and treated as conforming land uses
FCM Safety Zones (Land Use)

JAZB Safety Zone B

Green trapezoid

Contiguous Open Space
- Requires a minimum of 20% of total Zone B acreage or 20 acres, whichever is greater, to remain as contiguous open space
  - Applies to the totality of Zone B, not per parcel
  - Requirement easily met by existing airport land and other land guided to remain as open space or not regularly occupied
FCM Safety Zones (Land Use)

JAZB Safety Zone A

**Blue trapezoid**

- Most restrictive safety zone
- Prohibits the development of structures
- Co-terminus with FAA Runway Protection Zones (RPZ)
  - The RPZ has similar land use restrictions
  - Mostly contained to airport-owned property
- Smaller than State Model Zone A
  - Based on detailed safety/risk study and economic impact analysis
FCM Draft Zoning Ordinance Language

Minor updates and clarifications from 2010 draft language

• Mostly updates to zone descriptions and dimensions based on minor airfield configuration changes
• Removed City of Bloomington from the list of JAZB participants
• Adding clarifying language about airspace evaluation process
• Clarified judicial review language
Presentation Agenda

• Purpose & Goals
• Review of FCM Zoning Historical Timeline
• Summary of Draft FCM Airport Zoning Ordinance
• Next Steps
Next Steps / Timeline

Next Steps

• Public comment period ends on March 14, 2018
• JAZB reviews comments submitted during public comment period
• JAZB schedules next meeting to:
  ▪ Review public comments and proposed responses
  ▪ Approve submittal of Updated Draft FCM Airport Zoning Ordinance to MnDOT for review
• Submit Draft Flying Cloud Zoning Ordinance to MnDOT
• Receive MnDOT comments and submit response
• Hold 2\textsuperscript{nd} Public Hearing after MnDOT approval
• Final adoption of the Zoning Ordinance by JAZB
• Adoption and enforcement of the FCM Airport Zoning Ordinance by participating municipalities

Comments can be sent to:
Secretary to the FCM Joint Airport Zoning Board
Metropolitan Airports Commission
6040 28th Avenue South
Minneapolis, MN 55450
—or—
emailed to: fcm.zoning@mspmac.org
Flying Cloud Airport
Joint Airport Zoning Board

Thank you for your participation!
Item E –

List of Exhibits Entered into the Public Hearing Record
List of exhibits entered into the record during the Public Hearing:

- Exhibit A – Draft Flying Cloud Airport Zoning Ordinance dated January 18, 2018
- Exhibit B – Draft Flying Cloud Airport Zoning Ordinance Technical Report dated January 18, 2018 and updated on February 6, 2018
- Exhibit C – Public Presentation by Neil Ralston, Airport Planner, Metropolitan Airports Commission
- Exhibit D – Notice of Public Comment Period and Public Hearing for Draft Flying Cloud Airport Zoning Ordinance
- Exhibit E – Affidavits of Publication of the Public Notice in the *Star Tribune*, *Eden Prairie News*, and *State Register*, dated February 23, February 21, and February 12, 2018 respectively
- Exhibit F – Affidavit of Mailing of the Public Notice, dated February 12, 2018
- Exhibit G – Affidavit of web posting of the Public Notice, dated February 26, 2018
- Exhibit H – Affidavit of GovDelivery distribution of the Public Notice, dated February 26, 2018
- Exhibit I – Flying Cloud Airport Joint Airport Zoning Board meeting record for January 18, 2018

These exhibits are available upon request to Shelly Cambridge, JAZB Secretary, at 612-726-8144 or via email at Shelly.Cambridge@mspmac.org.
Item F –
Written Public Comments and Responses
FLYING CLOUD AIRPORT DRAFT AIRPORT ZONING ORDINANCE
PUBLIC COMMENTS AND RESPONSES

RESPONSES TO PUBLIC COMMENTS

This section contains responses to comments received about the Draft Flying Cloud Airport Zoning Ordinance.

