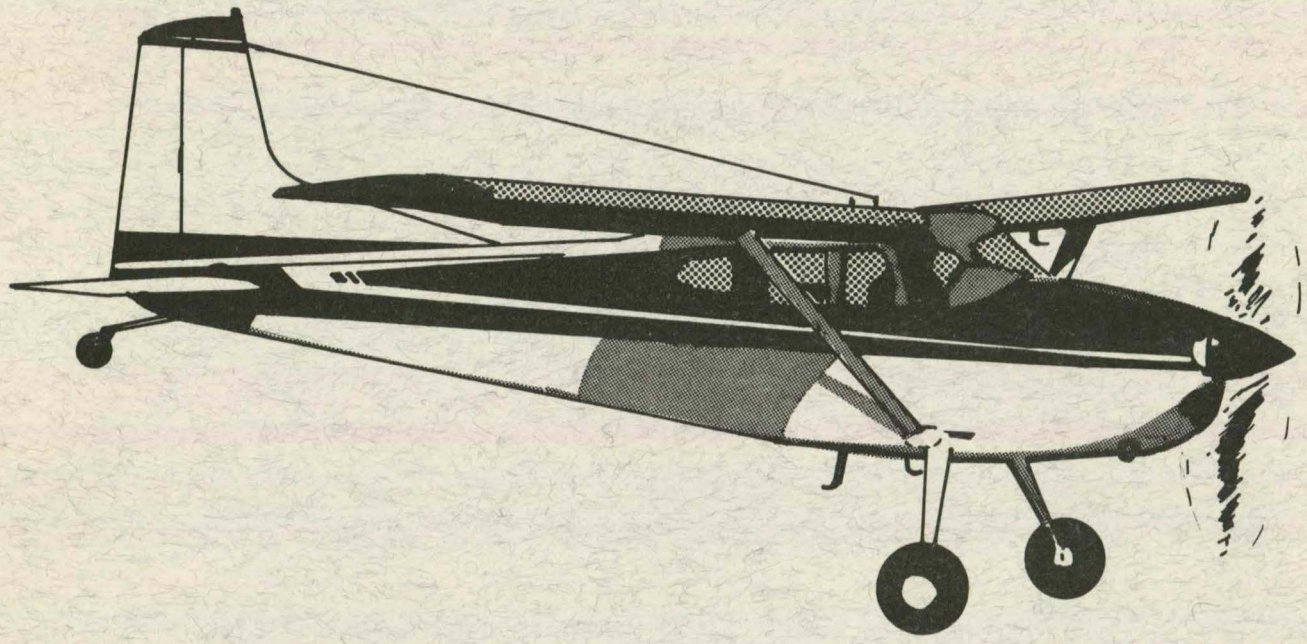

# airport development plan

## audubon iowa

# AIRPORT DEVELOPMENT PLAN

# AUDUBON MUNICIPAL AIRPORT

Prepared for

City of Audubon, Iowa

The preparation of this report was financially aided through a grant from the Iowa Department of Transportation.

Prepared by

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1979

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# SECTION I

# COMMUNITY AND AIRPORT BACKGROUND

## A. GOALS AND OBJECTIVES

The objectives of the Audubon Municipal Airport Development Plan are as follows:

- To provide an effective graphic presentation of the ultimate airport development over a 20 - year planning period
- To establish a schedule of priorities and phasing for proposed airport improvements which will meet aviation demand expectations

The Airport Development Plan will:

- Provide a tool for decision making at the local level
- Provide a development schedule that is feasible and prudent

The Airport Development Plan evolves from a planning process. The recommendations made, as a result of that process, are continually subject to change over the 20 - year planning period. The recommendations made should remain flexible.

While it may appear desirable to make what appears to be an inflexible set of recommendations, ever-changing opportunities and constraints will dictate the ultimate level of facility development. Aviation demand, site suitability, and adequate financial resources are the key variables which will dictate the level of airport development. To this list of key variables, political feasibility should be added.

The Airport Development Plan should be consistent with national, state, and local goals and objectives. As such, the Airport Development Plan will present relevant information regarding aviation activity at Audubon and future facility needs. As aviation demand changes, facility requirements will also change. The State Airport Systems Plan will also change. The Iowa State Airport Systems Plan goals are as follows:

1. To provide for an orderly and timely plan of development for a system of airports adequate to meet the short, intermediate and long-range needs of the state.

2. To provide for coordination of airport planning with local regional, and state planning efforts, compatible with social, economic and environmental goals, efficient and desirable land use, and development of other transportation modes.

3. To provide a basis for coordination of airport development, air navigation facilities, airspace use, and air traffic control procedures within the framework of long-range comprehensive planning.

4. To provide a framework to guide the allocation of state and federal funds for airport development.

5. To provide an opportunity for public input and public information dissemination relating to airport planning.

Source: IDOT State Airport Systems Plan, 1978, Section 1, pg 1

The City of Audubon has not yet prepared a Comprehensive Community Development Plan. When such a plan is prepared, every effort should be made to ensure consistency between the airport and adjacent community land uses.

## B. COMMUNITY ELEMENTS

Utilities:

Water

Water supplied by: (X) municipal ( ) private

Name of supplier: City of Audubon

Source of city water: ( ) lake(s) ( )reservoir(s)

( ) river(s) (X) well(s) Number of wells 11

Elevated storage capacity: 500,000 gals.

Capacity of water plant: 725,000 gals./day

Average consumption: 375,000 gals./day

Peak consumption: 600,000 gals./day

Sanitation

Type of sewage treatment plant: (X) Primary (X) Secondary
( ) Tertiary

Percent of community served by sewer: 90 %

| Average Load | Peak Load | Design Capacity |
|---|---|---|
| 350,000 gpd | 450,000 gpd | 500,000 gpd |

Natural Gas

Name of supplier: Iowa Public Service Co.
(Moritorium Presently in Effect)

Electricity

Suppliers: ( )municipal (X) private ( )co-op

Names of suppliers: Iowa Public Service Co.

Telephone

Name of system: United Telephone Company of Iowa

Fire Insurance Class In City: 1

Other Transportation Modes:

Highway

Distance in miles from:

| | | | |
|---|---|---|---|
| Chicago | 411 | Los Angeles | 1,749 |
| Dallas | 680 | Minneapolis | 295 |
| Denver | 619 | Detroit | 715 |
| Kansas City | 204 | Milwaukee | 460 |
| Omaha | 80 | St. Louis | 410 |
| | | Des Miones | 80 |

Train

Community served by railroad(s): (X) yes ( ) no

Frequency of switching service: Three/Week

Piggy back ramp available: ( ) yes (X) no

Distance to nearest piggy back service 28 miles

Names of railroads Chicago, Rock Island, & Pacific Railroad

Motor Carrier

Highway bus service available ( ) yes (X) no

Number highways serving city: Federal 1 State 1

Distance to nearest interstate interchange: 18 miles

No. motor freight carriers serving community: 3

No. of local terminals: 1

No. intrastate carriers 1 No. interstate carriers 2

Air Carrier

Distance to nearest commercial air transportation:

Miles 80 - Omaha

Names of airlines serving point: Ozark, United, Continental, TWA

Length of time goods in transit to:

| City | Days by Railroad | Days by Motor Freight |
|---|---|---|
| Boston | 6 | 5 |
| Chicago | 3 | 1 |
| Cleveland | 4 | 1½ |
| Dallas | 3 | 1½ |
| Detroit | 4 | 1½ |
| Kansas City | 4 | 1 |
| Los Angeles | 5 | 5 |
| Minneapolis | 3 | 1 |
| New York | 5 | 5 |
| St. Louis | 4 | 1 |

The Audubon Municipal Airport is located approximately three-quarter mile south of the City. Access is provided via U.S. Highway 71.

Tax Structure:

Assessed value of city property: $ 23,817,899

Basic tax levy for latest year (per $1,000 assessed value):

City: $9.58 County: $3.59 School: $12.14

Board of Ed.: _____ Area College: _____

Misc.: _____ Total: $25,320

Bonded Indebtedness: City $177,000 School $415,000

Future indebtedness plans: $132,000 For City Water Main Construction

The above community data was obtained from the "Community Quick Reference" prepared by the Iowa Development Commission. The data was prepared in 1977.

## C. SOCIOECONOMIC BACKGROUND

Population:

The population base of Audubon County is expected to remain somewhat stable after 1995. Through 1995, the county is expected to continue a modest rate of population loss.

TABLE 1

Audubon County, Population Trends, 1975 - 2020

| Year | Total | Male | Female |
|---|---|---|---|
| 1970 | 9595 | 4682 | 4913 |
| 1975 | 9165 | 4439 | 4726 |
| 1980 | 8895 | 4279 | 4616 |
| 1985 | 8819 | 4227 | 4592 |
| 1990 | 8783 | 4200 | 4583 |
| 1995 | 8715 | 4160 | 4555 |
| 2000 | 8660 | 4131 | 4529 |
| 2005 | 8632 | 4123 | 4509 |
| 2010 | 8661 | 4148 | 4513 |
| 2015 | 8690 | 4171 | 4519 |
| 2020 | 8691 | 4175 | 4516 |

Source: Office for Planning and Programming
Iowa State Demographic Center
Series I-76, No. 2

Audubon County experienced a population loss of 5.7 percent from 1950 to 1960. The County continued to lose population in the 1960's. The 1960 population was 10,919 persons while the 1970 population was 9,595 persons. This represents a 12.1 percent decline in population.

The City of Audubon has also experienced a population loss. The estimated population at Audubon as of July 1, 1975, was 2,622 persons. Reference maybe made to the table below.

TABLE 2

City of Audubon Population, 1970 - 1975

| Year | City Population |
|---|---|
| July 1, 1975 | 2622 |
| July 1, 1973 (Revised) | 2665 |
| April 1, 1970 (Census) | 2907 |
| Change: 1970-1975 | |
| Number | -285 |
| Percent | -9.8 |

Source: Bureau of the Census
Series P-25, No. 663
April, 1977

Labor Force:

Labor force 3,767

Resident unemployed 157

Percent unemployed 4.16

Resident total employment 3,610

Nonagricultural wage and salary 2,043

Self-employed, unpaid family and domestic workers 595

Agriculture 972

EMPLOYMENT DATA - PLACE OF WORK

Nonagricultural wageand salary workers 1,933

Manufacturing 172

Nonmanufacturing 1,761

ESTIMATED LABOR FORCE AVAILABLE:

Male 200 Female 300 Total 500

Source: Iowa Development Commission
Quick Community Reference
April 1977

Local Manufacturing Characteristics:

Number of manufacturing plants in community: 5

Number of manufacturing plants with unions: NONE

Number of manufacturing employees in community: 150

Number of work stoppages in the last 5 years: NONE

Major manufactures of other large employers in community:

Name of firm: Emmert Manufacturing Co., Inc.

Employement: Male 49 Female 8 Total 57

Union Affiliation NONE

Products manufactured: Farm Related Products

Name of firm: Talbot Carlson, Inc.

Employment: Male 23 Female 12 Total 35

Union Affiliation NONE

Products manufactured: Feed Additives & Feeders

Name of firm: Southside Welding Company

Employment: Male 11 Female 1 Total 12

Union Affiliation NONE

Products manufactured: Machine Shop Steel Fabrication

Name of firm: S & H Products

Employement: Male 15 Female 0 Total 15

Union Affiliation: None

Products manufactured: Alfalfa Dehydrated Products

## D. AREA AIRPORTS

Audubon County is served by the Audubon Municipal Airport located in the City of Audubon. Public airport facilities near Audubon are found at Harlan, Denison, Carroll, Guthrie Center, Atlantic and Manning.

The role of each of these facilities within the 1978 State Airport Systems Plan, SASP, are as follows:

| | |
|---|---|
| Audubon | Basic Utility (BU) |
| Harlan | General Utility (GU) |
| Denison | General Utility (GU) |
| Carroll | General Utility (GU) |
| Guthrie Center | System Candidate Airport |
| Atlantic | General Utility (GU) |
| Manning | System Candidate Airport |

(Source : 1978 SASP)

A basic utility and general utility airport is defined by the Federal Aviation Administration, FAA, as follows:

Basic Utility -- Stage I. This type of airport accommodates about 75 percent of the propeller airplanes under 12,500 pounds (5 670 kg). It is primarily intended to serve low-activity locations, small population communities, and remote recreational areas. Usually Stage I is only the first step toward development of a Stage II Basic Utility Airport.

