# AIRPORT DEVELOPMENT PLAN

# WAVERLY MUNICIPAL AIRPORT
# WAVERLY, IOWA

**NOVEMBER, 1992**

# WAVERLY MUNICIPAL AIRPORT

# AIRPORT DEVELOPMENT PLAN

**Prepared For**

**City of Waverly, Iowa**

Airport Commission

Mary Ann Ahrens - Chair
Gerald Vallem
Robert Meurer
Scott Otis
Norm Mutchler

City Council Liason

Bill Webster
Les Zelle

Airport Manager

Lee Nichols  Tom Nichols

Public Works

Larry Buchholz - Director
Richard Crayne - City Administrator

by

Johnson, Brickell, Mulcahy and Associates, Inc.
1992

## TABLE OF CONTENTS


| | TITLE | PAGE |
|---|---|---|
| Table of Contents | | i |
| List of Figures | | ii |
| List of Tables | | iii |
| Forward | | iv |
| Chapter One | Inventory | 1-1 |
| Chapter Two | Forecast of Aviation Demand | 2-1 |
| Chapter Three | Facility Requirements | 3-1 |
| Chapter Four | Cost/Benefit Considerations | 4-1 |
| Chapter Five | Development Alternatives | 5-1 |
| Chapter Six | Airport Layout Plan | 6-1 |
| Chapter Seven | Development Plan | 7-1 |
| Appendix A | Airport Ownership | A-1 |

## LIST OF FIGURES


| FIGURE | TITLE | PAGE |
|---|---|---|
| 1-1 | Bremer County | 1-2 |
| 1-2 | Waverly Municipal Airport | 1-4 |
| 1-3 | Pavement Condition Index Map | 1-6 |
| 1-4 | Airways | 1-8 |
| 1-5 | Instrument Approaches | 1-9 |
| 1-6 | Airport Soils | 1-12 |
| 1-7 | Topographic Conditions | 1-13 |
| 1-8 | Airport Service Area | 1-16 |
| 2-1 | Airport Service Area | 2-2 |
| 2-2 | Registered Aircraft, Bremer County, 1991-2010 | 2-5 |
| 2-3 | Based Aircraft, 1991-2010 | 2-8 |
| 2-4 | Design Airplane - Scenario A | 2-12 |
| 2-5 | Percent Annual Hourly Distribution at Waverly in 1987/1988 | 2-18 |
| 2-6 | Percent Annual Daily Distribution at Waverly in 1987/88 | 2-19 |
| 2-7 | Aviation Activity, Waverly, 1989-1992 | 2-21 |
| 3-1 | Windrose | 3-3 |
| 3-2 | Runway OFZ | 3-8 |
| 3-3 | Runway Visibility Zone | 3-9 |
| 3-4 | Tiedown Layouts | 3-17 |
| 6-1 | Airport Layout Plan | 6-4 |
| 6-2 | FAR Part 77 | 6-5 |
| 6-3 | Runway Protection Zone | 6-6 |
| 6-4 | Terminal Area | 6-7 |
| 7-1 | Ultimate Development Concept | 7-9 |

## LIST OF TABLES


| TABLE | TITLE | PAGE |
|---|---|---|
| 1-1 | Obstruction Data | 1-3 |
| 1-2 | PCI Rating | 1-6 |
| 1-3 | Sufficiency Ratios | 1-7 |
| 1-4 | Wind Direction | 1-8 |
| 1-5 | Airport Soils | 1-11 |
| 1-6 | Facility Development | 1-15 |
| 1-7 | Natural Change and Migration | 1-17 |
| 1-8 | Population Change, Bremer County, 1990-2010 | 1-18 |
| 1-9 | Historic Population Change, 1960-1990 | 1-18 |
| 1-10 | Resident Civilian Labor Force | 1-19 |
| 1-11 | Labor Force - Bremer County, 1986-1990 | 1-20 |
| 1-12 | Business Establishments, Bremer County | 1-20 |
| 1-13 | Per Capita Income, Bremer County | 1-21 |
| 1-14 | Farmland Value, 1981-1990 | 1-21 |
| 2-1 | Registered Airworthy Aircraft, Iowa, 1974-1990 | 2-3 |
| 2-2 | Registered Aircraft, Iowa, 1988-2010 | 2-3 |
| 2-3 | Registered Aircraft, Eight Counties, 1980-1989 | 2-4 |
| 2-4 | Registered Aircraft by Type, Bremer County | 2-4 |
| 2-5 | Aircraft Registrations - Bremer County, 1991 | 2-5 |
| 2-6 | Based Aircraft, 7 Public Owned Airports, 1984-1991 | 2-7 |
| 2-7 | Based Aircraft Mix, 1991-2010 | 2-9 |
| 2-8 | Operations, Iowa Tower Airports, FY 86-FY 90 | 2-14 |
| 2-9 | Annual Aircraft Operations, 29 Airports | 2-16 |
| 2-10 | Waverly Activity Count | 2-17 |
| 2-11 | Operational Activity, 1991 | 2-20 |
| 2-12 | Total Annual Operations | 2-22 |
| 2-13 | Local and Itinerant Operations | 2-22 |
| 2-14 | Primary Use By Aircraft Type | 2-23 |
| 2-15 | Annual Instrument Approaches | 2-25 |
| 3-1 | Recommended Runway Length | 3-5 |
| 3-2 | Taxiway Standards, B-II | 3-6 |
| 3-3 | RW & TW Clearance Standards | 3-7 |
| 4-1 | Waverly Airport Benefit Variables - Scenario A | 4-4 |
| 4-2 | Annual Transportation Benefit | 4-4 |
| 4-3 | Capital Costs - Public Sector | 4-9 |
| 4-4 | Capital Costs - Private Sector | 4-9 |
| 4-5 | Airport Benefit Summary, 1992-2011 | 4-9 |
| 4-6 | Benefit/Cost Ratio | 4-10 |
| 7-1 | Capital Project Cost Summary | 7-13 |
| 7-2 | Capital Improvement Program | 7-15 |

# FOREWARD

# WAVERLY MUNICIPAL AIRPORT

# DEVELOPMENT PLAN

## Airport Planning Process

The City of Waverly retained Johnson, Brickell, Mulcahy and Associates, Inc., to prepare an Airport Development Plan for the Waverly Municipal Airport. A grant-in-aid was obtained from the Iowa Department of Transportation to carry out a Scope of Work designed to address the extent, cost, feasibility, and schedule of future airport facility needs.

The primary goal of the Airport Development Plan was to identify future airport facility improvements which would satisfy aviation demand in a feasible and prudent manner. The objectives are noted below and were incorporated into the planning process described on the following page.

OBJECTIVES:

1. To provide an effective presentation of the future development of the airport and anticipated land uses in the vicinity of the airport.

2. To establish a realistic schedule for the implementation of the development proposed in the plan, particularly for the short term capital improvement program.

3. To propose an achievable financial plan to support the implementation schedule.

4. To justify the plan technically and procedurally through a thorough investigation of concepts and alternatives on technical, economic, and environmental grounds.

5. To present for public consideration, in a convincing and candid manner, a plan which adequately addresses the issues and satisfies local, state and Federal regulation.

6. To document policies and future aeronautical demands for reference in municipal deliberations on spending and debt incurrence and land use controls, e.g., subdivision regulations and the erection of potential obstructions to air navigation.

7. To set the stage and establish the frame work for a continuing planning process. Such a process should monitor key conditions and adjust plan recommendations if required by changed circumstances.

The report is presented in six chapters, the first of which summarizes relevant background information used in the preparation of Chapter Two through Six.

## AIRPORT DEVELOPMENT PLANNING PROCESS

I. INVENTORY

- Existing airport site(s)
- Airport service area
- Goals and objectives

II. FORECAST

- Registered aircraft
- Based aircraft
- Itinerant and local operations
- Air taxi operations
- Design aircraft
- Decision point

III. FACILITY NEED

- Wind coverage
- Runway length, width, strength
- Taxiway
- Landing and navigational needs
- FAR Part 77
- Terminal area

IV. BENEFIT/COST ASSESSMENT

- Demand/Capacity
- Airport service level
- Decision point

V. ALTERNATIVES

- On/Off airport land use
- Environmental considerations
- Development alternatives

VI. PLANS

- ALP
- Imaginary surfaces
- Runway protection zone plan/profile
- Terminal area plan

VII. IMPLEMENTATION

- Development schedule
- Cost estimates
- O & M
- Capital revenue sources
- Strategy for implementation

Citizen Participation On-going

SOURCE: JBM, 1992

# CHAPTER ONE

# INVENTORY

## Introduction

Chapter One describes existing conditions at the Waverly Municipal Airport as well as conditions within the airport service area. The inventory of existing conditions summarized within this Chapter include:

- A description of the geographic setting.
- A description of existing facilities and services now found at the Waverly Municipal Airport.
- A brief discussion of area airport facilities and their role within the Iowa State Aviation System Plan.
- A discussion a historic and future socioeconomic conditions within the airport service area.

## Geographic Setting

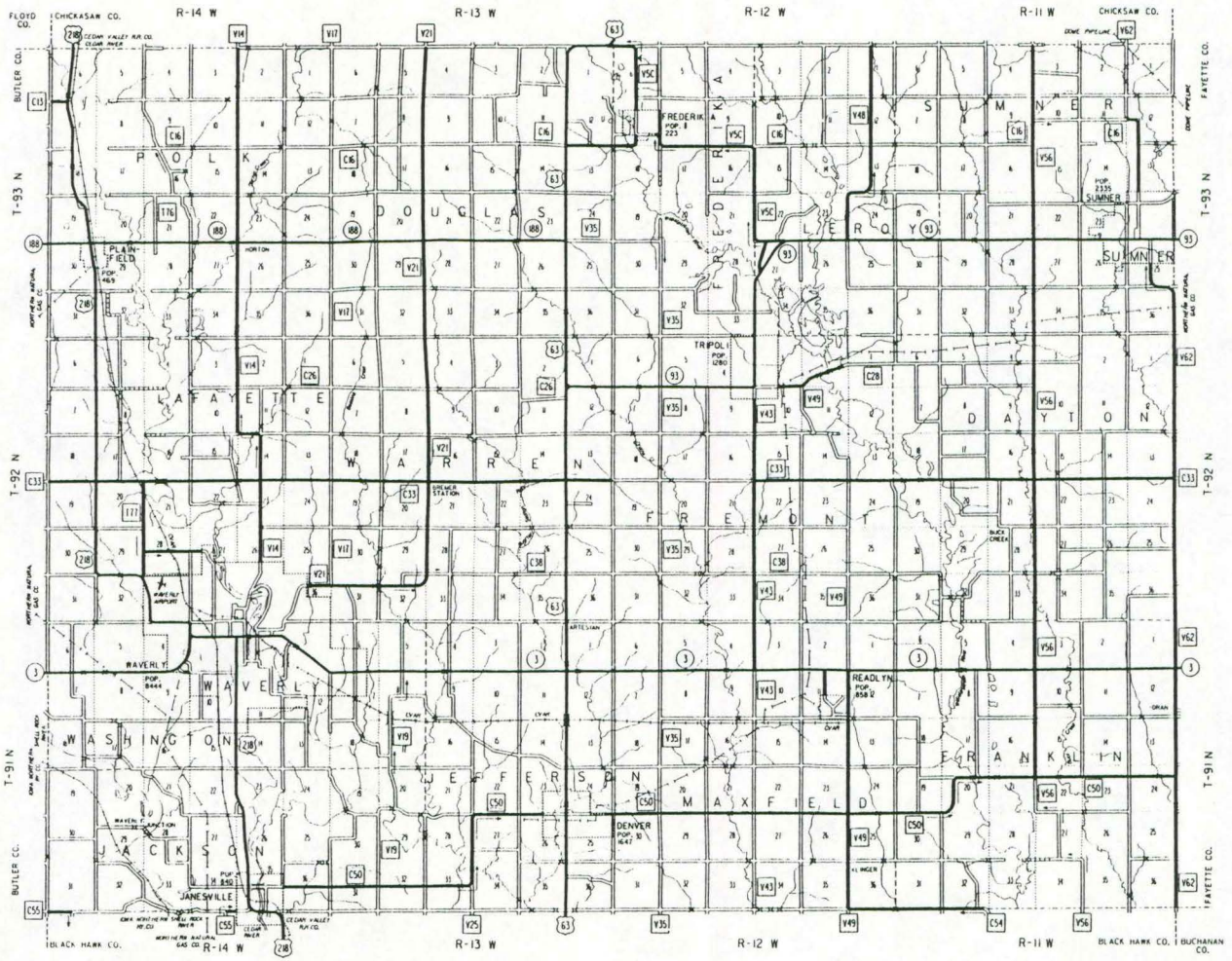
Waverly is located within the western one-quarter of Bremer County, approximately 14 miles north of the Waterloo - Cedar Falls metropolitan area. Regional accessibility is provided by U.S. Highways 218 and 63 in a north/south direction and by State Highway 3 in an east/west direction.

The community is located in close proximity of the "Avenue of the Saints", which will link the Minneapolis/St. Paul metropolitan area with St. Louis. Construction of the "Avenue of Saints", together with improvements to U.S. Highway 63, will enhance highway accessibility to the region.

The City of Waverly was incorporated on March 2, 1859 some seven (7) years after the first white family settled in the area. The community's location along the Cedar River together with a rich hinterland provided an impetus for population growth. Within the period 1854 to 1864, the Cedar Falls and Minnesota railroad was constructed along with a number of other business establishments. Wartburg College, a four-year liberal arts college was established in 1879.

The community has increased in population each decade; with 8,522 persons residing within the corporate boundary in 1990.

FIGURE 1-1: BREMER COUNTY




IOWA

Prepared By

Iowa Department of Transportation

Phone: (515) 239-1289

In Cooperation With

United States Department of Transportation

SCALE IN MILES

SCALE IN KILOMETERS

1988

PRODUCED WITH CADD 8-02-89 CARTOGRAPHIC SECTION

LEGEND

DIVIDED HIGHWAY
PAVED ROAD
BITUMINOUS ROAD
GRAVEL ROAD
EARTH ROAD

INTERSTATE HIGHWAY
UNITED STATES HIGHWAY
STATE HIGHWAY
COUNTY HIGHWAY

RAILROAD
PIPELINE
AIRPORT
HYDROLOGY
BRIDGE

STATE BOUNDARY
COUNTY BOUNDARY
CORPORATE LIMIT LINE
TOWNSHIP LINE
SECTION LINE

AS OF JANUARY 1, 1989

## Existing Development

The airport site, consisting of 48 acres, is located approximately three (3) miles northwest of the central business district. The airport latitude is 42°44'31.1" north. The longitude is 92°30'27.9" west.

Airfield development consists of a single runway. RW 10/28 is 2,800 feet in length and 50 feet in width. Low intensity runway edge and threshold lights are operational and non-precision instrument runway markings are maintained. RW 10/28 is not equipped, at the present time, with runway end identifier lights (REIL). A precision approach path indicator (PAPI) was recently installed on Runways 10 and 28.

A lighted wind indicator and a non-standard rotating beacon light are also operational.

Turnarounds are located on each runway end. A connecting taxiway, 40 feet in width, provides access to the apron area. The apron, 300' X 100' accommodates nine (9) tiedown spaces. An access taxiway, 20 feet in width, extends from the southwest corner of the apron to the 11 unit tee hangar. Underground fuel storage (80, 100LL) tanks are located within the terminal area.

- 100 LL 2,500 gallon storage
- 80/87 10,500 gallon storage
  These tanks are being replaced with two (2) 1,000 gallon above ground tanks.

Hangar buildings consist of a single 11 unit tee type hangar located west of the apron. An office/terminal building is located south of the apron. A conventional hangar used as a maintenance shop, was destroyed by a fire in 1986.

Access to the terminal area is provided from U.S. Highway 218 by a gravel access road. The vehicle parking lot has capacity for approximately 24 vehicles. Municipal water is available within the terminal area. The septic tank system was installed in 1981.

The Airport Master Record indicates the presence of obstructions in the approach and sidelines. These obstructions are penetrations of established safety areas and should be removed when feasible to do so.

**TABLE 1-1: OBSTRUCTION DATA**

| FAR Part 77 | RW 10 / RW 28 |
|---|---|
| CTLG Obstruction | Trees / ----- |
| Height above RW end | 22' / ----- |
| Distance from RW end | 550' / ----- |
| CNTRLN Offset | 150'R / ----- |
| Obstruction CLNC slope | 15:1 / 50:1 |

* RW 28: 8 ft brush located 125 feet from RW end.
* RW 10: Pole line extends along U.S. Highway 218 and county road. Obstruction marking on selected pole line.

SOURCE: IDOT, AIRPORT MASTER RECORD, 5/22/91

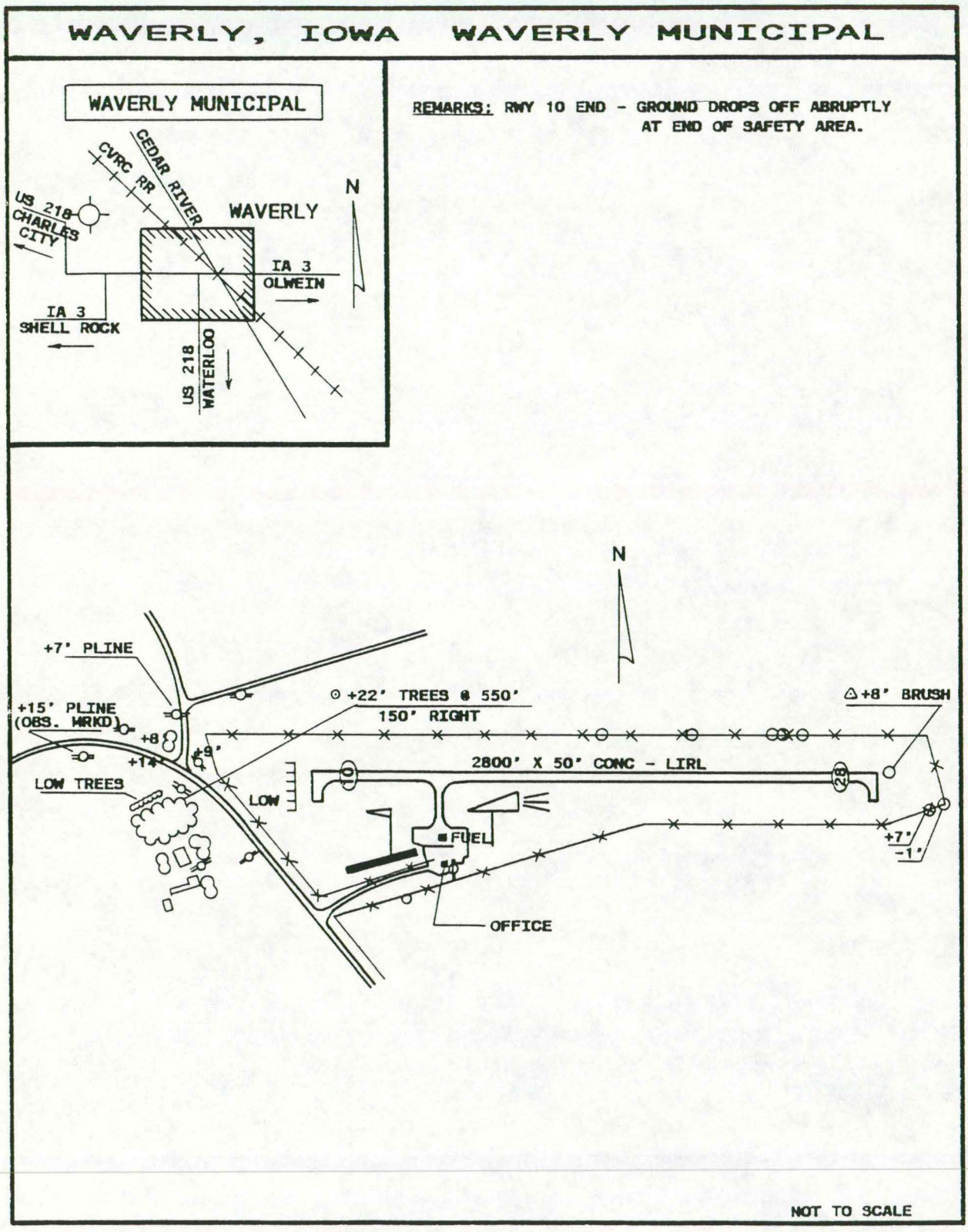



FIGURE 1-2: WAVERLY MUNICIPAL

Initial pavement construction in 1964 consisted of a seal-coated runway, connecting taxiway and apron. RW 10/28 the apron and connecting taxiway were reconstructed in 1983. Construction consisted of five (5) inch PCC over a four (4) inch crushed rock based and compacted subgrade. Turnarounds on each runway end were also constructed as was the access taxiway.

## Pavement Condition

The Pavement Condition Index, PCI, was developed to establish a numerical value indicating overall pavement condition. A pavement condition survey was conducted at the Waverly Municipal Airport in May of 1989.

The PCI's at the Waverly Municipal Airport ranged from 88 (excellent condition) to 97 (excellent condition). The average PCI for all airfield pavement features was 93 (excellent condition).

**TABLE 1-2: PCI RATING**

| BRANCH NUMBER/USE/ NAME | SECTION NUMBER/RANK/ SURF/AREA(SF) | LAST CONSTRUCT DATE | LAST INSPECTION DATE | PCI |
|---|---|---|---|---|
| A01WV/Apron/ Apron 1 | 01/P/PCC/29515.00 CAT: ZONE: C25 | June/01/1983 Age (YRS): 5.9 | May/10/1989 | 88 |
| R10WV/Runway/ Runway 10/28 | 01/P/PCC/145650.00 CAT: ZONE: C25 | Jun/01/1983 Age (YRS): 5.9 | May/10/1989 | 97 |
| T01WV/Taxiway/ Taxiway 01 | 01/P/PCC/9910.00 CAT: ZONE: C25 | Jun/01/1983 Age (YRS): 5.9 | May/10/1989 | 94 |

SOURCE: ERES CONSULTANTS, IMPLEMENTATION OF A STATEWIDE AIRPORT PAVEMENT MANAGEMENT PLAN - WAVERLY, January, 1990.

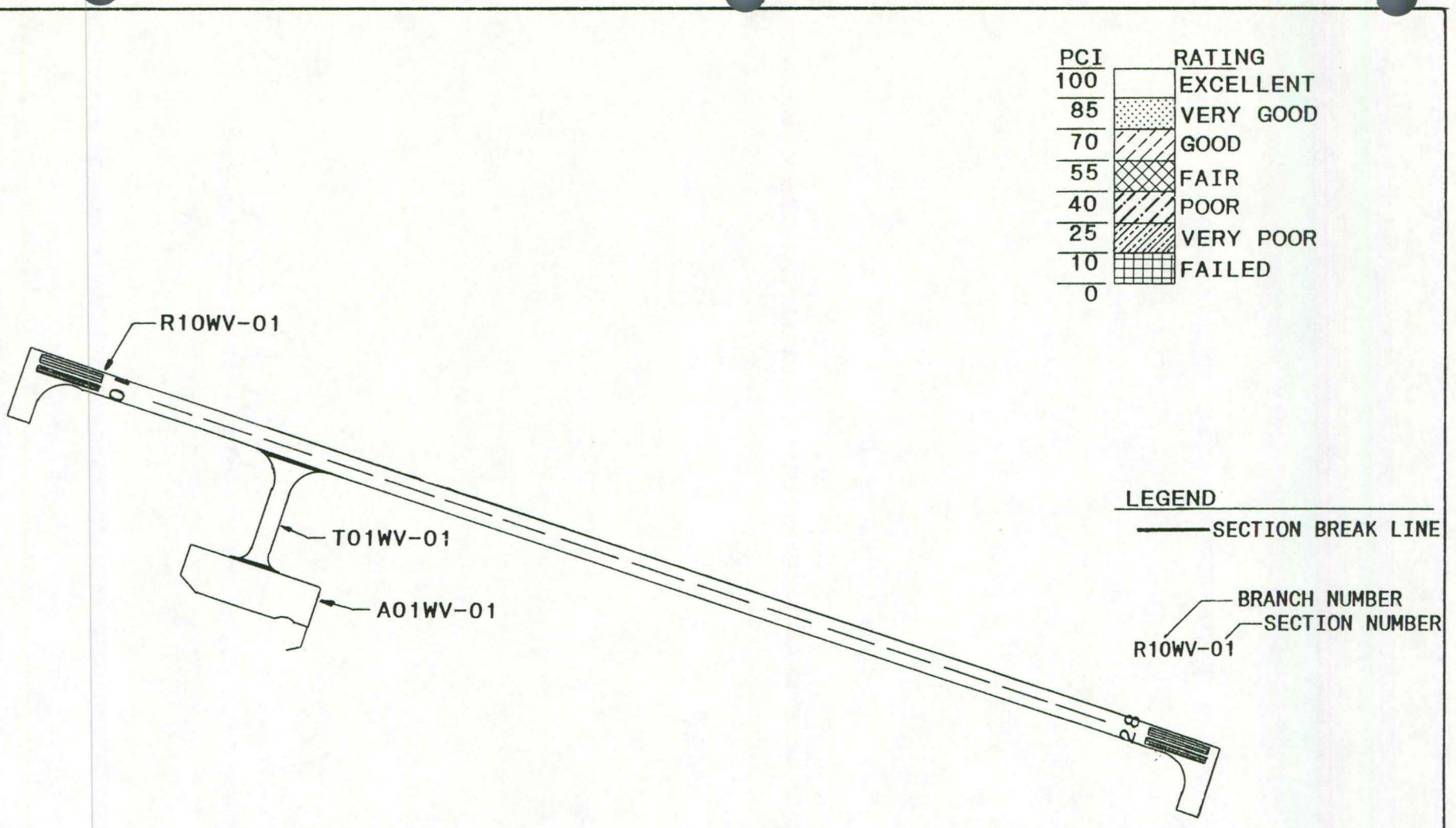
## Sufficiency Ratings

The Iowa Department of Transportation (IDOT) each year assigns a numerical rating describing the adequacy of the airport facilities. Each rating is assigned a maximum point value. The maximum ratings total 100 points. Airports receiving a rating of less than 50 points are encouraged by IDOT to consider some improvement. The Waverly Municipal Airport (Dec. 1991) received a total rating of 70.3 points.

The basic rating system consists of three (3) categories:

- Structural adequacy - measures the ability of runways, taxiways, and aprons to withstand specific wheel loads and given climatic conditions.
- Safety - measures the ability of the airport to provide for a safe level of service.
- Service - measures the capability of airport facilities to accommodate various types and volumes of aircraft that use the airport.

FIGURE 1-3: PAVEMENT CONDITION INDEX MAP




WAVERLY MUNICIPAL AIRPORT
PAVEMENT CONDITION
INDEX MAP

**TABLE 1-3: SUFFICIENCY RATINGS - WAVERLY MUNICIPAL AIRPORT**

| RATING ITEM | MAXIMUM | RATING |
|---|---|---|
| STRUCTURAL ADEQUACY | | |
| Runway Structural Adequacy | 24.0 | 21.0 |
| Taxiway/Apron Structural Adequacy | 6.0 | 5.4 |
| TOTAL STRUCTURAL ADEQUACY RATING | 30.0 | 26.4 |
| SAFETY | | |
| Runway Length | 5.0 | 2.6 |
| Runway Width | 4.0 | 1.8 |
| Surface Condition | 9.0 | 7.9 |
| Runway Safety Area | 4.0 | 2.3 |
| Lateral Clearance | 3.0 | 1.8 |
| Primary Surface Obstructions | 2.0 | 1.8 |
| Sight Distances | 2.0 | 1.8 |
| Approach Obstructions | 7.0 | 5.4 |
| Turns & Taxiways | 5.0 | 1.8 |
| **TOTAL SAFETY RATING** | | **40.027.1** |
| SERVICE | | |
| Runway Length | 8.0 | 4.1 |
| Runway Lighting | 5.0 | 2.7 |
| Capacity | 4.0 | 4.0 |
| Airfield Lighting | 5.0 | 2.0 |
| Aprons/Terminal Parking | 4.0 | 4.0 |
| Land Area | 4.0 | 0.0 |
| **TOTAL SERVICE RATING** | **30.0** | **16.8** |

SOURCE: IDOT, IOWA AIRPORT SUFFICIENCY RATINGS, Dec. 1990

ITEMS RATED BELOW TOLERABLE

| RATING ITEMS | RUNWAY ID |
|---|---|
| Rwy struct. adq. | Crosswind runway nonexistent |
| Rwy length-safety | Crosswind runway nonexistent |
| Rwy width | Crosswind runway nonexistent |
| Surface cond. | Crosswind runway nonexistent |
| Rwy safety | Crosswind runway nonexistent |
| Lateral clearance | Crosswind runway nonexistent |
| Primary surf. obstr. | Crosswind runway nonexistent |
| Sight distances | Crosswind runway nonexistent |
| App obstructions | Crosswind runway nonexistent |
| Turns/taxiway | Crosswind runway nonexistent |
| Runway length-service | Crosswind runway nonexistent |
| Rwy lighting | Crosswind runway nonexistent |
| AFL lighting | |
| Land area | |

## Airspace and Air Traffic Control

The Waverly Municipal Airport is within the airspace area served by the Minneapolis Air Route Traffic Control Center (ARTCC). The Minneapolis ARTCC has delegated certain airspace to the Waterloo Approach Control.

All aircraft are governed by either visual flight rules or instrument flight rules. During VFR Operations, the pilot maintains spatial orientation of an aircraft by visual reference. During IFR operations, the pilot maintains spatial orientation by reference to aircraft and ground navigational instruments.

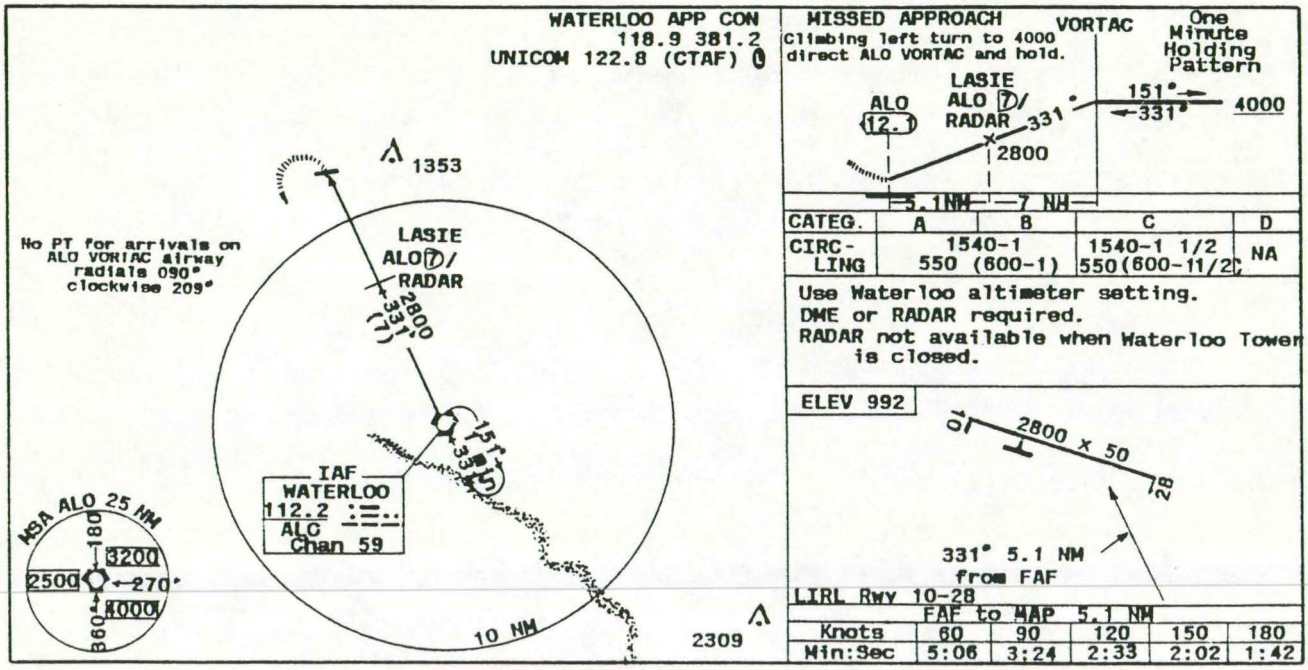
Area VORTAC facilities are located near Mason City and Waterloo. The Mason City VORTAC facility is located 3.4 miles south of Mason City Municipal Airport. The Waterloo VORTAC is located on the Waterloo Municipal Airport.