<table>
<thead>
<tr>
<th>Commenter</th>
<th>ID</th>
<th>Subject</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gary Hammer</td>
<td>1</td>
<td>My only comment about the proposal is that the airport has taken over our neighborhood over the years. Typical of Minnesota planning, development occurs after residential neighborhoods have been built and then the people living there are expected to go along with every proposal. The MAC needs to work in its website for reporting noise violations (it didn’t work for me the last time a jet flew over our home at 3:00 am) and acknowledge calls made to its telephone center reporting violations. Last time, I left a voice mail and received nothing back. That indicates to me that there isn’t much interest in violations. Other than that we don’t mind the air traffic at Flying Cloud and actually enjoy watching it.</td>
<td>The JAZB’s purpose is to collaboratively develop an airport zoning ordinance that achieves a balance between providing for a reasonable level of public safety while allowing for compatible community development. The implementation of airport zoning remains important for FCM for the following reasons: • Airport safety zoning accomplishes the state law direction to prevent airport hazards, and MnDOT’s expectation is that the JAZB will successfully zone FCM in order to avoid potential airport grant funding implications; • The pace of development around FCM is only increasing and the lack of an adopted airport safety zoning ordinance is creating uncertainty and confusion about possible land use controls and/or restrictions; • MAC would like to continue to pursue non-aeronautical uses of some FCM parcels located within designated safety zones. Uncertainty regarding zoning is holding up land release approvals. Adoption of an Airport Zoning Ordinance will not alter the number, frequency or noise level of traffic at Flying Cloud Airport. The present zoning effort underway is not being conducted to justify future airport expansion or to increase the size of aircraft operating at FCM. The portion of the comment pertaining to the noise complaint reporting system was...</td>
</tr>
<tr>
<td>Name</td>
<td>Email/Comment Date</td>
<td>Content</td>
<td>Response</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Dan Blake</td>
<td>Eden Prairie, MN February 12, 2018</td>
<td>Can you please tell me if my property is within the proposed JAZB Safety Zone B?</td>
<td>Responded as follows via email:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Good afternoon, and thank you for your inquiry.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Your property is not within the proposed JAZB Safety Zone B.</td>
</tr>
<tr>
<td>Tyler Stevenson</td>
<td>Eden Prairie, MN February 11, 2018</td>
<td>Does the prohibition of land use that results in glare in the eyes of pilots using FCM apply to the use of solar panels on the roof of a homestead within safety zone C?</td>
<td>Responded as follows via email:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Thank you for your question.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The proposed Flying Cloud Airport Zoning Ordinance does not seek to prohibit the installation of solar panels on residential rooftops within Safety Zone C. If a particular solar installation is determined to cause glare issues for pilots using the airport, we would want to work with the property owner to mitigate the visual impairment. However, based on operational experience, the likelihood of a residential rooftop solar installation to cause a serious glare problem is expected to be a rare occasion.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>In the event that a property owner wishes to be proactive about the potential from glare from a specific solar installation, there is an option of submitting an airspace review case to the Federal Aviation Administration (FAA) so they can take a look at it. Please let me know if you would like any further information about this process.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Again, thank you for your question.</td>
</tr>
<tr>
<td>Cynthia Pierce</td>
<td>Tulsa, OK March 9, 2018</td>
<td>Magellan Pipeline maintains a 12-inch high-pressured petroleum products pipeline and associated easements across the proposed Flying Cloud Airport zoning area. Please see attached GIS drawing showing the approximate location of the pipeline to the zoning area. While Magellan has no comments at this time, please continue to notify Magellan at the address and e-mail cited below of all activity.</td>
<td>Comment acknowledged.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Please acknowledge receipt of this e-mail. Thank you!</td>
<td></td>
</tr>
</tbody>
</table>
From: Gary Hammer <sledgehammer1951@gmail.com>  
Sent: Sunday, February 11, 2018 7:26 AM  
To: fcm.zoning@mspmac.org  
Subject: Proposal on Flying Cloud

My only comment about the proposal is that the airport has taken over our neighborhood over the years. Typical of Minnesota planning, development occurs after residential neighborhoods have been built and then the people living there are expected to go along with every proposal.

The MAC needs to work in its website for reporting noise violations (it didn’t work for me the last time a jet flew over our home at 3:00 am) and acknowledge calls made to its telephone center reporting violations. Last time, I left a voice mail and received nothing back. That indicates to me that there isn’t much interest in violations.

Other than that we don’t mind the air traffic at Flying Cloud and actually enjoy watching it.

Gary Hammer  
9841 Laguna Cir  
Eden Prairie, MN
Can you please tell me if my property is within the proposed JAZB Safety Zone B?

PID: 2911622210050
16831 Cedarcrest Dr
Eden Prairie, MN 55347

Thank you

Dan Blake
612.282.5482
Hello,

Does the prohibition of land use that results in glare in the eyes of pilots using FCM apply to the use of solar panels on the roof of a homestead within safety zone C?

Thank you,
Tyler

Tyler Stevenson
Cell: 612-251-3990
Metropolitan Airports Commission Zoning Board:

Magellan Pipeline maintains a 12-inch high-pressured petroleum products pipeline and associated easements across the proposed Flying Cloud Airport zoning area. Please see attached GIS drawing showing the approximate location of the pipeline to the zoning area. While Magellan has no comments at this time, please continue to notify Magellan at the address and e-mail cited below of all activity.

Please acknowledge receipt of this e-mail. Thank you!

~Cynthia Pierce
H. Cynthia Pierce
Magellan Midstream Partners, L.P.
PO Box 22186, MD OTC-8
Tulsa, OK 74121-2186
Office: 918-574-7464
Fax: 918-574-7885
cynthia.pierce@magellanlp.com

Make Safety An Everyday Priority!

Confidentiality Notice: The information contained in this message may be privileged and confidential and protected from disclosure. If the reader of this message is not the intended recipient, or an employee or agent responsible for delivering this message to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately by replying to the message and deleting it from your computer. Thank you.
This copy is not a survey and has been furnished by Magellan Pipeline Company, L.P. (Magellan) for information as to approximate locations only of any pipelines or other facilities shown thereon. Magellan disclaims any representations as to accuracy or completeness of the information depicted on this copy and makes no warranties regarding accuracy or completeness of such information depicted hereon. Actual locations of pipelines and facilities must be determined on-site through timely contact with the appropriate One Call agency - Call 811 - and coordination with Magellan. Excavation, grading, construction and/or vehicle traffic in the vicinity of the pipeline(s) and facilities shown on this copy are prohibited without written permission from Magellan or other owners of pipelines or facilities depicted hereon.
Flying Cloud Airport
Joint Airport Zoning Board

City of Chanhassen
City of Eden Prairie
City of Shakopee
Metropolitan Airports Commission