Basic Utility -- Stage II. This type of airport accommodates about 95 percent of the propeller airplanes under 12,500 pounds ( 5 670 kg). It is primarily intended to serve medium size population communities with the diversity of usage and potential for increased aviation activities.

General Utility. This type of airport accommodates all propeller airplanes of less than 12,500 pounds (5 670 kg), except airplanes type certificated after July 19, 1970, and having a seating configuration of 10 passenger seats or more. It is primarily intended to serve communities located on the fringe of a metropolitan area or a relatively large population community remote from a metropolitan area. There should be a minimum of 500 itinerant operations by airplanes having a gross weight of 6,000 pounds (2 700 kg) or greater.

Source: FAA AC 150/5300 - 4B, Chg. 2, p. 3.

As noted, Guthrie Center and Manning are not in the 1978 SASP. Reference may be made to page 66 of the 1978 SASP concerning criteria used to determine which airports were to be included. The following table provides a summary of area airport facilities.

TABLE 3

AREA AIRPORTS FACILITIES

| Airport | Runway Orientation | Length | Width | Paved | Lighting | REIL | NDB | VASI |
|---|---|---|---|---|---|---|---|---|
| Audubon | 14/32 | 3,000' | 60' | Yes | LIRL | Yes | Yes | No |
| Carroll | 13/31 | 4,000' | 75' | Yes | MIRL | Yes | Yes | Yes |
| Atlantic | 12/30 | 2,600' | 75' | Yes | MIRL | Yes | Yes | No |
| | 8/26 | 3,500' | 150' | No | MIRL | Yes | Yes | No |
| Denison | 12/30 | 4,100' | 75' | Yes | MIRL | Yes | Yes | No |
| | 6/24 | 2,100' | 200' | No | MIRL | Yes | Yes | No |
| | 18/36 | 2,100' | 100' | No | MIRL | Yes | Yes | No |
| Harlan | 15/33 | 3,400' | 75' | Yes | LIRL | No | Yes | No |
| | 3/21 | 2,000' | 100' | No | LIRL | No | Yes | No |
| Guthrie Center | 15/33 | 2,700' | 30' | Yes | LIRL | NO | Yes | No |
| Manning | 6/24 | 2,200' | 100' | No | LIRL | No | No | No |

Source: 1978 SASP

LIRL = Low Intensity Runway Lights

MIRL = Medium INtensity Runway Lights

REIL = Runway End Identifier Lights

VASI = Visual Approach Slope Indecator (2 - Box)

NDB = Non-Directional Radio Beacon

Figure provides a graphic description of the geographic location of area airports and airways.

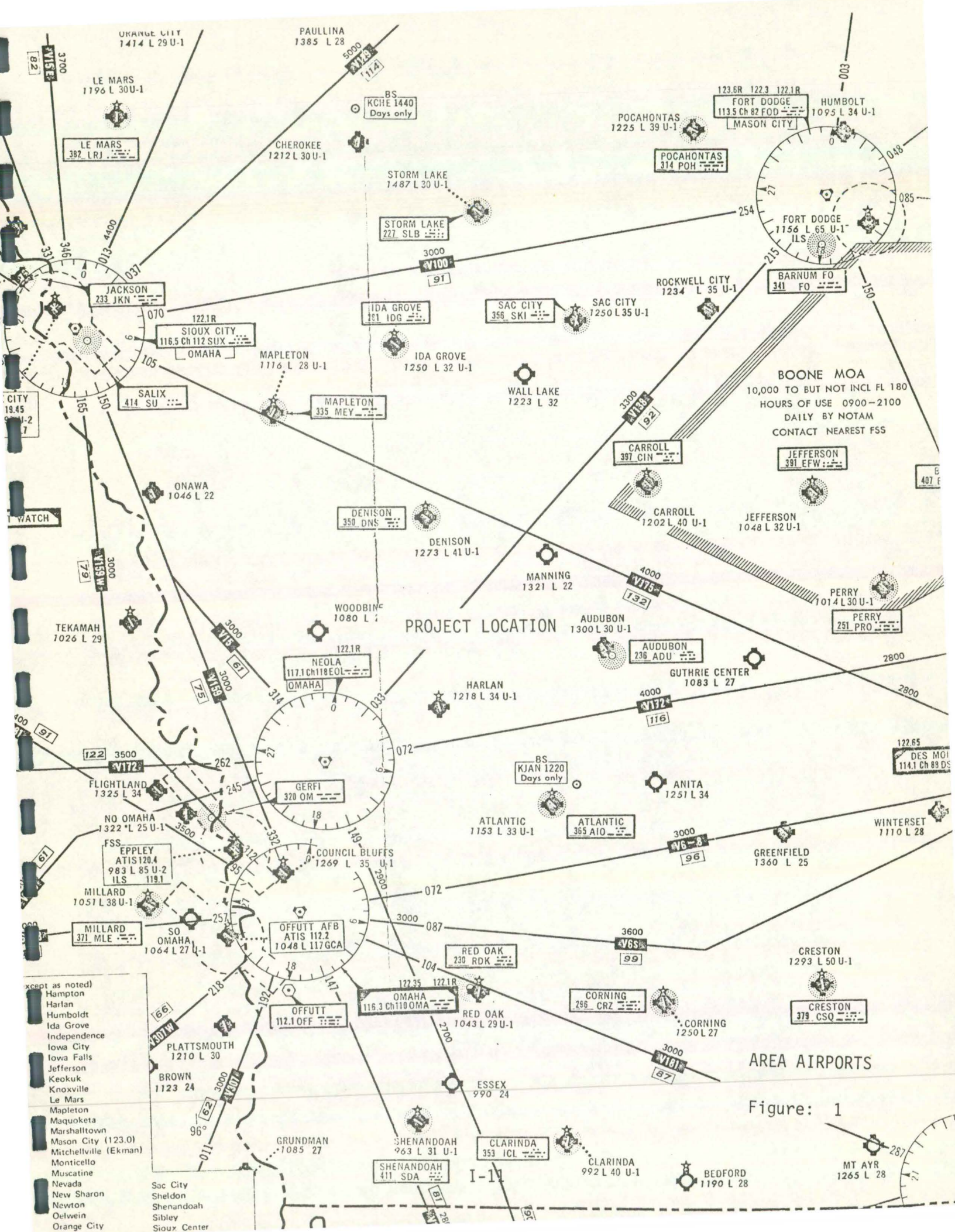

PROJECT LOCATION
AREA AIRPORTS
I-11
BOONE MOA
10,000 TO BUT NOT INCL FL 180
HOURS OF USE 0900–2100
DAILY BY NOTAM
CONTACT NEAREST FSS
ORANGE CITY
1414 L 29 U-1
PAULLINA
1385 L 28
LE MARS
1196 L 30 U-1
LE MARS
382 LRJ
CHEROKEE
1212 L 30 U-1
BS
KCHE 1440
Days only
STORM LAKE
1487 L 30 U-1
STORM LAKE
227 SLB
POCAHONTAS
1225 L 39 U-1
POCAHONTAS
314 POH
FORT DODGE
113.5 Ch 82 FOD
MASON CITY
HUMBOLT
1095 L 34 U-1
FORT DODGE
1156 L 65 U-1
ILS
BARNUM FO
341 FO
ROCKWELL CITY
1234 L 35 U-1
JACKSON
233 JKN
SIOUX CITY
116.5 Ch 112 SUX
OMAHA
IDA GROVE
281 IDG
IDA GROVE
1250 L 32 U-1
SAC CITY
356 SKI
SAC CITY
1250 L 35 U-1
MAPLETON
1116 L 28 U-1
MAPLETON
335 MEY
SALIX
414 SU
WALL LAKE
1223 L 32
CARROLL
397 CIN
CARROLL
1202 L 40 U-1
JEFFERSON
391 EFW
JEFFERSON
1048 L 32 U-1
ONAWA
1046 L 22
DENISON
350 DNS
DENISON
1273 L 41 U-1
MANNING
1321 L 22
PERRY
1014 L 30 U-1
PERRY
251 PRO
TEKAMAH
1026 L 29
WOODBINE
1080 L 2
AUDUBON
1300 L 30 U-1
AUDUBON
236 ADU
GUTHRIE CENTER
1083 L 27
HARLAN
1218 L 34 U-1
NEOLA
117.1 Ch 118 EOL
OMAHA
FLIGHTLAND
1325 L 34
GERFI
320 OM
BS
KJAN 1220
Days only
ANITA
1251 L 34
ATLANTIC
1153 L 33 U-1
ATLANTIC
365 AIO
NO OMAHA
1322 *L 25 U-1
FSS
EPPLEY
ATIS 120.4
983 L 85 U-2
ILS 119.1
COUNCIL BLUFFS
1269 L 35 U-1
GREENFIELD
1360 L 25
WINTERSET
1110 L 28
MILLARD
1051 L 38 U-1
MILLARD
371 MLE
SO OMAHA
1064 L 27 U-1
OFFUTT AFB
ATIS 112.2
1048 L 117 GCA
RED OAK
230 RDK
RED OAK
1043 L 29 U-1
OMAHA
116.3 Ch 110 OMA
OFFUTT
112.1 OFF
CORNING
296 CRZ
CORNING
1250 L 27
CRESTON
1293 L 50 U-1
CRESTON
379 CSQ
PLATTSMOUTH
1210 L 30
BROWN
1123 24
ESSEX
990 24
GRUNDMAN
1085 27
SHENANDOAH
963 L 31 U-1
SHENANDOAH
411 SDA
CLARINDA
353 ICL
CLARINDA
992 L 40 U-1
BEDFORD
1190 L 28
MT AYR
1265 L 28
except as noted)
Hampton
Harlan
Humboldt
Ida Grove
Independence
Iowa City
Iowa Falls
Jefferson
Keokuk
Knoxville
Le Mars
Mapleton
Maquoketa
Marshalltown
Mason City (123.0)
Mitchellville (Ekman)
Monticello
Muscatine
Nevada
New Sharon
Newton
Oelwein
Orange City
Sac City
Sheldon
Shenandoah
Sibley
Sioux Center

Figure: 1

# SECTION II

# FORECAST OF AVIATION DEMAND

## A. Introduction

The airport facility is expected to have a significant role in the development of Audubon and the community's surrounding hinterland. Activity at the airport will be influenced not only by future developments locally but national trends as well. The number of aircraft based at a small general aviation airport often varies from year to year. Because of the small numbers dealt with, it is not unreasonable for such a facility to experience significant increases and decreases in the number of registered aircraft based at a facility. This is especially evident where a large share of the aircraft are owned by a single individual or business concern.

The future estimate of aviation activity is based not only upon historic trends, but the increasing propensity and need to travel. While the need to travel can be satisfied in a number of ways and by various modes, travel by air for business and pleasure is increasing. Reference may be made to tables 4 and 5. For the former, it is a matter of economics to use air to transport sales, management and marketing personnel. The decision to travel or transport a product from one point to another is based upon a number of factors to include those listed below:

- Distance
- Accessibility
- Cost per unit of travel
- Reason for making the trip
- Number of persons
- Type and value of cargo
- Regulations
- Economic trends
- Availibity of other modes of travel
- Aviation interest

The potential for development of aviation locally is also influenced by the airport facility as well as the maintenance and management of the airport.