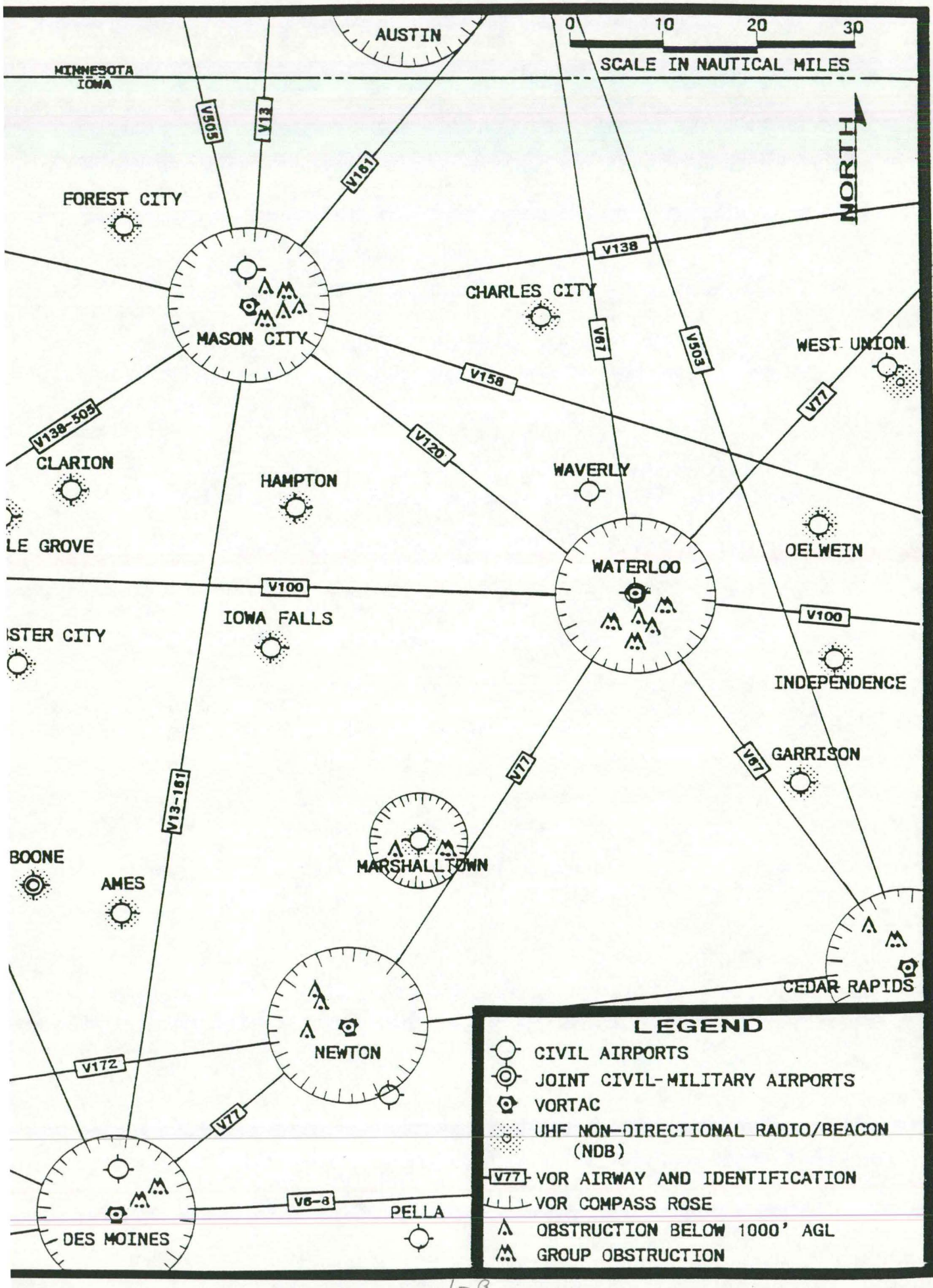
A number of low altitude federal airways radiate out from the VORTAC facilities. The VOR generates directional information and transmits it by ground equipment to the aircraft, providing 360 magnetic courses to and from the facility. Provision is also made for voice transmission and automatic identification of the facility on the same radio frequency.

## Navigational Aids

A non-precision instrument approach may be executed to Runways 10 and 28 using the Waterloo VORTAC. The Waterloo VORTAC is an enroute navigational aid located 12.1 nautical miles south of the Waverly Municipal Airport. A non-precision approach procedure is a standard instrument approach in which no electronic glide slope is provided.

**FIGURE 1-5: INSTRUMENT APPROACHES - WAVERLY MUNICIPAL**




AUSTIN
0 10 20 30
SCALE IN NAUTICAL MILES
MINNESOTA
IOWA
NORTH
V505
V13
V181
FOREST CITY
V138
MASON CITY
CHARLES CITY
V67
V503
WEST UNION
V158
V77
V138-505
CLARION
V120
HAMPTON
WAVERLY
LE GROVE
OELWEIN
WATERLOO
V100
IOWA FALLS
V100
INDEPENDENCE
GARRISON
V67
V77
V13-161
MARSHALLTOWN
BOONE
AMES
CEDAR RAPIDS
NEWTON
V172
V77
V6-8
PELLA
DES MOINES
LEGEND
CIVIL AIRPORTS
JOINT CIVIL-MILITARY AIRPORTS
VORTAC
UHF NON-DIRECTIONAL RADIO/BEACON (NDB)
V77 VOR AIRWAY AND IDENTIFICATION
VOR COMPASS ROSE
OBSTRUCTION BELOW 1000' AGL
GROUP OBSTRUCTION

MDA - Minimum Decent Altitude (1,540 feet):
The lowest altitude expressed in feet above mean sea level to which decent is authorized on final approach, where no electronic glide slope is provided, or during circle-to-land maneuvering in execution of a standard instrument approach procedure.

VIS - Visibility (One mile) (One and one half-mile) - C:
Meteorological visibility expressed in statue miles

HAA - Height Above Airport (550 feet)

T - Published Departure Procedure: (Waverly Muni. take-off minimums, RW 10 and 28: 300-1)

**Climatic**

The mean temperature ranges from 17 degrees fahrenheit in January to 74 degrees fahrenheit in July. Precipitation ranges from .66 inches in January to 4.78 inches in June with an annual average of 30.87 inches.

Temperature is an important factor in determining runway length. The mean maximum daily temperature is used as a variable in the computation of runway length. The Waterloo Airport Station reported a mean maximum daily temperature in July of 86.7 degrees fahrenheit for the period 1931 to 1960.

The prevailing winds are from the northwest in the winter and south during the summer months. Since wind data is not available for the Waverly Municipal Airport, wind data recorded at the Waterloo Station was selected as being the most representative. Data for the period 1982 to 1990 was obtained from the National Climatic Center.

Under all weather conditions, 63.2 percent of the observations were recorded between zero and 10 knots while 29.5 percent were recorded between 11 and 16 knots. The average annual wind speed within the period 1982 and 1990 was 9.2 knots.

**TABLE 1-4: WIND DIRECTION - 36 COMPASS POINTS**

| DIRECTION | % | DIRECTION | % | DIRECTION | % | DIRECTION | % |
|---|---|---|---|---|---|---|---|
| 1 | 1.5 | 11 | 2.2 | 21 | 2.0 | 31 | 5.5 |
| 2 | 1.2 | 12 | 3.2 | 22 | 1.9 | 32 | 4.7 |
| 3 | 1.3 | 13 | 4.0 | 23 | 1.8 | 33 | 4.2 |
| 4 | 1.3 | 14 | 3.6 | 24 | 1.9 | 34 | 3.1 |
| 5 | 1.5 | 15 | 3.8 | 25 | 1.6 | 35 | 2.7 |
| 6 | 2.1 | 16 | 4.1 | 26 | 1.5 | 36 | 2.4 |
| 7 | 1.6 | 17 | 4.6 | 27 | 1.8 | CALMS | 5.6 |
| 8 | 1.2 | 18 | 4.5 | 28 | 1.9 | | |
| 9 | 1.6 | 19 | 3.1 | 29 | 2.6 | | |
| 10 | 1.7 | 20 | 2.1 | 30 | 4.4 | | |

SOURCE: NATIONAL CLIMATIC CENTER, WATERLOO STATION, 1982-1990

## Soils

Five soil types are found on and in the immediate vicinity of the airport. These soils are noted as follows:

**TABLE 1-5: AIRPORT SOILS**

| MAP SYMBOL | NAME | PERCENT SLOPE | CAPABILITY UNIT (3) | AASHO (2) | CRS(1) |
|---|---|---|---|---|---|
| OSB | Ostrander Loam | 2-5 | IIE-1 | A-4, A-6 | 85 |
| CK | Clyde Clay Loam | 0-3 | IIW-1 | A-7, A-6 | 75 |
| ReB | Redlyn Loam | 2-5 | IIe-1 | A-6 | 85 |
| FoB | Floyd Loam | 1-4 | IIw-1 | A-6 | 80 |
| DoB | Dickinson-Ostrander Complex | 2-5 | IIe-2 | A-3, A-6 | 65 |

(1) Corn Suitability Rating

(2) AASHO - Soil classification ranging from those classified as A-1, consisting of gravelly soils of high bearing capacity to A-7 which is made up of clay soils having low strength when wet.

(3) Defines suitability for most types of farming. Class I soils have few limitations that affect their use. Class II soils have moderate limitations that reduce the choice of plants or require moderate conservation practice.

SOURCE: USDA, SOIL SURVEY - BREMER COUNTY, 1967

Ostrander soils consist of dark-colored, well drained soils that developed over friable glacial till and is found on nearly level ridge tops as well as on long moderate side slopes. Clyde clay loam soils is found in drainageways and in low, concave parts of uplands. Floyd loam occupies concave and slightly convex lower slopes that form coves of drainageways. Surface runoff associated with Floyd loam soils is defined as slow.

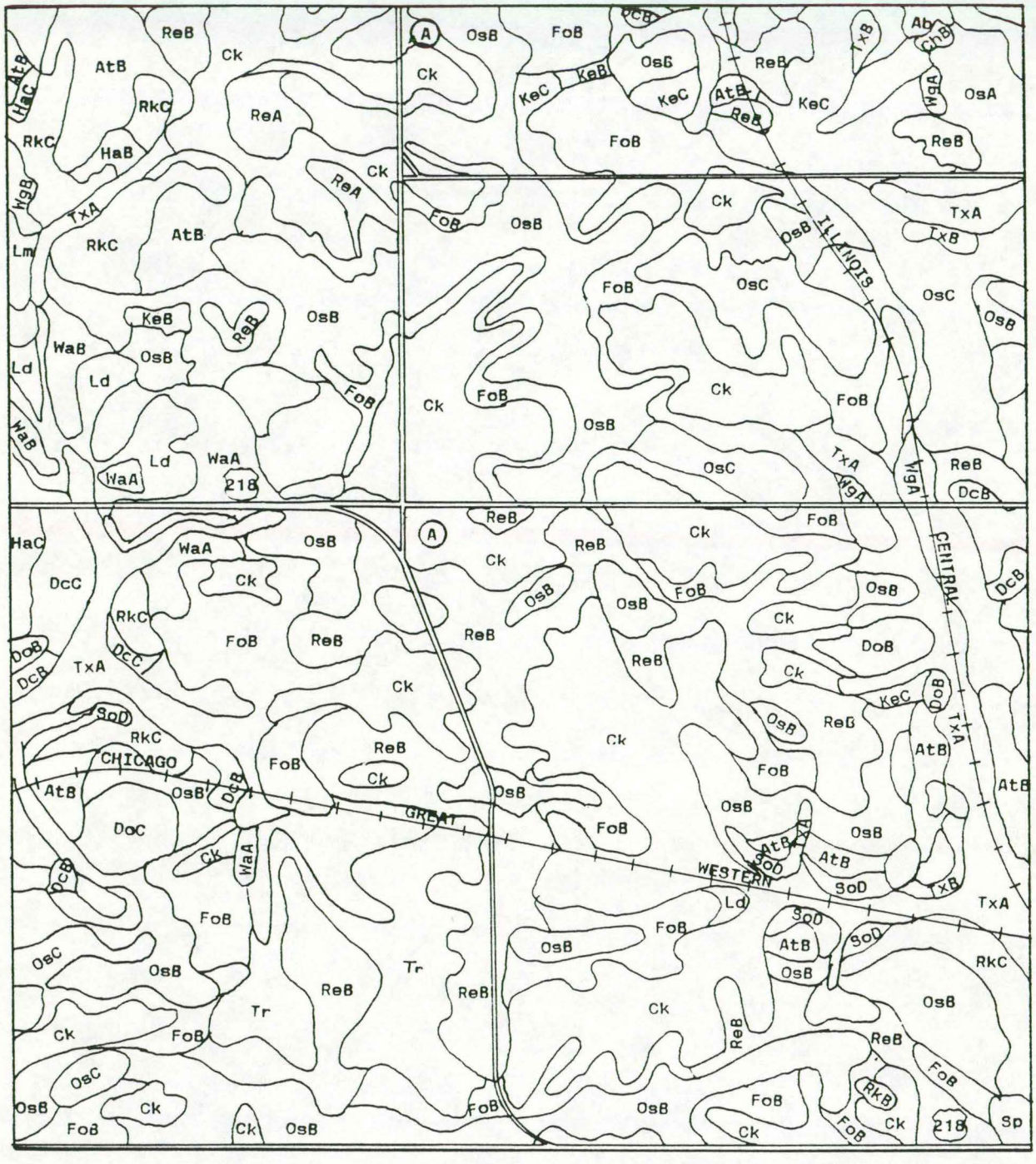
Dickinson sandy loam is found on ridges and upland slopes that face east, south and southeast. Redlyn loam is found on long, convex slopes and broad, rounded ridge crests. Intensive row cropping is typically found on agricultural land within the immediate vicinity of the airport.

## Topography

The airport is located at an elevation of 992 feet above sea level. RW 10/28 extends in a west/north-westerly direction across a north/south ridge line. Consequently, the terrain drops off beyond each runway end. Site drainage is provided by tributaries of the Cedar River. The site slopes away from the runway to the east, south and west. The terrain increases in elevation north of RW 10/28.

Relief is most pronounced south of the runway with a decrease in terrain exceeding 30 feet. Existing topographic conditions offer significant constraints to future development given the present airport layout.

FIGURE 1-6: AIRPORT SOILS



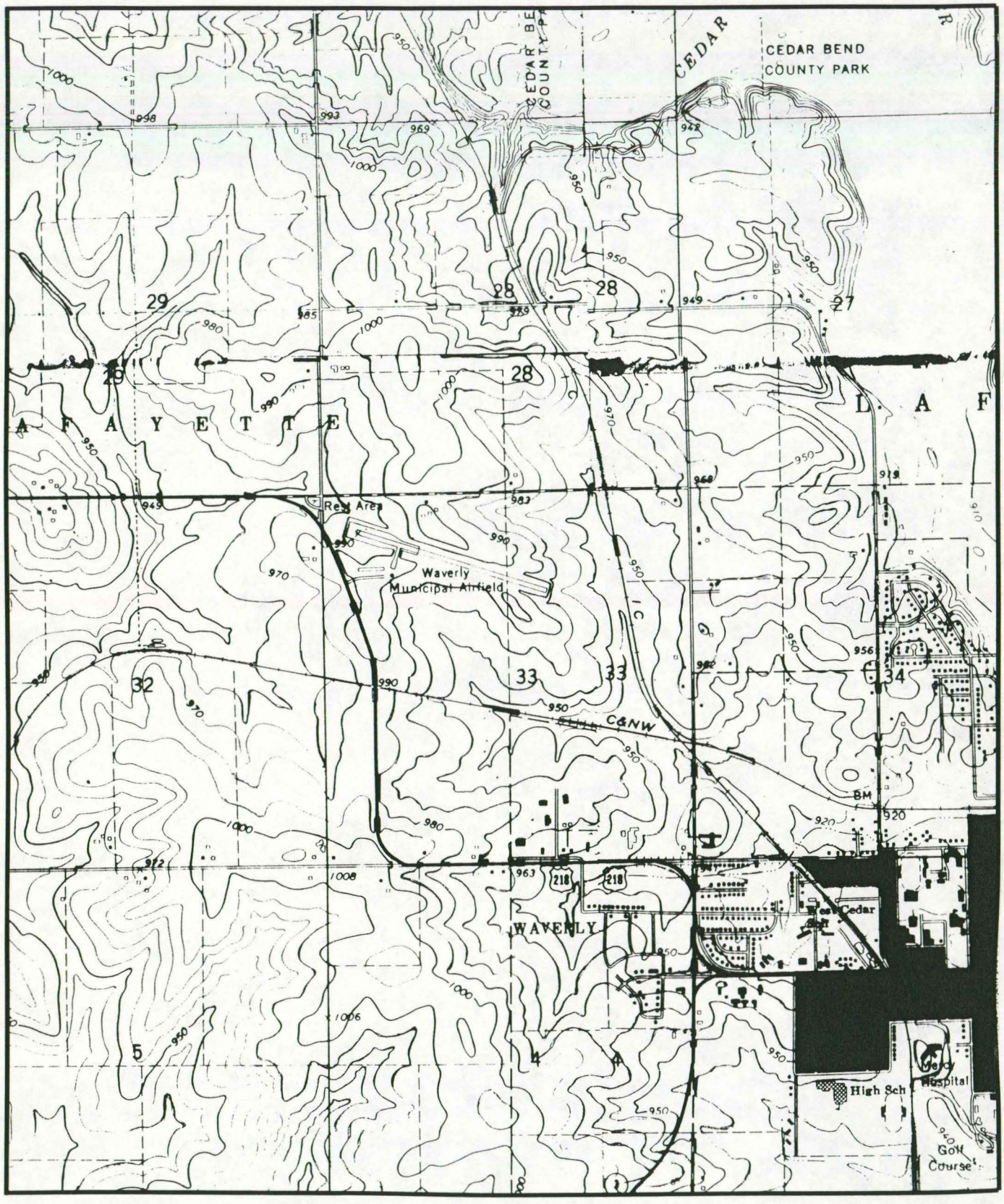



**FIGURE 1-7: TOPOGRAPHIC CONDITIONS**

## Iowa State Aviation System Plan

The 1991 Iowa State Aviation System Plan identified the Waverly Municipal Airport as a "Level II" airport within the state system. A "Level III" airport is one defined as follows:

Functional Role: To provide primary general aviation service.
Design Category: General Utility Facilities capable of handling some jet and large multi-engine aircraft, but primarily smaller aircraft. Primary runway lengths generally range from 3,400 feet to 4,000 feet.

Other area airports were classified as follows:

| AIRPORT | CLASSIFICATION | FUNCTION |
|---|---|---|
| Mason City | Level I | To provide scheduled passenger/freight |
| Charles City | Level II | To provide general aviation passenger/freight trans-port service |
| Oelwein | Level II | To provide general aviation passenger/freight trans-port service |
| Allison | Level IV | To provide local general aviation service |
| New Hampton | Level IV | To provide local general aviation service |
| Waterloo | Level I | To provide scheduled passenger/freight |

The 1991 plan also sets forth design guidelines. With the respect to the Waverly Municipal, the Iowa Department of Transportation would envision a primary runway no less than 3,400 feet in length and an ultimate length of 4,000 feet. A secondary runway is also recommended as is a partial parallel taxiway for all primary runways. Landing aids recommended consist of a medium intensity runway light system as well as runway end identifier lights. Approach slope indicators are also recommended. The guidelines are not standards that must be met, but represent the extent of facility development envisioned by IDOT for the Waverly Municipal Airport.

## National Plan of Integrated Airports

The Federal Airport system consists of those airports; public, civil and joint use (military/civil) within the U.S. and its territories considered necessary to provide a system of airports adequate to anticipate and meet the needs of the nation's civil aeronautics criteria for inclusion in the NPIAS is as follows:

> "An airport that was included in the predecessor to the current Plan should remain in the Plan if it is subject to a current compliance obligation resulting from a FAAP or ADAP grant."
>
> "An existing airport that is included in an accepted SASP or RASP may be included in the Plan if it has at least 10 based aircraft and services a community located 30 minutes or more average ground travel time from the nearest existing or proposed Plan airport. Proposed airports to serve such communities will be included if there is clear evidence that at least 10 aircraft will be based at the airport within the first year of its operation."

SOURCE: FAA, ORDER 5090.3B, October, 1983

## AREA AIRPORTS

### Public Owned Airports

Mason City, Waverly, Waterloo, Osage, New Hampton and Allison support public owned airports. These facilities are part of the Iowa Aviation System Plan. Of the area airports, all are designed to accommodate small airplanes with the exception of Mason City and Waterloo, which are designated as commercial service airports. The level of service provided by each of these facilities vary.

### TABLE 1-6: FACILITY DEVELOPMENT - SELECTED AIRPORTS

* Mason City Municipal

| Runway | Surface | Width | Length | Lights | REIL | VASI | Pattern |
|---|---|---|---|---|---|---|---|
| 12/30 | Asphalt | 150' | 5502' | MIRL | N/N | Y/Y | 800L |
| 17/35 | Asphalt | 150' | 6501' | HIRL | N/N | Y/Y | 800L |

Navigation
NDB-6 NM (MC) * LOC/OME BCRW17 * ILS - RW 35 * VOR/DME - RW 17
VOR-3 NM (MCW) * RNAV - RW 30 * VOR - RW 35
Approach Lights RW 17 and 35

* Allison Municipal

| Runway | Surface | Width | Length | Lights | REIL | VASI | Pattern |
|---|---|---|---|---|---|---|---|
| 18/36 | Turf | 155' | 2055' | NO | N/N | N/N | 800L |

Navigation
VOR 21 NM (ALO)

* New Hampton

| Runway | Surface | Width | Length | Lights | REIL | VASI | Pattern |
|---|---|---|---|---|---|---|---|
| 4/22 | Turf | 145' | 2550' | NO | N/N | N/N | 800L |
| 17/35 | Asphalt | 75' | 2900' | YES | N/N | N/N | 800L |

Navigation
VOR 37 NM (UKN)

* Osage

| Runway | Surface | Width | Length | Lights | REIL | VASI | Pattern |
|---|---|---|---|---|---|---|---|
| 17/35 | Concrete | 50' | 3400' | YES | N/N | N/N | 800L |

Navigation
VOR 26 NM (MCW)

* Waverly

| Runway | Surface | Width | Length | Lights | REIL | VASI | Pattern |
|---|---|---|---|---|---|---|---|
| 10/28 | Concrete | 50' | 2800' | MIRL | N/N | Y/Y | 800L |

Navigation
VOR 12 NM (ALO)

* Waterloo

| Runway | Surface | Width | Length | Lights | REIL | VASI | Pattern |
|---|---|---|---|---|---|---|---|
| 6/24 | Asphalt | 150' | 5403' | MIRL | -/- | 6/24 | 800L |
| 12/30 | Asphalt | 150' | 8401' | HIRL | -/- | -/30 | 800L |
| 18/36 | Asphalt | 150' | 6001' | MIRL | -/36 | -/36 | 800L |

Navigation
NDB - 6 NM * ILS-RW 12 * VOR/DME-RW 30 * VOR-RW 12
VOR - On Site * LOC BC-RW 30 * VOR-RW 6 * VOR-RW 18
* VOR-RW 24 VOR-RW 36 * NDB-RW 12

SOURCE: IDOT, 1991-92 IOWA AIRPORT DIRECTORY, July 1990.

## AIRPORT SERVICE AREA

### Geographic Area

The Waverly Municipal Airport Service Area consists of a primary and secondary area. The primary airport service area is defined as that geographic area where a majority of the general aviation traffic generated would use the Waverly Municipal Airport. The secondary service area would encompass that fringe area where the general aviation user may use the Waverly Facility or an area airport.

The Waverly Municipal Airport is located in the southwest quarter of Bremer County. The extreme eastern part of the County is located closer to the public airport at Oelwein than to the Waverly Airport. The north-northwestern area of the County is located equi-distant between Charles City and Waverly. Except for the airport at Allison, there are no competing public owned airports to the west.

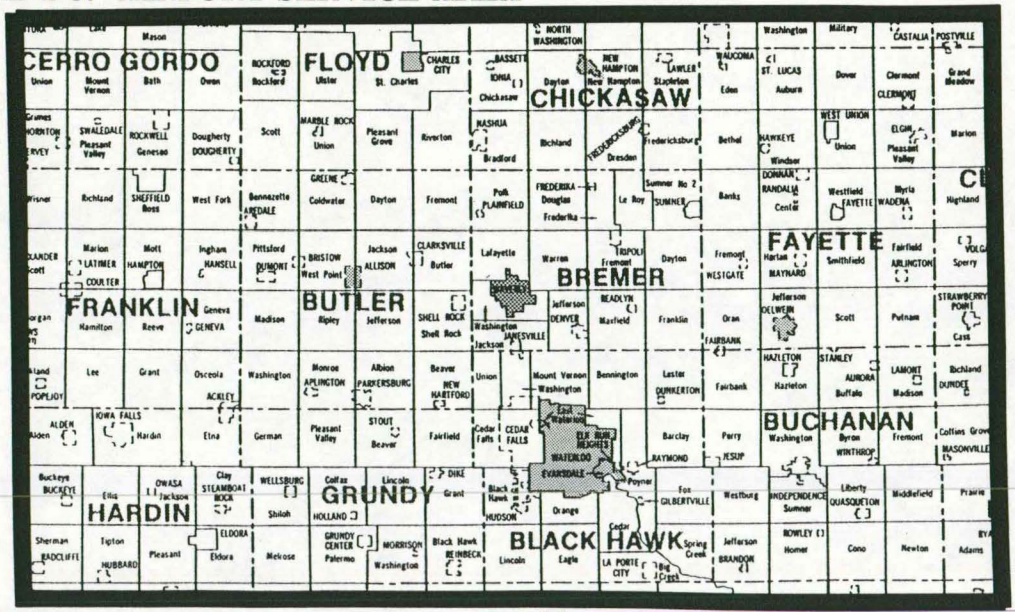
The airport service area is not only defined by the geographic location of competing facilities, but by the extent of facility development and services provided. The Waverly Airport, like other general aviation airports are located within the Waterloo Airport service area. Aircraft having a need for a runway length greater than provided at the smaller general aviation airports may use the Waterloo Municipal Airport.

The primary service area of the Waverly Municipal Airport coincides with the western three-fourths of Bremer County. A secondary or fringe area may be found in the extreme eastern one-fourth of the County. The fringe area would also extend into the eastern one-half of Butler County.

Public owned airports located at Allison, Charles City, New Hampton, West Union, Oelwein and Waterloo define the geographic extent of the Waverly Airport service area.

For purposes of this study, the service area is defined to coincide with the geographic limits of Bremer County. The primary airport service area would encompass 439 square miles.

**FIGURE 1-8: AIRPORT SERVICE AREA**



## Political Subdivisions

The airport service area includes all of 14 townships and 8 incorporated cities.

**POLITICAL SUBDIVISIONS - AIRPORT SERVICE AREA**

| | | | | | |
|---|---|---|---|---|---|
| County: (1) | | | | | |
| Bremer | | | | | |
| Township | | | | | |
| Dayton | Frederika | Jefferson | Polk | Douglas | Fremont |
| LaFayetta | Sumner No. 2 | Franklin | Jackson | LeRoy | Warren |
| Maxfield | Washington | | | | |
| Incorporated | | | | | |
| Frederika | Denver | Plainfield | Waverly | Tripoli | Readlyn |
| Sumner | Jamesville | | | | |

SOURCE: PDS, 1992

The above political subdivision benefit from the Waverly Municipal Airport. Beyond providing accessibility to Bremer County from some 13,000 other public owned airports throughout the U.S., there are a number of indirect benefits extended from the airport. While difficult to quantify, they provide a basis for multi-jurisdictional support of the airport.

## Historic Population Change

Within the period 1960 to 1980, Bremer County experienced a population increase of 3,712 persons or 17.6 percent of the 1960 population. Bremer County experienced its first population decrease since 1910 within the period 1980 to 1990. In 1990, 22,813 persons resided within the County.

The three (3) components of population change are births, deaths and migration. Within four (4) periods noted in the following table, the number of births exceeded the number of deaths. Consequently, the more salient component contributing to the population decrease was the out migration of county residents. As noted, 2,977 persons left the county between 1979 and 1989.

**TABLE 1-7: NATURAL CHANGE AND MIGRATION**

| | NATURAL CHANGE | MIGRATION | BIRTHS | DEATHS |
|---|---|---|---|---|
| 1950-1959 | 2,629 | - 405 | 4,565 | 1,936 |
| 1960-1969 | 2,065 | - 436 | 4,036 | 1,971 |
| 1970-1979 | 1,212 | + 871 | 3,296 | 2,084 |
| 1980-1989 | 970 | -2,977 | 3,103 | 2,133 |

SOURCE: WILLIS GOUDY AND SANDRA BURKE, IOWA COUNTIES - 1991 Ed.

Historic and projected population change within Bremer County is summarized in the following table. Of the three (3) projections, those prepared by the State Demographer and IDOT envision a year 2000 population of 27,267 to 28,834. The Woods and Poole Economics projections suggest that the population will continue to increase through 2010, but at a more modest rate. Without a major and

continued effort to create job opportunities for those persons within their family formation years, the Woods and Poole projection is more realistic. For purposes of this study, future population change is expected to continue an upward trend through 2010.

The Waterloo/Cedar Falls metropolitan area is expected to contribute to future population increase within Bremer County, especially with planned improvements to U.S. Highways 63 and 218.

**TABLE 1-8: POPULATION CHANGE, BREMER COUNTY, 1990-2010**

| HISTORIC | U.S. CENSUS |
|---|---|
| 1960 | 21,108 |
| 1970 | 22,737 |
| 1980 | 24,820 |
| 1990 | 22,813 |

| FORECAST | STATE DEMOGRAPHER | IDOT | WOODS AND POOLE ECONOMICS |
|---|---|---|---|
| 2000 | 25,600 | 27,267 | 23,720 |
| 2010 | ------ | 28,834 | 24,350 |

SOURCE: WILLIS GOUDY AND SANDRA BURKE, IOWA COUNTIES - 1991 Ed.

With the exception of Waverly, the remaining seven (7) incorporated communities within the airport service area experienced a population loss between 1980 and 1990. Less than one-third of the county's population resided within Waverly in 1960. The City of Waverly increased its share of the County population each decade since 1960. In 1990 37.4 percent of the County population lived in Waverly. Within the period 1960 to 1990, Waverly experienced a population increase of 2,165 persons or 34.1 percent over the 30 year period.

**TABLE 1-9: HISTORIC POPULATION CHANGE, 1960-1990**

| COMMUNITY | 1960 | 1970 | 1980 | 1990 |
|---|---|---|---|---|
| Waverly | 6,357 | 7,205 | 8,444 | 8,522 |
| Numerical chg. | ---- | 848 | 1,239 | 78 |
| Percent chg. | ---- | 13.3 | 17.2 | 0.9 |
| Bremer County | 21,108 | 22,737 | 24,820 | 22,813 |
| City as % of County | 30.11 | 31.7 | 34.0 | 37.4 |

| OTHER INCORPORATED CITIES | 1960 | 1970 | 1980 | 1990 |
|---|---|---|---|---|
| Frederika | 249 | 190 | 223 | - 185 |
| Denver | 831 | 1,169 | 1,647 | + 1,566 |
| Janesville | 648 | 741 | 840 | + 817 |
| Readlyn | 547 | 616 | 858 | + 773 |
| Sumner | 2,170 | 2,174 | 2,335 | - 2,077 |
| Tripoli | 1,179 | 1,345 | 1,280 | + 1,188 |
| Plainfield | 445 | 446 | 469 | + 455 |

SOURCE: I.S.U., CENSUS SERVICES, 1/25/91

## Historic Employment

The resident civilian labor force within Bremer County from 1980 to 1990 experienced annual increases and decreases. There were, in 1990, 120 fewer persons in the resident civilian labor force than 1980. The percent unemployed in 1990 was the lowest of any year between 1980 and 1990.

Historic data presented in the following table is the method by which an individual, unemployed or employed, is counted in the area where the individual lives regardless of the area where they work.

**TABLE 1-10: RESIDENT CIVILIAN LABOR FORCE**

| Year | Resident Civilian Labor Force (1) | Percent Unemployed | Year | Resident Civilian Labor Force (1) | Percent Unemployed |
|---|---|---|---|---|---|
| 1980 | 10,920 | 5.8 | 1986 | 10,100 | 9.7 |
| 1981 | 10,610 | 6.8 | 1987 | 10,100 | 7.0 |
| 1982 | 10,720 | 9.7 | 1988 | 10,500 | 4.1 |
| 1983 | 11,200 | 9.2 | 1989 | 10,700 | 3.7 |
| 1984 | 10,600 | 7.6 | 1990 | 10,800 | 3.5 |
| 1985 | 10,200 | 9.4 | 1991 | ------- | ----- |

(1) By place of residence

SOURCE: IOWA DEPARTMENT OF EMPLOYMENT SERVICES, LABOR FORCE SUMMARY, 1980-1990

Employment and wage data is compiled as reported by employees subject to State Unemployment Insurance laws and from federal agencies subject to the Unemployment Comprehensive for Federal Employees (UCFE) program. The employment data is reported by place of work as opposed to place of residence. It excludes proprietors, self-employed, unpaid family members, etc.