TABLE 4

Estimated Miles Flown in General Aviation by Type of Flying, 1965-1974

Actual Use
(Thousands of miles)

| Year | Estimated Total Miles Flown | Business | | Commercial | | Instructional | | Personal | | Other | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Miles | Percent | Miles | Percent | Miles | Percent | Miles | Percent | Miles | Percent |
| 1965[1] | 2,562,380 | 1,204,321 | 47 | 461,228 | 18 | 258,733 | 14 | 512,476 | 20 | 25,622 | 1 |
| 1966[1] | 3,336,138 | 1,536,158 | 46 | 515,730 | 16 | 646,169 | 19 | 605,912 | 18 | 32,169 | 1 |
| 1967[1] | 3,429,964 | 1,431,372 | 42 | 568,502 | 16 | 713,242 | 21 | 690,595 | 20 | 36,253 | 1 |
| 1968[2] | 3,700,864 | 1,406,328 | 38 | 666,156 | 18 | 814,190 | 22 | 777,181 | 21 | 37,009 | 1 |
| 1969[2] | 3,926,461 | 1,425,923 | 36 | 722,916 | 19 | 910,290 | 23 | 829,043 | 21 | 38,289 | 1 |
| 1970[3]r/ | 3,207,127 | 1,134,279 | 35 | 554,683 | 17 | 686,152 | 22 | 753,434 | 24 | 78,579 | 2 |
| 1971[3]r/ | 3,143,181 | 1,128,951 | 36 | 506,598 | 16 | 651,091 | 21 | 794,713 | 25 | 61,900 | 2 |
| 1972[3]r/ | 3,317,068 | 1,143,841 | 34 | 580,861 | 18 | 691,513 | 21 | 833,855 | 25 | 66,998 | 2 |
| 1973[3] | 3,728,534 | 1,343,723 | 36 | 688,402 | 18 | 777,868 | 21 | 825,099 | 22 | 93,442 | 3 |
| 1974[3] | 4,042,700 | 1,433,276 | 35 | 789,695 | 20 | 815,443 | 20 | 919,587 | 23 | 84,599 | 2 |

Source: FAA

r/ Revised

[1]Estimated from FAA Form 2350

[2]Estimated from FAA Form 8320-3

[3]Estimated from AC Form 8050-73

Note: 1. Business includes business and executive

2. Commercial includes air taxi, aerial application, and industrial/special

3. Instructional includes training and rental

TABLE 5

Estimated Hours Flown in General Aviation by Type of Flying, 1965-1974

Actual Use
(Thousands of hours)

| Year | Estimated Total Hours | Business | | Commercial | | Instructional | | Personal | | Other | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hours | Percent | Hours | Percent | Hours | Percent | Hours | Percent | Hours | Percent |
| 1965[1] | 16,733 | 5,857 | 35 | 3,348 | 20 | 3,346 | 20 | 4,016 | 24 | 166 | 1 |
| 1966[1] | 21,023 | 7,057 | 33 | 3,555 | 17 | 5,674 | 27 | 4,540 | 22 | 197 | 1 |
| 1967[1] | 22,153 | 6,578 | 30 | 3,918 | 18 | 6,262 | 28 | 5,173 | 23 | 222 | 1 |
| 1968[2] | 24,053 | 6,976 | 29 | 4,810 | 20 | 6,494 | 27 | 5,532 | 23 | 241 | 1 |
| 1969[2] | 25,351 | 7,064 | 28 | 4,928 | 19 | 7,023 | 28 | 5,999 | 24 | 337 | 1 |
| 1970[3] | 26,030 | 7,204 | 28 | 4,582 | 18 | 6,791 | 26 | 6,896 | 26 | 557 | 2 |
| 1971[3] | 25,512 | 7,141 | 28 | 4,264 | 17 | 6,416 | 25 | 7,252 | 28 | 439 | 2 |
| 1972[3] | 26,974 | 7,239 | 27 | 4,831 | 18 | 6,814 | 25 | 7,601 | 28 | 489 | 2 |
| 1973[3] | 30,048 | 8,558 | 28 | 5,608 | 19 | 7,646 | 25 | 7,546 | 25 | 690 | 3 |
| 1974[3] | 32,475 | 9,140 | 28 | 6,294 | 19 | 7,972 | 25 | 8,404 | 26 | 665 | 2 |

Source: FAA

[1]Estimated from FAA Form 2350

[2]Estimated from FAA Form 8320-3

[3]Estimated from AC Form 8050-73

Note: 1. Business includes business and executive

2. Commercial includes air taxi, aerial application, and industrial/special

3. Instructional includes training and rental

## B. Based Aircraft

State of Iowa Trends:

The 1978 Iowa State Airport Systems Plan (SASP) estimated future numbers of registered aircraft for the State through 1997. Reference may be made to the table below.

TABLE 6

Registered Aircraft, 1960-1997

U.S.A. and State of Iowa

| | U.S. Aircraft | Iowa Aircraft | Iowa Percent of U.S. Total | Aircraft/ 10,000 Population U.S. | IOWA |
|---|---|---|---|---|---|
| 1960 | 70,627 | 1654 | 2.34 | 3.96 | 6.00 |
| 1965 | 95,442 | 1980 | 2.07 | 5.00 | 7.09 |
| 1970 | 131,743 | 2565 | 1.95 | 6.48 | 9.08 |
| 1971 | 131,148 | 2619 | 2.00 | 6.36 | 9.24 |
| 1972 | 145,010 | 2609 | 1.80 | 6.96 | 9.18 |
| 1973 | 153,540 | 2652 | 1.73 | 7.32 | 9.30 |
| 1974 | 161,500 | 2708 | 1.68 | 7.62 | 9.47 |
| 1975 | 167,000 | 2789 | 1.67 | 7.82 | 9.72 |
| 1976 | 172,000(a) | 2984 | 1.73 | 7.97 | 10.33 |
| 1977 | 178,000(a) | 2907 | 1.63 | 8.16 | 10.00 |
| 1982 | 210,878(b) | 3378(b) | 1.60 | 9.23 | 11.37 |
| 1987 | 243,718(b) | 3767(b) | 1.55 | 10.17 | 12.35 |
| 1997 | 309,398(b) | 4544(b) | 1.47 | 11.99 | 14.30 |

(a) FAA Estimate
(b) DOT Projection

(1978 SASP, p.38)

The forecast was based upon a simple linear regression analysis of historical trends. The state expects a continual growth in the number of aircraft registered in the state. However, as the table indicates, the state's share of the national total is decreasing from 2.34 percent in 1960 to an estimated 1.47 percent in 1997.

Regional Trends

Because of the annual variation in numbers of registered and based aircraft at a given facility, a better understanding of future expectations can be achieved by reviewing trends within a broad regional area. Historic numbers of registered aircraft for a nine county area were obtained from the U.S. Census of Civil Aircraft for the years 1965 through 1975. Reference may be made to table 7 .

TABLE 7

Registered General Aviation Aircraft

9 County Area, 1965 - 1975

| Year | Adair | Audubon | Carroll | Cass | Crawford | Greene | Guthrie |
|---|---|---|---|---|---|---|---|
| 1975 | 15 | 6 | 18 | 23 | 21 | 34 | 16 |
| 1974 | 14 | 5 | 21 | 30 | 21 | 31 | 15 |
| 1973 | 21 | 8 | 16 | 33 | 16 | 28 | 15 |
| 1972 | 26 | 8 | 13 | 33 | 20 | 31 | 15 |
| 1971 | 10 | 4 | 21 | 33 | 17 | 29 | 12 |
| 1970 | 22 | 6 | 15 | 32 | 17 | 21 | 11 |
| 1969 | 9 | 7 | 14 | 31 | 21 | 21 | 16 |
| 1968 | 12 | 6 | 15 | 29 | 19 | 18 | 13 |
| 1967 | 9 | 7 | 11 | 22 | 15 | 20 | 9 |
| 1966 | 9 | 3 | 13 | 23 | 17 | 22 | 11 |
| 1965 | 9 | 3 | 16 | 15 | 15 | 16 | 8 |

| Year | Pottawattamie | Shelby | Total |
|---|---|---|---|
| 1975 | 57 | 25 | 215 |
| 1974 | 57 | 24 | 218 |
| 1973 | 54 | 26 | 217 |
| 1972 | 64 | 31 | 241 |
| 1971 | 52 | 23 | 201 |
| 1970 | 50 | 20 | 194 |
| 1969 | 50 | 23 | 192 |
| 1968 | 44 | 21 | 177 |
| 1967 | 42 | 29 | 164 |
| 1966 | 39 | 22 | 159 |
| 1965 | 46 | 14 | 142 |

Source: U.S. Census of Civil Aircraft, 1965 - 1975

As noted in the preceding table, the number of registered general aviation aircraft in the nine county area experienced a steady rate of growth up to 1972. Since 1973, the number of aircraft has stabilized. Of the nine counties, Audubon had the fewest number of registered aircraft. The County's share of the total region and the regions share of the state total is presented in the table following.

TABLE 8

Audubon's Historic Share of the State & Regional Total
1965 - 1975

| Year | State Total | Region Total | % of State | Audubon Total | % of Region |
|---|---|---|---|---|---|
| 1975 | 3,044 | 215 | 7.06 | 6 | 2.79 |
| 1974 | 2,965 | 218 | 7.35 | 5 | 2.29 |
| 1973 | 2,884 | 217 | 7.52 | 8 | 3.69 |
| 1972 | 3,102 | 241 | 7.77 | 8 | 3.32 |
| 1971 | 2,550 | 201 | 7.88 | 4 | 1.99 |
| 1970 | 2,582 | 194 | 7.51 | 6 | 3.09 |
| 1969 | 2,588 | 192 | 7.42 | 7 | 3.65 |
| 1968 | 2,399 | 177 | 7.38 | 6 | 3.39 |
| 1967 | 2,294 | 164 | 7.15 | 7 | 4.27 |
| 1966 | 2,150 | 159 | 7.40 | 3 | 1.89 |
| 1965 | 1,911 | 142 | 7.43 | 3 | 2.11 |

Source: U.S. Census of Civil Aircraft, 1965 - 1975

The nine county regional share of the state total was stable from 1965 to 1970 recording a modest rate of growth up to 1971. Since 1971, the region has experienced a decrease in its share of the state total number of registered aircraft. In 1975, the state recorded 3,044 registered aircraft, the region 215 and Audubon County 6. Audubon County's share of the regional total has experienced considerable variation from year to year as is evident in the above table.

In order to remove the annual variation, the historic data was plotted as depicted in figure 2. This line, $Yc = a + bx + cx^2$ shows a modest rate of growth form 1965 to 1963. As with actual occurances, the trend line shows a leveling off of growth in the number of registered aircraft.

The regional estimate is based upon values obtained from $Yc = a + bx + cx^2$ for the years 1965 through 1974. This line yields a growth of 81 aircraft over the ten year planning period or an average annual growth of 8.1 aircraft. Actual historic growth was an average increase of 7.3 aircraft annually. Calculated growth in the last 5 years revealed an average annual increase of 3.8 aircraft. It appears reasonable to assume that the 9 county area will continue to experience a continual growth in the number of registered aircraft at a rate of 3.8 to 7.3 per year.

It should be noted that the number of registered aircraft and the number of based aircraft usually varies. For purpose here, it is assumed that in the future, the number of registered aircraft and the number of based aircraft will move closely approximate each other. This reasoning is based upon conclusions drawn from the 1978 Iowa State Airports Systems Plan.

> "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 fee structure, availability of terminal services, availability of naviagional 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 and registered 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."
>
> Source: 1978 SASP, p. 38)

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

> "Ideally, as airport development improves the quaility 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: 1978 SASP, p. 39)