The data presented in the following table provides an indication of employment trends within the period 1986 to 1990. All categories of employment reported experienced an increase except for those employed in the transportation sector and by state and/or federal government.

Persons employed within the manufacturing sector increased by 32.1 percent between 1986 and 1990. In 1990 there were 1,791 persons employed in the manufacturing sector compared with 1,942 in trade, and 1,490 in the service sector. Employment within the financial sector increased from 695 in 1986 to 809 in 1990. Total employment by industrial sectors covered by unemployment insurance increased by 19.1 percent within the period 1986-1990.

**TABLE 1-11: LABOR FORCE - BREMER COUNTY, 1986-1990**

| | | 1986 | 1987 | 1988 | 1989 | 1990 | % Change 86-90 |
|---|---|---|---|---|---|---|---|
| I. | Total Industries | 6,539 | 6,681 | 7,443 | 7,471 | 7,788 | 19.1 |
| II. | Private Business | 5,316 | 5,444 | 5,864 | 6,239 | 6,528 | 22.8 |
| | Ag. & Mining | 69 | 65 | 63 | 62 | 87 | 26.1 |
| | Construction | 184 | 223 | 237 | 259 | 292 | 58.7 |
| | Manufacturing | 1,356 | 1,293 | 1,613 | 1,686 | 1,791 | 32.1 |
| | Transportation | 144 | 127 | 118 | 133 | 114 | -20.8 |
| | Trade | 1,617 | 1,808 | 1,846 | 2,005 | 1,942 | 20.1 |
| | Finance | 695 | 668 | 663 | 702 | 809 | 16.4 |
| | Services | 1,249 | 1,257 | 1,321 | 1,389 | 1,490 | 19.3 |
| III. | Government | 1,223 | 1,237 | 1,238 | 2,283 | 1,260 | - 3.0 |
| | State | 42 | 34 | 32 | 31 | 31 | -26.2 |
| | Local | 1,109 | 1,126 | 1,134 | 1,134 | 1,157 | 4.3 |
| | Federal | 72 | 77 | 72 | 75 | 72 | 0.0 |

Average year employment. Employment subject to unemployment insurance coverage.

SOURCE: IOWA DEPARTMENT OF JOB SERVICES, ANNUAL REPORT, 1986-1990

The number of business establishments in Bremer County experienced a modest increase between 1980 and 1985 followed by a slight decrease within the period 1986-1989. While the number of business establishments increased by five (5) percent from 1980 to 1989, employment increased by 36.5 percent. In 1989, the 564 business establishments employed 7,946 persons with an annual payroll of 139,673,000 dollars.

**TABLE 1-12: BUSINESS ESTABLISHMENTS, BREMER COUNTY, 1989-1989**

| YEAR | NUMBER OF ESTABLISHMENTS (1) | NUMBER OF EMPLOYEES | ANNUAL PAYROLL (1,000) |
|---|---|---|---|
| 1980 | 537 | 5,821 | $ 65,188,000 |
| 1985 | 586 | 5,891 | $ 91,621,000 |
| 1989 | 564 | 7,946 | $139,673,000 |

(1) An establishment is defined as a single physical location where business is conducted or where services or industrial operations are performed.

SOURCE: WILLIS GOUDY AND SANDRA BURKE, IOWA'S COUNTIES - 1991 ED.

Changes in per capita income provide another indicator of economic conditions within the airport service area. The per capita income increased from 9,112 dollars in 1980 to 14,782 dollars in 1989.

**TABLE 1-13: PER CAPITA INCOME, BREMER COUNTY, 1980-1989**

| YEAR | PER CAPITA (1) | YEAR | PER CAPITA |
|---|---|---|---|
| 1980 | 9,112 | 1985 | 11,904 |
| 1981 | 10,100 | 1986 | 12,397 |
| 1982 | 10,050 | 1987 | 12,995 |
| 1983 | 10,071 | 1988 | 13,515 |
| 1984 | 11,262 | 1989 | 14,782 |

(1) Bureau of Economic Analysis tabulation is based upon income from sources such as wages, salaries, self-employment, farming, interest, rent, social security, and public assistance. It also includes the imputed value of non-monetary income or benefits such as medicare, public housing subsides, and other "in-kind" resources.

SOURCE: WILLIS GOUDY AND SANDRA BURKE, IOWA'S COUNTIES - 1991 ED.

The agricultural sector like most sectors of the economy experienced some difficulty in the early and to mid 80's. The following table summarizes changes in farm land values from 1980 to 1990.

**TABLE 1-14: FARMLAND VALUE, 1981-1990**

| YEAR | DOLLARS/ACRE | YEAR | DOLLARS/ACRE |
|---|---|---|---|
| 1981 | 2,463 | 1986 | 861 |
| 1982 | 2,078 | 1987 | 931 |
| 1983 | 1,934 | 1988 | 1,108 |
| 1984 | 1,588 | 1989 | 1,235 |
| 1985 | 1,082 | 1990 | 1,324 |

SOURCE: WILLIS GOUDY AND SANDRA BURKE, IOWA'S COUNTIES - 1991 ED.'

The average per acre value of farmland in 1970 was 420 dollars increasing to 2,259 dollars per acre in 1980. A significant decrease was noted within the period 1981 to 1986. Since 1986, a modest increase in farmland values have been reported.

The number of farms within Bremer County have experienced a decrease since 1970. At the same time, the average farm size has increased. In 1990, there were 1,440 farms in Bremer County with an average size of 228 acres.

# CHAPTER TWO

# FORECAST OF AVIATION DEMAND

## INTRODUCTION

### Forecast Methodology

The forecast of aviation demand provides a basis by which to establish an estimate of potential aviation activity within a defined geographic area. In estimating potential demand, consideration must be given to a number of variables which influence demand within the airport service area.

- Aircraft ownership (registered aircraft)
- Pilots
- Population change, income
- Labor force characteristics
- Major industrial and business users
- Area airport facilities and services

Economic activity within the airport service area, along with area airport facilities and services are the more important variables influencing aviation demand. In relatively small communities, the addition or elimination of a single industry can substantially change the level of aviation activity. In large communities, a plant opening or closure may have less impact upon total usage due to the mix of activity found.

Aircraft ownership is influenced by socioeconomic trends within the airport service area as well as the cost associated with such ownership. Nationally, general aviation has undergone a major change with long-term growth of the active fleet slowing down.

> "Since 1978 there has been a dramatic decline in shipments of all types of general aviation aircraft. A number of reasons have been advanced for this, chief among them being rapid price increases, high interest rates, and expensive fuel over this period. Recent data, however, suggests that the downturn of the past decade in aircraft shipments may have bottomed out. Shipments in FY1989 totaled 1,430, an increase of 28.9 percent over 1988."

SOURCE: FAA, FAA Aviation Forecasts, FY 1990-2001, FAA-APO 901, March, 1990, p.4

Future aircraft ownership within the airport service area is expected to reflect national trends.

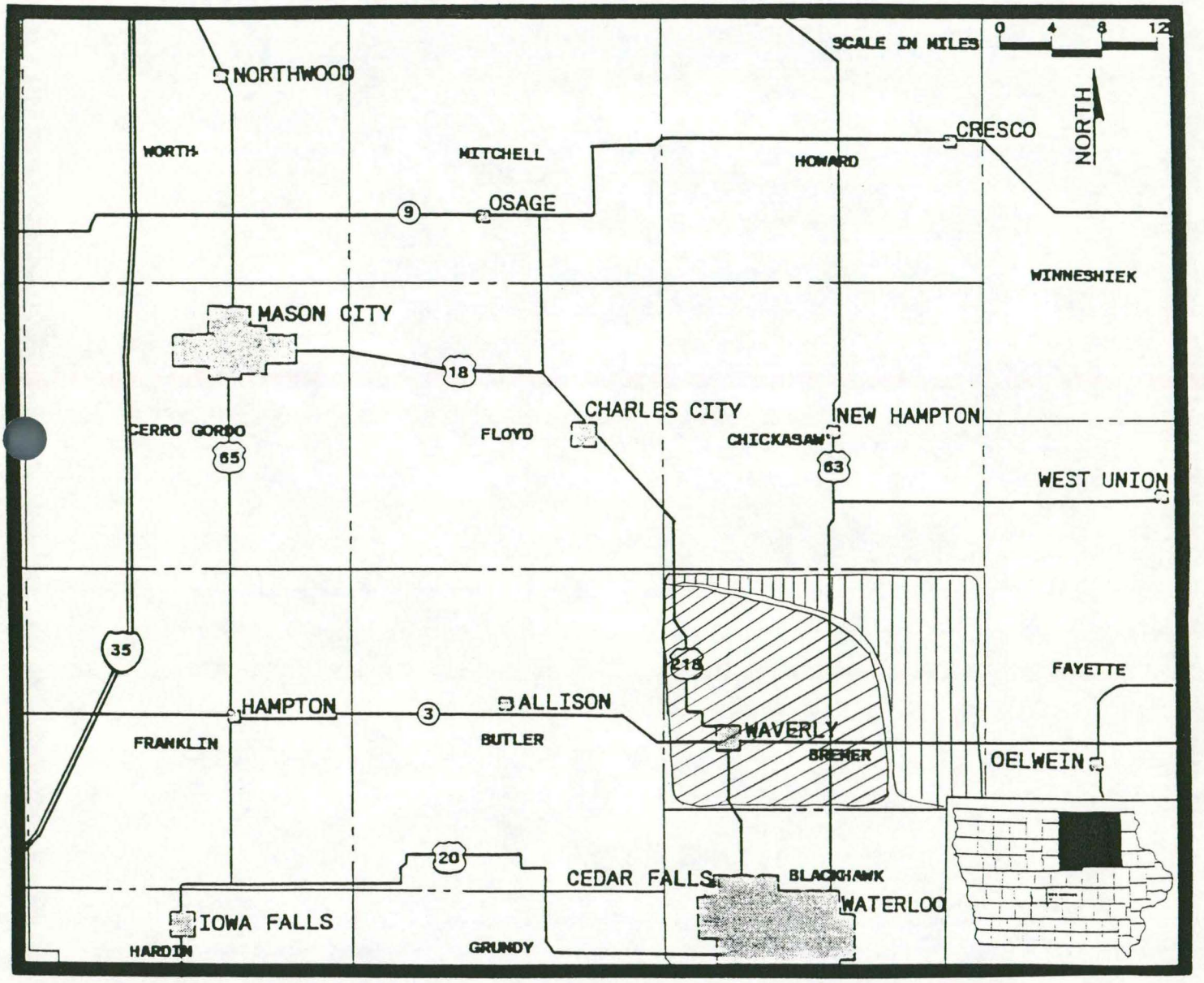
The forecast of aviation activity will also be influenced by the extent of facility development and site location. A final consideration falls within the realm of individual choice. The decision to base an aircraft at one facility or another is influenced by the extent of facility development and services provided. For example, the availability of aircraft storage facilities and associated costs are important considerations in basing an aircraft as are services provided by the Fixed Base Operator (FBO).

Touch and go operations generated by student traffic may be largely due in part to efforts by the FBO in promoting aviation while itinerant traffic is influenced by economic activity within the

airport service area. The decision to travel or transport an item from one point to another is based upon a number of factors.

- Distance and accessibility, isolation
- Trip purpose and cost
- Commodity, value
- Availability of other modes

**FIGURE 2-1: AIRPORT SERVICE AREA**



Iowa Trends

Aviation activity in Iowa has also experienced considerable change. Table 2-1 summarizes the number of aircraft registered in the State of Iowa from FY74 through FY90. As noted, the number of aircraft experienced a continual increase to 1979 when 3,530 aircraft were registered in the State. Beginning in 1980, the number of aircraft registered has experienced a continual decrease with 3,079 aircraft registered in FY84 and 2,535 in FY88. There was a small increase in registration from 1988 to 1989 followed by a decrease in 1990.

**TABLE 2-1: REGISTERED AIRWORTHY AIRCRAFT, IOWA, FISCAL YEAR 1974-1990**

| YEAR | AIRCRAFT | YEAR | AIRCRAFT | YEAR | AIRCRAFT |
|---|---|---|---|---|---|
| 1974 | 2,565 | 1980 | 3,492 | 1986 | 2,962 |
| 1975 | 2,620 | 1981 | 3,417 | 1987 | 2,962 |
| 1976 | 3,144 | 1982 | 3,417 | 1988 | 2,599 |
| 1977 | 3,308 | 1983 | 3,335 | 1989 | 2,535 |
| 1978 | 3,492 | 1984 | 3,099 | 1990 | 2,543 |
| 1979 | 3,530 | 1985 | 2,962 | 1991 | 2,514 |

SOURCE: IDOT, AERONAUTICS DIVISION, 1990 (Airworthy Aircraft)

Annual changes in aircraft ownership parallel economic changes. As the Gross State Product in real terms begins to grow in a positive direction, the number of aircraft may also increase. Historically, as the Gross State Product increased, so did the number of registered general aviation aircraft. This historic pattern however is expected to undergo some changes.

**TABLE 2-2: REGISTERED AIRCRAFT, IOWA, 1988-2010**

| YEAR | IDOT | YEAR | IDOT |
|---|---|---|---|
| 1988 | 2,535 | 2000 | 2,562 |
| 1990 | 2,514 | 2010 | 2,600 |
| 1995 | 2,537 | | |

SOURCE: (1) IOWA DEPARTMENT OF TRANSPORTATION

Regional Trends

An eight county area was selected for a more indepth comparative assessment than that provided by a review of statewide trends. Table 2-3 summarizes registered general aviation aircraft by county for the period 1980 through 1989. The number of registered aircraft within the eight county area decreased from 326 in 1981 to 300 in 1989. Of the 300 registered aircraft within the eight county area, 22 (7.3%) were registered in Bremer County.

## TABLE 2-3: REGISTERED AIRCRAFT, EIGHT COUNTIES, 1980-1989

| County | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
|---|---|---|---|---|---|---|---|---|---|---|
| Buchanan | 23 | 25 | 26 | 23 | 21 | 21 | 21 | 20 | 21 | 22 |
| Butler | 16 | 19 | 25 | 26 | 22 | 22 | 23 | 21 | 19 | 19 |
| Bremer | 26 | 25 | 23 | 22 | 36 | 36 | 34 | 24 | 21 | 22 |
| Black Hawk | 168 | 166 | 155 | 148 | 151 | 151 | 150 | 173 | 175 | 170 |
| Chicksaw | 12 | 13 | 14 | 12 | 10 | 10 | 8 | 7 | 7 | 5 |
| Fayette | 33 | 31 | 30 | 30 | 9 | 9 | 21 | 22 | 20 | 20 |
| Floyd | 37 | 33 | 34 | 32 | 34 | 34 | 33 | 34 | 30 | 32 |
| Grundy | 11 | 10 | 9 | 11 | 10 | 10 | 9 | 9 | 10 | 10 |
| TOTAL | 326 | 322 | 316 | 305 | 299 | 293 | 299 | 310 | 303 | 300 |

SOURCE: FAA, CENSUS OF U.S. CIVIL AIRCRAFT, AMS-420, 1980-89 (As of Dec. 31)

The eight county area recorded a 7.9 percent fewer registered aircraft in 1989 than in 1980. With the exception of Fayette and Chickasaw, the remaining counties recorded only modest decreases in aircraft registrations. Black Hawk County actually experienced an increase in the number of registered aircraft.

Bremer County

Table 2-4 summarizes the registered aircraft mix for the period 1985 through 1989. Within the five (5) year period, the number of single engine piston powered airplanes decreased from 27 to 16. The number of registered multi-engine piston powered airplanes decreased from 6 to 3. There was one (1) turbo prop aircraft registered throughout the five year period.

## TABLE 2-4: REGISTERED AIRCRAFT BY TYPE, BREMER COUNTY

| | PISTON | | | | TURBOPROP | | | |
|---|---|---|---|---|---|---|---|---|
| | SINGLE ENG. | | MULTI-ENG. | | MULTI-ENG. | | | |
| | 1-3 PLACE | 4+ PLACE | 1-6 PLACE | 7+ PLACE | 1-12 PLACE | 13+ PLACE | TURBOJET | OTHER/ROTO-CRAFT |
| 1985 | 5 | 22 | 3 | 3 | 1 | -- | 1 | -/2 |
| 1986 | 4 | 22 | 2 | 3 | 1 | -- | -- | 1/1 |
| 1987 | 5 | 12 | 2 | 2 | 1 | -- | -- | 1/1 |
| 1988 | 3 | 12 | 3 | -- | 1 | -- | -- | 1/1 |
| 1989 | 2 | 14 | 3 | -- | 1 | -- | -- | 1/1 |
| 1990 | -- | --- | -- | -- | -- | -- | -- | ---- |

(1) There were no turbojet registrations recorded

SOURCE: FAA, CENSUS OF U.S. CIVIL AIRCRAFT, AMS-420, Dec. 31, 1989

As of Dec. 31, 1989, 72.7 percent of all registered aircraft were single engine piston powered aircraft. Multi-engine piston powered aircraft comprised 13.6 percent of the registered fleet.

The number of registered aircraft within Bremer County decreased from 26 in 1980 to 21 in 1984. A significant increase in registrations were recorded in 1985 and 1986 followed by a significant decrease in 1987. Over the ten (10) year period, there were 25 aircraft registered on an average annual basis. Actual numbers fell within a range of 21 to 36. Nearly all of the decrease can be attributed to fewer single engine piston powered aircraft being registered within Bremer County.

The Iowa Department of Transportation (IDOT) records indicate that there were five (5) active airworthy aircraft registered in Bremer County as of August 1991. The following table lists registered aircraft by zip code and includes make, model, year and city.

**TABLE 2-5: AIRCRAFT REGISTRATIONS - BREMER COUNTY, 1991**

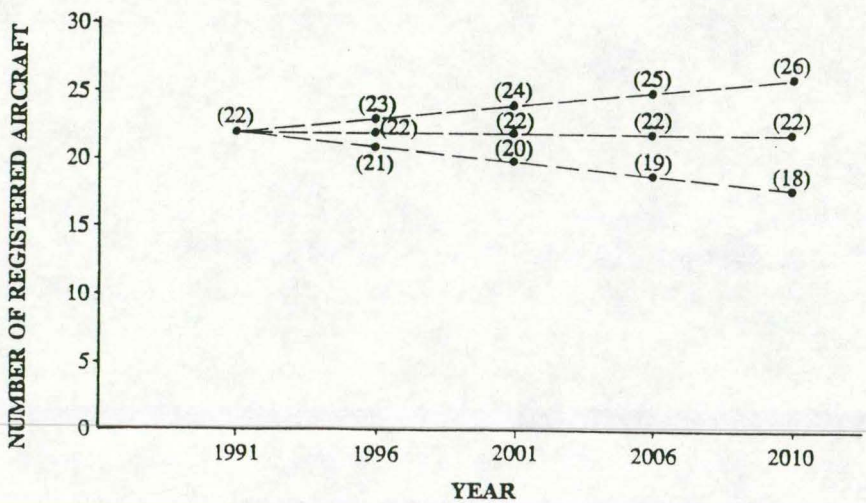
| ZIP CODE | CITY | YEAR | MAKE/MODEL | ENGINE |
|---|---|---|---|---|
| 50677 | Waverly | 76 | Cessna 182P | S |
| 50622 | Denver | 75 | PA28 RB 200 | S |
| 50676 | Tripoli | 72 | Scorpion Too | S |
| 50644 | Independence | 78 | Cessna R 182 | S |
| 50647 | Janesville | 79 | PA32-300 | S |

SOURCE: IDOT - AIR AND TRANSIT DIVISION, AUGUST, 1991.

Bremer County is not expected to experience significant increases or decreases in the number of registered aircraft. Several factors contribute to the perceived stability. Among these are the geographic proximity of Waverly to the Waterloo/Cedar Falls metropolitan area, historic increases in population as well as a diversified economic base. The continued modest increases in population are expected to continue through 2010. Efforts to expand employment opportunities within Waverly are expected to be successful. Consequently, a stable population and employment scenario is envisioned for Waverly.

Aircraft registrations are expected to follow the trend line illustrated in the following figure with annual deviations of one (1) to four (4) aircraft above and/or below the trend line.

**FIGURE 2-2: REGISTERED AIRCRAFT, BREMER COUNTY, 1991-2010.**



Based Aircraft

The number of aircraft based at a facility is dependent to some degree upon the geographic location of the facility as well as the extent of facility development and services provided. In assessing the number of aircraft that would be based at the Waverly Municipal Airport, consideration must be given to the relationship such a facility would have to existing private and public airports in the area.

To facilitate understanding of the estimates for a specific airport location, reference is made to the 1978 SASP which concludes:

> "The choice of a site for basing an aircraft is not always directly related to the residence of the owner. The choice may be affected by such factors as hangar rental and maintenance free structure, availability of terminal services, availability of navigational aids, runway length and condition, etc. An aircraft may be based several miles from the owner's place of residence in order to have access to more attractive features. Current based aircraft figures would indicate that some airports which provide services desired by aircraft owners may attract a larger number of aircraft than are registered in the county, while in other areas the total aircraft based in the county is less than the total registered aircraft in the county."

The above will explain some of the annual variations of general aviation aircraft registered or based at one airport or another. Those airports which now enjoy numbers of based aircraft owned by persons from outside the community or airport service area, may in the future lose their historical dominance.

> "Ideally, as airport development improves the quality of airports throughout the State, the attractiveness of the airports will become more similar causing the number of aircraft based in a county to more nearly equal the number registered in that county."

SOURCE: SASP, 1978 (p.39)

Historic numbers of based aircraft at seven (7) public airports within the immediate vicinity of the Waverly Municipal Airport are summarized in Table 2-6. The total number of aircraft based at seven public owned airports decreased from 190 in 1984 to 144 in 1986. Waterloo accounted for nearly all of the decrease. Since 1986, the number of aircraft based at the seven (7) public owned airports has remained essentially unchanged.

## TABLE 2-6: BASED AIRCRAFT, SEVEN PUBLIC OWNED AIRPORTS, 1984-1991

| Airport | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | County |
|---|---|---|---|---|---|---|---|---|---|
| Allison | 5 | 5 | 5 | 5 | 5 | 3 | 4 | 4 | Butler |
| Charles City | 31 | 31 | 32 | 26 | 26 | 27 | 28 | 20 | Floyd |
| New Hampton | 4 | 4 | 2 | 2 | 2 | 2 | 2 | 4 | Chickasaw |
| Oelwein | 16 | 11 | 14 | 18 | 15 | 15 | 15 | 16 | Fayette |
| Independence | 20 | 22 | 16 | 13 | 17 | 11 | 12 | 15 | Buchanan |
| Waterloo | 103 | 103 | 56 | 72 | 75 | 75 | 75 | 75 | Black Hawk |
| Waverly | 11 | 10 | 19 | 8 | 5 | 10 | 10 | 12 | Bremer |
| TOTAL | 190 | 186 | 144 | 144 | 145 | 143 | 146 | 146 | |
| Waverly As % of Total | 5.8 | 5.4 | 13.2 | 5.6 | 3.4 | 7.0 | 6.8 | 8.2 | |

SOURCE: IDOT, OFFICE OF ADVANCE PLANNING, 1984-1991

Of the seven (7) public owned airports, Waverly captured 5.8 percent of the total in 1984 compared to 8.2 percent in 1991. Over the eight (8) year period, Waverly captured somewhere between 3.4 and 13.2 percent of the aircraft based at the eight (8) public owned airports. Since 1989, the number of aircraft based at the airport has displayed some stability. The annual variation may be attributed to changes in airport management, fixed based operator, and availability of hangar storage space.

The ratio of based aircraft at public owned airports to registered aircraft is expected to reflect past trends with a modest increase in the number of based at public owned airports to total registered aircraft.

As of January 30, 1992, there were eleven (11) aircraft based at the Waverly Municipal Airport. Of those ten (10) were single engine piston powered airplanes. One (1) twin engine piston powered aircraft was based at the airport. There were no turbo-prop, jet, helicopters nor ultra-lights reported as based at the airport.

The eleven (11) hangar storage spaces at the airport were full as of January, 1992, with two (2) aircraft on a waiting list for storage space. All based aircraft were reported as being in a hangar with none using only tiedown space for an extended period of time. Should additional hangar storage space be available at a reasonable cost, the number of based aircraft is expected to be no less than 13.

The proximity of Waverly to the Waterloo/Cedar Falls metro area as well as the Waterloo Municipal Airport would suggest that the opportunity to capture a larger share of the registered aircraft is not an unrealistic possibility. The availability and cost of hangar storage space will have a significant impact upon the numbers of based aircraft. Individuals who use their aircraft primarily for recreational flying will tend to seek out the lowest cost storage space as well as a site having less congestion.

Business aircraft will seek out those airports having not only adequate storage space, but other services as well. The availability of FBO services, landing and navigational aids, and proximity to the place of business are more important to the business use than the cost of hangar storage.

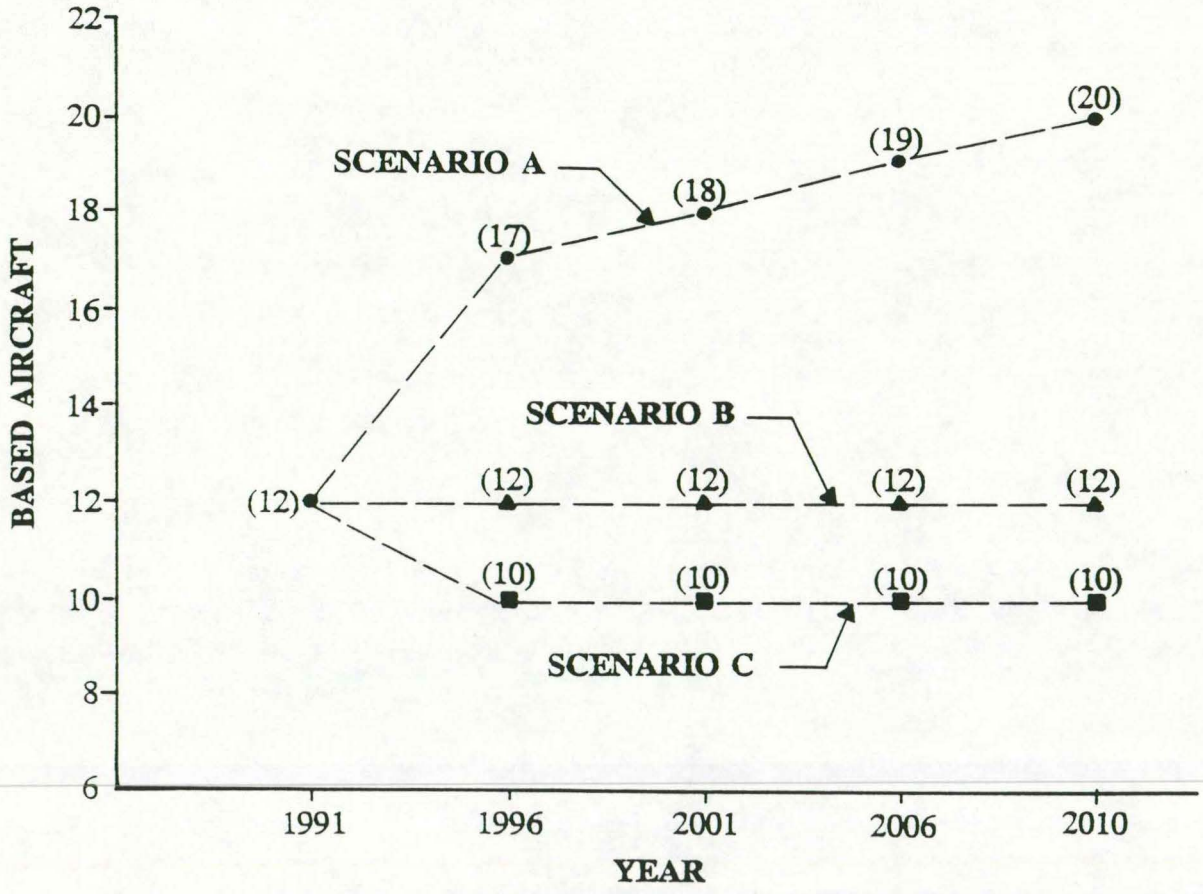
Aircraft owners with their place of business in Waverly could be expected to base their aircraft at the Waverly Municipal Airport provided an acceptable level of service was provided at the airport. Few, if any, aircraft owners with a place of business based in Waterloo/Cedar Falls would base their airplane at Waverly.

Aircraft owned by the FBO for instruction, charter, aerial application and other specialized uses will also influence the total number of based aircraft. The FBO may account for two (2) to six (6) of the based aircraft total.

Unlike general aviation airports located 30 or more miles beyond a metropolitan area, the proximity of Waverly to Waterloo/Cedar Falls would suggest that some opportunity to increase the number of aircraft based at the airport does exist.

Without additional aircraft storage at a rate below Waterloo Municipal, the number of based aircraft would be expected to change little over the 20 year planning period. Should instruction, charter and other services be established and maintained at the airport along with other facility improvements, upwards of 20 or more aircraft may be based at the airport.

**FIGURE 2-3 BASED AIRCRAFT, 1991-2010**



Scenario A: Optimistic

1. Maintain FBO Operation through 2010, Expand services
2. Construct FBO maintenance facility by 1996
3. Construct 6 to 10 additional tee type hangar storage units by 1996.
4. Lease hangar storage at a rate below Waterloo Municipal
5. Construct airfield improvements within the period 1992 to 2001.
6. Encourage Corporate usage

Scenario B: Do Nothing

1. Maintain the present level of service
2. Maintain present airport management structure
3. Maintain the present extent of airfield development

Scenario C: Worse Case

1. No FBO services
2. Minimal maintenance of existing facilities

Single engine piston powered aircraft are expected to comprise 80 percent to 92 percent of the based aircraft fleet through 2010. The balance of aircraft is expected to consist of light multi-engine piston powered airplanes. Should adequate runway length be provided, one (1) to two (2) turbo prop and/or jet aircraft may be based at the facility.

**TABLE 2-7 BASED AIRCRAFT MIX, 1991-2010**

| | SCENARIO A | | | SCENARIO B | | | | SCENARIO C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Piston | | Turbo (1) | Piston | | Turbo | | Piston | | Turbo | |
| Year | SE | ME | Prop/Jet | SE | ME | Prop | Jet | SE | ME | Prop | Jet |
| 1991 | 11 | 1 | - | 11 | 1 | - | - | 11 | 1 | - | - |
| 1996 | 15 | 2 | 1 | 11 | 1 | - | - | 10 | - | - | - |
| 2001 | 16 | 2 | 2 | 11 | 1 | - | - | 10 | - | - | - |
| 2010 | 16 | 2 | 2 | 11 | 1 | - | - | 10 | - | - | - |

(1) Provided adequate runway length is provided.

SOURCE: JBM

A study session conducted by the Waverly City Council and Airport Advisory Committee in September, 1991, generated the following comments from local businesses.

## WAVERLY AREA CORPORATE COMMENTS TO AFFIRM NEED FOR AIRPORT EXPANSION

(September 23, 1991)

"The proposed construction of a new 4000' foot runway was discussed at the WEDCO board meeting. Having this runway would certainly be an attraction to many business/industry prospects. Therefore, the WEDCO Board offers unanimous support for the proposed improvements and urges the City of Waverly to proceed with this project." - **WEDCO**

"The Century Companies house a corporate airplane at the Waterloo Airport. We are unable to use the Waverly facilities, primarily because the runway is not long enough to allow the safe operation of our plane. It is clear that the Century Companies have a vested interest in promoting improvements of the Waverly Airport. It is apparent to me that if Waverly is to be successful in its economic development efforts it is imperative that we develop adequate airport facilities. Commercial air travel in our area has deteriorated markedly in recent years. New and developing industry will take a critical look at the local facilities available to them for air travel. Had we anticipated the current air travel situation when we relocated our home office in 1977, our decision may have been very different. Other companies will have similar considerations, and I do not want to see Waverly lose those opportunities for economic development." - **CENTURY COMPANIES**

> [Century Companies own a Citation 2 aircraft. During the last seven months they have logged 110,278 miles, 362 flight hours*, and transported 1,447 people. In addition, they have people using the large commercial airlines and contract another aircraft to meet the remainder of their air transportation needs. The airplane is to Century what a computer is to most business today. They simply could not conduct their business without use of aircraft.]
> * 362 flight hours multiplied by approximately $1,300 an hour to operate a Citation 2 aircraft = $470,600. This figure obviously is only a part of the total investment.