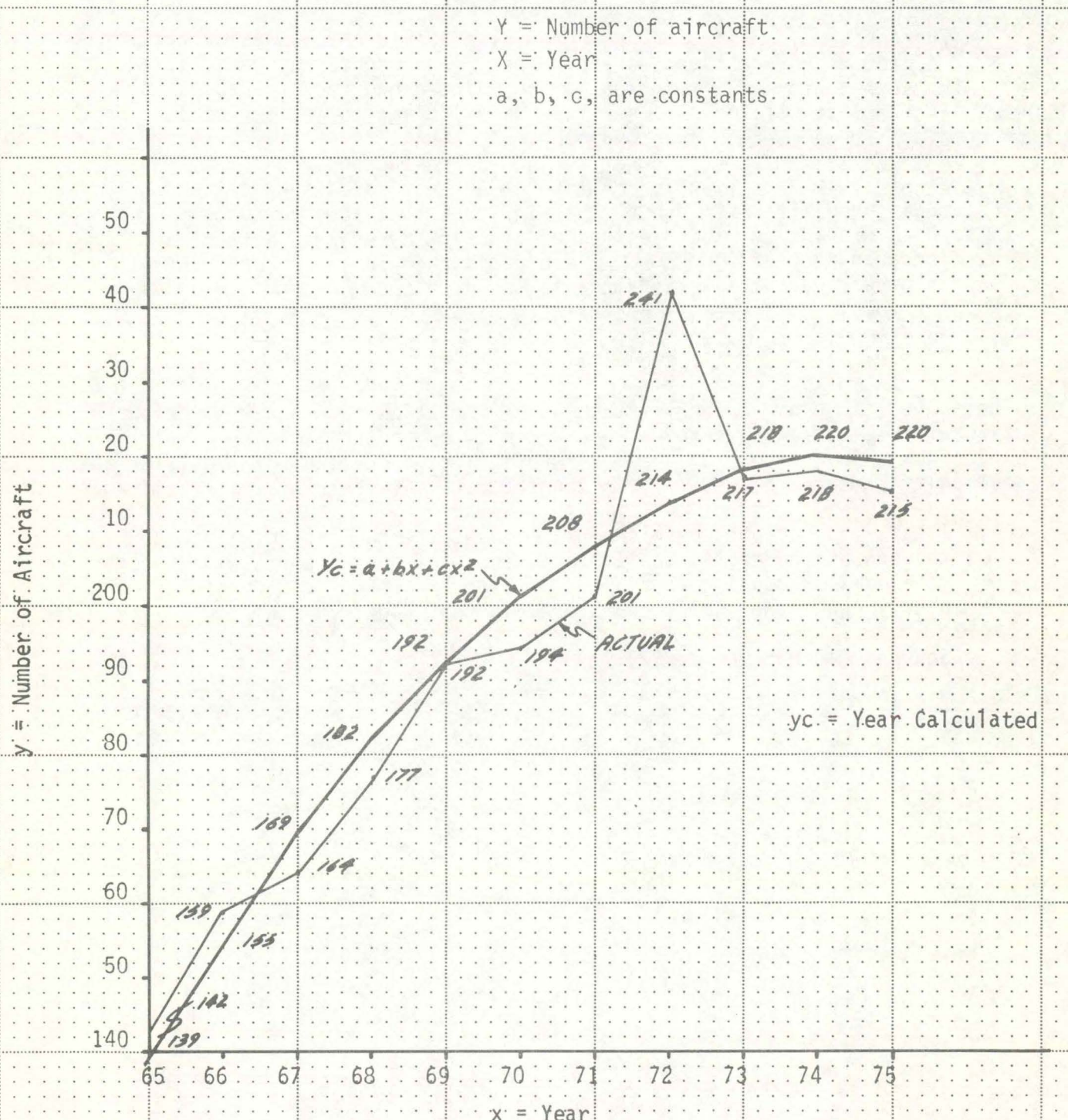



FIGURE 2 : Registered G-A Aircraft - 9 County Region
1965 - 1975

TABLE 9

REGIONAL REGISTERED AIRCRAFT

1976 - 1997

| Year | Low | Middle | High |
|---|---|---|---|
| 1978 | 226 | 232 | 237 |
| 1979 | 230 | 238 | 244 |
| 1980 | 234 | 244 | 251 |
| 1981 | 237 | 249 | 259 |
| 1982 | 242 | 255 | 266 |
| 1987 | 261 | 283 | 303 |
| 1992 | 280 | 310 | 339 |
| 1997 | 299 | 338 | 376 |
| | 3.8 | 5.5 | 7.3 |

Low: Average annual increase from 1971-1975 (3.8 aircraft/yr)

Middle: Average of low and high

High: Average annual increase from 1965-1975 (7.3 aircraft/yr)

AUDUBON COUNTY:

The nine county region had a total of 198 registered aircraft as of December 15, 1977. Audubon County registered 5.5% of the total. Assuming that the county will capture 5.5 percent of the regions total estimated aircraft over the twenty year planning period, it is expected that 16 to 21 aircraft will by registered in the county by 1997. Reference maybe made to the table below. (Source: Aviation Data Service)

TABLE 10

Registered Aircraft, Audubon County
1978 - 1997

| Year | Low | Middle | High |
|---|---|---|---|
| 1978 | 12 | 13 | 13 |
| 1979 | 13 | 13 | 13 |
| 1980 | 13 | 13 | 14 |
| 1981 | 13 | 14 | 14 |
| 1982 | 13 | 14 | 15 |
| 1987 | 14 | 16 | 17 |
| 1992 | 15 | 17 | 19 |
| 1997 | 16 | 19 | 21 |

It is expected that all aircraft registered in the county will be based at the Audubon Municipal Airport. The middle trend line is expected to prevail over the twenty year planning period.

AUDUBON MUNICIPAL AIRPORT:

As noted above, all aircraft registered in the county are expected to be based at the Audubon Municipal Airport. In addition, a number of aircraft, not registered in the county, are also expected to be based at the airport.

As of September, 1978, there were 16 aircraft based at the facility; twelve of which were owned by the fixed base operator. Reference may be made to Table 11 regarding aircraft ownership and gross weight.

TABLE 11

Based G-A Aircraft
Audubon County
1978

| Aircraft Owner | Aircraft | Engine | Gross Weight |
|---|---|---|---|
| 1. Goeken, Charles Audubon | Cessna 152 | one | 1,670 |
| 2. Goeken, Charles Audubon | Cessna 152 | one | 1,670 |
| 3. Goeken, Charles Audubon | Cessna 172 | one | 2,300 |
| 4. Goeken, Charles Audubon | Cessna 172 | one | 2,300 |
| 5. Goeken, Charles Audubon | Cessna 177 | one | 2,500 |
| 6. Goeken, Charles Audubon | Piper PA-28-161 | one | 2,400 |
| 7. Goeken, Charles Audubon | Piper PA-28-181 | one | 2,400 |
| 8. Goeken, Charles Audubon | Piper PA-28-R-201T | one | 2,400 |
| 9. Goeken, Charles Audubon | Piper PA-38-112 | one | 1,670 |
| 10. Goeken, Charles Audubon | Piper PA-34-200 | two | 4,570 |
| 11. Goeken, Charles Audubon | Piper PA-36-375 | one | |
| 12. Goeken, Charles Audubon | Piper PA-28-R-200 | one | 2,600 |
| 13. Gard, Roger Audubon | Bellanca 7ECA | one | 1,650 |
| 14. Weber, LeLand Audubon | Cessna 182 G | one | 2,950 |
| 15. Kaltoff, LeLand Kimballton | Piper PA-28-R-200 | one | 2,600 |
| 16. Conklin | Minicoupe | one | (Home Built) |

Source: Airport Manager, September 8, 1978

To develop an estimate of future numbers of based aircraft, two assumptions were made:

1. The estimated number of registered aircraft in Audubon County will be based at the facility.
2. A number of aircraft for sales and demonstration will also be based at the facility. These aircraft may not necessarily be registered in the County and their numbers are expected to vary considerably from year to year.

TABLE 12

Based Aircraft, Audubon
1978-1997

| Year | Middle Trend Line | Sales Inventory | Total |
|---|---|---|---|
| 1978 | 13 | 3 ± | 16 ± 3 |
| 1979 | 13 | 3 ± | 16 ± 3 |
| 1980 | 13 | 5 ± | 18 ± 5 |
| 1981 | 14 | 5 ± | 19 ± 5 |
| 1982 | 14 | 5 ± | 19 ± 5 |
| 1987 | 16 | 8 ± | 24 ± 8 |
| 1992 | 17 | 10 ± | 27 ± 10 |
| 1997 | 19 | 10 ± | 29 ± 10 |

For purposes of estimating future aircraft operations, only the number of aircraft shown in the above table under "middle trend line" will be used. However, proposed hangar facility needs will be based upon the total to include the "sales inventory".

The Airport Manager reported that there are eight probable aircraft owners in the county and that he would be involved in the sale of Piper and Cessna general aviation aircraft. The sale of his present inventory to the light potential owners would reduce his inventory to four aircraft in addition to those based at the facility for sales and demonstration purposes.

## C. Aviation Operations

### Aircraft Operations

Aircraft operations are a function of the following:

- = Number of based aircraft
- = Number of airmen
- = Air Taxi Service
- = Aircraft Maintenance facilities & services
- = Industrial & Commercial Base
- = Socioeconomic characteristics of the service area

None are more important than the other in contribution to the total number of aircraft operations. An operation is defined as a single landing or takeoff. A "touch-and-go", for example, represents two operations.

The number of aircraft and airmen within the airport service area provide the best basis for estimating present and future numbers of aircraft operations. While it would be desirable to have historical counts available such as are available at control tower airports, this data base is usually lacking at general aviation airports.

The Iowa Department of Transportation has developed a program to conduct traffic counts at various systems airports in the state. A survey at Audubon was recently completed. The survey, conducted by the Transportation Inventory Division of the IDOT, estimated a total 11,600 annual operations at Audubon. Of the total 11,600 operations, 700 were "touch-and-go" operations or local operations. The survey data was obtained from a portable recorder placed on the taxiway. The survey began at 4 p.m. on July 17, 1978, and was completed on August 1, 1978. The 16 day survey revealed a total 681 taxiway counts or an average of 45.40 per day. The peak day revealed a total of 82. Reference maybe made to the following table concerning survey data.

TABLE 13

AUDUBON MUNICIPAL AIRPORT

TAXIWAY PORTABLE RECORDER SUMMARY

JULY 17,1978 - AUGUST 1,1978

| Hour | 7-17 Mon | 7-18 Tue | 7-19 Wed | 7-20 Thu | 7-21 Fri | 7-22 Sat | 7-23 Sun | 7-24 Mon | 7-25 Tue | 7-26 Wed | 7-27 Thu | 7-28 Fri | 7-29 Sat | 7-30 Sun | 7-31 Mon | 8- 1 Tue | Total | Daily Ave. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12-1am | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1-2 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-3 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3-4 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4-5 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5-6 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6-7 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0.13 |
| 7-8 | | 0 | 7 | 0 | 0 | 0 | 5 | 0 | 3 | 0 | 0 | 4 | 0 | 0 | 0 | 2 | 21 | 1.40 |
| 8-9 | | 3 | 0 | 0 | 0 | 0 | 7 | 2 | 0 | 0 | 4 | 0 | 1 | 0 | 3 | 1 | 21 | 1.40 |
| 9-10 | | 2 | 5 | 0 | 0 | 0 | 3 | 0 | 0 | 9 | 4 | 2 | 2 | 2 | 8 | 3 | 40 | 2.67 |
| 10-11 | | 0 | 7 | 0 | 0 | 0 | 2 | 2 | 0 | 7 | 10 | 0 | 0 | 1 | 4 | 3 | 36 | 2.40 |
| 11-12 | | 0 | 1 | 0 | 0 | 0 | 1 | 4 | 11 | 0 | 1 | 0 | 4 | 5 | 0 | 0 | 27 | 1.80 |
| 12-1pm | | 3 | 15 | 0 | 0 | 2 | 3 | 4 | 0 | 5 | 2 | 3 | 4 | 4 | 6 | | 51 | 3.64 |
| 1-2 | | 3 | 4 | 0 | 0 | 1 | 5 | 0 | 11 | 3 | 4 | 3 | 9 | 2 | 11 | | 56 | 4 |
| 2-3 | | 6 | 0 | 2 | 0 | 4 | 0 | 1 | 0 | 0 | 3 | 0 | 2 | 1 | 4 | | 23 | 1.64 |
| 3-4 | | 13 | 6 | 8 | 0 | 3 | 10 | 4 | 9 | 6 | 4 | 5 | 1 | 10 | 0 | | 79 | 5.64 |
| 4-5 | 0 | 5 | 7 | 15 | 3 | 6 | 6 | 8 | 0 | 0 | 1 | 2 | 5 | 13 | 0 | | 71 | 4.73 |
| 5-6 | 1 | 0 | 5 | 11 | 8 | 1 | 15 | 2 | 4 | 1 | 11 | 1 | 1 | 4 | 1 | | 66 | 4.40 |
| 6-7 | 0 | 0 | 6 | 5 | 2 | 0 | 4 | 5 | 3 | 4 | 7 | 2 | 1 | 6 | 3 | | 48 | 3.20 |
| 7-8 | 0 | 0 | 10 | 2 | 0 | 0 | 5 | 8 | 0 | 2 | 5 | 2 | 0 | 5 | 1 | | 40 | 2.67 |
| 8-9 | 2 | 6 | 9 | 8 | 0 | 0 | 3 | 4 | 4 | 0 | 5 | 5 | 2 | 2 | 0 | | 50 | 3.33 |
| 9-10 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 2 | 2 | 17 | 16 | 8 | 2 | 0 | 0 | | 50 | 3.33 |
| 10-11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 |
| 11-12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 |
| Total | 4 | 41 | 82 | 53 | 13 | 17 | 69 | 46 | 48 | 54 | 77 | 37 | 35 | 55 | 41 | 9 | 681 | 45.40 |

The 1976 State Airport Systems Plan developed a model using based aircraft and airmen to estimate future operations. The assumption is made herein that such an approach provides a sound basis for future estimation.

log (annual total operation) = 2.614 + 0.501 log (based aircraft x county airmen)

TABLE 14

Total Annual, Itinerant and Local Operations

1978 SASP

| Year | Total Annual | Total Itinerant | Total Local | Based Aircraft | Ops/ B.A |
|---|---|---|---|---|---|
| 1977 | 7,600 | 2,500 | 5,100 | 12 | 633 |
| 1982 | 8,000 | 2,600 | 5,400 | 12 | 666 |
| 1987 | 8,100 | 2,700 | 5,400 | 12 | 676 |
| 1999 | 10,200 | 3,600 | 6,600 | 18 | 567 |

Source: 1978 SASP, p. 4. - A - 1.