"I would like to take this opportunity to lend my wholehearted support to the City's effort to lengthen the runway. Hobson Brothers has a customer base reaching across the continental United States, Canada, Europe, Asia, South and Central America. A improved airport would mean that many of our customers could fly directly into Waverly via their corporate planes."
- **HOBSON BROTHERS**

"Over the past five to six years our manufacturing space has increased by more than 100,000 square feet. All of this expansion requires the handling and transporting of more materials and supplies. With the inventory control systems now being used by dealers, emergency and short-term deliveries are important. This means air freight in many cases. The upgrading of the Airport would expedite this service as well as enhance its value as a backup landing strip for use in an emergency. The improvements proposed are reasonable and worthwhile and can be economically justified. - **CEDAR VALLEY ENGINEERING**

"As you know, commercial service in and out of Waterloo has suffered due to airline deregulation and cannot be relied upon which makes our area difficult to reach. We support the City's effort to lengthen the runway...and upgrade the general approach system." - **WAVERLY PLASTICS**

"If Waverly is to continue to be a leader in northeast Iowa it is absolutely necessary that we have an airport that is capable of handling corporate planes that would use this type of facility. We are living in one of the best towns in Iowa and it is extremely important that we keep it that way." - **DORFMAN AUTO SUPPLY**

"Construction of a 4,000 foot runway would facilitate the arrival and departure of persons who use private planes in travelling to Wartburg. Such persons would include members of our board of trustees, consultants, various friends of the college, students and parents." - **WARTBURG COLLEGE**

"As Waverly and Carnation grow and expand, it is important that the services of the City expand as well. From our personal standpoint, we recommend the runway be lengthened to handle small corporate business type jets....this would handle our Company jet, major suppliers and other business relationships we have." - **CARNATION COMPANY**

"As you are aware, Koehring is in the midst of... New product lines and new production requirements which all equate to new people and new job opportunities. As our facility takes on additional management responsibilities with satellite locations, it may become extremely important for our Waverly airport to have the capability of accepting larger private aircraft not only for our use, but for our corporate parents and suppliers as well." - **KOEHRING CRANES & EXCAVATORS**

"Our present use of the airport is minimized because of the approach system and present 2800 foot runway. We would increase our use of the airport should at least a 4000 foot runway be provided and improvements were made in the approach system." - **MIDWEST GAS**

SOURCE: WAVERLY CITY COUNCIL AND WAVERLY AIRPORT ADVISORY BOARD SEPTEMBER 23, 1991, STUDY SESSION

Should the Century Companies continue to operate a Citation II or aircraft with similar characteristics and base the airplane at Waverly; additional runway length would be required. Operations by the Citation II and other itinerant aircraft would exceed 500 annual operations.

Based aircraft are expected to consist of those airplanes having the following characteristics:

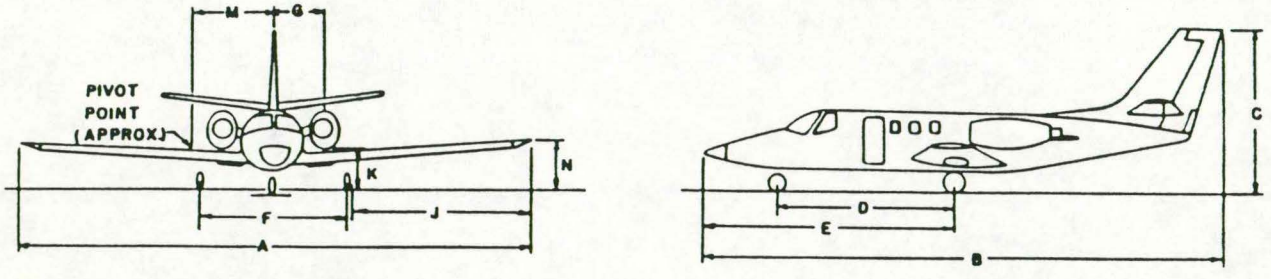
Scenario "A"

1. Fewer than ten (10) passenger seats
2. Approach speed up to but not including 121 knots
3. A wing span up to but not including 79 feet
4. A gross weight under 15,000 pounds

Scenario "B" and "C"

1. Fewer than ten (10) passenger seats
2. An approach speed less than 91 knots with less than 500 annual operations by airplanes with an approach speed of 91 knots or more but less than 121 knots
3. A wing span up to but not including 49 feet
4. A gross weight under 12,500 pounds

**FIGURE 2-4: DESIGN AIRPLANE - SCENARIO A**




Cessna Citation II

- Approach Speed: 108 knots
- Maximum Takeoff Weight: 13,300 lbs.
- Maximum Landing Weight: 12,700 lbs.

(A) Wing Span: 51'-8"
(B) Length: 47'-2"
(C) Height: 15'-0"

## AIRCRAFT OPERATIONS

### Introduction

An aircraft operation is defined as the airborne movement of aircraft in controlled and non-controlled airport terminal areas and about given enroute fixes or at other points where counts can be made. Each movement counts as an operation. A "touch and go", for example, counts as two operations.

Total annual aircraft operations are further broken down into local and itinerant operations. A local operation is defined as one by an aircraft that:

1. Operates within the local traffic pattern or within sight of the control tower;
2. is known to be departing for or arriving from local practice areas; or
3. executes simulated instrument approaches of low passes at the airport.

An itinerant aircraft operation is one that operates outside the local traffic pattern. A typical example of an itinerant operation is an air taxi operation. Aviation operations are most often discussed in terms of:

1. Total annual aircraft operations
   - Total annual local
   - Total annual itinerant
2. Peak day and peak hour operations

Aircraft operations are a function of the following elements:

1. Based Aircraft
2. Resident Pilots
3. Airport Facilities
4. Airport Management
5. Social and Economic Characteristics of the Airport Service Area
6. FBO and Air Taxi Services

### National Trends

An indication of historic and future levels of aviation activity may be obtained from a review of activity at airports having FAA control towers. In 1980, 66,200,000 operations were conducted at 432 airports having control towers. Total operations decreased within the period 1980 through 1987 as did the number of FAA tower facilities. In 1987, there were an estimated 61,000,000 operations conducted at 399 tower locations. The downward trend was reversed in 1988 and 1989 when an estimated 61,400,000 operations were conducted at the 399 tower locations.

Future aviation activity at the 399 airports with tower facilities is expected to increase annually. Total aircraft operations are expected to increase from 62,800,000 in 1990 to 79,200,000 in 2001. Operations by general aviation aircraft is expected to increase from 38,200,000 to 47,400,000 within the same period.

Within the period 1990 through 2001 activity by general aviation aircraft is expected to increase by 24.1 percent compared to a 27.5 increase in air carrier operations and a 41.4 percent increase in aircraft operations by air taxi and commuter aircraft.

## Iowa Trends

An insight regarding aviation activity within the State of Iowa may be obtained from reference to counts from the five tower airports in Iowa. These facilities are located at Dubuque, Des Moines, Waterloo, Cedar Rapids, and Sioux City. In FY 1987, there were 459,186 total aircraft operations conducted at the five tower airports compared with 418,936 in FY 1986. A decrease in the total number of operations was recorded in 1988 followed by an increase in 1989. In FY 1990 there were 437,594 operations conducted at the five tower airports.

**TABLE 2-8: OPERATIONS, IOWA TOWER AIRPORTS, FY86-FY90**

| | 1986 | 1987 | 1988 | 1989 | 1990* |
|---|---|---|---|---|---|
| Air Carrier | | | | | |
| Itinerant | 50,754 | 59,214 | 56,946 | 54,649 | 50,313 |
| Local | ------ | ------ | ------ | ------ | ------- |
| Total | 50,754 | 59,214 | 56,946 | 54,649 | 50,313 |
| Air Taxi | | | | | |
| Itinerant | 63,911 | 67,274 | 78,205 | 77,176 | 65,923 |
| Local | ------ | ------ | ------ | ------ | ------ |
| Total | 63,911 | 67,274 | 78,205 | 77,176 | 65,923 |
| General Aviation | | | | | |
| Itinerant | 176,537 | 186,369 | 183,369 | 187,919 | 186,477 |
| Local | 106,053 | 121,194 | 100,963 | 102,671 | 81,190 |
| Total | 282,590 | 307,563 | 284,311 | 290,590 | 267,667 |
| Military | | | | | |
| Itinerant | 12,135 | 13,293 | 14,074 | 13,666 | 14,682 |
| Local | 9,546 | 11,842 | 12,305 | 13,190 | 13,009 |
| Total | 21,861 | 25,135 | 26,379 | 26,859 | 27,691 |
| Total | | | | | |
| Itinerant | 303,337 | 326,150 | 332,573 | 334,410 | 317,395 |
| Local | 115,599 | 133,036 | 113,268 | 116,861 | 120,199 |
| Total | 418,936 | 459,186 | 445,841 | 451,271 | 437,594 |

*Prelim.
(Des Moines, Souix City, Dubuque, Waterloo, Cedar Rapids)

SOURCE: FAA, FAA Air Traffic Activity, FY86 to FY90

As noted, there is considerable annual variation in activity at the five tower airports. Within the five year period, air carrier activity experienced one (1) year of growth and three (3) years of decrease in activity. General aviation experienced substantial growth between 1986 and 1987 and a significant decrease in activity from 1989 to 1990. Air taxi operations increased in number between 1986 and 1988, but experienced a decrease in 1989 and 1990.

Total activity by general aviation aircraft decreased from 473,000 operations in FY 1979 to 278,199 in FY 1985. The 41.2 percent decrease in activity within the period FY79 to FY85 was reversed with an increase in activity in FY86 and FY87. The increase in operations by general aviation aircraft may have been due in part to an improved State economy. General aviation activity increased by 1.6 percent in FY86 and 8.8 percent in FY87 at the five tower airports. Activity however, decreased in 1988; experiencing an increase in 1989 and a 7.9 decrease from FY89 to 1990.

A large percentage of the increase and/or decrease can be found within the number of local operations conducted at the five tower airports. As the total number of operations has decreased, itinerant operations as a percent of the total has increased. In FY 1990 nearly 70 percent of the total general aviation operations at the five tower airports were itinerant. For purposes of estimating future numbers of local and itinerant operations, the assumption, herein, is that approximately 60 percent will be itinerant in nature while the 40 percent will be local in character.

The Iowa Department of Transportation initiated a program to count aircraft operations at non-tower airports using a sound-actuated counter. The tapes are audited to determine if the sound is from a single-engine aircraft, a multi-engine aircraft, jet, helicopter, or other source that should be eliminated from the count. Consequently, data accumulated can be used to identify activity over a 24 hour period as well as by day of the week. Using the recorded departure data, the IDOT is able to estimate the total number of annual operations conducted at an airport facility.

Total annual aircraft operations for 29 airports within the State of Iowa that were counted within the period 1985 through 1987 are summarized in the following Table. A total of 211,946 operations were conducted at the 29 airports counted. As noted, a majority of the operations were by single engine aircraft with the balance consisting of multi-engine and jet operations.

Given the number of based aircraft, there were approximately 324 operations conducted per based aircraft. Obviously not all the estimated operations were conducted by based aircraft and therefore the ratio may have little application other than as an indication of activity that may exist based upon the number of aircraft located at an airport. The count program also revealed the annual distribution of operations conducted at the 29 airports.

| | |
|---|---|
| Spring | 29.3% |
| Summer | 33.0% |
| Fall | 21.7% |
| Winter | 16.1% |

From a review of data, activity was often, but not necessarily in all cases, highest on the weekends as well as in the late afternoon. Weekend activity and late afternoon/early evening activity would generally indicate pleasure flying as well as student traffic. Those airports having a

concentration of activity within the weekday and a small seasonal variation would most likely represent a greater use of the facility for business reasons. Of the 29 general aviation airports where traffic counts had been conducted, there were approximately 324 total annual operations per based aircraft.

**TABLE 2-9: ANNUAL AIRCRAFT, OPERATIONS, 29 AIRPORTS**

| | FIXED WING FLEET OPERATIONAL MIX (PERCENTS) | | | |
|---|---|---|---|---|
| AIRPORT | SINGLE ENGINE | MULTI-ENGINE | JET | ESTIMATED TOTAL ANNUAL OPERATIONS (ARRIVALS AND DEPARTURES) |
| Algona | 93.6 | 6.4 | 0 | 8290 |
| Atlantic | 94.9 | 5.0 | .1 | 8146 |
| Boone | 93.1 | 6.8 | .1 | 15766 |
| Carroll | 92.3 | 7.0 | .7 | 5648 |
| Charles City | 93.6 | 6.3 | .1 | 9104 |
| Cherokee | 86.9 | 13.1 | 0 | 8240 |
| Clarinda | 94.9 | 5.1 | 0 | 2376 |
| Davenport | 90.3 | 8.7 | 1.0 | 26354 |
| Denison | 94.3 | 4.7 | 1.0 | 7820 |
| Eagle Grove | 90.4 | 9.6 | 0 | 3642 |
| Hampton | 63.5 | 20.9 | 15.6 | 2434 |
| Harlan | 96.4 | 3.6 | 0 | 5020 |
| Independence | 93.1 | 6.9 | 0 | 4116 |
| Iowa Falls | 89.8 | 9.8 | .4 | 4520 |
| Jefferson | 91.6 | 8.4 | 0 | 3268 |
| Manchester | 93.7 | 6.3 | 0 | 1596 |
| Maquoketa | 89.8 | 9.8 | .4 | 4154 |
| Marshalltown | 86.5 | 10.4 | 3.1 | 10842 |
| Monticello | 94.4 | 5.6 | 0 | 7694 |
| New Hampton | 86.4 | 13.6 | 0 | 1086 |
| Newton | 67.7 | 31.4 | .9 | 12120 |
| Orange City | 60.2 | 39.8 | 0 | 2070 |
| Perry | 97.9 | 1.9 | .2 | 6850 |
| Red Oak | 91.4 | 8.6 | 0 | 7440 |
| Shenandoah | 96.1 | 3.7 | .2 | 5122 |
| Spencer | 64.3 | 35.1 | .6 | 11814 |
| Vinton | 97.3 | 2.7 | 0 | 6244 |
| Webster City | 96.4 | 3.4 | .2 | 17082 |
| West Union | 86.5 | 12.7 | .8 | 3088 |

* Does not include rotocraft operations as it is usually not possible to differentiate between rotocraft arrivals, departures, hovering, and ground operations using the RENS aircraft activity counter.

SOURCE: IDOT, Iowa Automated Aircraft Activity Counting 1985-1987, August, 1988, P. 6

The 1991 Iowa Aviation System Plan concluded that there were 1,142,161 total operations conducted at state system airports in 1990. This number was projected to increase to 1,315,500 operations by 2010; representing a 15.2 percent increase over 1990 totals.

**Waverly Municipal Airport**

The IDOT count program was initiated at Waverly in October, 1987 and concluded in October, 1988. Within that period, 3,143 hours of monitoring were conducted on a periodic basis using sound acoustical aircraft activity counters. The counter records aircraft engines at take-off power. The tapes were then audited by IDOT to determine if the sound recorded was from a single engine aircraft, multi-engine aircraft, jet, helicopter or other source.

**TABLE 2-10: WAVERLY ACTIVITY COUNT**

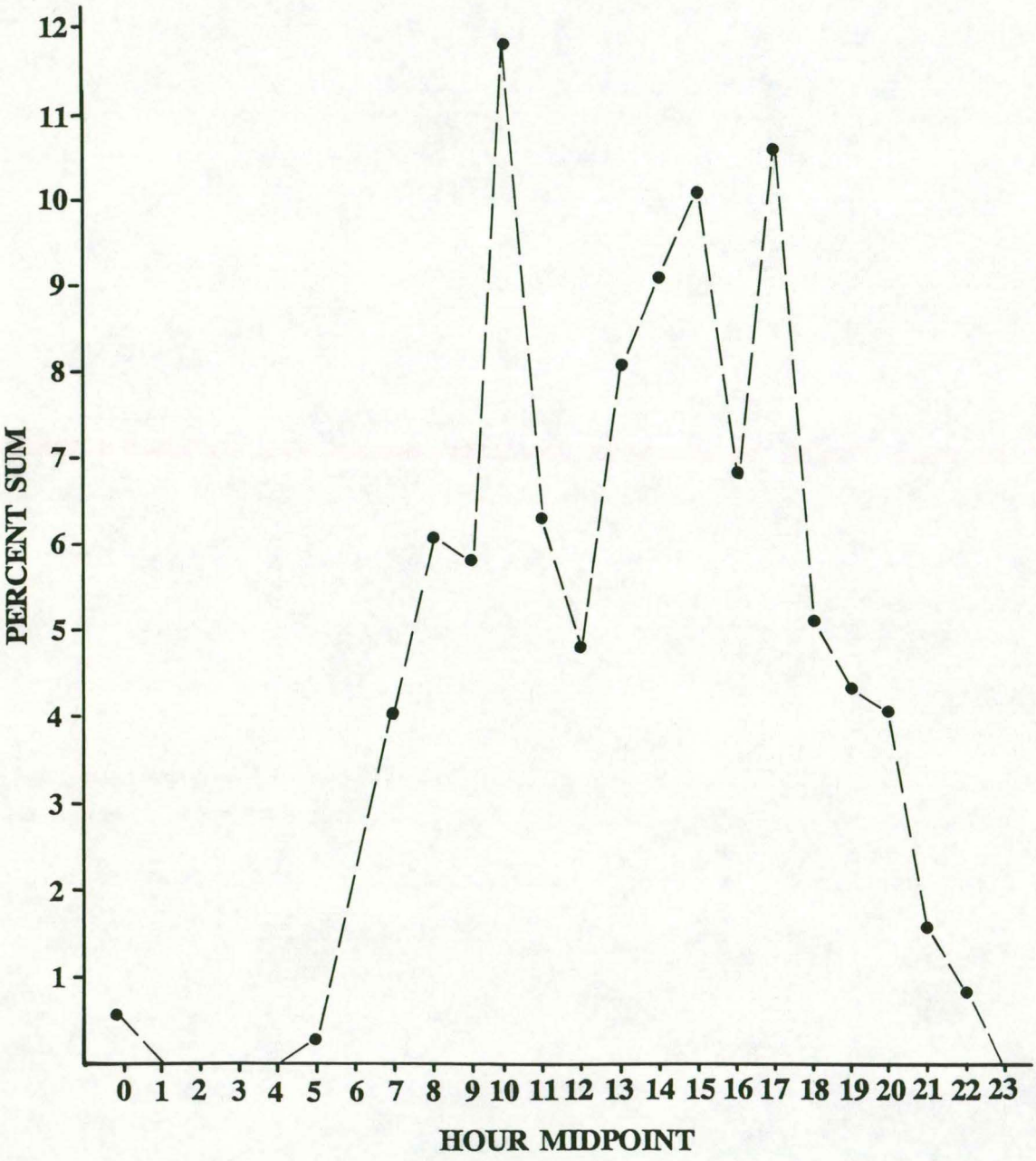
| | SPRING | SUMMER | FALL | WINTER | TOTAL |
|---|---|---|---|---|---|
| Hours of Monitoring | 696 | 589 | 1136 | 722 | 3143 |
| Total Departures | 66 | 174 | 90 | 31 | 361 |
| Departures Per Hour | 0.09 | 0.30 | 0.08 | 0.04 | 0.11 |
| % Single Engine | 82.67 | 92.82 | 47.40 | 55.56 | 70.81 |
| % Twin Engine | 5.33 | 3.31 | 4.05 | 1.85 | 3.73 |
| % Jet | 0.00 | 0.00 | 0.58 | 0.00 | 0.21 |
| % Helicopter | 12.00 | 3.87 | 47.98 | 42.59 | 25.26 |

SOURCE: IDOT, IOWA AUTOMATED AIRCRAFT ACTIVITY COUNTING

A majority of the departures, 94.7 percent, were conducted by single engine aircraft. Departures by twin engine airplanes accounted for 5.0 percent of the activity. There was minimal jet (0.3 percent) activity recorded. Based upon the activity counts, the Iowa Department of Transportation estimated that 2304 total annual operations were conducted.

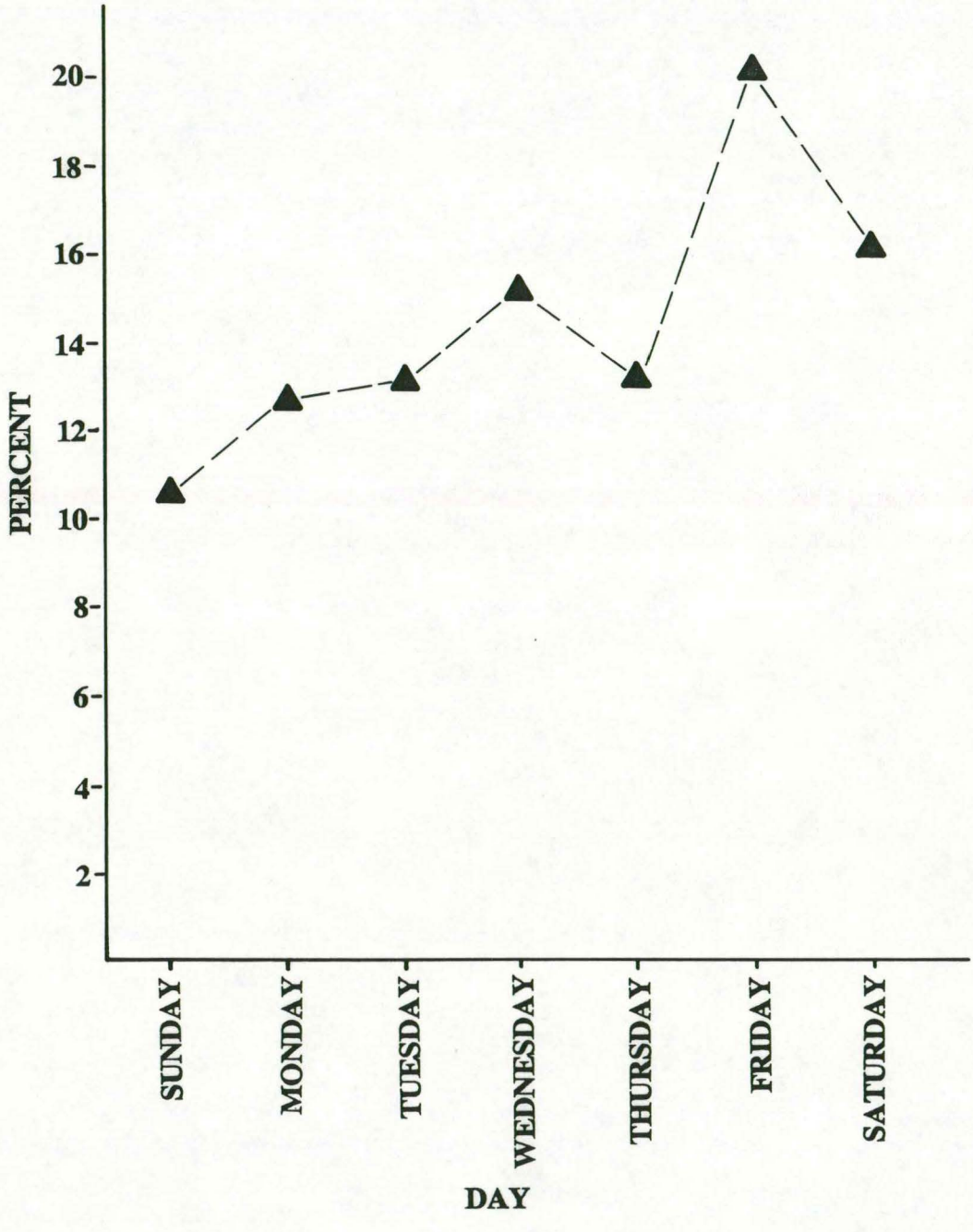
Friday accounted for 19.93 percent of the average week activity while Saturday accounted for 16.16 percent. Single engine aircraft accounted for 68.91 percent of the weekday traffic and 76.19 percent of the weekend traffic. Peak hour activity occurred between 10:00 and 11:00 A.M. and between 1:00 and 5:00 PM.

**FIGURE 2-5: PERCENT ANNUAL HOURLY DISTRIBUTION AT WAVERLY IN 1987/88**




SOURCE: IDOT, IOWA AUTOMATED AIRCRAFT ACTIVITY COUNTING, 1987-88

**FIGURE 2-6: PERCENT ANNUAL DAILY DISTRIBUTION AT WAVERLY IN 1987/88**




SOURCE: IDOT, IOWA AUTOMATED AIRCRAFT ACTIVITY COUNTING, 1987-88.

Additional insight may be obtained from aviation activity reports prepared monthly by Nichols Aviation. Data by month for 1991 is summarized in the following table.

**TABLE 2-11: OPERATIONAL ACTIVITY, 1991**

| | | TOTAL OPERATIONS |
|---|---|---|
| January | 71 x 2 | 276 |
| February | 138 x 2 | 276 |
| March | 121 x 2 | 242 |
| April | 128 x 2 | 256 |
| May | 138 x 2 | 276 |
| June | 205 x 2 | 410 |
| July | 205 x 2 | 410 |
| August | 157 x 2 | 314 |
| September | 116 x 2 | 232 |
| October | 61 x 2 | 122 |
| November | 60 x 2 | 120 |
| December | 89 x 2 | 178 |

3,160 operations manually recorded from January, 1991 to November, 1991.

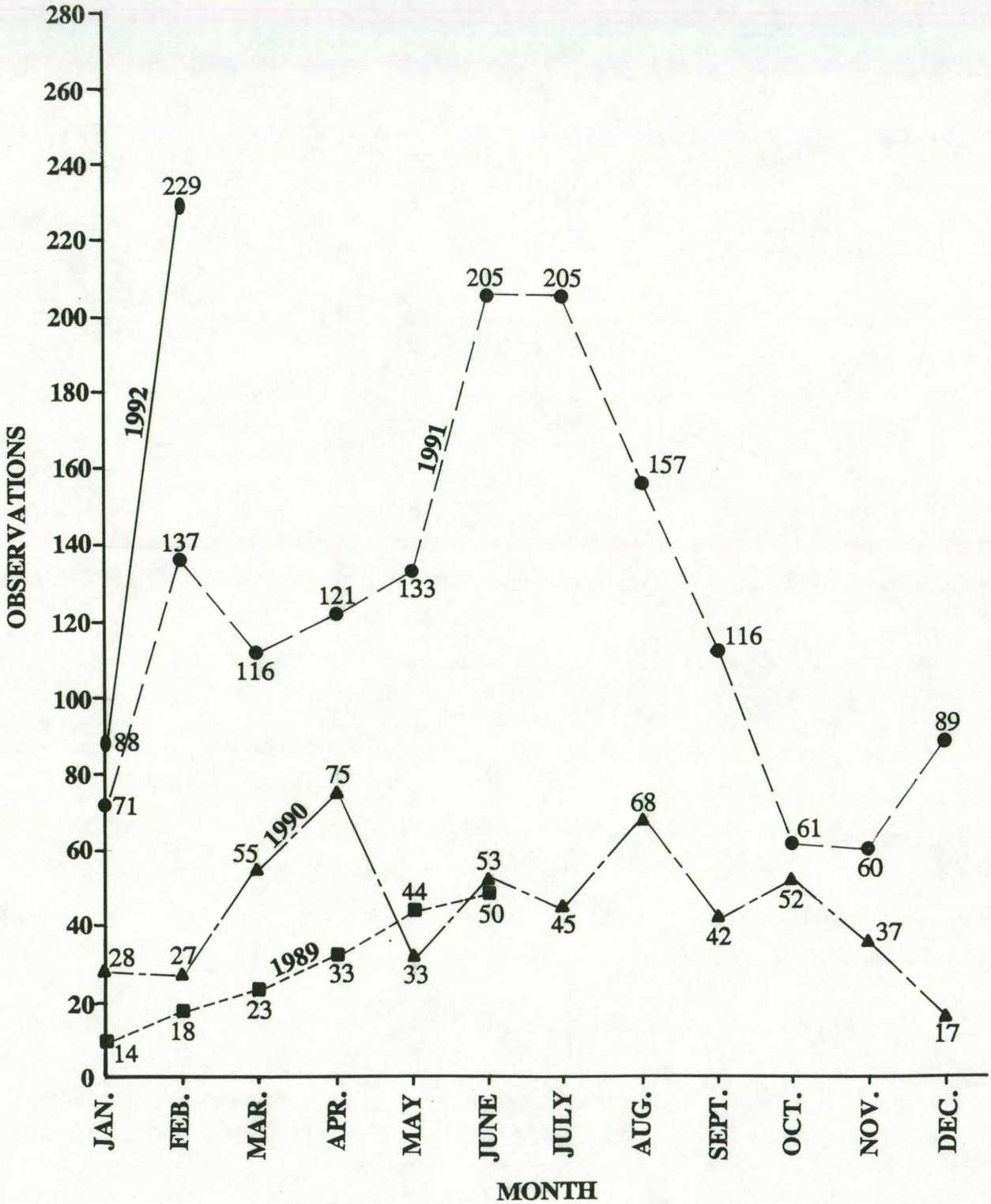
SOURCE: NICHOLS AVIATION, 1991, MONTHLY ACTIVITY REPORTS.

Based upon 1991 activity counts, approximately 3,100 total annual operations were conducted in 1991 compared to 2,300 estimated by IDOT for 1987/88. 1991 operational activity consisted, for the most part, of activity by single engine aircraft.

The 1991 Iowa Aviation System Plan estimated that 2,304 total annual operations were conducted at the Waverly Municipal Airport in 1990. Total annual operations were forecast to reach 2,500 in 2010. The 1991 Iowa Aviation System Plan also estimated that 122 multi-engine operations were conducted in 1990. Total multi-engine operations were forecast to reach 200 in 2010.

The Federal Aviation Administration estimates that general aviation operations activity will increase by approximately 24 percent within the period 1990 to 2001. Within the same period, the general aviation fleet is forecast to grow by 4.5 percent. Consequently, the number of operations as a ratio of active aircraft, is forecast to increase.

FIGURE 2-7: AVIATION ACTIVITY, WAVERLY, 1989-1992.




NOTE: Records incomplete from July, 1990 to December, 1990. Multiply observations by 2 to obtain approximately number of operations.

Activity at the Waverly Municipal Airport will depend to some extent on the number of based aircraft, services, number of pilots/students, commercial and industrial growth and public attitude. The number of itinerant operations is expected to be more constant than the number of local operations. Costs associated with aircraft ownership and operation, as well as student activity, is expected to influence ultimate levels of activity. Consequently, the total number of annual aircraft operations may vary significantly from year to year.

The ratio of operations to based aircraft may be used to estimate total operational activity. The 1991 Iowa Aviation System Plan estimated that there were approximately 230 operations per based aircraft in 1990. Estimated operations based upon 1991 activity counts indicate that there were approximately 258 operations per based aircraft. There were approximately 324 operations conducted per based aircraft at 29 general aviation airports where sound actuated counts had been made.

Based aircraft and changes in operational activity per based aircraft was used to estimate total annual operational activity through 2010.

**TABLE 2-12: TOTAL ANNUAL OPERATIONS**

| YEAR | LOW (1) | MIDDLE (1) | HIGH (1) | |
|---|---|---|---|---|
| 1991 | 3100 | 3100 | 3100 | 258 ops/AC |
| 1996 | 2860 | 3432 | 4862 | 286 ops/AC |
| 2001(2) | 3190 | 3828 | 5742 | 319 ops/AC |
| 2010 | 3190 | 3828 | 6380 | 319 ops/AC |

(1) Based aircraft estimates
(2) 24 percent increase in operational activity 1991 to 2001.

SOURCE: JBM

The basis for estimating future numbers of based aircraft was previously discussed. The most salient variable affecting future operational activity will be the extent of service(s) provided by the FBO. Second, the availability and cost of hangar storage space compared to that at Waterloo Airport will also have an impact on future levels of activity. Sixty (60) percent of the total annual operations are expected to be local operations.