However, compared to the recent count and total annual estimate, the 1978 SASP appears somewhat low. This is because there has been a significant increase in the number of based aircraft since preparation of the SASP estimate as well as a substantial increase in the number of student operations.

1978 Estimate
11,600 Total Annual Ops. ÷ 14 Based Aircraft = 829 Ops. / Based Aircraft

TABLE 15

Total Annual Operations, Audubon
1978 - 1997

| Year | Low | Middle | High | Total Annual Ops. Low | Middle | High |
|---|---|---|---|---|---|---|
| 1978 | 12 | 13 | 14 | 9,948 | 10,777 | 11,606 |
| 1979 | 13 | 13 | 14 | 10,777 | 10,777 | 11,606 |
| 1980 | 13 | 13 | 14 | 10,777 | 10,777 | 11,606 |
| 1981 | 13 | 14 | 14 | 10,777 | 11,606 | 11,606 |
| 1982 | 13 | 14 | 15 | 10,777 | 11,606 | 12,435 |
| 1987 | 14 | 16 | 17 | 11,606 | 13,264 | 14,093 |
| 1992 | 15 | 17 | 19 | 12,435 | 14,093 | 15,751 |
| 1997 | 16 | 19 | 21 | 13,264 | 15,751 | 17,409 |

The preceding table estimates that the current number of annual operations are between 10,000 and 11,600. This number is expected to remain stable over the next 5 years increasing to some 15,000 to 17,500 operations by 199 .

Total annual operations are broken down into local and itinerant. A local operation is defined as one by an aircraft operating within sight of a control tower or within the local traffic pattern and are known to be departing for, or arriving from flight in local practice areas located within a 20 mile radius of the field. Itinerant operations, the second type, compose the remaining arrivals and departures. Reference may be made to the following table concerning annual, local, and itinerant operations.

TABLE 16

Annual Itinerant & Local Operations
Audubon, 1978 - 1997
(Based on Middle Estimate of Total Annual Ops.)

| Year | Local | Itinerant |
|---|---|---|
| 1978 | 7,112 | 3,664 |
| 1982 | 7,660 | 3,946 |
| 1987 | 9,301 | 4,792 |
| 1997 | 10,396 | 5,355 |

Approximately 2/3 of the total annuals operations are expected to be local operations.

Operations Mix:

At the small general aviation airport, the operations mix is of more significance than the total number of annual operations. For planning purposes, the Federal Aviation Administration has classified airports according to the level of service provided.

Basic Utility Stage I: This facility would accommodate 75% of the propeller aircraft under 12,500 pounds.

Basic Utility Stage II: The BU - II Airport accommodates 95% of the propeller aircraft under 12,500 pounds.

General Utility: This type of Airport accommodates all propeller aircraft 12,500 pounds or less.

"There should be a minimum of 500 itinerant operations by airplanes having a gross weight of 6000 pounds or greater."

(Source: FAA AC 1500/5300 - 4B, Chg. 2, p. 4)

As noted, to justify a general utility airport, a total of 500 annual itinerant operations are required by aircraft with a gross weight in excess of 6,000 pounds.

Based upon the expected operations mix, a basic utility stage II airport would appear to meet the needs of Audubon over the 20 year planning period. This reasoning is based upon the following:

1. All based aircraft are excepted to have gross weight under 8,000 pounds. The PA-34-200 is the largest based aircraft.

2. Light twins, with a gross weight between 6,000 and 8,000 pounds, may be based at the airport.

3. No heavy twins are expected to be based at the airport. (Aircraft with a gross weight in excess of 8,000 pounds).

4. Aircraft, with a gross weight in excess of 6,000 pounds, would be required to average 9.6 itinerant operations per week in order to justify a general utility level of airport development.

Peak Day and Peak Hour Operations:

The recent activity count revealed a peak day operation count of 82 (7/19/78). This count does not include touch-and-go operations. The peak hour was at 9 p.m. on 7/26/78, with 17. Peak day and peak hour data is of sigificance at high traffic airports and is used to determine airport capacity. At small g-a airports, capacity is not usually a problem. For example:

| Single Runway, Mix 1 | |
|---|---|
| Practical Annual Capacity | 215,000 ops/year |
| Practical Hourly Capacity | IFR 53 ops/hour |
| | VFR 99 ops/hour |

(Source: FAA AC 150/5060-1A and AC 150/5060-3A)

Anticipated operational activity at Audubon is well below the airport capacity. Average peak day and peak hour activity is summarized in the table below.

TABLE 17

Peak Day and Peak Hour Operations
1978 - 1997

| Year | Peak Day - Middle Estimate (.00706) |
|---|---|
| 1978 | 76 |
| 1982 | 82 |
| 1987 | 93 |
| 1997 | 111 |

| Year | Peak Hour - Middle Estimate (.00228) |
|---|---|
| 1978 | 24 |
| 1982 | 26 |
| 1987 | 30 |
| 1997 | 36 |

## D. AIRMEN AND PASSENGER

### Airmen

The 1978 SASP estimates a continued increase in the number of registered airmen in the State of Iowa through 1997. The 1978 SASP estimated the following number of airmen through 1997 for Audubon County:

| | |
|---|---|
| 1982: | 31 |
| 1987: | 32 |
| 1997: | 34 |

### Air Passengers

The number of air passengers was estimated at 1.5 times the number of itinerant operations. Reference may be made to the table below.

TABLE 18

Air Passengers

| Year | Passengers |
|---|---|
| 1978 | 5,496 |
| 1982 | 5,919 |
| 1987 | 7,189 |
| 1997 | 8,032 |

## E. SUMMARY

Based upon the forecast of aviation demand, a basic utility stage II airport will meet aviation demand expectations over the twenty year planning period.

Audubon Municipal Airport

| | | |
|---|---|---|
| Phase One | 1978 - 1982 | Basic Utility, Stage II |
| Phase Two | 1983 - 1987 | Basic Utility, Stage II |
| Phase Three | 1988 - 1997 | Basic Utility, Stage II |

The community is encouraged to update the activity forecast at five years intervals. The addition of deletion of 2 or more aircraft from an inventory could alter the needs at the airport.

# SECTION III

# FACILITY REQUIREMENTS

## A. Introduction

Airport facility requirements presented herein are recommended for implementation over a twenty year period. The needs identified are based upon the following:

1. Forecast of aviation demand
2. Existing airport facilities
3. Existing airport site

While it may be desirable to implement required facilities as soon as possible, constraints at the local, state, and federal level may prevent such from taking place. The most salient of these constraints relate to the financial status of the local entity as well as the availability of state and federal asssistance.

It cannot be emphasized enough that planning is a process. As such, the recommendations presented herein are based upon present conditions and future levels of activity. Time brings change which may also affect the assumptions used herein. State and Federal requirements also change. Because of the likelihood of these charges, the Airport Development Plan must remain a flexible document. The Plan will change as local, state, and federal needs change. Every effort should be made to insure that only the facilities needed are implemented. The community is encouraged to monitor aviation activity throughout the twenty year planning period. As a result of this effort, the plan can then be updated with minimal effort. A five year update appears to represent a realistic time frame.

## B. Runways and Taxiways

### Weather Conditions

For utility airports, a 12 m.p.h. crosswind wind component value is used to assess wind coverage by an existing or proposed runway. An airport should be able to provide a 95% coverage of winds greater than 12 m.p.h. The existing runway, RW 14/32, provides a 90.9% coverage. This coverage is based upon the wind rose for Omaha which the 1972 Iowa State Airport Systems Plan recommends as the appropriate wind data to use. As such, a crosswind runway is justified.

Because of topographic constraints at the Audubon Municipal Airport, an assumed alignment of N 40 E. for the crosswind runway will be used. Reference maybe made to figure 19 .

In addition to wind speed and direction, the following climatic data is summarized in table .

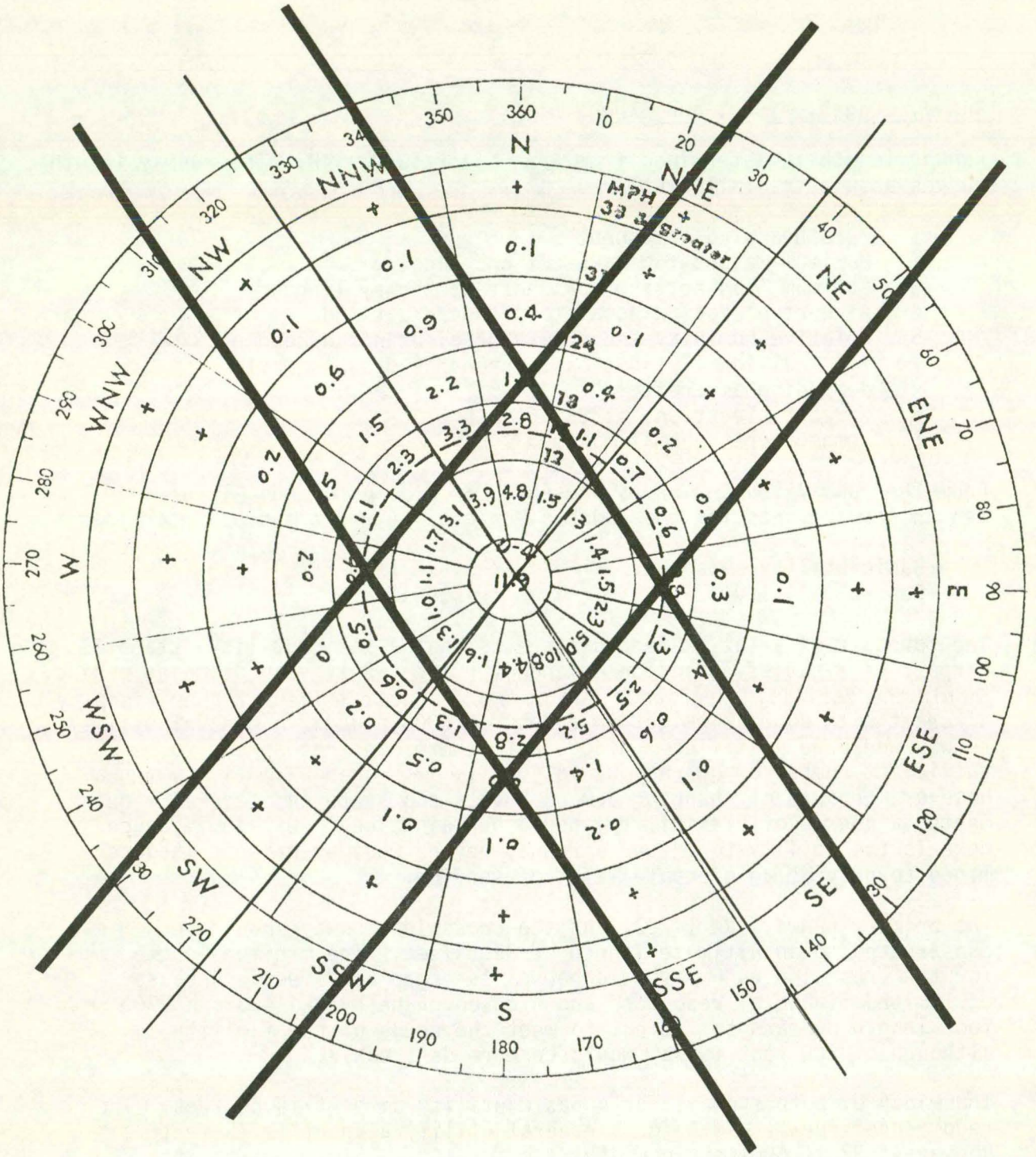
TABLE 19

Temperature and Precipitation, Audubon
(In °F and Inches)

| Month | Temperature | Precipitation | Month | Temperature | Precipitation |
|---|---|---|---|---|---|
| Jan. | 20.1 | 1.13 | July | 75.6 | 3.96 |
| Feb. | 23.9 | 1.07 | Aug. | 73.5 | 4.72 |
| Mar. | 34.1 | 1.90 | Sept. | 64.7 | 3.06 |
| Apr. | 49.1 | 2.59 | Oct. | 53.7 | 1.85 |
| May | 60.5 | 3.77 | Nov. | 36.4 | 1.59 |
| June | 70.3 | 4.82 | Dec. | 25.6 | 0.89 |

Source: I.S.U.- The Climate of Iowa, 1964.

Annual precipitation, 1931 to 1960, at Audubon averaged 31.55 inches. The average annual temperature at Audubon is 49°F. The normals for maximum and minimum temperatures in °F at Omaha for the hottest month are 87.0 ° and 65.1 °.




Source: 1972 SASP

Figure 3 : Wind Rose

## Runway Length, Width, and Strength

Runway length is determined from FAA AC 150/5300 - 4B. The runway length curves assume the following:

1. Zero headwind component
2. Maximum weignt for take-off and landing
3. Optimum flap setting for shortest runway length
4. Airport elevation equal to pressure altitude
5. Relative humidity and runway gradient not accounted for individually, but based upon the group's most demanding aircraft
6. Airport elevation: 1286.86' ASL
7. Temperature, normal maximum: 87 F

From the runway length curves presented in Figures 4 and 5, runway length requirements for the Audubon Municipal Airport can be determined.

| | |
|---|---|
| Basic Utility, Stage II: | 3,500 ft. |
| General Utility | 4,100 ft. |

The forecast of aviation demand suggests that a basic utility, stage II airport will satisfy aviation demand over the twenty year planning period. Should the facility experience 500 or more annual itinerant operations by aircraft with a gross weight in excess of 6000 pounds, a general utility runway would be justified. At present, there does not appear to be a sufficient number of operations to justify the general utility runway. However, because of changing demand levels and state and federal requirements, a degree of flexibility should be maintained. Of significance here is the ability to extend a runway beyond what at present is determined to provide an adequate level of service.

The primary runway, RW 14/32, and the crosswind runway should be constructed to an ultimate length of 3500 feet. The minimum length for the crosswind runway should be no less than 2800 feet. Because of limited financial resources and wind coverage by RW 14/32, a 2800 foot length appears sufficient to meet the needs of the facility, although a 3500 foot runway would be more desireable.

The width of both runways for a basic utility airport is 60 feet. The recommended runway width for a general utility airport is 75 feet. Runway 14/32 is 60 feet in width.

To bring the runway facilities to basic utility stage II standards, the following actions are recommended.

| | | |
|---|---|---|
| Runway 14/32 | 60' x 3,000' | (Existing) |
| | 60' x 3,500' | (Future) |
| Crosswind Runway | 60' x 2,800' | (Future) |

A pavement design, which will support a single wheel load at 12,500 pounds, is recommended.

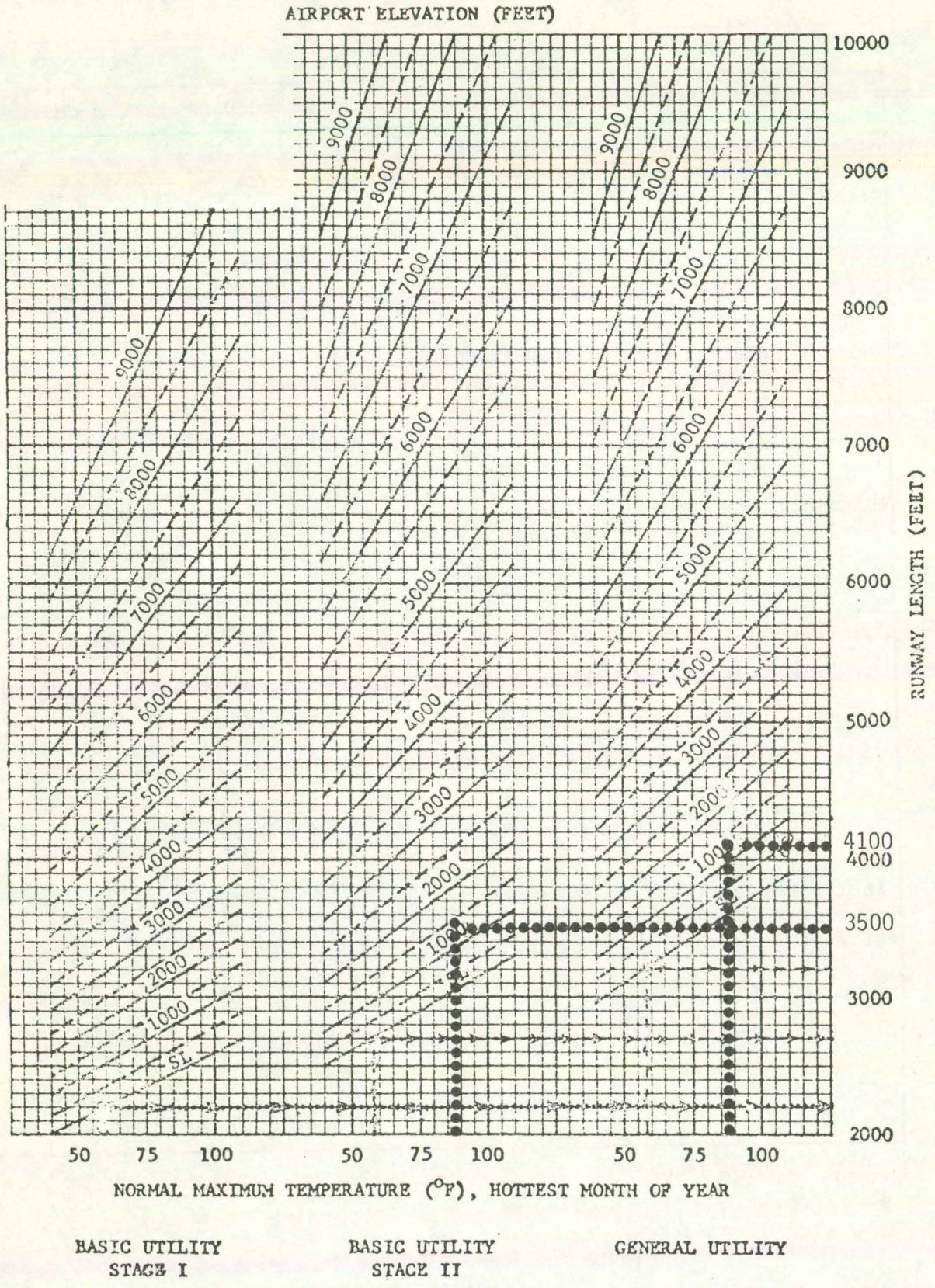
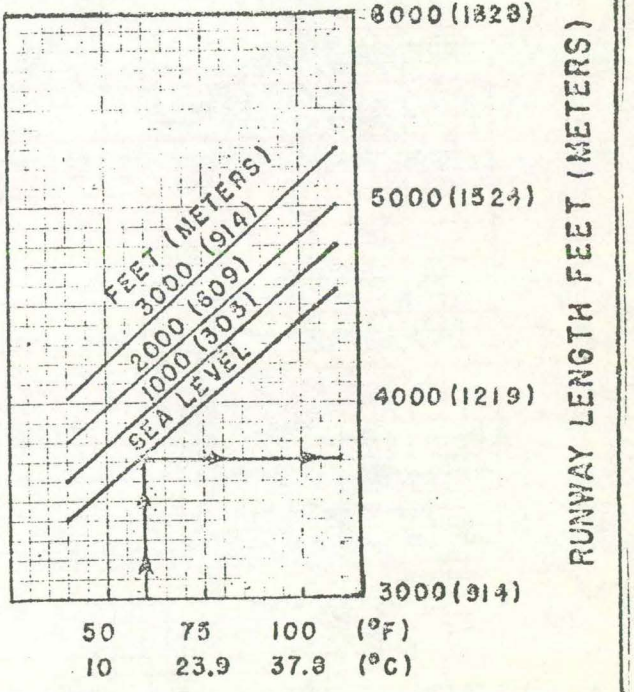



FIGURE 4 RUNWAY LENGTH CURVES

Source: AC150/5300 - 4B

| REPRESENTATIVE AIRPLANES | | | RUNWAY LENGTH CURVES |
|---|---|---|---|
| Beech | B80 | Queen Air | EXAMPLE: |
| Beech | E90 | King Air | TEMPERATURE 59°F (15°C) |
| Beech | B99 | Airliner | AIRPORT ELEVATION SEA LEVEL |
| Beech | A100 | King Air | GEN. UTILITY 3700' (1 128 m) |
| Britten-Norman | Mark III-I Trilander | | NOTE: For airport elevations above 3000 feet (914 m) use General Utility Curves, Figure 4-1. |
| Mitsubishi | MU-2L | | |
| Swearigen | Merlin III-A | | |
| Swearigen | Merlin IV-A | | |
| Swearigen | Metro II | | |
| See Figure 2-1 for airplane models in the above group that also have an option for a seating configuration of less than 10 passenger seats. | | | |




Source: AC 150/5300 - 4B

Figure 5 Runway length to accommodate airplanes having seating configuration of 10 passenger seats or more.

Taxiways:

Taxiways are classified by FAA AC 150/5300 - 4B into three groups: parallel, exit, and hangar and apron access. The FAA, at present, encourages the construction of full or partial parallel taxiway systems. The IDOT finds justification for a partial parallel taxiway at one runway end when annual operations are between 30,000 and 50,000. Based upon current IDOT guidelines a partial or full parallel taxiway system would not be justified at Audubon.

Taxiways are required to facilitate the movement of aircraft from the runway to the apron and hangar facilities. It is recommended that taxiway facilities connecting the runway and apron be no less than 30 - foot in width for a basic utility airport and 40 foot for a general utility airport. Taxiways connecting the apron to the hangars should be no less than 20 - foot in width.

Turnarounds:

Where a parallel taxiway system is not feasible, a turnaround is recommended. Turnarounds should be constructed on RW End 14. A turnaround on RW End 32 should be constructed at the time of an extension to RW 14/32. A typical turnaround is shown below.

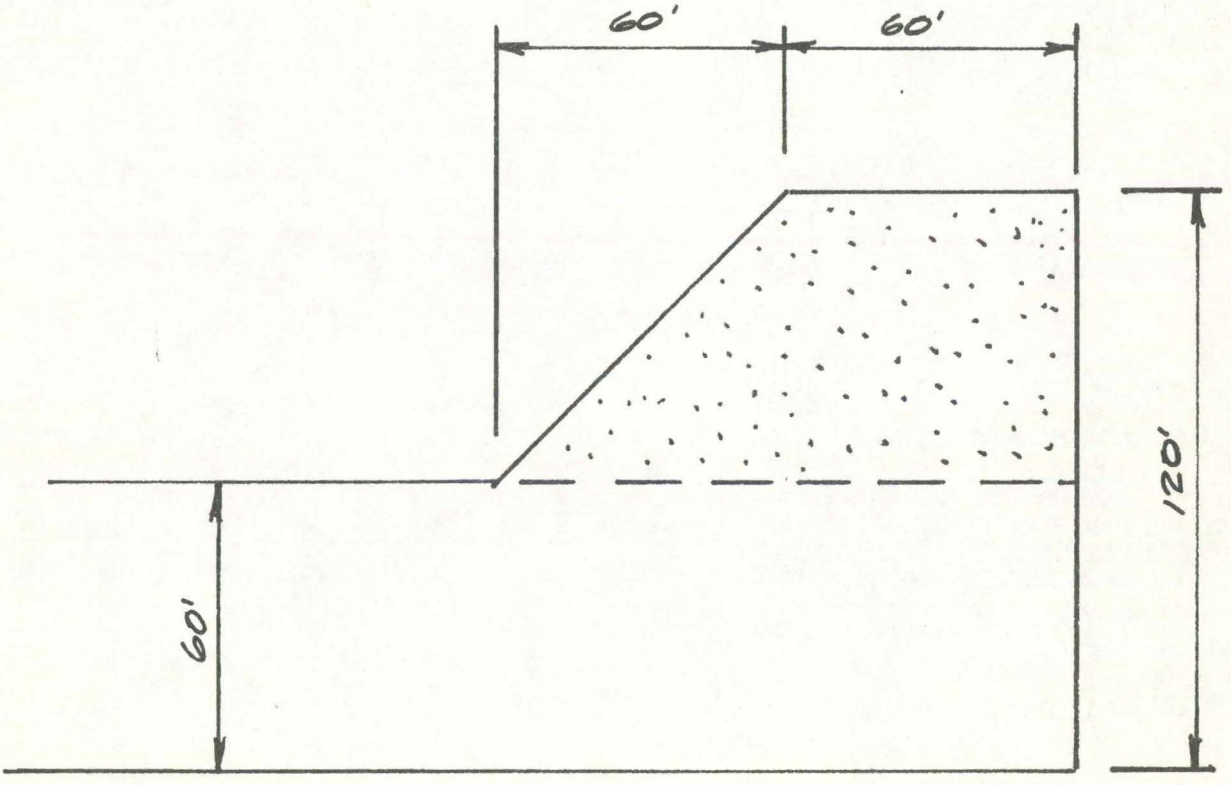
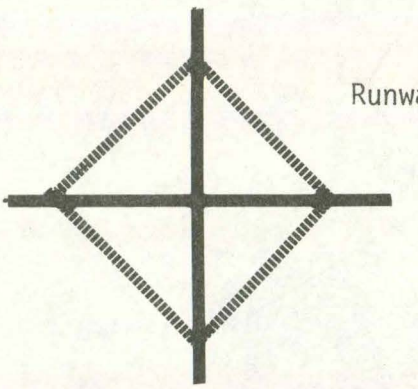



Figure 6: Typical Turnaround

Runway Design Considerations

For airports not having a parallel taxiway system, runway grade changes should be such that any two points five feet above the runway centerline will be mutually visible the entire runway length. The layout of the runways and other airport components must be such that a runway visibility zone can be provided. This zone is an area formed by imaginary lines connecting the visibility point of each runway.