**TABLE 2-13: LOCAL AND ITINERANT OPERATIONS**

| | SCENARIO C | | SCENARIO B | | SCENARIO A | |
|---|---|---|---|---|---|---|
| Year | Local | Itinerant | Local | Itinerant | Local | Itinerant |
| 1991 | 1860 | 1240 | 1860 | 1240 | 1860 | 1240 |
| 1996 | 1716 | 1144 | 2059 | 1373 | 2917 | 1945 |
| 2001 | 1914 | 1186 | 2297 | 1531 | 3445 | 2297 |
| 2010 | 1914 | 1186 | 2297 | 1531 | 3445 | 2553 |

(1) 60% Local (2) 40% Itinerant

SOURCE: JBM

Total annual aircraft operations under Scenario C are expected to change little over the 20 year planning period. A modest increase in activity may be realized in Scenario B with the greatest potential for increased activity found in Scenario A. Scenario C assumes that FBO service would not be sustained for a period of time sufficient to attract greater use of the airport. It also assumes that no major capital improvements would be under taken. Scenario B assumes maintenance of present conditions to include the present level of service provided by the FBO. Scenario A is based upon additional hangar construction as well as increased FBO services.

Total annual activity will be influenced by the type of aircraft using the facility. Some indication of the primary use of the aircraft by aircraft type is reflected in the following table. As noted, 62 percent of the single engine aircraft are used for personal reasons followed in turn by business and instructional usage. Twin engine piston aircraft are used for business followed in turn by air taxi and personal usage.

**TABLE 2-14: PRIMARY USE BY AIRCRAFT TYPE**

| | Executive | Business | Personal | Instructional | Aerial Application | Aerial Observation | Other Work | Commuter Air Carrier | Air Taxi | Other |
|---|---|---|---|---|---|---|---|---|---|---|
| ı | 1.7% | 17.9% | 62.0% | 8.5% | 3.2% | 2.0% | 0.6% | 0.2% | 2.5% | 1.4% |
| Eng. | 0.6 | 15.1 | 66.8 | 9.0 | 3.5 | 1.9 | 0.7 | 0.04 | 1.1 | 1.2 |
| Eng. | 10.0 | 38.0 | 27.2 | 4.5 | 1.1 | 2.2 | 0.2 | 1.6 | 12.6 | 2.6 |
| :r | 0 | 0 | 2.0 | 0 | 23.2 | 0 | 0 | 4.0 | 55.6 | 15.2 |
| ɔprop | 61.6 | 12.3 | 2.5 | 0.2 | 2.2 | 0.3 | 0.2 | 7.6 | 9.2 | 4.0 |
| ɔjet | 79.7 | 4.7 | 1.9 | 0.3 | 0 | 0.2 | 0 | 0.1 | 9.5 | 3.7 |
| :raft | 15.5 | 7.3 | 14.6 | 5.2 | 13.0 | 12.1 | 3.7 | 1.8 | 15.0 | 11.8 |
| AL | 5.2 | 0.2 | 58.3 | 7.9 | 3.3 | 2.3 | 0.9 | 0.5 | 3.1 | 1.9 |

SOURCE: FAA, CENSUS OF U.S. CIVIL AIRCRAFT, 1990

The operational mix throughout the twenty year planning period is expected to consist for the most part of operations by single engine and light twin engine piston powered aircraft. Turboprop and jet activity will be influenced by use of the facility by aircraft primarily used for business reasons as well as the extent of development.

Of the total annual operations conducted in 1991, approximately 90 percent were by single engine aircraft. Three (3) percent of the estimated total was by helicopters with the remaining activity consisting of operations by twin engine airplanes.

Operational mix based upon the three (3) service/development scenarios are summarized in the following table.

**TABLE 2-15: OPERATIONAL MIX, 1991-2010**

SCENARIO B

| | PISTON | | TURBO | | | |
|---|---|---|---|---|---|---|
| YEAR | SE | ME | PROP | JET | ROTOCRAFT | TOTAL ANNUAL |
| 1991 | 2852 | 124 | 31 | * | 93 | 3100 |
| 1996 | 3158 | 137 | 34 | * | 103 | 3432 |
| 2001 | 3522 | 153 | 38 | * | 115 | 3828 |
| 2010 | 3522 | 153 | 38 | * | 115 | 3828 |

SCENARIO A

| | PISTON | | TURBO | | | |
|---|---|---|---|---|---|---|
| YEAR | SE | ME | PROP | JET | ROTOCRAFT | TOTAL ANNUAL |
| 1991 | 2852 | 124 | 31 | * | 93 | 3100 |
| 1996 | 3890 | 486 | 340 | * | 146 | 4862 |
| 2001 | 4594 | 574 | 402 | * | 172 | 5742 |
| 2010 | 5104 | 638 | 447 | * | 191 | 6380 |

SCENARIO C

| | PISTON | | TURBO | | | |
|---|---|---|---|---|---|---|
| YEAR | SE | ME | PROP | JET | ROTOCRAFT | TOTAL ANNUAL |
| 1991 | 2852 | 175 | * | * | 93 | 3100 |
| 1996 | 2631 | 143 | * | * | 86 | 2860 |
| 2001 | 2935 | 160 | * | * | 96 | 3190 |
| 2010 | 2935 | 160 | * | * | 96 | 3190 |

*Occasional Activity

SOURCE: JBM

Activity by aircraft with an approach speed in excess of 121 knots is expected to be minimal and not exceed 500 total annual operations. Such aircraft would be expected to use the Waterloo airport. A majority of operations will be by aircraft with an approach speed under 91 knots and a wing span under 49 feet. Under Scenario A, in excess of 500 annual operations by airplanes with an approach speed of 91 knots or more but less than 121 knots could be expected.

Provided FBO services are expanded as a result of constructing a maintenance facility together with additional runway length, 500 or more annual operations by aircraft with an approach speed in excess of 91 knots, could be expected. Should such services not be provided over an extended period of time nor additional runway length provided, nearly all of the operational activity would be by aircraft with an approach speed under 91 knots.

Under Scenario A, operational activity by approach speed is expected to fall within the following ranges:

- Approach Category A: less than 91 knots - 83 to 90%
- Approach Category B: 91 knots less than 121 knots - 10 to 17%
- Approach Category C: 121 knots less than 141 knots - Occasional Activity fewer than 500 total annual operations

Within Scenario C, approximately 95 percent of the activity will be by airplanes with an approach speed under 91 knots.

**Annual Instrument Approaches**

The number of annual instrument approaches (AIA) recorded by the Federal Aviation Administration in FY88 was one (1) increasing to ten (10) in 1990. Annual instrument approaches are not expected to exceed one (1) percent of the total annual approaches throughout the 20-year planning period.

**TABLE 2-16: ANNUAL INSTRUMENT APPROACHES**

| YEAR | TOTAL AIA's | YEAR | TOTAL AIA's |
|---|---|---|---|
| 1988 | 1 | 1991 | 11 |
| 1989 | 7 | 1996 | 10-17 |
| 1990 | 10 | 2001 | 11-20 |
| | | 2010 | 11-22 |

SOURCE: FAA, FEDERAL AIR TRAFFIC ACTIVITY, FY88-90
JBM, 1991-2010

# CHAPTER THREE

# FACILITY REQUIREMENTS

## Airport Service Level

The forecast of aviation activity represents a trend line along which actual occurrences are anticipated. Future numbers of registered and based aircraft, together with operational activity, will experience modest changes through the year 2010. Actual occurrences will fall above and below the trend line.

The Waverly Municipal Airport is expected to experience fewer than 500 total annual operations by aircraft with an approach speed 121 knots or more. Representative aircraft with an approach speed of 121 knots or more, but less than 141 knots are noted as follows:

| | |
|---|---|
| Gates Lear Jet Corporation | Lear Jet (24,25,54) |
| Grumman | Gulfstream (III) |
| Israel Aircraft Westwind | Westwind (1124) |
| Rockwell | Saber (75A,80) |
| Lockheed | Jetstar (L1329) |
| Hawker Siddeley | HS-125 (400A,600A,700A) |

These airplanes would be expected to use the Waterloo airport. The Waverly Municipal Airport should be developed to accommodate those airplanes with an approach speed up to but not including 121 knots and a wing span less than 79 feet. A majority of these airplanes will have a gross maximum take-off weight under 12,500 pounds.

| | |
|---|---|
| Beech | King Air (B100,F90,B200) |
| Cessna | Citation (I) |
| Cessna | Models (402,404,414,421,441) |
| Mitsubishi | Marquise (MU-2N) |
| Rockwell | Turbo Comdr. (690A) |
| Piper | Navajo (31-310) |
| Piper | Cheyenne (400LS) |

These and other similar aircraft are expected to use the airport on a regular basis. Regular basis is defined in FAA AC-150/5325-4A as 500 operations per year.

Large airplanes or those with a gross take-off weight in excess of 12,500 pounds that may use the Waverly Municipal Airport would include the following airplanes having an approach speed under 121 knots.

| | |
|---|---|
| Gates | Learjet (28/29) |
| Shorts | Model (330,360) |
| Cessna | Citation (II,III) |

## Development Concept

Chapter Three outlines those facilities required to meet and satisfy anticipated aviation activity through the year 2010. Facility requirements outlined herein are based upon Federal Aviation Administration (FAA) and Iowa Department of Transportation (IDOT) airport design standards and guidelines.

The FAA has continued to refine design standards for airport facilities. FAA AC 150/5300-13, Change One, dated 6/5/91 sets forth new requirements that contributes to the development and maintenance of a national system of safe, delay-free, and cost-effective airports. FAA AC 150/5325-4A dated 1/29/90 presents guidelines for determining runway length.

Within the FAA AC 150/5300-13, Airport Reference Codes (ARC) were developed and are based upon two components.

- Approach Speed
- Wing Span

Current airplanes were placed into five categories based upon approach speed. The approach speed is 1.3 times their stall speed in their landing configuration at their maximum certificated landing weight.

Category A: Speed less than 91 knots.
Category B: Speed 91 knots or more but less than 121 knots.
Category C: Speed 121 knots or more but less than 141 knots.
Category D: Speed 141 knots or more but less than 166 knots.
Category E: Speed 166 knots or more.

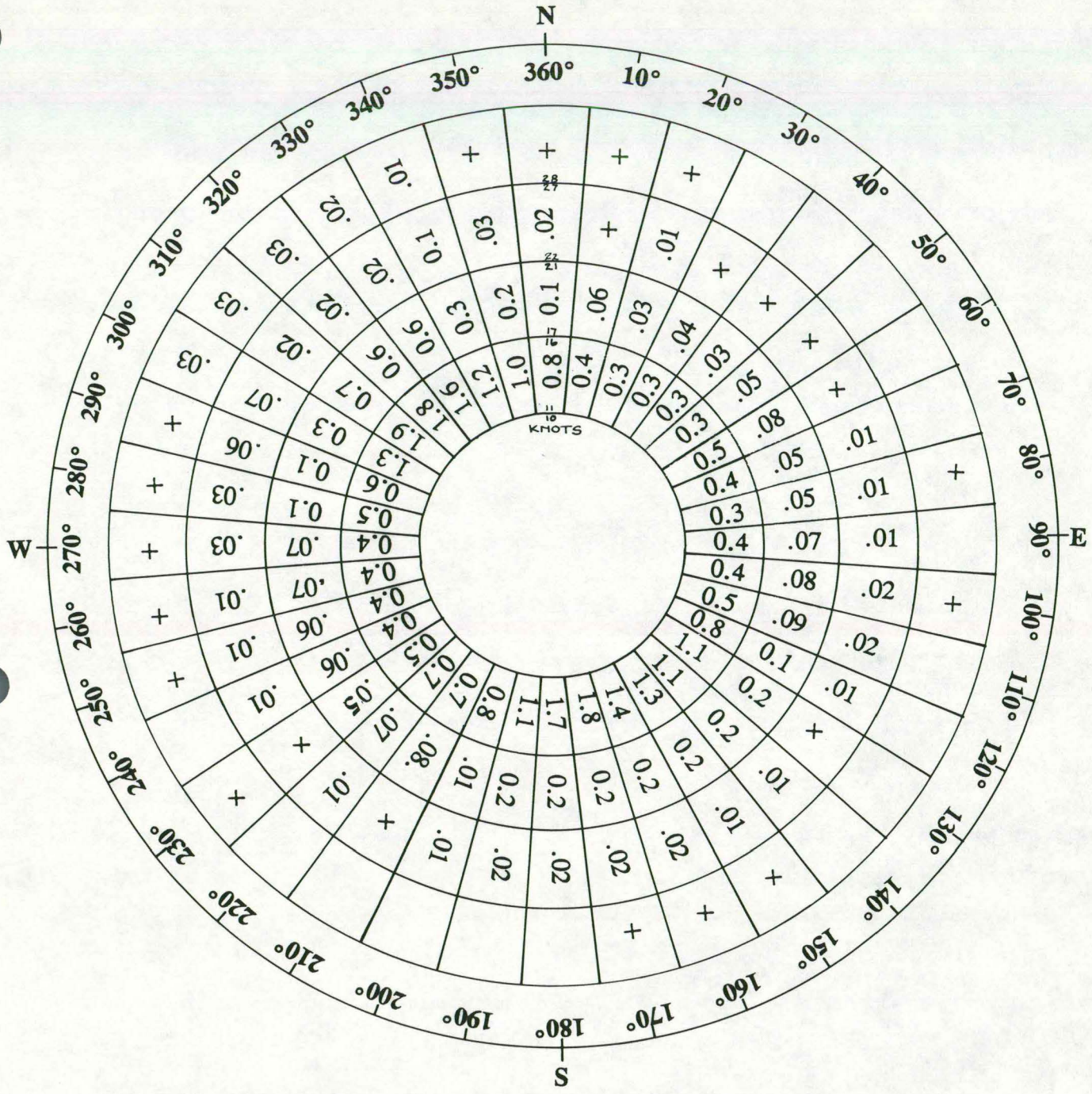
The Airplane Design Group (ADG) are aircraft placed into groupings based on wingspan. These groups are as follows:

Category I: Up to but not including 49 feet.
Category II: 49 feet up to but not including 79 feet.
Category III: 79 feet up to but not including 118 feet.
Category IV: 118 feet up to but not including 171 feet.
Category V: 171 feet up to but not including 214 feet.
Category VI: 214 feet up to but not including 262 feet.

The Waverly Municipal Airport should be designed to satisfy requirements set forth for ARC B-II.

## Runway Alignment and Wind Coverage

Runway alignment is based upon a number of factors to include topography, cultural features, physical features, land ownership, environmental and climatic conditions. Of these, wind coverage provided by an existing or proposed alternate runway alignment is a primary concern.




All Weather Wind
Waterloo, Iowa
Period: 1982-1990

**FIGURE 3-1: WINDROSE**

The optimum runway orientation is one which will provide the airport a 95 percent level of wind coverage at a crosswind component value not exceeding 12 m.p.h. (10.5 knots) for ARC A-I and B-I; 15 m.p.h. (13 knots) for ARC A-II and B-II. The 18.4 m.p.h. (16 knots) crosswind component value should be used for ARC A-III, B-III, and C-I through D-III.

The primary runway alignment at the Waverly Municipal Airport should be that alignment which will allow the airport to provide the 95 percent wind coverage at the 15 m.p.h. (13 knots) crosswind component value with a single runway. The second or crosswind runway may then be developed to accommodate the small airplanes within ARC A-1 and B-1. Since wind coverage provided by RW 10/28 is less than 95 percent at a crosswind component of 13.0 knots, the crosswind runway should be designed to B-II standards. Wind coverage provided by Runways 10/28 is summarized below.

| | RW 10/28 | Crosswind | Combined |
|---|---|---|---|
| 10.5 knots | 83.564% | ---- | ---- |
| 13.0 knots | 91.468% | ---- | ---- |

**Runway Length**

The Airport Reference Code (ARC) does not set forth runway length requirements. Reference must be made to FAA AC 150/5325-4A, Runway Length Requirements for Airport Design in order to determine runway length. Four sets of runway curves were developed for those airplanes with a gross weight less than 12,500 pounds. The small airplanes were divided into those with 10 passenger seats or more and those with less than 10 passenger seats.

Three sets of curves were developed for those airplanes with less than ten (10) passenger seats:

1. 75% of the fleet
2. 95% of the fleet
3. 100% of the fleet

Runway length curves for those aircraft with a gross weight of 60,000 pounds or less were divided into two groups representing 75 percent and 100 percent of the fleet. Airplanes expected to use the airport on a regular basis were previously noted and are defined as 100 percent of the small airplane fleet.

| | |
|---|---|
| - Gross weight | Under 12,500 pounds (1) |
| - Approach speed | Less than 121 knots |
| - Wing span | Less than 79 feet |
| - Passenger seat | Less than ten (10) |

(1) A Cessna Citation II may use the airport on a regular basis. The Citation II has a maximum landing weight of 12,700 pounds and a maximum take off weight of 13,300 pounds. The wing span is 51'8". The approach speed is 108 knots.

Ultimate runway length requirements for the primary runway were obtained from the FAA computer program, Airport Design, Version 2.2.

**TABLE 3-1: RECOMMENDED RUNWAY LENGTHS**

Airport Elevation 990 ft.
Mean Daily Maximum Temperature of the Hottest Month: 86.7°F
Maximum Difference in Runway Centerline Elevation: 8.9 ft.
Length of Haul for Airplanes more than 60,000 lbs.: 0

---

RUNWAY LENGTHS RECOMMENDED

| | |
|---|---|
| Small airplanes with approach speeds less than 30 knots | 330 ft. |
| Small airplanes with approach speeds less than 50 knots | 890 ft. |
| Small airplanes with less than 10 passenger seats | |
| 75% of these small planes | 2900 ft. |
| 95% of these small planes | 3400 ft. |
| 100% of these small planes | 4000 ft. |
| Small airplanes with 10 or more passenger seats | 4400 ft. |
| Large airplanes of 60,000 pounds or less | |
| 75% of these large planes at 60% useful load | 5500 ft. |
| 75% of these large planes at 90% useful load | 7000 ft. |
| 100% of these large planes at 60% useful load | 5700 ft. |
| 100% of these large planes at 90% useful load | 8500 ft. |

SOURCE: FAA, COMPUTER PROGRAM - AIRPORT DESIGN, Version 2.2

Given an elevation of 990 feet above sea level and a mean daily maximum temperature of 86.7 degrees fahrenheit, a runway 4,000 feet in length would accommodate 100 percent of the small airplane fleet having less than ten (10) passenger seats.

Runway 10/28 is 2,800 feet in length and 50 feet in width. The runway (107°11'00") provides a 91.46 percent level of wind coverage at a crosswind component value of 13 knots. There is, at present, no crosswind runway facility at the Waverly Municipal Airport.

Consideration should be given to the ultimate development of a primary runway no less than 4,000 feet in length and 75 feet in width. A secondary runway constructed to the same length and width should ultimately be planned. In no case should the second runway be less than 3,200 feet in length or 80 percent of the primary runway length. Ultimate development is intended to accommodate traffic set forth in Scenario A.

An ultimate runway length of 3,400 feet would generally satisfy Scenario B while a runway length of 2,900 feet would accommodate activity set forth in Scenario C. The following Chapters will examine the cost(s)/benefit(s) of each level of service and development alternative. Use of the Waterloo Airport in lieu of adding additional capacity will be one of the alternatives examined.

## Taxiways

Taxiways are constructed for the purpose of moving aircraft between various components of the airport. As activity increases, taxiways become necessary for the purpose of increasing airport capacity and providing for increased safety.

Runway 10/28 is not served by a parallel taxiway. The Airport Layout Plan should show a future parallel taxiway. For runways designed to B-II standards, the taxiway width should be no less than 35 feet. S 250 foot separation between the taxiway and runway centerline should be maintained. B-I standards require a taxiway width of 25 feet and a separation distance from runway centerline to taxiway centerline of 150 feet.

A right-angle entrance and exit (dual use) taxiway is expected to provide an adequate level of service. Exit taxiways should be located at those intervals along the runway that represent the average turnoff point by the group of aircraft using the runway. On runways frequently used by aircraft in Approach Category A and B, an exit location 1,500 to 2,000 feet from the threshold is recommended.

A minimum separation distance of 105 feet should be provided between the taxiway and parallel taxilane. The taxiway system which provides for movement between tee hangars and the apron generally need not be more than 20 feet in width. Taxiway pavement strengths of 12,500 pounds single wheel would provide an adequate level of service for taxiways providing tee hangar access.

The taxilane is defined at that portion of the aircraft parking area used for access between taxiways, aircraft parking positions, hangars, and storage facilities. The width of the taxilane should be 0.63 times the wingspan of the most demanding aircraft plus seven feet. Using a wingspan of 79 feet, the taxilane should be no less than 115 feet in width. Consequently no hangar, fence, etc. should be located with 57.5 feet of the taxilane centerline. Within areas used by aircraft having a wingspan of 49 feet or less, the separation may be reduced to 38 feet.

Runway and taxiway width and clearance standards were obtained from the FAA computer program, Airport Design, Version 2.2. Clearance requirements for the runway and associated taxiway are summarized in Table 3-2.

**TABLE 3-2: TAXIWAY STANDARDS, B-II**

| | |
|---|---|
| Taxiway width | 35 ft. |
| Taxiway edge safety margin | 7.5 ft. |
| Taxiway shoulder width | 10 ft. |
| Taxiway safety area width | 79 ft. |
| Taxiway object free area width | 131 ft. |
| Taxilane object free area width | 115 ft. |
| Taxiway wingtip clearance | 26 ft. |
| Taxilane wingtip clearance | 18 ft. |

SOURCE: FAA AC 150/5300-13, AIRPORT DESIGN, CHG. 1, 6/5/91

## Runway and Taxiway Clearance Standards

Clearance requirements for the primary and secondary runways and associated taxiways are summarized in Table 3-3.

**TABLE 3-3: RW & TW CLEARANCE STANDARDS**

| | B-I | B-II |
|---|---|---|
| RW centerline to hold line | 125 ft. | 250 ft. |
| RW centerline to parallel taxiway or taxiway centerline | 150 ft. | 300 ft. |
| RW centerline to edge of aircraft parking | 125 ft. | 400 ft. |
| Taxiway centerline to parallel taxiway or TW centerline | 69 ft. | 105 ft. |
| Taxiway centerline to fixed or movable object | 44.5 ft. | 65.5 ft. |
| Taxilane centerline to parallel taxilane centerline | 64 ft. | 97 ft. |
| Taxilane centerline to movable or fixed object | 39.5 ft. | 57.5 ft. |

SOURCE: FAA AC 150/5300-13, AIRPORT DESIGN, CHG. 1, 6/5/91

## Obstacle Free Zone, (OFZ)

The Obstacle Free Zone (OFZ) is a three dimensional volume of airspace. The runway OFZ extends 200 feet beyond each end of the runway and to a width of 250 feet for non-precision instrument and visual runways serving small airplanes with an approach speed 50 knots or more.

The OFZ associated with the primary runway extends 200 feet beyond the runway end to a width of 400 feet.

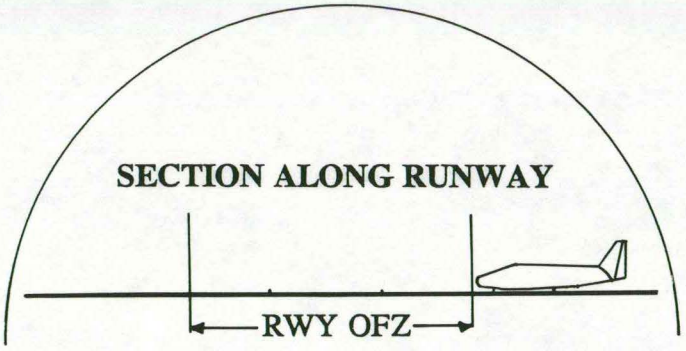
The approach OFZ applies to runways with an approach light system. The inner-transitional surface OFZ applies only to precision instrument runways. The Obstacle Free Zone is to be maintained free of all objects except frangible navigational aids.

## Object Free Area, (OFA)

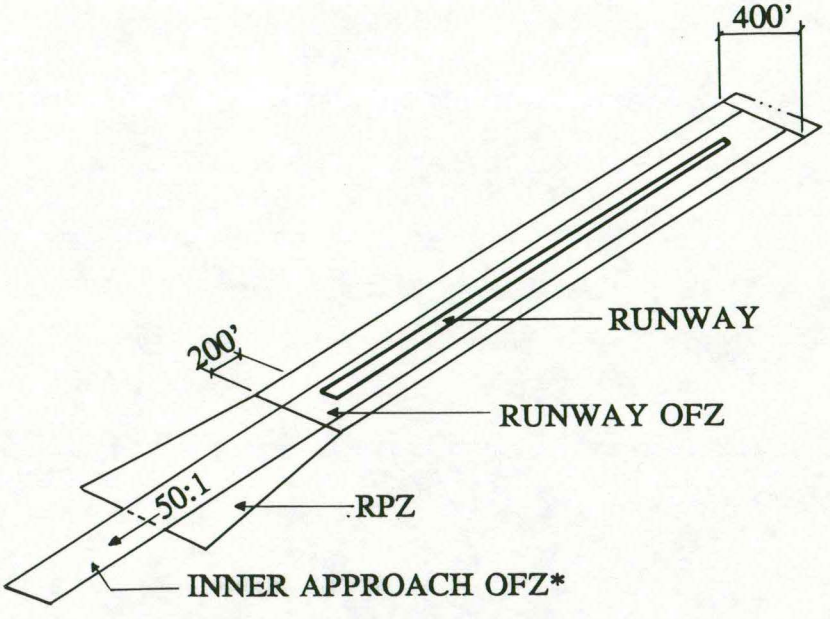
The object free area (OFA) is a two dimensional ground area surrounding runways, taxiways and taxilanes. The runway OFA extends 600 feet beyond the runway end and outward 250 feet from the runway centerline for non-precision instrument and visual approaches, (ARC B-II).

For a runway designed to B-I standards, the OFA extends out from the runway end 500 feet and out 200 feet from the runway centerline. Should the runway show only small airplanes, the OFA extends out 300 feet and 125 feet outward from the runway centerline extended.

FIGURE 3-2: RUNWAY OFZ




APPROACH CATEGORY A & B




*ONLY WITH AN APPROACH LIGHT SYSTEM

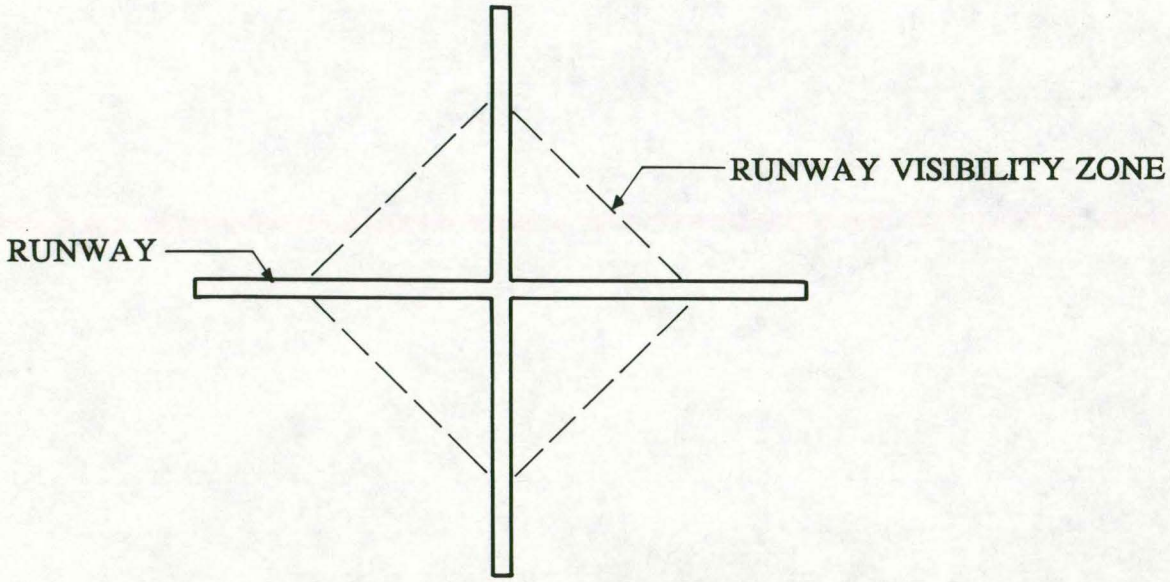
## Runway Grade Change and Visibility

Consideration must also be given to runway grade changes, line of sight along and between runways as well as elimination of obstructions within the obstacle free zone (OFZ). The following line of sight criteria should be obtained:

- Runway grade changes should be such that any two points five feet above the runway centerline will be visible along the entire length of the runway where a full parallel taxiway does not exist. Where a full parallel taxiway does exist, the criteria may be reduced to one half the runway length rather than the entire runway length.

- Where intersecting runways exist, a runway visibility zone is created as depicted in the following figure.

**FIGURE 3-3: RUNWAY VISIBILITY ZONE**




SOURCE: FAA AC 150/5300-13

- Runway grades, terrain, etc. must be such a line of sight is maintained within the visibility zone of the intersecting runways five feet above the centerline. Of primary concern with planning future facilities is the need to provide and maintain the visibility zone between the two intersecting runways as well as providing a smooth transition between existing and future pavement surfaces.

**Runway Safety Area, (RSA)**

A graded area beyond the runway surface is referred to as the runway safety area. Dimensional requirements associated with the runway safety area differ depending on approach speed and wingspan.

The area, located symmetrically about the runway, extends outward from the runway centerline 75 feet and 300 feet beyond the runway ends for those runway facilities designed for ARC B-II standards. The RSA associated with runways designed to ARC B-I extend out 240 feet from the runway end and outward 60 feet from the centerline. The traverse grade should not exceed two percent per 100 feet. The runway safety area should be void of all structures except those fixed by function.

| | Existing | Ultimate |
|---|---|---|
| RW 10/28: | 120' X 3280' | 150' X 4600' |
| Crosswind: | N/A | 150' X 4600' |

**Runway Protection Zone, (RPZ)**

The runway protection zone represents that portion of the approach surface on the ground. The inner edge of the RPZ coincides with the primary surface. The RPZ extends outward uniformly to a width determined by a point which is 50 feet above the ground elevation or the runway end elevation. The trapezoidal shaped runway protection zone area should be under control of the airport owner and maintained free of obstructions and concentrations of people. Typical RPZ configurations are noted as follows:

RW 12/30

| | | |
|---|---|---|
| Initial | 500' X 1000' X 800' | - non-precision instrument |
| Ultimate | 500' X 1000' X 800' | - non-precision instrument 3/4 statute mile plus visibility minimums - RW 28 |
| | 500'X 1000" X 800' | - visual approach RW 10 |

Crosswind Runway

| | | |
|---|---|---|
| Ultimate | 500' X 1000' X 800' | - non-precision instrument |

**Runway, Taxiway, and Apron Paving**

Airport pavement is intended to provide a smooth and safe all weather surface free from particle and other debris that may be picked up by propeller wash. The pavement should be of sufficient thickness and strength to accommodate the anticipated loads without undue pavement stress.

| | Existing | Ultimate |
|---|---|---|
| RW 10/28 | 12,500 lbs | 12,500 lbs (single wheel) |
| | 16,000 lbs | 16,000 lbs (dual wheel) |

The existing pavement strength on RW 10/28 will provide an adequate level of service throughout the 20 year planning period provided maintenance is carried out a needed. A crosswind runway should have the same pavement strength as the primary runway and should in no case support less than a 12,500 pound single wheel loading.

## Drainage

An adequate drainage system is important for the safety of aircraft operations and for the longevity of the pavements. Improper drainage can result in the formation of puddles on pavements which are hazardous to aircraft landing or taking off. Improper drainage can also reduce the load bearing capacity of subgrades and the anticipated life of expensive pavement structures.

Surface drainage systems should be designed on a five year frequency of storm. Methods of computation are contained in FAA Advisory Circular 150-5300-5B, Airport Drainage.

Subsurface drainage systems are desirable where water may rise to within one foot of the pavement section. Water in the subgrade contributes directly to frost boil and heaving action. Also, saturated subgrades exhibit a greatly reduced load bearing capacity. For these reasons, soil conditions and subsurface water conditions play an important part in airport design.

A subsurface drainage system consisting of 4 and 6 inch perforated tile may be required under the paved areas of the airport.

## Runway and Taxiway Lighting

A Low Intensity Runway Light (LIRL) system is operational on RW 10/28. A Medium Intensity Runway Light (MIRL) system should be installed on the primary runway while a LIRL system may provide an adequate level of service on the crosswind runway.

Runway lights are used to outline the edges of the runway during periods of darkness or low visibility. Each runway edge light fixture emits a white light except on instrument runways where yellow is substituted for white on the last 2,000 feet or one-half the runway length whichever is less. The yellow lights are located on the end opposite the landing threshold or instrument approach end opposite the landing threshold or instrument approach end. The edge light fixtures should be located no more than ten feet from the defined runway edge and spaced 200 feet on center. The runway light stake should be no less than 30 inches high due to snow removal and grass cutting. The lights, located on both sides of the runway should be directly across from each other and perpendicular to the runway centerline. Special requirements exist at runway intersections.