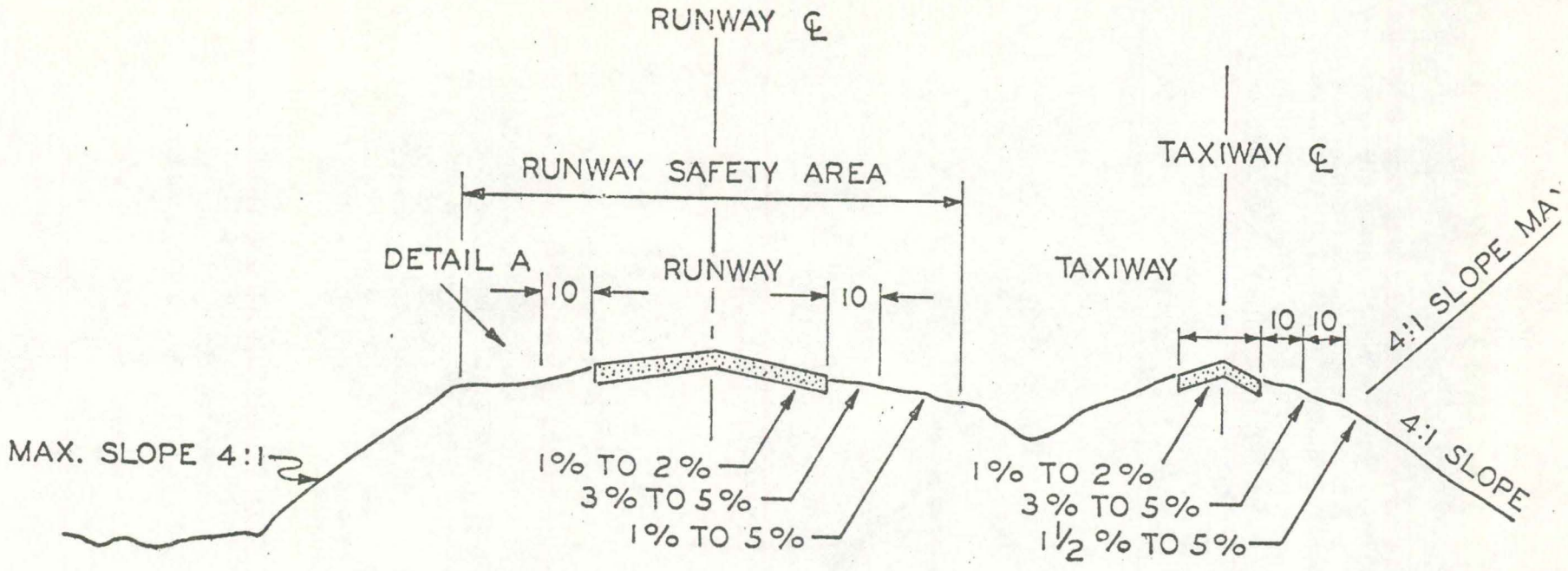


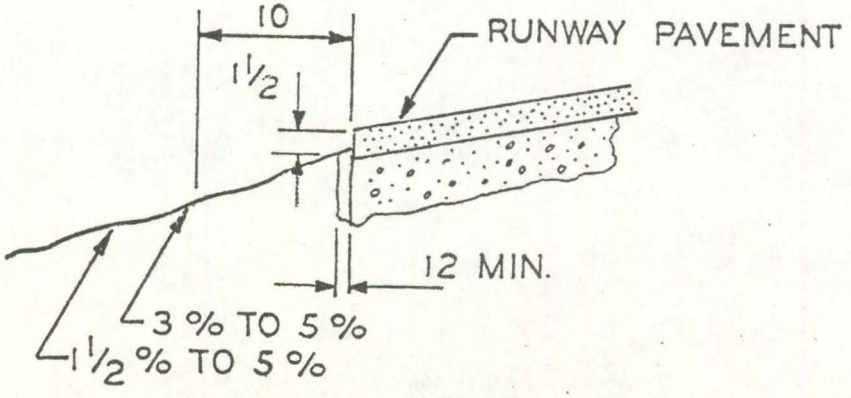
Runway Visibility Zone

Figure 7 : Runway Visibility Zone

Maximum grade changes should not exceed two percent where vertical curves are required. The length of the vertical curve should be no less than 300 feet for each percent grade change. No vertical curves are required when the grade change is less than 0.4%. Traverse grades on the runway itself should be at least one percent and no more than two percent. Within ten feet of the pavement edge, the grade should have a minimum slope of three percent and not to exceed five percent. Reference may be made to Figure 8 concerning a typical runway cross section.

A graded area beyond the runway surface is referred to as the runway safety area. The runway safety area extends 200 feet beyond the runway end and outward 60 feet from the runway centerline for basic utility runways. This area should void of structure which may cause damage to an aircraft.




DETAIL A

## TYPICAL CROSS SECTION

FIGURE 8

Lateral Widths and Clearances:

The following are criteria for separation of airport facilities:

| | Minimum | Desirable |
|---|---|---|
| - Runway to taxiway centerline | 150' | 200' |
| - Runway centerline to building restriction line (BRL) and property line )non-taxiway side) | 200' | 250' |
| - Runway centerline to building restriction line (taxiway side) | 250' | 300' |
| - Runway centerline to property line (taxiway side) | 250' | 350' |
| - Taxiway centerline to airplane tiedown area | 75' | Design |
| - Taxiway centerline to fixed or movable obstacle | 50' | Design |
| - Runway centerline to fixed or movable obstacle | 125' | 125' |
| - Runway centerline to tiedown area | 275' | 275' |

(Source: FAA AC 150/5300 - 4B)

Pavement Markings:

Non-precision instrument (N.P.I.) markings are recommended for installation on Runway 14/32. A non-precision instrument runway is one to which a straight-in non-precision approach has been approved. N.P.I. markings consist of basic runway markings in addition to threshold markings.

Centerline Markings:

The centerline markings consist of a broken line having 120 foot dashes and 80 foot blank spaces. The minimum width is one foot.

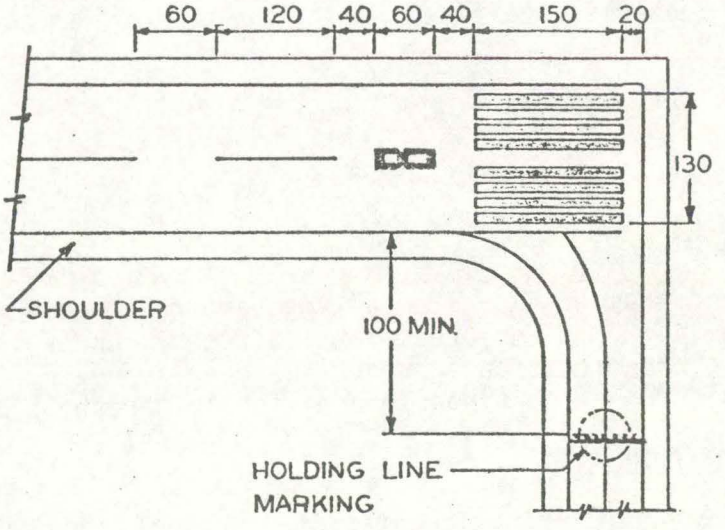
Designation Markings:

Each runway end is marked with designated numbers representing the magnetic azimuth, measured clockwise from north and the runway centerline from the approach end and recorded to the nearest 10 with the last zero omitted.

- Threshold Markings

  Threshold markings consist of eight 150' x 12' stripes. Each stripe is separated by a minimum of three feet except in the center where the minimum distance is 16 feet.

Reference should be made to FAA AC 150/5340-1D concerning pavement marking requirements and the figure below.




NON PRECISION INSTRUMENT RUNWAY

FIGURE 9

## C. Landing and Navigational Aids

### Runway and Taxiway Lighting

Runway 14/32 has at present in operation a low intensity runway light system (LIRL). The 1978 SASP finds a low intensity system adequate for basic utility runways, but recommends a medium intensity system (MIRL) for general utility runway facilities. Where taxiways exist, a taxiway light system should be installed on those taxiways which parallel the runway or connect the apron and runway. Upgrading the present system to a medium intensity system is considered a low priority.

Runway lights are used to outline the edges of the runway during periods of darkness or low visibility. Each runway edge light fixture emits an aviation white light (VFR) defining the lateral limits of the runway. The edge light should be located no closer 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 and vegetation. 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 an 180 aviation red light inward and 180 green light outward. Threshold lights should be located no closer than two feet and no more than ten feet from the runway threshold. VFR runways have three fixtures in each group where as IFR runways have four fixtures.

Reference should be made to FAA AC 150/5300 - 4B, and AC 150/5340 - 24 concerning runway light systems. FAA AC 150/5340 - 24 recommends a MIRL system for runways having a non-precision instrument (NPI) approach procedure. An alternative to taxiway edge lights at low activity airports, may be the use of L-853 reflectors. It should also be noted that a yellow light is substituted for white on the last 2000 feet or one-half the runway length, whichever is less, for instrument runways. The yellow lights are located on the end opposite the landing threshold or instrument approach end.

A MIRL system should be installed on the primary and crosswind runways. Where a displaced threshold exists, special consideration must be given to the location and threshold lights.

Visual Approach Slope Indicator, VASI

A two-box VASI system is recommended for installation on RW 14/32. The 1978 SASP recommends a VASI - 2 system at both ends of the runway where annual operations are 10,000 or greater. A VASI - 2 system should also be installed on the crosswind runway.

The VASI - 2 system should be located on the left side of the runway approach and 50 feet out from the pavement edge. The downwind bar should, ideally, be located 500 feet ± from the threshold. The upwind bar should be located 700 feet ± from the downwind bar. The VASI system enables the pilot to determine whether his approach is high, on glide slope, or low from the two-color light beam emitted.

Runway End Identifier Lights, REIL's

REIL's have been installed on RW 14/32. Relocation with a runway extension and / or installation of a VASI system will be required. A REIL system should also be installed on the crosswind runway.

The 1978 SASP recommends installation of REIL's where annual operations are 3000 or greater. Reference may be made FAA AC 150/5300 - 2C concerning the layout of VASI and REIL systems.

Segmented Circle, Wind Indicator, and Beacon

A segmented circle should be installed on the airport. Reference may be made to FAA AC 150/5340 - 5A concerning the layout of a segmented circle. The wind indicator, lighted, should be located with in the segmented circle.

A new airport beacon light was recently installed at Audubon. FAA AC 150/5340 - 21 recommends a 10-inch rotating beacon (green/clear) on airports having a MIRL system. For runways over 3,200 feet in length the beacon should be located at least 750 feet form the runway centerline. The beacon is located on a hill west of the airport.

Non - Directional Radio Beacon

A non-directional radio beacon (NDB) is in operation at the airport. The NDB system allows an aircraft equipped with an automatic direction finder (ADF) to "home" in on the signal.