Two groups of threshold lights, the second part of a runway light system, are located symmetrically about the runway centerline. The threshold lights emit a 180 red light inward and 180 green light outward. The threshold lights should be located no closer than two feet and not more than ten feet from the runway threshold. The two groups of lights contain no less than three fixtures for a VFR runway and four fixtures for an IFR runway. The outer most light is located in line with the runway edge lights. The remaining lights are placed in ten foot centers towards the runway centerline extended. Air-to-ground radio control for the runway light system should also be maintained.

Taxiway edge lights should be located no more than ten feet from the taxiway edge on 200 foot centers. The taxiway edge light which emits a blue light define the lateral limits of the system. Reflectors may be used in lieu of taxiway lights where activity is minimal.

| | Existing | Ultimate |
|---|---|---|
| RW 10/28 | LIRL | LIRL/MIRL |
| Crosswind | None | LIRL/MIRL |

## Visual Approach Slope Indicator, (VASI)

Runways 10 and 28 are equipped with a VASI-2 system. The VASI-2 consists of 2 light units which emit a red and white light beam and enable the pilot to determine if his/her approach is high, on course, or low.

## Runway End Identification Lights, (REIL)

Runway End Identification Lights (REIL's) are not operational on RW 10/28 and should be placed on the primary runway and secondary runway. REIL's should be located in line with the threshold lights, 75 feet from the runway edge. IDOT recommends installation of a REIL system when the annual operations exceed 3,000.

**Rotating Beacon**

An airport beacon light is currently in operation. The beacon light, which emits alternating white and green flashes of light, should be located no closer than 750 feet to a runway centerline.

**Segmented Circle and Lighted Wind Indicator**

The segmented circle consists of a 100 foot diameter circle with a minimum of 18 segments constructed around the surface wind indicator. The marking system may be used to convey traffic patterns. A lighted wind indicator should be installed at the center. The segmented circle should be located between the terminal area and runway.

**Pavement Markings**

Non-precision instrument runway markings are in place on RW 10/28. NPI markings consist of basic centerline and runway designation markings in addition to threshold markings.

Unpaved (turf) runways are normally defined by placing markers at the corners of the runway and at 400 foot intervals along the length of the runway.

## Nondirectional Beacon (NDB)

A nondirectional radio beacon (NDB) is recommended for installation. Future metal buildings, power lines, metal fences, etc. should be located no closer than 100 feet to the NDB. The NDB radiates a signal which can be used by pilots to provide electronic directional guidance to the airport. The NDB is typically located on a 35 foot pole. The ground should be smooth, level, and well drained.

## Waterloo VORTAC

A non-precision instrument approach may be executed to Runways 10 and 28 using the Waterloo VORTAC. The Waterloo VORTAC is an enroute navigational aid located 12.1 nautical miles south of the Waverly Municipal Airport.

## Localizer and Other ILS Components

Installation of a localizer and/or other components of an instrument landing system are not contemplated at the Waverly Municipal Airport within the 20-year planning period.

Ground components of the instrument landing system, ILS, consist of the following:

- A localizer radio course to furnish horizontal guidance to the runway.
- A glide slope radio course to furnish vertical guidance along the correct decent angle to the proper "touchdown" point on the runway.
- Outer and middle marker beacons to provide accurate radio fixes along the approach path.

## TERMINAL AREA

### Concept

The terminal area represents the landside component of the airport. At general aviation airports the primary emphasis is typically placed upon structures for aircraft storage, facilities used and service provided by fixed base operators (FBO), queuing and tiedown space for itinerant aircraft, vehicle access and parking, fuel storage, and terminal building activities.

The terminal area should be organized into functional areas with space for future development. These areas are identified as follows:

1. Corporate Hangar Area
   - For conventional type hangar facilities designed to serve specific users. Such hangars would typically be constructed by the private sector on leased airport property.
   - Corporate hangars would be constructed only in response to demand.

2. Tee Type Hangar Area
   - For individual aircraft storage. Such hangars would typically consist of a single structure subdivided into individual aircraft storage units. Tee hangars may be constructed by the airport owner or by the private sector.

3. FBO Facility Area
   - For conventional type hangars used by fixed base operators for aircraft storage and maintenance. Space may also be provided within the conventional hangar for office and classroom use.

4. Terminal Building Area
   - For the construction of a small free standing structure. The structure would provide space for airport administrative offices, public restrooms and lounge area, pilot lounge, and conference room.
   - At many small airports, terminal building functions are included with the FBO facility.

5. Aviation Fuel Storage Area
   - For underground fuel storage. The area should be in close proximity to the apron fuel pad area and FBO facilities. Underground storage should be provided for 100 LL, Avgas, and jet fuel.

6. Apron Tiedown Area
   - For based and itinerant aircraft.

7. Aircraft Queuing Space and Fuel Area

The concept proposed for the terminal area must be flexible so as to allow for future expansion.

## Tee Hangars

T-hangar dimensions vary with manufacturers and need. Critical dimensions would include those concerning clear door, depth, wing depth, and tail height. Space requirements using a nested T-hangar concept are illustrated as follows:

| | STRUCTURE | | | | |
|---|---|---|---|---|---|
| NUMBER OF UNITS | WIDTH | LENGTH | CLEAR DOOR | WING DEPTH | TAIL DEPTH |
| 6 | 51' | 147'0" | 41'6" X 12' | 18' | 20'1" |
| 8 | 51' | 189'0" | 41'6" X 12' | 18' | 20'1" |
| 10 | 51' | 231'0" | 41'6" X 12' | 18' | 20'1" |
| 8 | 60' | 202'6" | 44'6" X 14' | 21' | 22'6" |

Hangar structures should be separated by a minimum of 75 feet. A taxiway, 20 feet in width should be maintained so as to provide access from the apron area to individual hangar stalls.

The demand for hangar space is influenced not only by the absolute number of aircraft, but by the cost, availability, and condition of the units as well.

* Existing - 11 stalls (1-11 unit structure)
* 1991-1995 - As demand warrants
* 1996-2010 - As demand warrants

The size of T-hangar units needed will depend upon the mix of airplanes based at the airport. As individual unit dimensions increase, the area that is reserved for future construction must be sufficient in size to accommodate various configurations.

## Conventional Hangars

A conventional hangar to be used by the FBO is proposed for construction. The hangar dimensions should consider the needs of the operator and provide a clear door that would accommodate the wing span and tail height of aircraft that may be placed in the hangar.

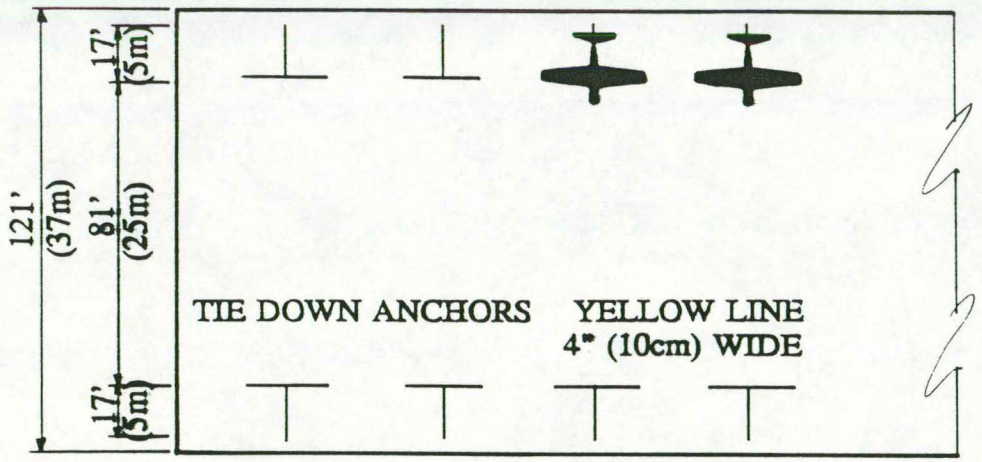
A structure with no less than 10,000 square feet of space should be considered. Construction may consist of a rigid frame clear span structure of 100 feet. A clear door up to an 80'x20' opening may be required. Doors may be bi-fold or on rollers. Given the investment, some degree of flexibility must be maintained so as to accommodate changing demand.

## Apron Tiedowns

An apron area should be maintained to provide space for aircraft movements (queuing space) and improved surface tiedowns for itinerant aircraft. The queuing area provides space for aircraft access to the FBO shop, individual hangars, fuel, pad, etc.

A typical tiedown area is illustrated in the following figure.

**FIGURE 3-4: TIEDOWN LAYOUTS**




**DESIGNED FOR SINGLE LANE TAXIING**
**AREA PER AIRPLANE 2,720 SQ. FT. (253m²)**

Taxilane:
81' between Tiedowns
Single lane taxiing

Since all based aircraft are expected to be in hangars, the primary concern is with itinerant aircraft. The nine (9) improved surface tiedowns will provide accommodate tiedown needs through 2010 for small airplanes.

However, additional ramp area should be considered at the time a conventional hangar is constructed.

**Access Road**

The IDOT recommends that the primary access road to the terminal area be hard surfaced. The width should be no less than 22 feet in width with provisions for shoulder and drainage. The existing access road from U.S. Highway 218 is expected to provide an adequate level of service throughout the 20 year planning period.

# CHAPTER FOUR
# COST/BENEFIT CONSIDERATIONS

## Introduction

The economic impact from the proposed airport development plan can be described in terms of direct, indirect, and induced benefits. The primary benefit of an airport is the time saved and cost avoided by the user over the next best alternative mode of transportation or airport facility. Benefits of a direct nature accrue primarily to the user and on-site activities. Indirect benefits derive from off-site economic activities that are attributable to the airport. Induced benefits are the multiplier effects of the direct and indirect impacts.

Direct benefits are summarized as follows:

* Transportation
  - Time saved
  - Reduced ground travel cost
* Reduced delays at air carrier airports
* Community benefits
  - Hospital/medical
  - Civil defense
  - Law enforcement
* Stimulation of business
  - Consideration in industrial siting
* Access to the National Airport System
* Commercial activities
  - Passengers and air cargo (FBO)
  - FBO operation
  - Aerial applicators

Indirect benefits are summarized in terms of:

* Off-site economic activities
  - Employment and wages paid
  - Expenditures for goods and services
  - Capital expenditures
  - Business efficiency
  - Taxes

Induced benefits:

* Multiplier
  - 2.5 times the direct and indirect benefits

While much emphasis is placed upon the number of based aircraft, an important consideration often overlooked are those businesses located elsewhere that may do business locally and use aviation to transport cargo and passengers. The airport provides accessibility to a national system of airports. Therefore, the number of itinerant aircraft operations are perhaps an equal or better measure of economic benefit than are the number of based aircraft.

Costs may also be described in terms of direct and indirect costs. Direct costs would be those associated with capital construction as well as annual operation and maintenance (O & M) costs. Indirect costs are those accrued by the user in the utilization of the facility. Other costs of an indirect nature may be those revenues lost to government from land that may be removed from the tax role as well as land utilization for other uses that produce income (commercial, agriculture, etc.).

Of concern to public decision makers is whether or not the proposed facility would return benefits in excess of costs. For purposes of discussion herein, the identification of benefits and costs should first be described.

Benefits:

1. Employment - Direct and Indirect
   A. Airport employees (public)
   B. Business located on the airport (private)
   C. Business located off the airport which use the facility (private - indirect)
2. Revenue - Direct
   A. Tenants lease
   B. Grants-in-aid
   C. Business taxes

Costs:

1. Expenditures - Direct
   A. Capital expenditures
   B. Operating and maintenance
2. Revenue - Direct
   A. Property and business taxes
3. Indirect Costs
   A. Environmental/agricultural land
   B. Other uses

The above describe a broad base for discussion. Key concerns appear to center upon the following:

1. Annual O & M costs: Capital cost; Debt amortization.
2. Availability of area airports: Waterloo Municipal Airport.
3. Usage by local business and industry.

Concerns regarding environmental issues are beyond the scope of this project. Such concerns would typically be addressed within an environmental assessment of the proposed action. Consequently the proposed action may produce benefits and costs that are not addressed within. An example may be the loss of prime agricultural land or wildlife habitat.

**Benefits**

The methodology used to quantify the benefits extended from the proposed airport development is based, for the most part, on the transportation benefit realized given alternative public airport locations. A study entitled Measuring the Regional Economic Significance of Airports was used as the basis for estimating transportation benefit generated at the Waverly Municipal Airport. The study, prepared by Stewart E. Butler of the Economic Analysis Division, Transportation System Center and Lawrence J.

Kiernan from the National Planning Division, Federal Aviation Administration, provides a useful methodology that may be applied locally.

**Reduced Ground Travel Cost**

Annual Ground Trips - GN + Y

GN, the number of annual itinerant GA operations, is equal to the number of GA-related ground trips on the assumption that passengers making a GA trip together will share one automobile in traveling between the trip origin and the airport. Y, the number of annual commercial passengers, equals the number of ground trips related to commercial service on the assumption that each commercial passenger requires a separate motor vehicle.

O-C-B trip costs = Qb  Annual Benefit - (GN+Y)(Qb-Qd)
O-A-B trip costs = Qd
Qb = Waterloo Airport
Qd = Waverly Airport

Total benefit was calculated using the equation stated below.

Total Annual Benefit = E(FGN + Y) (b/P - d/P + (GN + Y) (Qb - Qd)

A rate of $30 per hour (E) was used as the estimated value of the aircraft owners' and pilots' time. The Aircraft Owners and Pilots Association (AOPA) reports that the average annual income of its 260,000 members was $53,200, which equates to $25.58 per hour. The average number of passengers per trip (F) varies with aircraft type:

| | |
|---|---|
| Single engine piston aircraft with 3 seats or less | 1.5 passengers |
| Single engine piston aircraft with 4 seats or more | 2.3 passengers |
| Multi-engine piston aircraft | 3.1 passengers |

Vehicle operating costs per mile (Q) was placed at $0.28 per mile. Vehicle speed (P) varies with the travel route.

**Methodology**

The primary objective of this Chapter is to determine the benefits and costs associated with improved service at the Waverly Municipal Airport compared to using the Waterloo Municipal Airport. A favorable benefit/cost determination does not suggest that the project is feasible. Feasibility must consider the extent of local public, political, and financial support as well as the availability of grants-in-aid.

The proposed construction of a 4-lane divided highway (Avenue of the Saints) will reduce the travel time between Waverly and the Waterloo Municipal Airport. The intersection of Bremer Avenue and U.S. Hwy 218 was selected as the centroid for the primary airport service area. The distance from Bremer Avenue/U.S. Hwy 218 to the Waterloo Airport via 4th Street SW and the "Avenue of the Saints" (U.S. Hwy 218) was estimated at approximately 14.6 miles. The distance from Bremer Avenue and U.S. Hwy 218 to the Waverly Municipal is approximately 2.8 miles.

Table 4-1 summarizes the assigned values used in the calculation of transportation benefits anticipated under Scenario A.

**TABLE 4-1: WAVERLY AIRPORT BENEFIT VARIABLES - SCENARIO A**

| | Symbol | | 1991 | 1996 | 2001 | 2010 |
|---|---|---|---|---|---|---|
| Total annual itinerant operations | GN | = | 1240 | 1945 | 2297 | 2297-2553 |
| Itinerant operations/based aircraft | G | = | 103 | 114 | 128 | 115-128 |
| Based aircraft | N | = | 12 | 17 | 18 | 18-20 |
| Distance to Waverly Municipal | d | = | 2.8 miles | | | |
| Passenger time (Value/hour) | E | = | $30.00 per hour | | | |
| Passenger per trip | F | = | 2.5 passengers per trip | | | |
| Car speed | P | = | 55 miles per hour; 30 miles per hour | | | |
| Vehicle operating cost/mile | Q | = | $0.28 per mile | | | |
| Distance to Waterloo Municipal | b | = | 14.6 miles | | | |
| Commercial passengers | Y | = | 0 | | | |

SOURCE: JBM, 1992

The total annual transportation benefit calculated for the Waverly Municipal Airport is $135,230 based upon 1991 values. The annual transportation benefit is expected to increase throughout the 20-year planning period reaching $250,500 in 2001 and $311,377 in 2011. Should any one of the variables in Table 4-1 change, the annual benefit would also change.

**TABLE 4-2: ANNUAL TRANSPORTATION BENEFIT**

| Year | Annual Benefit In 1991 Dollars |
|---|---|
| 1992 | $135,230 |
| 1996 | $212,114 |
| 2001 | $250,501 |
| 2011 | $311,377 |

SOURCE: JBM, 1992

The above represents a very conservative estimate of transportation benefits that would be realized annually.

Economic impact of a direct nature, in addition to the transportation benefit noted above, is based upon employment generated. Approximately one (1) FBO job per 7.2 based aircraft will be created.

| | |
|---|---|
| 1992 | 1 to 1.5 jobs |
| 1996 | 2 to 2.5 jobs |
| 2001 | 2 to 2.5 jobs |
| 2011 | 2.5 to 3.5 jobs |

Assuming an average annual salary(1), the airport would generate $25,000 to $37,500 in payroll in 1991 and $62,500 to $87,500 in payroll by 2010. Given an induced multiplier of 0.75(2), approximately 18,750 to 28,125 additional dollars would be added to the local economy in 1992.

| | Payroll | Payroll + Induced |
|---|---|---|
| 1991 | 25,000 - 37,500 | (43,750 - 65,625) |
| 1996 | 50,000 - 62,500 | (87,500 - 109,375) |
| 2001 | 50,000 - 62,500 | (87,500 - 109,375) |
| 2011 | 62,500 - 87,500 | (109,375 - 153,125) |

(1) Average annual salary: $25,000
(2) Induced multiplier: 0.75 Measuring the Regional Economic Significance of Airports

Direct transportation benefits (transportation benefit + employment) in 1992 was placed at $43,750 to $65,625. By 2010, the direct benefit based upon 1991 dollars would approach $109,375 to $153,125.

Other benefits of a direct nature beyond those related to transportation would include those that extend benefits to the community as a whole as well as to specific sectors of the local economy. An example of the latter is benefits extended to the agricultural sector provided by aerial applicators operating from the facility.

Benefits of an indirect nature are more difficult to quantify. Such indirect benefits previously noted would include employment and wages paid by business and industry as well as expenditures for goods and services. Perhaps more important to local officials are expenditures made for capital facilities and taxes generated by such improvements. The economic impact of the proposed development may find increased tax revenues as a result of indirect benefits that relate to increased business efficiency and capital investment.

The more salient benefit provided is found in the increased accessibility to business and industry located within the primary airport service area. The benefits provided by increased accessibility are reflected to some degree in the estimates of itinerant aviation activity. The direct benefit of increased accessibility is expected to have a significant impact upon indirect benefits.

Grants-in-aid represent a benefit to the community as revenue that would otherwise not be brought into the County unless the facility is constructed. The grant-in-aid will impact the community in a number of ways.

* Direct benefit as revenue from an outside source.
* Induced benefit as each dollar is spent.
* Indirect benefit as operational efficiency of local business is increased.

The cost of a grant-in-aid for airport improvements should be viewed as being generated by the airport user. It is often argued that the user should pay for the cost of airport improvements. The fact is that the user does pay indirectly the major share of the cost of airport construction through the contributions made to the aviation trust fund.

A grant-in-aid is accounted for herein as a benefit since it is derived from a source outside the community service area. It represents a major infusion of money into the community having a short term impact in terms of construction expenditures (labor and materials).

**Operating and Maintenance Costs**

The cost side must consider not only capital expenditures, but annual operating and maintenance (O & M) costs as well. O & M budgets at general aviation's airports in Iowa vary greatly depending upon activity at the airport and local priorities. Maintenance is sometimes deferred in an attempt to balance airport generated revenue with annual expenditures.

Items typically included in an O & M budget are noted as follows:

* Salaries (airport management, maintenance)
  - Public employee
  - Contract services
* Utilities
* Office (telephone, postage, supplies, publication, etc.)
* Equipment maintenance (Landing, navigational aids)
* Vehicle maintenance, operation
* Insurance
* Professional services
* Building maintenance
* Depreciation
* Grounds maintenance (snow, grass)
* Pavement maintenance/markings

For purposes of this analysis, an average annual O & M less than $45,000 could be expected increasing to $60,000 with proposed improvements. Not included are those costs typically associated with runway, apron and taxiway construction, nor the cost associated with building construction.

There are a number of management scenarios that may be considered that would influence the level of expenditures for O & M items. Such scenarios typically cover the construction and ownership of hangar and fuel facilities, contractual arrangements with the FBO for airport management services and so on. A more in depth discussion will be offered in Chapter Six.

**Airport Revenue**

Airport generated revenues at most airports in Iowa are limited to the following sources:

* Hangar rental
* Crop sales/farm income
* Tax on aviation fuel
* Lease of terminal space, conventional hangar space

At the present time Federal assistance is limited to ninety (90) percent of the project cost, State assistance is limited to seventy (70) percent. With the exception of hangar facilities, vehicle parking, and terminal buildings, the remaining airport components are eligible for assistance. The balance of the project cost must be funded locally.

The assumption herein is that the project feasibility rests upon the ability of the airport sponsor/owner to acquire State and/or Federal assistance. The proposed action must be found by the FAA to meet criteria set forth int he National Plan of Integrated Airport Systems (NPIAS). The Iowa Department of Transportation must find the airport to be of state-wide significance. The proposed development must also have an approved Airport Layout Plan (ALP) and Environmental Assessment (EA) to be eligible for Federal assistance.

**System Cost/Benefit**

This section compares the capital costs of the proposed airport development with the present value of the net benefits to be obtained. The term "net benefits" refers to the annual benefits described previously less average annual operating and maintenance costs.

The Iowa Department of Transportation developed a methodology to assess public benefits accruing compared to the development cost. The methodology used to estimate the benefits included those variables used in the previous section to estimate the transportation benefits gained over time. To capitalize the benefits, a factor of 10.594 was used which reflects the discounted value of 20 years of benefits at a seven percent discount rate. Three other considerations were incorporated into the IDOT methodology.

* Average annual operating and maintenance expenditures (O & M).
* Average annual airport generated revenue.
* Average annual airport employment.

The benefits used in this cost/benefit analysis are those that are relatively easy to quantify. None of the recreational advantages obtained from airport development or other community benefits that arise such as medical uses, vocational training, civil defense, law enforcement, etc. are included in this analysis. Such benefits are difficult to quantify.

Indirect benefits from off-site employment and/or capital investments that can be attributed to the airport are also difficult to quantify since there are many other factors associated with business/industrial growth. Transportation benefit as it relates then to site location and/or a decision to expand, is only one of the factors taken into consideration.

Based upon anticipated activity in 1992, the capitalized benefit for the Waverly Municipal Airport was placed at $1,522,387. Should the FBO elect to construct a shop facility and expand the present level of service, the capitalized benefit would increase significantly. Airport generated revenue is expected to be minimal and not exceed $10,000 annually within the immediate future.

The major source of revenue generated by the airport is from hangar rentals. The airport does not realize any income from land leases or agricultural operations. After July 1, 1992, the airport will realize no revenue from fuel sales. Transfers from the general fund have historically been used to supplement airport generated revenues.

**Capital Costs**

The capital costs associated with airport development would provide for land acquisition in fee title and runway protection zone requirements. The capital costs would provide for the development of a new primary runway, 75 x 4,000 feet, partial parallel taxiway, and a medium intensity runway/taxiway light system. Runway end identifier lights and a precision approach path indicator would also be installed on the primary runway. A non-precision instrument approach is proposed to each runway.

RW 10/28 would be maintained as a crosswind runway. Even though RW 10/28 is not to standard, the benefit/cost analysis will assume that no major capital expenditures for additional length or width will be realized within the 20-year planning period. The present pavement, with adequate maintenance, is expected to provide a sufficient level of service through 2003 and beyond. Additional land should be acquired to accommodate the primary surface associated with RW 10/28. Additional fill will also be required in order to provide for the runway safety area.

Terminal area development would include additional ramp area and construction of a 10,000 square foot conventional hangar. Additional land should be acquired to accommodate future terminal area development. Consideration may also be given to construction of an 8-unit tee hangar and a second conventional storage hangar.

Construction of a new north/south primary runway would require the closure of an east/west county road as well as the possible removal of an existing farmstead. Extensive grading would also be encountered with the development of a new runway.

The estimated capital expenditures provides for the development of a new primary runway to Airplane Group II dimensional standards. The capital costs also include those associated with construction of a partial parallel taxiway and expanded apron.

**TABLE 4-3: CAPITAL COSTS - PUBLIC SECTOR**

| PHASE ONE | TOTAL | FEDERAL | STATE | PRIVATE | SPONSOR |
|---|---|---|---|---|---|
| 1992-1996 | 834,163 | 0 | 327,715 | 366,000 | 140,448 |
| **PHASE TWO** | | | | | |
| 1997-2001 | 2,401,528 | 2,161,375 | 0 | 0 | 240,153 |
| **PHASE THREE** | | | | | |
| 2002-2011 | 415,510 | 0 | 0 | 285,436 | 130,074 |

SOURCE: JBM

Included in the preceding table are those costs associated with the construction of hangar and aircraft maintenance facilities. The private sector is expected to construct a conventional hangar for use as a FBO facility. Consequently, no public funds are expected to be committed to the project.

**TABLE 4-4: CAPITAL COSTS - PRIVATE SECTOR**

| | |
|---|---|
| 1. Conventional hangar (10,000 SF); Site Development | $365,000 - 380,000 |
| 2. Tee Hangars - 8 unit | 109,756 |
| 3. Conventional Storage | 275,680 |
| Total Capital Costs - Private Sector | $650,436 - 670,436 |

SOURCE: JBM

The private sector is expected to invest no less than $365,000 in development of a 10,000 square foot conventional hangar facility. With the exception of the eleven (11) unit tee hangar, all future hangar facilities are expected to be owned by the private sector.

Table 4-5 summarizes the capitalized benefit anticipated within the period 1992 through 2011. The capitalized benefit is expected to increase from $1,522,387 in 1992 to $4,061,217 in 2011. Increased benefits are based on teh assumption that Phase One investment by the private sector will result in an increase in based aircraft as well as expanded services by the FBO. An increase in based aircraft and activity may provide justification for construction of a new primary runway within the period 1996 to 2001.

**TABLE 4-5: AIRPORT BENEFIT SUMMARY, 1992-2011**

| | | Payroll | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Transportation Benefit (1) | Airport Direct | Payroll Induced | Airport Revenue | Total | Less O & M | Net Benefit | Capitalized Benefit (2) |
| 1992 | $135,230 | $25,000 | $18,750 | $ 5,000 | $183,980 | $45,000 | $138,980 | $1,522,387 |
| 1996 | $212,114 | $50,000 | $37,500 | $ 5,000 | $304,614 | $60,000 | $244,614 | $2,679,502 |
| 2001 | $250,501 | $50,000 | $37,500 | $ 7,500 | $345,504 | $60,000 | $285,504 | $3,127,411 |
| 2011 | $311,377 | $62,500 | $46,875 | $10,000 | $430,752 | $60,000 | $370,752 | $4,061,217 |

(1) In 1992 Dollars

(2) Net Benefit Times 10.954

SOURCE: JBM

Table 4-6 compares the net capitalized benefit against the capital development costs. The capital development cost represents the total capital investment by the public and private sector. The benefit/cost ratio was calculated by dividing the capitalized benefits by the capital development cost.

**TABLE 4-6: BENEFIT/COST RATIO**

| Year | Capitalized Benefit | Capital Cost | BCR |
|---|---|---|---|
| 1992 | $1,522,387 | $ 468,163 | 3.25 (Phase 1 investment) |
| 1996 | $2,679,502 | $2,869,691 | 0.93 (Phase 1 and 2 investment) |
| 2001 | $3,127,411 | $2,869,691 | 1.09 (Phase 1 and 2 investment) |
| 2010 | $4,061,217 | $2,999,765 | 1.35 (Phase 1, 2 and 3 investment) |

SOURCE: JBM

The initial Phase One public sector investment of $468,163 is expected to generate a favorable return. The private sector within this period is expected to invest $365,000 to $380,000 in hangar and site improvements.

Costs are expected to exceed benefits with the initial construction of the new primary runway. Within a five-year period, activity generated by the private and public sector is expected to generate benefits equal to costs.

Should only transportation benefits be used in the calculation of the benefit/cost ratio, the benefits would not exceed costs associated with the construction of a new primary runway to an ultimate length of 4000 feet.

**TABLE 4-7: TRANSPORTATION BENEFIT/COST RATIO**

| Year | Transportation Benefit | Less O & M | Net Benefit | Capitalized Benefits | Capital Cost | BCR |
|---|---|---|---|---|---|---|
| 1992 | 135,230 | 45,000 | 90,230 | 988,379 | 468,163 | 2.11 |
| 1996 | 212,144 | 60,000 | 152,114 | 1,666,257 | 2,869,691 | 0.58 |
| 2001 | 250,501 | 60,000 | 190,501 | 2,086,748 | 2,869,691 | 0.73 |
| 2010 | 311,377 | 60,000 | 251,377 | 2,663,088 | 2,999,765 | 0.89 |

# CHAPTER FIVE

# DEVELOPMENT ALTERNATIVES

## Alternatives

Chapter Five identifies various development scenarios at the Waverly Municipal Airport. These development scenarios fall within the range extending from a "No-Project" alternative to service from another airport. The Airport Development Plan prepared for the Waverly Municipal by Brice, Petrides and Associates Inc. in 1982 considered various development scenarios as well.

## Service From Area Airports

Aside from the Waterloo Municipal Airport, there are no other public owned airports located within the Waverly Airport service area or within close proximity of Waverly. Give the present investment in airport facilities at Waverly coupled with aviation demand, closure of the Waverly Municipal Airport is not considered a prudent choice. Consequently service from Waterloo as a substitute for service presently provided is not a scenario being considered.

## System Relationship

There are a number of scenarios that may be examined.

Consideration may be given to a scenario that promotes greater cooperation between Waterloo and Waverly. Such might be based upon the concept of a metropolitan airport/aviation system. To date there have been no studies commissioned to examine the concept of a metro or regional airport system.

Other scenarios may be developed as well. Among such would be the concept of an expanded service area for the Waverly Airport. The expanded area may include those communities and counties extending up to 25 miles west of Waverly. The Waverly Airport Commission also suggested that consideration be given to a system or regional concept that would place Oelwein, Independence and Waverly under a single airport management structure. The system analysis may be expanded to include the following Level I, II, III, and IV state system airports:

Allison - Level IV
Grundy Center - Level IV
Oelwein - Level II
Waterloo - Level I
Waverly - Level III
Independence - Level III

An adequate level of service at the Waverly Municipal Airport is one that will accommodate those airplanes with the following characteristics:

| | | |
|---|---|---|
| 1. | Approach Speed | Less than 121 knots |
| 2. | Wing Span | Less than 79 feet |

The Waverly Municipal Airport should be designed to standards set forth in FAA AC 150/5300-13 for Airport Reference Code B-II. Development of the Waverly Municipal Airport to ARC B-II standards is consistent with recommendations made in the 1991 Iowa Aviation System Plan.

| | | |
|---|---|---|
| 1. | Functional Role: | To provide primary general aviation service |
| 2. | Design Category: | Facilities capable of handling some jet and large multi-engine aircraft but primarily small aircraft (aircraft with take-off weight of less than 12,500 pounds). Primary runway lengths generally range from 3,400 feet to 4,000 feet. |

A primary runway, developed to an ultimate length of 4,000 feet would be consistent with the 1991 Iowa Aviation System Plan and would not duplicate services provided by the Waterloo Municipal Airport.

**The "No-Project" Alternative**

The "No-Project" alternative would not satisfy a need within the defined airport service area. This alternative may result in a loss of employment and may inhibit economic development opportunities within the airport service area. The "No-Project" alternative would eliminate the opportunity to accommodate present and future levels of aviation activity as projected in Scenario "A".

**1981 Airport Development Plan**

The 1981 Airport Development Plan prepared for the Waverly Municipal Airport by Brice, Petrides and Associates Inc. examined three (3) alternative development concepts. The present airport configuration is unchanged from 1981. Site conditions, to include development alternatives and constraints, are essentially the same as in 1981. The development alternatives discussed herein, with minor modification, are the same as those presented in the 1981 Plan.

**Alternative One**

Alternative One gives consideration to reconstructing and extending existing runway, RW 10/28. There are a number of constraints to accommodating a facility 75 foot in width and 4,000 feet in length. The most salient limitations are noted as follows:

1. RW 10
   - U.S. Highway 218
   - Intersection of County with U.S. Highway 218
   - Farmstead located south of RW 10 centerline extended.
   - Topographic
   - Ability to accommodate OFA (600' beyond threshold) and RSA (300' beyond threshold)
   - Pole lines

Given existing site conditions, an extension to RW 10 is not considered a viable alternative for consideration.

A number of constraints to placement of an extension on RW 28 are also found.

2. RW 28
   - Railroad
   - Topographic

An extension of no more than 600 feet could be accommodated on RW 28 should the runway be constructed to Airport Reference Code B-II standards. The obstacle free area associated with B-II standards is 500 feet in width and extends out 600 feet from the threshold. Consequently, the ultimate length of RW 10/28 would be no more than 3,400 feet.

The OFA associated with a B-I runway is 400 feet in width and extends out 500 feet. If serving small airplanes only, the OFA is 250 feet in width and extends out 300 feet.

The 1981 Plan estimated that no less than 418,000 cubic yards of fill material would be required to accommodate an extension RW 28. An additional 12.5 acres of land in fee would also have to be acquired.

**Alternative Two**

Alternative Two considers the development of a new primary runway. In this alternative the existing runway would be maintained as a crosswind runway. There are a number of constraints to development of a new runway.

- Existing east/west county road
- Topographic conditions
- Power lines
- Farmsteads

The 1981 Plan recommended development of a new runway, RW 17/35. The proposed alignment was located along a ridge-line extending in a north/northwesterly direction. The proposed 1981 alignment would have included the acquisition of 62.4 acres of land, the relocation of a farm, and the closure of a gravel road.

The proposed alignment (N 0°00') presented herein was selected so as to avoid the displacement of an existing farmstead. The alignment would require closure of an east/west gravel road as well as the relocation of overhead utility lines.

The threshold of RW 36 would be located 1,000 feet south of RW 10/28 and would extend in a northerly direction 4,000 feet. The proposed alignment would provide a 91.45 percent level of wind coverage at a 10.5 knots crosswind component value. RW 10/28 and RW 18/36 would provide a combined coverage of 96.25 percent at 10.5 knots.

The existing farmsteads, located on either side of the proposed runway, would not penetrate the associated 7:1 transitional slope.

Implementation of Alternative II would require the acquisition of no less than 69 acres of land in fee title. In order to accommodate the runway protect zone associated with Runways 36 and 18, 20 acres in easement would also be required.

**Assessment of Alternatives**

Alternative I would not accommodate the ultimate runway length recommended. As noted, the maximum length of runway that could be obtained would not exceed 3,400 feet based on ACR B-II design requirements. Consequently the continued expansion of RW 10/28 is not recommended should the airport goal be to accommodate 100 percent of the small airplane fleet.

Alternative II would provide the Waverly Municipal Airport with a runway capable of satisfying aviation activity through 2011. It would, when combined with RW 10/28, provide an adequate level of wind coverage. Development of a new runway is considered essential to the expansion of FBO services at the airport. Without expanded FBO services and an investment by the private sector in hangar facilities, implementation of Alternative II may not represent a prudent course of action.

Service from another airport may be considered an appropriate alternative should there not be a commitment to expand FBO services. Construction of a shop facility, as well as additional airplane storage by the private sector, would be necessary in order to realize an expanded fixed base operation. Should investment by the private sector not be obtained, consideration should then be given to continued maintenance of the existing facility with expenditure of public funds being limited to:

1. Safety
2. Preservation

# CHAPTER SIX

# AIRPORT LAYOUT PLAN

## Introduction

The Airport Layout Plan (ALP) consists of four (4) drawings which depict existing conditions and future facility development anticipated through 2011. The ALP should be displayed in a prominent place and used in those decision making processes concerning the airport. It should continuously be reviewed against current events, conditions and policies of the Airport Commission. A process should be officially established to review the ALP so that changes can be made in response to ever changing conditions. The ALP exhibits were prepared on 24"x36" mylar sheets and reduced for inclusion herein.

## Airport Layout Plan

The ALP contains a summary in table form of existing and ultimate facility development. Also shown is a wind rose used to determine the extent of wind coverage provided by RW 10/28 and the proposed runway, RW 18/36. The wind data is based on the most recent 10 year data period.

The ALP does not recommend an increase in length to RW 10/28. It should also be noted that the present width of 50 feet does not meet the minimum design standard. Consideration should be given to increasing the pavement width to 60 feet.

The ALP does depict the acquisition of additional land in fee title along the north property line so as to accommodate the 7:1 transitional slope. Additional fill is also recommended beyond RW 10 so as to provide for the minimum runway safety area (RSA) requirements.

A non-precision instrument approach is recommended to RW 28 while a visual approach is expected to be maintained on RW 10. With construction of RW 18/36, terrain that currently penetrates the primary surface would be removed.

The runway obstacle free area (OFA) associated with RW 10 can be accommodated on existing airport property. An additional 0.25 acres of land in fee would be needed so as to satisfy OFA requirements associated with RW 28.

A partial parallel taxiway is proposed from the present apron to RW 10. A taxiway pavement width of 35 feet is recommended. The taxiway would also extend from the apron to the proposed runway and associated taxiway.

Non-precision instrument markings are proposed on RW 10/28. The low intensity runway edge light (LIRL) system is expected to be maintained until such time additional width was placed on RW 10/28. At that time, a medium runway intensity runway light system may be installed.

The ALP also depicts the proposed location and alignment of a new runway. The runway, 75 feet in width and 4,000 feet in length, would require the acquisition of 69.1 acres of land in fee title. In order to accommodate the runway protection zone (RPZ), an additional 20.0 acres of land in easement would be required.

| | | |
|---|---|---|
| 1. | RW 36 | 10.46 Acres - RPZ Easement |
| 2. | RW 18 | 9.54 Acres - RPZ Easement |

Closure of an east/west gravel road would be required.

The alignment was selected so as to avoid the need to displace and relocate any existing residential dwellings. The threshold of RW 36 was located so as to avoid relocation of the east/west power transmission line located south of the airport.

The ALP depicts the ultimate development of a full parallel taxiway. It is recommended that initial development consist only of that segment extending from RW 36 to a point 710 feet north of the intersection of RW 18/36 and RW 10/28.

Non-precision instrument approaches are planned to each runway. A medium intensity runway light system (MIRL) is recommended. Runway End Identifier Lights (REIL) and a Precision Approach Path Indicator (PAPI) are also recommended for installation.

Terminal area improvements are also depicted on the ALP and shown in greater detail on the Terminal Area Plan sheet. Future structures should be located so as to accommodate FAR Part 77 requirements as well as the runway visibility zone between the intersecting runways.

**Airport Airspace Drawing**

The airport airspace drawing is the second sheet of the airport layout plan and shows the airport imaginary surfaces in plan and profile, as outlined in Federal Aviation Regulations (FAR) Part 77, Objects Affecting Navigable Airspace. The plan view is drawn to a scale of 1"=2,000', with elevation contours of the imaginary surfaces superimposed over a U.S.G.S. 7-1/2 minute quadrangle map of the area surrounding the airport. The map identifies ground features in the vicinity of the airport and those physical features which may have an adverse effect on airspace. Items specifically noted include cities, highways, railroads, rivers, towers, grain elevators, and other terrain features which are significantly higher in elevation than the airport site, or which have an effect upon airport development.

Small scale profile views of the imaginary surfaces along centerline of each runway are also included on the drawing. The profile views depict the approach slopes and their relation to physical features of the terrain that exist beyond the runway ends.

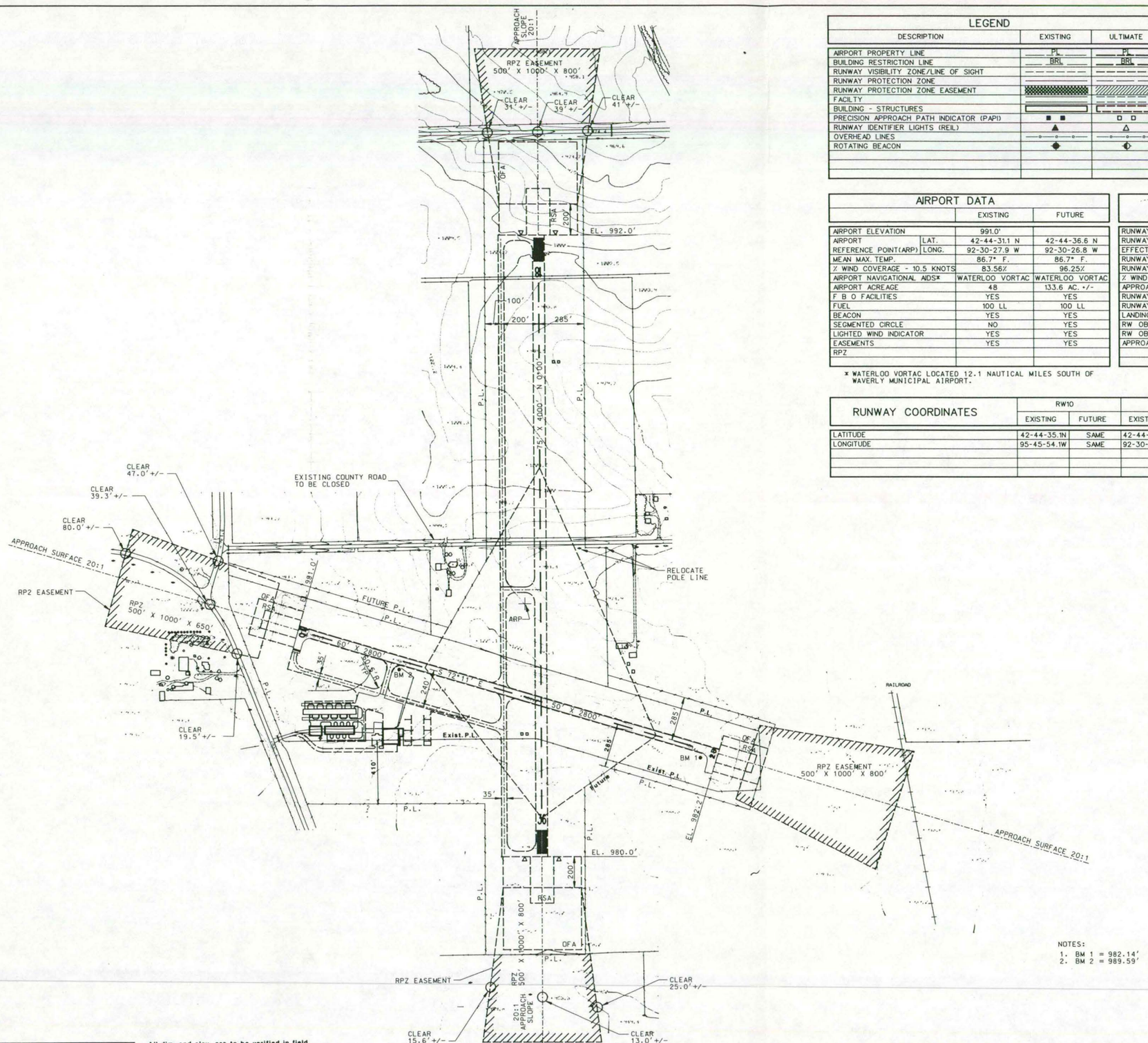
## Runway Protection Zone Drawing

This drawing consists of large scale plan and profile views of the inner approach surface for each end of each runway. The plan views, drawn to a scale of 1"=300', for each runway and the respective runway protection zone at each runway end are shown along with pertinent ground features.

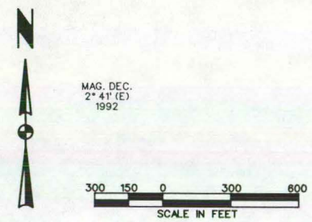
Directly below the plan views are drawn the respective profile views showing the planned approach slopes. The profiles extend a minimum of 1,000 feet beyond the runway ends at slopes of 20:1. Above-ground physical features, such as trees, power poles, roadways, building, etc. are identified in plan views and shown in profile in order to determine if any obstructions exist in the clear zone. It is highly important to take action to remove or nullify all obstructions shown in the runway feasibility, application may be made to the FAA for a determination of whether a hazard exists.

## Terminal Area Drawing

The terminal area drawing shows the location of existing structures, taxiways, tiedown and apron areas as well as vehicle access and parking areas. The terminal area plan also shows proposed improvements.




| LEGEND | | |
|---|---|---|
| DESCRIPTION | EXISTING | ULTIMATE |
| AIRPORT PROPERTY LINE | PL | PL |
| BUILDING RESTRICTION LINE | BRL | BRL |
| RUNWAY VISIBILITY ZONE/LINE OF SIGHT | | |
| RUNWAY PROTECTION ZONE | | |
| RUNWAY PROTECTION ZONE EASEMENT | | |
| FACILITY | | |
| BUILDING - STRUCTURES | | |
| PRECISION APPROACH PATH INDICATOR (PAPI) | | |
| RUNWAY IDENTIFIER LIGHTS (REIL) | | |
| OVERHEAD LINES | | |
| ROTATING BEACON | | |



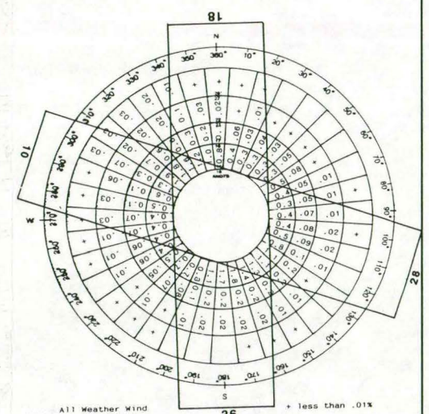

| AIRPORT DATA | | EXISTING | FUTURE |
|---|---|---|---|
| AIRPORT ELEVATION | | 991.0' | |
| AIRPORT REFERENCE POINT(ARP) | LAT. | 42-44-31.1 N | 42-44-36.6 N |
| | LONG. | 92-30-27.9 W | 92-30-26.8 W |
| MEAN MAX. TEMP. | | 86.7° F. | 86.7° F. |
| % WIND COVERAGE - 10.5 KNOTS | | 83.56% | 96.25% |
| AIRPORT NAVIGATIONAL AIDS* | | WATERLOO VORTAC | WATERLOO VORTAC |
| AIRPORT ACREAGE | | 48 | 133.6 AC. +/- |
| F.B.O. FACILITIES | | YES | YES |
| FUEL | | 100 LL | 100 LL |
| BEACON | | YES | YES |
| SEGMENTED CIRCLE | | NO | YES |
| LIGHTED WIND INDICATOR | | YES | YES |
| EASEMENTS | | YES | YES |
| RPZ | | | |

* WATERLOO VORTAC LOCATED 12.1 NAUTICAL MILES SOUTH OF WAVERLY MUNICIPAL AIRPORT.

| RUNWAY DATA | * RW 10/28 | | RW 18/36 | |
|---|---|---|---|---|
| | EXISTING | FUTURE | EXISTING | FUTURE |
| RUNWAY LENGTH | 2800' | 2800' | | 4000' |
| RUNWAY WIDTH | 50' | 60' | | 75' |
| EFFECTIVE RUNWAY GRADIENT | 0.3% | 0.3% | | 0.37% |
| RUNWAY PAVEMENT STRENGTH | 12500 SW | 12500 SW | | 12500 SW |
| RUNWAY SAFETY AREA (WIDTH, LENGTH) | 120'X3280' | 120'X3280' | | 150'X4600' |
| % WIND COVERAGE - 10.5 KNOTS | 83.56% | 83.56% | | 91.45% |
| APPROACH SLOPE | 20:1 | 20:1 | | 20:1 |
| RUNWAY MARKINGS | NPI | NPI | | NPI |
| RUNWAY EDGE & THRESHOLD LIGHTING | LIRL | LIRL | | MIRL |
| LANDING AIDS | PAPI | PAPI | | REIL,PAPI |
| RW OBJECT FREE ZONE | 250'X3200' | 250'X3200' | | 250'X4400' |
| RW OBJECT FREE AREA WIDTH/LENGTH | 240'X3400' | 240'X3400' | | 500'X5200' |
| APPROACH CATEGORY & DESIGN GROUP | B-I | B-I | | B-II |
| | | | | |
| | | | | |

* RW 10/28 DUAL WHEEL-16000 LBS.
* SMALL AIRPLANE ONLY

| RUNWAY COORDINATES | RW10 | | RW28 | | RW18 | | RW36 | |
|---|---|---|---|---|---|---|---|---|
| | EXISTING | FUTURE | EXISTING | FUTURE | EXISTING | FUTURE | EXISTING | FUTURE |
| LATITUDE | 42-44-35.1N | SAME | 42-44-27.2N | SAME | --- | 42-45-02.9N | --- | 42-44-23.2N |
| LONGITUDE | 95-45-54.1W | SAME | 92-30-09.3W | SAME | --- | 92-30-25.4W | --- | 30-30-25.4W |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |




| WIND DATA | | | |
|---|---|---|---|
| CROSSWINDS | RWY 10/28 | RWY 18/36 | COMBINED |
| 10.5 KNOTS | 83.56 | 91.45 | 96.25 |
| 13.0 KNOTS | 88.11 | 94.02 | 98.72 |
| | | | |
| | | | |
| | | | |

NOTES:
1. BM 1 = 982.14'
2. BM 2 = 989.59'

# AIRPORT LAYOUT PLAN

## WAVERLY MUNICIPAL AIRPORT
## WAVERLY, IOWA

JBM JOHNSON, BRICKELL, MULCAHY AND ASSOCIATES, INC.
CONSULTING ENGINEERS

All dim. and elev. are to be verified in field.

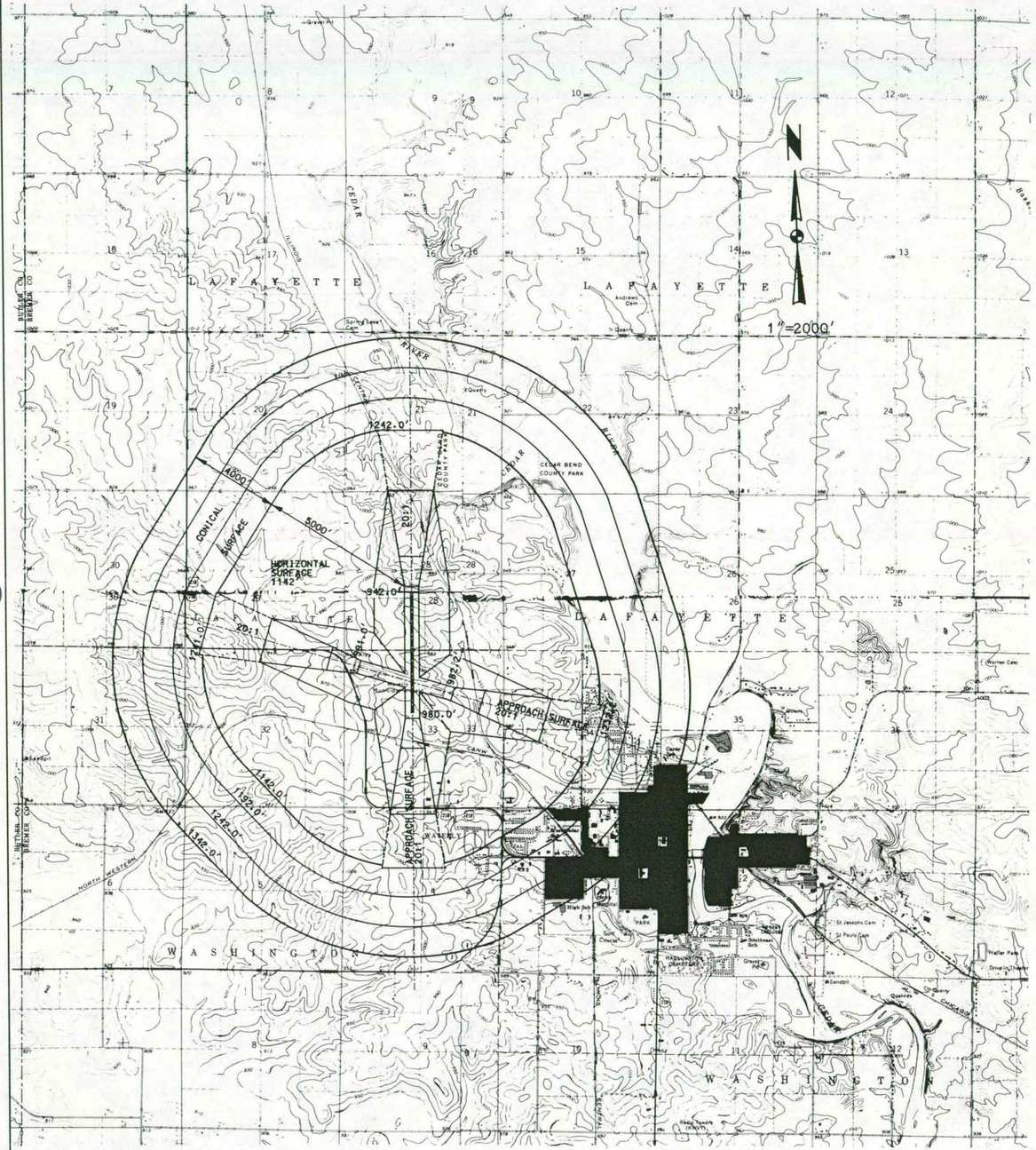
| DATE | REVISIONS | BY |
|---|---|---|
| | | |
| | | |

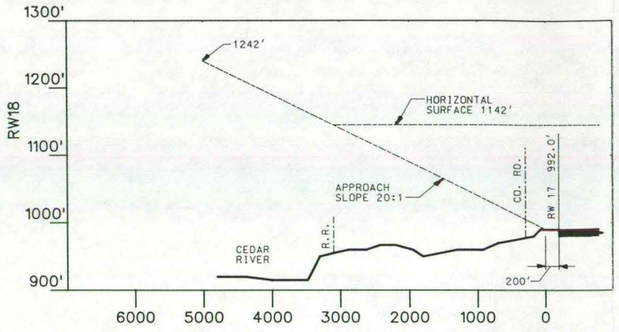
DESIGNED: JS | DRAWN: JMM
CHECKED: | DATE: 10/14/92

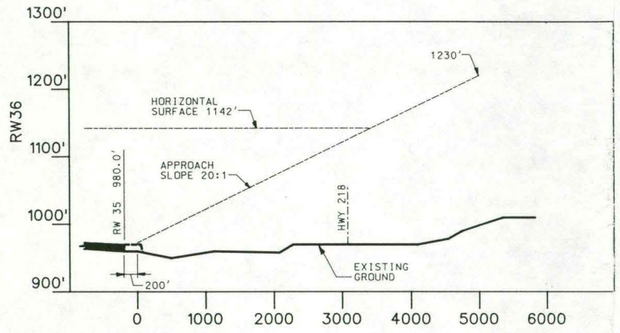
PROJECT NUMBER

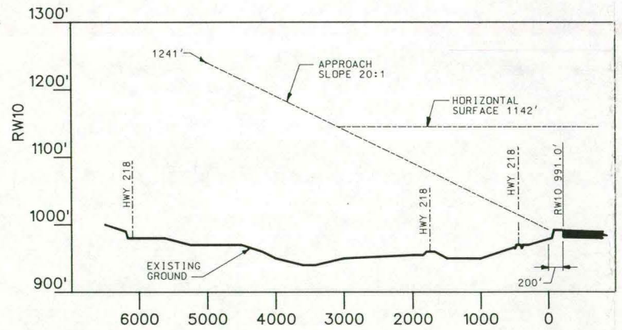
| STATE | | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|
| IOWA | | 1992 | 1 | 4 |

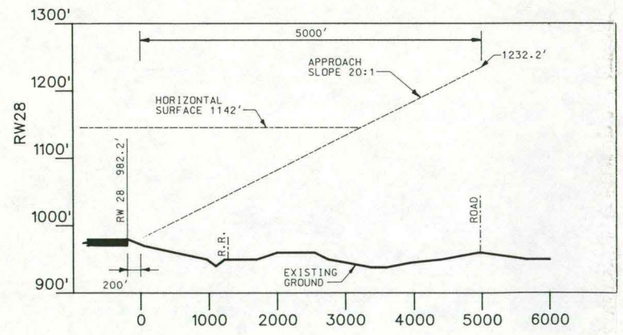
RESTORE.DWG




NOTE:
ALL OBJECTS TO BE REMOVED AS PER FAR PART 77.

ESTABLISHED AIRPORT ELEVATION 992' ASL

HORIZONTAL SCALE 1"=1000'
VERTICAL SCALE 1"=100'

| OBSTRUCTION TABLE | | | | |
|---|---|---|---|---|
| DESCRIPTION | ELEVATION | OBSTRUCTION | LOCATION | RECOMMENDATION |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

# AIRPORT AIRSPACE

## WAVERLY MUNICIPAL AIRPORT
## WAVERLY, IOWA

JBM JOHNSON, BRICKELL, MULCAHY AND ASSOCIATES, INC.
CONSULTING ENGINEERS

| DATE | REVISIONS | BY |
|---|---|---|
| | | |

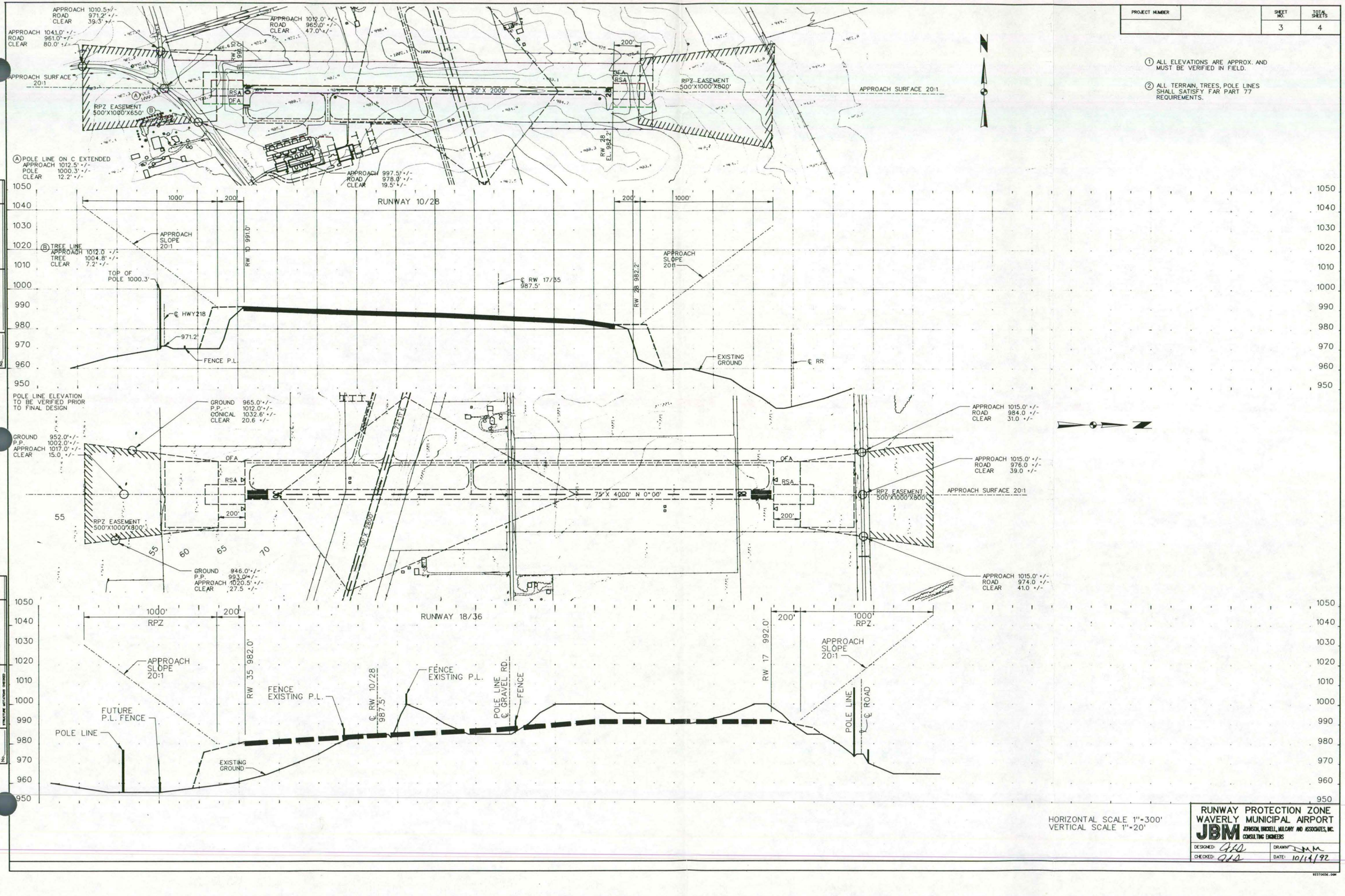
DESIGNED: [illegible] DRAWN: MAM
CHECKED: [illegible] DATE: 10/14/92

PROJECT NUMBER

| STATE | | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|
| IOWA | | 1992 | 2 | 4 |

| PROJECT NUMBER | SHEET NO. | TOTAL SHEETS |
|---|---|---|
| | 3 | 4 |

1. ALL ELEVATIONS ARE APPROX. AND MUST BE VERIFIED IN FIELD.
2. ALL TERRAIN, TREES, POLE LINES SHALL SATISFY FAR PART 77 REQUIREMENTS.



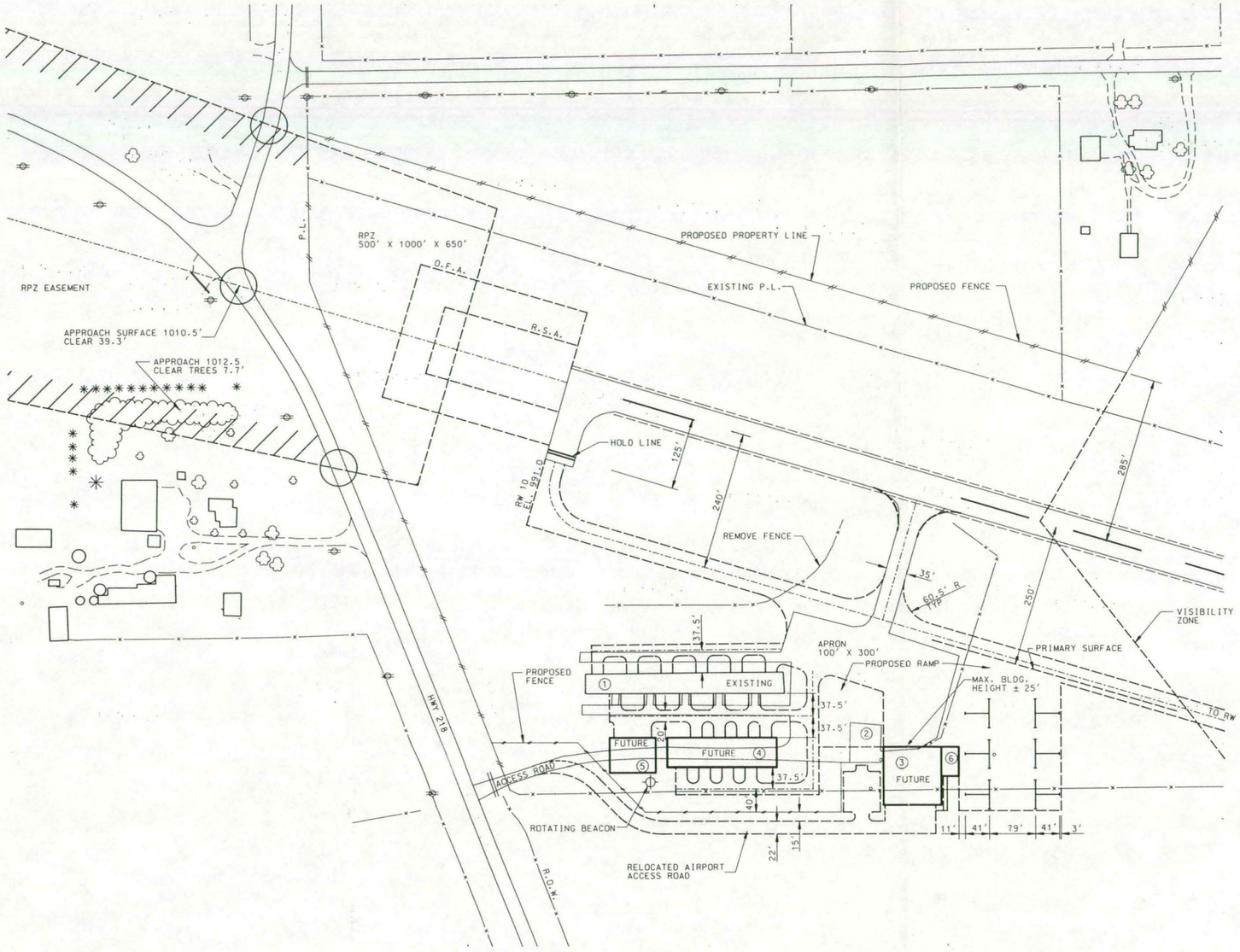

HORIZONTAL SCALE 1"=300'
VERTICAL SCALE 1"=20'

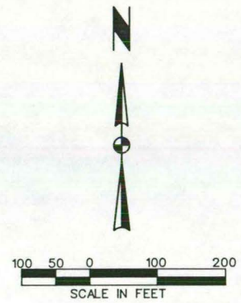
RUNWAY PROTECTION ZONE
WAVERLY MUNICIPAL AIRPORT

JBM JOHNSON, BRICKELL, MCCARY AND ASSOCIATES, INC.
CONSULTING ENGINEERS

| DESIGNED: | DRAWN: |
|---|---|
| CHECKED: | DATE: 10/14/92 |

9237003E.DGN




LEGEND

① EXISTING 11 UNIT TEE HANGAR
② EXISTING TERMINAL BUILDING
③ FUTURE 100' X 100' CONVENTIONAL HANGAR (FBO)
④ FUTURE 51' X 189' 8 UNIT NESTED TEE HANGAR
⑤ FUTURE 60' X 80' CONVENTIONAL STORAGE HANGAR
⑥ FUTURE 30' X 50' TERMINAL/FBO OFFICE

REMOVE EXISTING FENCE(S) AS REQUIRED PER F.A.R. PART 77.
REMOVE EXISTING TERMINAL BLDG. ② AND EXPAND PRON (OPTIONAL)
RELOCATE ROTATING BEACON LIGHT.

# TERMINAL LAYOUT

WAVERLY MUNICIPAL AIRPORT
WAVERLY, IOWA

JBM JOHNSON, BRICKELL, MULCAHY AND ASSOCIATES, INC.
CONSULTING ENGINEERS

| DATE | REVISIONS | BY |
|---|---|---|
| | | |

DESIGNED: J.S. DRAWN: D.A.M.
CHECKED: DATE: 10/14/92

PROJECT NUMBER

| STATE | | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|
| IOWA | | 1992 | 4 | 4 |

# CHAPTER SEVEN

# DEVELOPMENT PLAN

## Development Phases

The development schedule is presented in two (2) five-year phases and one (1) ten-year phase. Phase One extends from 1992 through 1996 while Phase Two covers the period from 1997 through 2001.

| | |
|---|---|
| Phase One | 1992-1996 |
| Phase Two | 1997-2001 |
| Phase Three | 2002-2011 |

## Phase One: 1992-1996

The primary objective in Phase One should be the construction of a conventional hangar sufficient in size to accommodate the needs of the fixed base operator, (FBO). The hangar should contain no less than 10,000 square foot of floor area. As previously noted, the hangar is expected to be constructed by the public sector rather than the private.

Public sector projects recommended in Phase One are limited to land acquisition, apron and taxiway improvements. Approximately 11.76 acres of land should be acquired in order to accommodate terminal area improvements.

Apron expansion is recommended so as to provide space for itinerant aircraft tie-downs as well as queuing space for refueling.

Phase One projects should consider safety and preservation needs before expansion. While additional length to RW 10/28 is not proposed, consideration should be given to increasing the width from 50 feet to 60 feet. In addition, additional fill is required beyond each runway in order to accommodate runway safety area requirements. A visual approach is anticipated to RW 10 while a non-precision instrument approach is expected to be maintained on RW 28.

In summary, Phase One projects give priority to:

1. Increasing the number based aircraft and aircraft operations by:
   - A. Expansion of FBO facilities and services
     - 1) Conventional hangar - shop area
   - B. Expansion of ramp and tie-down area
   - C. Construction of a connecting taxiway from apron to RW 10
2. Preservation of existing facilities

3. Increased safety
   A. Relocated beacon
   B. Maintenance of runway safety area associated with RW 10/28

Prior to anticipated construction of a new primary runway in Phase Two, the need should be clearly established. Expansion of the FBO facilities and services may provide the impetus for an increase in the number of based aircraft as well as operational activity in Phase One. Justification for construction of RW 18/36 is based upon an increase in activity.

**Phase Two: 1997-2001**

Within the period 1997 to 2001, consideration should be given to the acquisition of 69 acres of land in fee title for purpose of accommodating the construction of RW 18/36. In addition, 20 acres of land in easement should be obtained to provide for that portion of the runway protection zone that extends beyond the airport property line.

Prior to construction of RW 18/36, the east/west county road would require closure. Existing dwellings would continue to be served by the remaining road to the east and west. Power lines would also be removed and relocated as required.

Construction of RW 18/36 would require an extensive amount of grading. In addition to grading associated with the runway, terrain that would penetrate the primary and transitional surfaces would also have to be removed. The visibility zone, extending between the two intersecting runway facilities, must also be maintained.

Proposed for construction is a runway facility 75 feet in width and 4,000 feet in length. The hard surfaced runway would be designed to accommodate a 12,500 pound single wheel loading.

A turnaround is proposed for construction on RW 18. A partial parallel taxiway, 35 feet in width, is proposed to extend from RW 36 north 1,720 feet. A connecting taxiway would also be constructed from the partial parallel taxiway to the apron. While the ALP depicts a full parallel taxiway to RW 18/36, construction would be given a low priority.

A non-precision instrument approach is recommended to runways 18 and 36. Non-precision instrument markings are also proposed. Runway end identifier lights (REIL) and a precision approach path indicator (PAPI) are recommended for installation on each runway. Medium intensity runway edge and threshold lights (MIRL) should be installed and maintained on the new runway.

The runway safety area (RSA) associated with RW 18/36 extends along the entire length of the runway to a point 300 feet beyond the threshold. The runway safety area width is 150 feet. The runway obstacle free area (OFA) extends out from the threshold 600 feet and is 500 feet in width.

Construction of RW 18/36 represents a significant investment. Prior to construction, justification must be clearly demonstrated. The benefits extended must exceed associated development costs. An increase in the number of based aircraft together with an increase in itinerant operations is a key variable in determining the relationship of benefits to cost.

Based upon anticipated aviation activity in Phase One, there appeared to be little justification upon which to initiate development of RW 18/36 in Phase One. As previously noted, efforts to increase the number of based aircraft and operational totals could best be attained by supporting expanded FBO services.

Should an increase in aviation activity be realized sooner than anticipated, construction could be moved to Phase One. On the other hand, construction may be deferred to Phase Three should increased activity not be attained.

**Phase Three: 2002-2011**

Phase Three projects may be constructed in any one of the two preceding development phases should there be sufficient demand. Proposed is the construction of an 8-unit tee hangar south of the existing tee hanger. Construction of the tee hangar would require relocation of the existing access road.

The ALP also depicts the location of a proposed conventional hangar, (60'x80'). The structure may be used for storage of heavier twin engine airplanes should the demand exist.

Other considerations within the period, 2002-2011, include the construction of a new terminal/FBO office. The existing terminal structure may be removed and the apron area expanded.

The development schedule is based upon the forecast of aviation activity. Given the historic record and projected changes in aviation activity, the development schedule and associated capital improvement program should be reviewed annually.

**Capital Costs**

An estimate of cost for each phase was calculated. The cost estimates were based upon average 1991 pricing. Since the final design has not been completed, the cost associated with site grading, drainage, paving, and lighting may vary from the estimate of cost provided herein. Other capital costs may also vary depending on several parameters such as construction conditions, specification requirements, and time of construction. Future costs may be updated by comparing Engineering News Record Construction Cost Indexes and applying those to the average 1991 construction costs.

The capital cost estimates presented herein include a contingency of five (5) percent for unforeseen circumstances. An additional 17 percent was added to the component costs for engineering, legal, and administrative costs. The total cost represents the sum of construction costs, contingency, and engineering, legal, and administrative costs.

**Phase One: 1992-1996**

| | | |
|---|---|---|
| I. | Land Acquisition | |
| 1. | Fee Title | $ 41,375.00 |
| 2. | Fencing | 2,783.00 |
| 3. | Appraisal | 7,000.00 |
| 4. | Land Survey | 5,000.00 |
| 5. | Negotiations | 1,500.00 |
| 6. | Legal, recording | 5,000.00 |
| 7. | Contingencies | 2,534.00 |
| | TOTAL | $ 65,192.00 |
| II. | Apron | |
| 1. | Grading | $ 18,193.00 |
| 2. | Subgrade preparation | 7,171.00 |
| 3. | 4" granular base | 20,916.00 |
| 4. | 6" PCC | 101,592.00 |
| 5. | Shouldering | 440.00 |
| 6. | Anchors | 1,800.00 |
| 7. | Contingencies | 7,506.00 |
| 8. | Eng. Legal, Admin. | 26,795.00 |
| | TOTAL | $ 184,413.00 |
| III. | Conventional Hangar | |
| 1. | 10,000 SF | $ 300,000.00 |
| 2. | Contingency | 15,000.00 |
| 3. | Eng. Legal, Admin. | 51,000.00 |
| | TOTAL | $ 366,000.00 |

| | | |
|---|---|---|
| IV. | Lighting | |
| 1. | NDB | $ 22,000.00 |
| 2. | MITL | 7,050.00 |
| 3. | Rotating Beacon | 4,500.00 |
| 4. | Contingency | 1,678.00 |
| 5. | Eng. Legal, Admin. | 5,704.00 |
| | TOTAL | $ 40,932.00 |
| V. | Taxiway - RW 10/Apron | |
| 1. | Grading | $ 5,222.00 |
| 2. | Erosion Control | 1,000.00 |
| 3. | Seeding | 750.00 |
| 4. | 6" subdrains | 8,460.00 |
| 5. | Subgrade prep. | 3,528.00 |
| 6. | 4" granular base | 10,290.00 |
| 7. | 6" PCC | 49,980.00 |
| 8. | Shouldering | 1,410.00 |
| 9. | Marking | 1,000.00 |
| 10. | Contingency | 4,082.00 |
| 11. | Eng. Legal, Admin. | 13,879.00 |
| | TOTAL | $ 99,601.00 |
| VI. | RW 10/28 - RSA | |
| 1. | Fill | $ 62,963.00 |
| 2. | Seeding | 992.00 |
| 3. | Contingency | 3,198.00 |
| 4. | Eng. Legal, Admin. | 10,872.00 |
| | TOTAL | $ 78,025.00 |
| **PHASE ONE TOTAL** | | **$ 834,163.00** |

**Phase Two: 1997-2001**

| | | | |
|---|---|---|---|
| I. | Land Acquisition | | |
| | 1. | Fee Title | $ 172,500.00 |
| | 2. | Fencing | 22,523.00 |
| | 3. | Appraisal | 15,000.00 |
| | 4. | Land Survey | 10,000.00 |
| | 5. | Negotiation | 5,000.00 |
| | 6. | Legal, recording | 5,000.00 |
| | 7. | Contingency | 11,501.00 |
| | | TOTAL | $ 241,524.00 |
| II. | Grading & Drainage | | |
| | 1. | Excavation | $ 500.00 |
| | 2. | Drainage | 30,000.00 |
| | 3. | Erosion Control | 10,000.00 |
| | 4. | Seeding & Fertilizer | 49,500.00 |
| | 5. | 6" subdrains | 48,000.00 |
| | 6. | Contingency | 32,040.00 |
| | 7. | Eng. Legal & Admin. | 108,936.00 |
| | | TOTAL | $ 781,776.00 |
| III. | Runway Paving | | |
| | 1. | Subgrade preparation | $ 42,012.00 |
| | 2. | 4" granular base | 122,535.00 |
| | 3. | 6" PCC | 579,751.00 |
| | 4. | Shouldering | 8,235.00 |
| | 5. | RW Marking | 12,400.00 |
| | 6. | Contingency | 38,247.00 |
| | 7. | Eng. Legal & Admin. | 130,039.00 |
| | | TOTAL | $ 933,219.00 |
| IV. | RW & TW Lighting | | |
| | 1. | REIL | $ 7,000.00 |
| | 2. | PAPI | 14,000.00 |
| | 3. | MIRL | 40,000.00 |
| | 4. | MITL | 28,400.00 |
| | 5. | Elect. vault | 10,000.00 |
| | 6. | Radio Control | 1,500.00 |
| | 7. | Contingency | 3,625.00 |
| | 8. | Eng. Legal, Admin. | 12,325.00 |
| | | TOTAL | $ 116,850.00 |

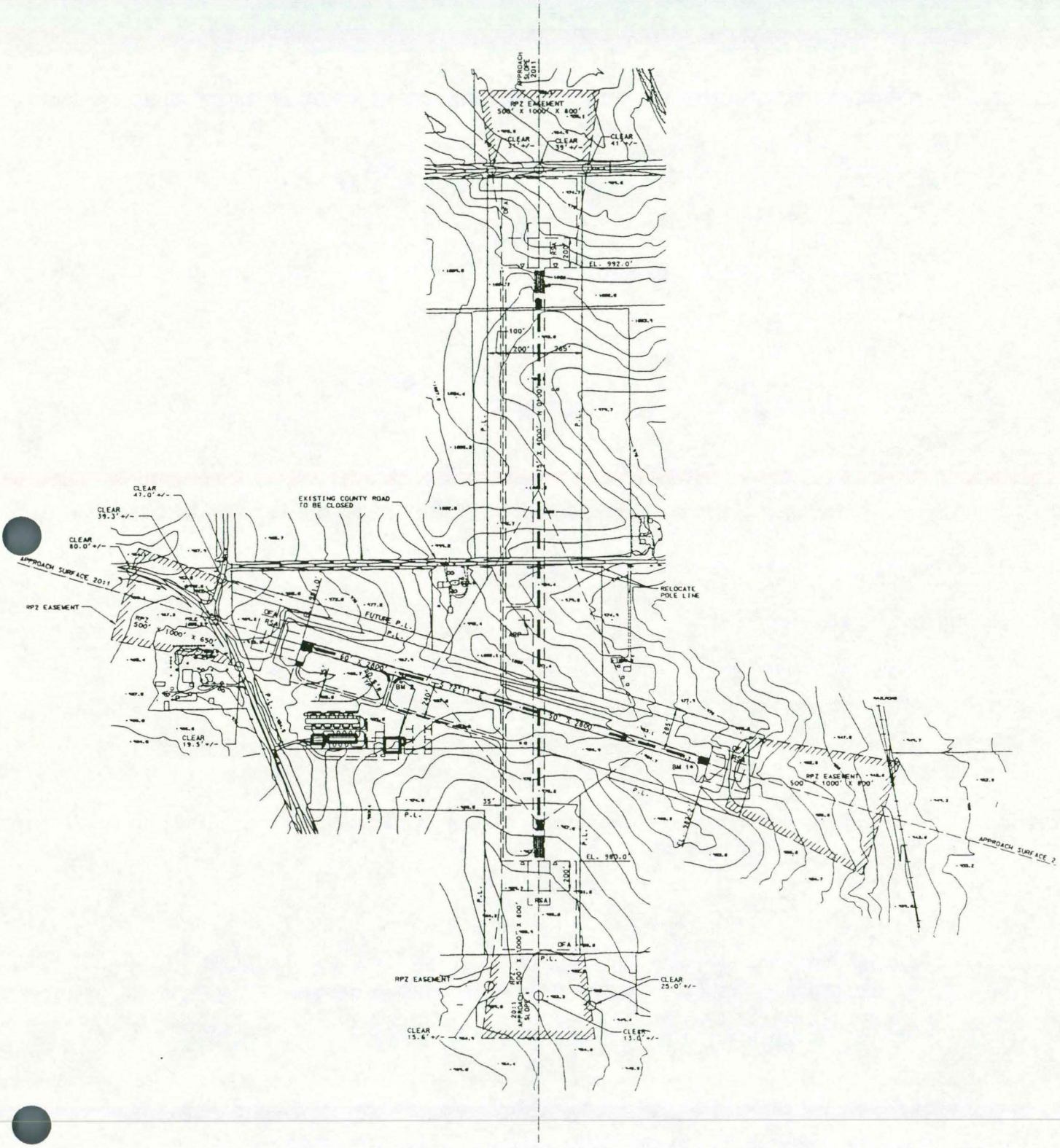
| | | |
|---|---|---|
| V. | Taxiway Paving | |
| 1. | Subgrade preparation | $ 14,416.00 |
| 2. | 4" granular base | 42,046.00 |
| 3. | 6" PCC | 204,221.00 |
| 4. | Shouldering | 5,800.00 |
| 5. | TW Marking | 2,500.00 |
| 6. | Contingency | 13,449.00 |
| 7. | Eng. Legal, Admin. | 45,727.00 |
| | TOTAL | $ 328,159.00 |
| **TOTAL PHASE TWO** | | **$2,401,528.00** |

**Phase Three: 2002-2011**

| | | |
|---|---|---|
| I. | Tee Hangar | |
| | 1. 8-stall | $ 89,964.00 |
| | 2. Contingency | 4,498.00 |
| | 3. Eng. Legal, Admin. | 15,294.00 |
| | TOTAL | $ 109,756.00 |
| II. | Grading and Paving | |
| | 1. Grading | $ 7,640.00 |
| | 2. Subgrade preparation | 3,325.00 |
| | 3. 4" aggregate base | 9,699.00 |
| | 4. 6" PCC | 47,107.00 |
| | 5. Subdrain | 9,900.00 |
| | 6. Contingency | 3,884.00 |
| | 7. Eng. Legal, Admin. | 13,204.00 |
| | TOTAL | $ 94,759.00 |
| III. | Conventional Hangar | |
| | 1. 60'x80' | $ 144,000.00 |
| | 2. Contingency | 7,200.00 |
| | 3. Eng. Legal, Admin. | 24,480.00 |
| | TOTAL | $ 175,680.00 |
| IV. | Access Road/Parking | |
| | 1. Grading | $ 4,668.00 |
| | 2. 4" granular base | 9,279.00 |
| | 3. Drainage/miscellaneous | 15,000.00 |
| | 4. Contingency | 1,447.00 |
| | 5. Eng. Legal, Admin. | 4,921.00 |
| | TOTAL | $ 35,315.00 |
| **TOTAL PHASE THREE** | | **$ 415,510.00** |

**FIGURE 7-1**

**ULTIMATE AIRPORT DEVELOPMENT CONCEPT: 1992-2010**



## IMPLEMENTATION

### Federal Assistance

The Federal Airport Act of 1946 created the Federal-Aid Airport Program (FAAP) and a National Airport Plan (NAP). The Airport and Airway Development Act of 1970 repealed FAAP and NAP programs and established the Airport Development Aid Program (ADAP) and National Airport System Plan (NASP). Public law 97-24B (Airport and Airway Improvement Act of 1982) required the publication of a National Plan of Integrated Airport Systems (NPIAS) by September 3, 1984 and created the Airport Improvement Program (AIP). Airports in Iowa have benefitted from the various Federal airport assistance programs since FAAP was created in 1946.

The Airport and Airway Trust Fund created in 1970 as a repository for the tax monies paid by the aviation users supports Federal programs. The primary source of revenue is generated by an eight (8) percent tax on passenger tickets. Other sources include a tax on freightway bills, international departures, and general aviation fuel. The Airport and Airway Safety and Capacity Expansion Act of 1987 set annual funding ceilings for each year through 1992.

At present, the Federal Aviation Administration provides grants-in-aid up to 90 percent of the project cost on eligible items. In general, eligible items include all airport requirements except those which specifically benefit the private sector. For example, hangar facilities and taxiway 20 feet out from the hangar are not eligible. Vehicle parking lots are not eligible nor are terminal buildings except at Commercial Airports.

### State Assistance

The Iowa Department of Transportation provides assistance for airport improvements at those airports included in the State System of Airports.

At the present time, the rate of participation if 70 percent on eligible items. Airport components eligible for assistance are the same as those eligible for Federal assistance. Sources of aviation revenue are noted as follows:

1. Fuel
   - A. Aviation gas tax - 8 cents per gallon
   - B. Jet fuel tax - 3 cents per gallon
2. Aircraft Registration fees
   - A. Commercial: $35/aircraft
   - B. General Aviation
     - Year 1 - 1.5% of list price
     - Year 2 - 75% of first year
     - Year 3 - 50% of First year
     - Year 4 - 25% of first year
       (minimum $15/aircraft)

The amount of money that will be available from Federal sources is estimated at 2.1 million dollars and 1.7 million from State sources.

**Private Sector Investment**

The investment of public funds should also provide an impetus for private investment. An area in which private investment may be used effectively is for the development of tee-hangar facilities. Hangars benefit specific airplane owners. Consequently, it is reasonable to place the responsibility for hangar development with the private sector.

Such facilities constructed with private capital on the airport facility may be deeded to the airport owner in trade for a long term lease. The advantage of such an arrangement is that it relieves the airport owner (sponsor) of the burden of financing private hangar facilities while retaining possession and control of all real property on the airport.

The proposed development policy assumes that the private sector will construct future tee-hangar facilities and taxiway pavement within twenty (20) feet of the hangar. After a 10 to 15 year amortization period, the hangars constructed by the private sector would become airport property. Revenue generated from hangar rental would at this point be available to the airport owner.

Another alternative available would include a joint effort between the private sector and public sector. The latter may be required in some cases where the income generated from the rental of hangar stalls is insufficient to cover annual amortization costs. The Waverly Airport Commission's present policy is to construct hangar facilities with public funds.

**Sponsor Source of Funding**

Given historic sources of airport generated revenue and past operating and maintenance expenditures, little airport generated revenue is expected to be available to implement major capital projects. Consequently, the local (sponsors) share of the capital expenditures is expected to come from general obligation bonds and/or a combination of general obligation and revenue bonds. Revenue bonds as a sole source of funding is not considered a realistic option in the near term.

Should other public entities elect to support the Waverly Municipal Airport, additional revenue sources may be found in the form of contributions or tax levies. The latter source would be available provided an airport authority was created to include other municipalities. Reference may be made to Appendix A concerning the creation of an Airport Authority.

General obligation bonds may be issued for airport improvements on the basis of "public necessity". Payment is secured by the full faith, credit, and taxing power of the issuing agency. Voter approval is not required where the airport has been in existence.

## Implementation Strategy

Any strategy by which to implement the proposed projects will be defined in part by the ownership status. Public owned airports may be owned and operated by a municipality, county, airport authority and through a 28-E agreement.

Other factors that define the method of project implementation would include the availability of grants-in-aid as well as program requirements. For example, the Airport and Airway Safety and Capacity Expansion Act of 1987 expired in 1992. The 102nd Congress passed re-authorization legislation which extended the AIP program through fiscal year 1993. State assistance has also undergone various changes with projects being funded from the general fund rather than the Aviation Trust Fund.

Table 7-1 summarizes, by development phase, a single scenario for project implementation. Implementation assumes state, federal, sponsor and private sector participation. The sponsor may be the City, County and/or an airport authority.

Airport ownership (sponsor) should have little affect upon participation by the FAA or IDOT. Multi-jurisdictional co-operation is, however, generally viewed as being a positive attribute.

Phase One improvements place an emphasis upon obtaining a financial commitment from the City of Waverly. It also assumes participation by the Iowa Department of Transportation. As previously noted, Phase One activities place an emphasis upon safety and preservation as opposed to expansion of airfield capacity. It is recommended that efforts to increase activity be made prior to seeking federal assistance to expand the airport.

Phase Two seeks federal participation for the development of a new primary runway. Phase Three projects involve hangar construction and other non-eligible improvements.

## LE 7-1: CAPITAL PROJECT COST SUMMARY

| One: 1992-1996 | Total | Federal | State | Private | Sponsor (1) |
|---|---|---|---|---|---|
| and acquisition | 65,192 | 0 | 45,634 | 0 | 19,558 |
| pron | 184,413 | 0 | 129,090 | 0 | 55,323 |
| onventional Hangar | 366,000 | 0 | 0 | 0 | 366,000 |
| ighting/NDB | 40,932 | 0 | 28,652 | 0 | 12,280 |
| W 10/28 - RSA | 78,025 | 0 | 54,618 | 0 | 23,407 |
| **OTAL PHASE ONE** | **734,562** | **0** | **257,994** | **0** | **476,568** |
| **Two: 1997-2001** | | | | | |
| and acquisition | 241,524 | 217,372 | 0 | 0 | 24,152 |
| rading/drainage | 781,776 | 703,598 | 0 | 0 | 78,178 |
| W paving | 933,219 | 839,897 | 0 | 0 | 93,322 |
| W/TW lighting | 116,850 | 105,165 | 0 | 0 | 11,685 |
| W paving | 328,159 | 295,343 | 0 | 0 | 32,816 |
| **OTAL PHASE TWO** | **2,401,528** | **2,161,375** | **0** | **0** | **240,153** |
| **Three: 2002-2011** | | | | | |
| ee Hangar - 8 | 109,756 | 0 | 0 | 109,756 | 0 |
| rading/paving | 94,759 | 0 | 0 | 0 | 94,759 |
| onventional Hangar | 175,680 | 0 | 0 | 175,680 | 0 |
| ccess road/parking | 35,315 | 0 | 0 | 0 | 35,315 |
| **OTAL PHASE THREE** | **415,510** | **0** | **0** | **285,436** | **130,074** |

he sponsor, airport owner, may be anyone of the following:

- Airport Authority
- Municipality
- County
- 28-E

ntly, the City of Waverly owns and operates the airport through the Waverly Municipal Airport nission.

## Capital Improvement Program

A five-year capital improvement program (CIP) should be prepared for the Phase One capital projects. The airport CIP should be incorporated into the City's (sponsor) overall capital improvement program and updated annually. Table 7-2 establishes a five-year CIP for the airport beginning July 1, 1993 and extending through June 30, 1998.

**TABLE 7-2: CAPITAL IMPROVEMENTS PROGRAM, FY93-FY97**

| | | TOTAL | STATE | PRIVATE | SPONSOR |
|---|---|---|---|---|---|
| **I** | **FY-92/93** | | | | |
| | No Capital projects anticipated | | | | |
| **II** | **FY-93/94** | | | | |
| | RW 10/28 RSA | 78,025 | 54,618 | 0 | 23,407 |
| | Land Acquisition | 65,192 | 45,634 | 0 | 19,558 |
| | Conventional Hangar | 366,000 | 0 | 0 | 366,000 |
| | | 509,217 | 100,252 | 0 | 408,965 |
| **III** | **FY-94/95** | | | | |
| | TW Lighting/NDB | 40,932 | 28,652 | 0 | 12,280 |
| | Apron | 184,413 | 129,090 | 0 | 55,323 |
| | | 225,345 | 157,742 | 0 | 67,603 |
| **IV** | **FY-95/96** | | | | |
| | No Capital projects anticipated | | | | |
| **V** | **FY-96/97** | | | | |
| | No Capital projects anticipated | | | | |

The Airport Commission (Sponsor) should update the CIP annually. The conventional hangar noted in FY-94/95 should be constructed by the public sector as soon as it is feasible to do so.

# APPENDIX A

# AIRPORT OWNERSHIP

## Introduction

Nearly all public airports within Iowa are owned and maintained by municipalities. Although Chapter 330 of the Iowa Code provides for ownership and maintenance by the county, there are no county owned airport facilities within the State. Chapter 330 also provides for the creation of an airport commission. An airport commission may be appointed by the governing body of the airport owner after an election in which a majority of the voters favor airport control and management by an airport commission. In addition, Chapter 330 provides for the joint exercise of powers and the establishment of a joint airport commission.

Within Iowa there have been a number of airport authorities created. Chapter 330A of the Iowa Code sets forth procedures for creation as well as the powers of an airport authority. The airport may also be owned and operated as provided in Chapter 28E of the Iowa Code.

- Municipality (Airport Commission) Chapter 330
- County (Airport Commission) Chapter 330
- Airport Authority Chapter 330A
- 28E Agreement Chapter 28E

The airport service area for most public owned airports in Iowa extends well beyond the corporate boundary of the associated community. For the most part, the service area of general aviation airports in Iowa coincide more closely with the geographic extent of the county in which it is located. There are exceptions where the airport is not located in the geographic center or where more than one public owned airport is located in the county. Larger air carrier and transport category airports have a service area extending over a large multi-county area.

Public support is most often derived from the municipality that owns and operates the facility. There are a few exceptions where the county has provided financial assistance. The municipality in maintaining the airport facility, provides a service extending beyond the corporate boundary. Providing municipal services to an area located beyond the corporate boundary is often the subject of considerable discussion. Such discussions extend from small communities contemplating sewer and water extension to large metropolitan areas where numerous public facilities are used by non-residents.

Appendix A outlines a method of airport ownership. The recommendations set forth are based upon the need to encourage multi-jurisdictional ownership of facilities where the service benefits two or more entities. Second, some economics of scale may be realized through multi-jurisdictional cooperation.

## Airport Authority

Until 1970, all public airports in Iowa were owned and operated by a single municipality. Within the past few years, there has been a growing interest in the multi-jurisdictional ownership and operation of the general aviation airport. The depressed economy of the 1980's together with efforts to attract new industry provided a basis upon which to evaluate the importance of general aviation as a mode of transportation. Area communities along with county government soon recognized that the airport provided access to the area from large urban areas where corporate offices were located. The general aviation airport was recognized as an important component of the area's transportation infrastructure.

Airport Authorities may be created by one or more municipalities. For example, Polk County Authority consists of three communities and the county. The authority allows a multi-jurisdictional approach to maintaining the airport as part of the overall transportation system in the county. Procedures for creating an Airport Authority are set forth in Chapter 330A of the Iowa Code and are briefly described as follows:

1. The governing body (City Council, Board of Supervisors) of each municipality or county that desires to participate in the creation of an authority must pass a resolution stating it's intent to do so. The resolution, in addition to expressing intent, must also include the names of other municipalities, the number of Board members to be appointed, name of the authority as well as the date, time and place for public hearing. The resolution must be published at least once and at least 14 days prior to the hearing date.

2. After the hearing, the governing body must pass an ordinance authorizing the creation of an authority. The governing body may elect to have three (3) readings of the ordinance and may waive the 2nd and 3rd readings.

3. The Airport Authority Agreement is separate from the ordinance and can be amended. The Agreement should include provisions for the appointment of Board members, the levy amount and period of time the assessment is to cover, as well as, provisions for additional members and procedures for withdrawal. The Agreement should also set forth procedures for arbitration. There is no requirement for a public election.

4. Board
   The Airport Authority Board is the governing body of the authority and consists of at least 3 or more members. The Polk County Airport Authority Board consists of 7 members. Board members are appointed by the governing body of those entities having joined the Authority.

5. The authority has the power to:
   - Acquire, construct, and operated aviation facilities
   - Enter into contracts with local, state, and federal government
   - Fix and collect fees and rentals
   - Have the power of eminent domain
   - Borrow money and issue bonds

6. Member municipalities may be agreement levy up to 27 cents per $1000 dollars taxable valuation. There is a great deal of flexibility provided as to the levy amount. In no case should it be less than what is necessary to provide for debt service and to provide an adequate annual O & M budget. (For example, Panora, Yale, and Guthrie Center provided a 27 cent levy whereas Guthrie County provided a 13 cent levy.) The bonds are exempt from both federal and state income tax. The levy may extend over a 40 year period. In no case should it be less than the time period required to retire the airport revenue bonds. Excess revenues collected are placed in a capital reserve fund.

7. Existing airport facilities may be transferred or sold to the Authority. (For example, the City of Audubon upon executing the airport authority agreement transferred title of the Audubon Municipal Airport to the Audubon County Authority.)

8. Members may withdraw from the authority but only after having satisfied any obligation incurred while a member of the authority.

For additional information, reference should be made to Chapter 330A of the Iowa Code.

AUTHORITY CREATION:

1. Adopt Resolution (Intent)
2. Hold Public Hearing
3. Enact Ordinance to Join and Execute Airport Authority Agreement

Board of Supervisors - Bremer County; _____ County

1. Adopt Resolution
   Date _____
2. Public "Notice" Publication
   Date _____
3. Hold Hearing
   Date _____
4. Enact Ordinance
   First Reading _____
   Second Reading _____
   Third Reading _____
5. Execute Airport Authority Agreement

| City Council(s) | 1<br>Waverly | 2 | 3 | 4 |
|---|---|---|---|---|
| 1. Adopt Resolution<br>Date | | | | |
| 2. Public Notice<br>Publication<br>Date | | | | |
| 3. Hold Hearing<br>Date | | | | |
| 4. Enact Ordinance<br>First Reading | | | | |
| Second Reading | | | | |
| Third Reading | | | | |
| Other Incorporated<br>Cities (1) | | | | |
| 1. Adopt Resolution<br>Date | | | | |
| 2. Public Notice<br>Publication<br>Date | | | | |
| 3. Hold Hearing<br>Date | | | | |
| 4. Enact Ordinance<br>First Reading | | | | |
| Second Reading | | | | |
| Third Reading | | | | |