## D. Terminal Area

### Existing Facilities

The existing terminal area is located west of RW 14/32 and east of the Rock Island Railroad right-of-way (R.O.W.). The terminal area facilities consist of the following:

| | | | |
|---|---|---|---|
| 1. | Airport Manager's Residence | | 1,424 S.F. |
| 2. | Detacted Residential Garage | | |
| 3. | FBO Shop | 46' x 40' | 1,840 S.F. |
| 4. | Conventional Hangar | 72.3' x 54.3' | 3,926 S.F. |
| 5. | Conventional Hangar | 48.3' x 40' | 1,932 S.F. |
| 6. | Conventional Hangar | 90.5' x 28.6' | 2,588 S.F. |

The site is served by a 4 inch city water line. Propane is used as a heating source. A septic tank system is also in use. A fire hydrant is also located on the site.

Access to the apron from RW 14/32 is provided by a 30' x 180' stub taxiway. The apron area consists of 18,960 S.F. (2,106.6 SY) of improved surface.

Vehicle access is provided by a gravel road off U.S. Highway 71. The vehicle parking lot is gravel. Fuel pumps are located north of the F.B.O. shop. Three underground fuel tanks exist.

The most salient constraint within the terminal area is expansion potential. The only direction for expansion is to the south. The following constraints must be taken into account when assessing the functional capability of the facility.

1. Location of the railroad to the west
2. Location of building restriction line (BRL) 250 feet west of RW centerline (℄)
3. Location of aircraft tiedown restriction line 225 feet west of RW ℄

All facilities, with the exception of the managers residence, are located outside the BRL. The apron area is limited for use as an aircraft tiedown area by an imaginary line 225 feet from the RW ℄. However, a good part of the apron can be used for queuing.

Future buildings must be outside the BRL. As a result of these constraints, it will be necessary to locate future facilities along a line parallel to the runway.

Apron

The apron area should provide space for based and itinerant aircraft tiedowns as well as queuing space at the fuel pumps and in the front of maintenance shops. For planning purposes, it is assumed that all based aircraft will be placed in hangar facilities. As such, only itinerant aircraft needs are considered herein.

TABLE 20

Itinerant Aircraft Tiedowns
1978 - 1997

| Planning Period | Annual Itinerant Operations | Average Day | 10% Increase for Busy Day | 50% on Ground At Any One Time |
|---|---|---|---|---|
| I | 3,946 | 11 | 1 | 6 |
| II | 4,792 | 13 | 1 | 7 |
| III | 5,355 | 15 | 2 | 9 |

By 1997, a total of 9 improved surface tiedowns should be available at the airport. Unimproved tiedown areas could be used to satisfy demand in excess of the 9 tiedown spaces.

Hangars

The capacity of the existing hangar structures is subject to the size of aircraft and stacking procedure used. For planning purposes, it is assumed that the FBO shop would not be used for aircraft storage. It is also assumed that a total of nine aircraft could be placed in the three existing hangar facilities. Where conventional facilities exist, it is often difficult for an owner to remove an aircraft without moving other aircraft.

Based upon the middle trend line, there would appear to be a storage need for 19 aircraft by 1997. Assuming that 9 spaces currently exist, capacity for 10 additional aircraft should be constructed. In addition, storage should also be made available for the "sales and demonstration" aircraft. As noted, 10 such aircraft may be based at the facility by 1997. The following terminal area development strategy is offered for consideration.

1. Construct 10 unit tee hangar: 1978-1982
2. Construct FBO Shop, 60' x 80': 1978-1982
3. Construct 6-10 Unit tee hangar: 1987-1997
   (If demand expectations are realized)

The two ten unit tee hangars would be reserved for individually owned aircraft while the existing conventional hangars could be used for storage of aircraft operated by the F.B.O. to include the sales and demonstration aircraft. Aircraft dimensions for hangar sizing are provided on the following three pages.

The 1978 SASP recommends a minimum 60' x 80' maintenance facility at utility airports. The existing FBO shop, by this standard, is not adequate in size. However, when the existing 46' x 40' shop is combined with space in the conventional hangar, 72.3' x 54.3', to the south, the need would more closely be met. The construction of a new FBO facility could be justified in the future.

Terminal Building

The 1978 SASP recommends approximately 500 S.F. be set aside for terminal building functions to include office area, waiting room, pilot's briefing area, and restrooms. A separate structure is desirable, but the above activities may be included within a hangar structure.

Vehicle Parking

Existing parking space appears adequate based upon capacity. As the terminal area expands south, additional parking should be created to equal the number of aircraft.

GROUND STORAGE DIMENSIONS OF SELECTED
GENERAL AVIATION AIRCRAFT
(in feet and inches)

Single Engine, High Wing Tailwheel

| MAKE | MODEL | (WINGSPAN) | (LENGTH) | (HEIGHT) |
|---|---|---|---|---|
| Bellanca | 7 | 35-5 | 22-8 | 6-8 |
| Cessna | 120/140 | 32-10 | 21-0 | 6-3 |
| | 170 | 36-0 | 25-0 | 6-7 |
| | 180/185 | 36-2 | 25-9 | 7-9 |
| | 190 | 36-2 | 27-1 | 7-2 |
| | 195 | 27-4 | 27-1 | 7-2 |
| Piper | Pa-12/14/15 | 35-6 | 22-6 | 6-10 |
| | PA-18 | 35-3 | 22-5 | 6-8 |
| | PA-20 | 29-4 | 20-5 | 6-3 |
| Taylorcraft | BC-12 | 36-0 | 22-0 | 6-8 |

Single Engine, Low Wing Tricycle Gear

| MAKE | MODEL | (WINGSPAN) | (LENGTH) | (HEIGHT) |
|---|---|---|---|---|
| Aerostar | 415 | 30-0 | 20-7 | 6-3 |
| | M-20 | 35-0 | 23-7 | 8-4 |
| | M-22 | 35-0 | 27-0 | 9-10 |
| Beechcraft | 23 | 32-9 | 25-0 | 8-3 |
| | V-35B | 33-6 | 26-5 | 6-7 |
| | F-33 | 32-10 | 25-6 | 8-3 |
| Bellanca | 260/300 | 24-2 | 23-6 | 7-4 |
| Grumman | AA-1 | 24-6 | 19-3 | 6-10 |
| Piper | PA-24 | 36-0 | 24-9 | 7-5 |
| | PA-28-180 | 30-0 | 23-6 | 7-4 |
| | -200 | 30-0 | 24-2 | 8-0 |
| | PA-32 | 32-10 | 27-9 | 7-11 |
| Rockwell Int'l | 122 | 35-0 | 27-2 | 10-1 |

## Single Engine, High Wing Tricycle Gear

| MAKE | MODEL | (WINGSPAN) | (LENGTH) | (HEIGHT) |
|---|---|---|---|---|
| Cessna | 150 | 32-9 | 23-0 | 8-8 |
| | 172 | 35-10 | 26-11 | 8-10 |
| | 177 | 35-6 | 27-0 | 9-1 |
| | 182 | 35-10 | 28-1 | 8-11 |
| | 206 | 35-10 | 28-0 | 9-8 |
| | 207 | 35-10 | 21-9 | 9-7 |
| | 210 | 36-9 | 28-3 | 9-8 |
| Piper | PA-22 | 29-4 | 20-4 | 6-3 |

## Twin Engine, High Wing Tricycle Gear

| MAKE | MODEL | (WINGSPAN) | (LENGTH) | (HEIGHT) |
|---|---|---|---|---|
| Cessna | 366/377 | 38-2 | 29-10 | 9-4 |
| DeHaviland | DHC-6 | 65-0 | 65-0 | 18-7 |
| Mitsubishi | MU-2 | 39-2 | 39-6 | 13-8 |
| Rockwell Int'l. | 500 | 49-6 | 35-1 | 14-6 |
| | 560/680/Shrike | 49-1 | 36-7 | 14-6 |
| Short Bros. | Skyvan | 40-1 | 15-1 | 14-10 |

## Twin Engine, Low Wing Tricycle Gear

| MAKE | MODEL | (WINGSPAN) | (LENGTH) | (HEIGHT) |
|---|---|---|---|---|
| Aerostar | 600/601 | 34-3 | 34-10 | 12-2 |
| Beechcraft | B-55 | 37-10 | 27-0 | 9-7 |
| | E-55 | 27-10 | 29-0 | 9-2 |
| | A-60 | 39-3 | 33-10 | 12-4 |
| | A-65 | 45-11 | 35-6 | 14-3 |
| | B-80 | 50-3 | 35-6 | 14-3 |

## Twin Engine, Low Wing Tricycle Gear

Cont.

| MAKE | MODEL | (WINGSPAN) | (LENGTH) | (HEIGHT) |
|---|---|---|---|---|
| Beechcraft | A-90 | 50-3 | 36-6 | 14-8 |
| | A-100 | 45-11 | 39-11 | 15-4 |
| | 99A | 45-11 | 44-7 | 14-4 |
| Cessna | 310 | 37-6 | 29-7 | 9-11 |
| | 401/402/421 | 39-10 | 33-9 | 11-10 |
| Grumman | Gulfstream I | 78-4 | 63-9 | 22-10 |
| Piper | PA-23-160 | 37-2 | 27-5 | 9-6 |
| | -250 | 37-0 | 27-7 | 10-4 |
| | PA-30 | 36-0 | 25-2 | 8-3 |
| | PA-31 | 40-8 | 32-8 | 13-0 |
| Swearingen | Merlin IIB | 45-11 | 40-1 | 14-4 |
| | Merlin III | 46-3 | 42-2 | 16-8 |

## Turbo Jet, Turbo Fan Aircraft

| MAKE | MODEL | (WINGSPAN) | (LENGTH) | (HEIGHT) |
|---|---|---|---|---|
| Dassault | Fan Jet | | | |
| | Falcon | 53-6 | 56-3 | 17-5 |
| Cessna | Citation | 43-9 | 44-1 | 14-4 |
| Learjet | 24 | 35-7 | 43-3 | 12-7 |
| | 25 | 35-7 | 47-7 | 12-7 |
| | 35/36 | 38-1 | 48-8 | 12-4 |
| Grumman | G-II | 68-10 | 79-11 | 24-6 |
| Hawker Siddeley | HS-125 | 47-0 | 47-5 | 16-6 |
| Lockheed | Jetstar | 53-8 | 60-5 | 20-6 |
| Rockwell Int'l. | 40 | 44-5 | 43-9 | 16-0 |
| | 60 | 44-5 | 48-4 | 16-0 |
| | 70/75A | 44-6 | 47-2 | 17-3 |

Source: FAA AC150/5325-5B
AC150/5325-5B, Chg. 1
Airport Services Management, January, 1976

## E. FAR Part 77

### OBSTRUCTION STANDARDS

Part 77 of Volume XI, Federal Aviation Regulations, sets forth a number of standards to be used in identifying obstructions to air navigation. These standards are of considerable importance. The discussion herein is primarily extracted from Part 77. These standards will be used as a guide in the preparation of a zoning ordinance and the airport layout plan.

### STANDARDS FOR DETERMINING OBSTRUCTIONS

1. A stationary or mobile object is defined as an obstruction to air navigation if it is of a greater height than any one of the following:

   A. A height of 500 feet above the ground at the site.

   B. A height of 200 feet above the ground or airport elevation, whichever is higher, within 3 nautical miles of the airport reference point.

   C. The surface of a takeoff or landing area of an airport or any imaginary surface.

   D. Traverse ways on or near an airport to be used for the passage of mobile objects.

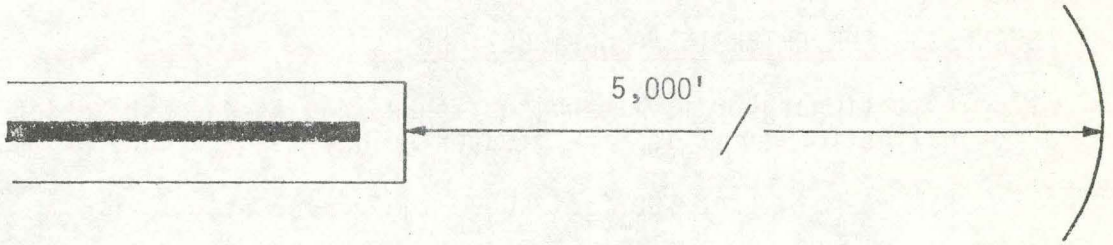
| | |
|---|---|
| - Interstate Highway | 17 Feet |
| - Public Roadway | 15 Feet |
| - Private Road | 10 Feet or height of the highest mobile object |
| - Railroad | 23 Feet |

### IMAGINARY SURFACES

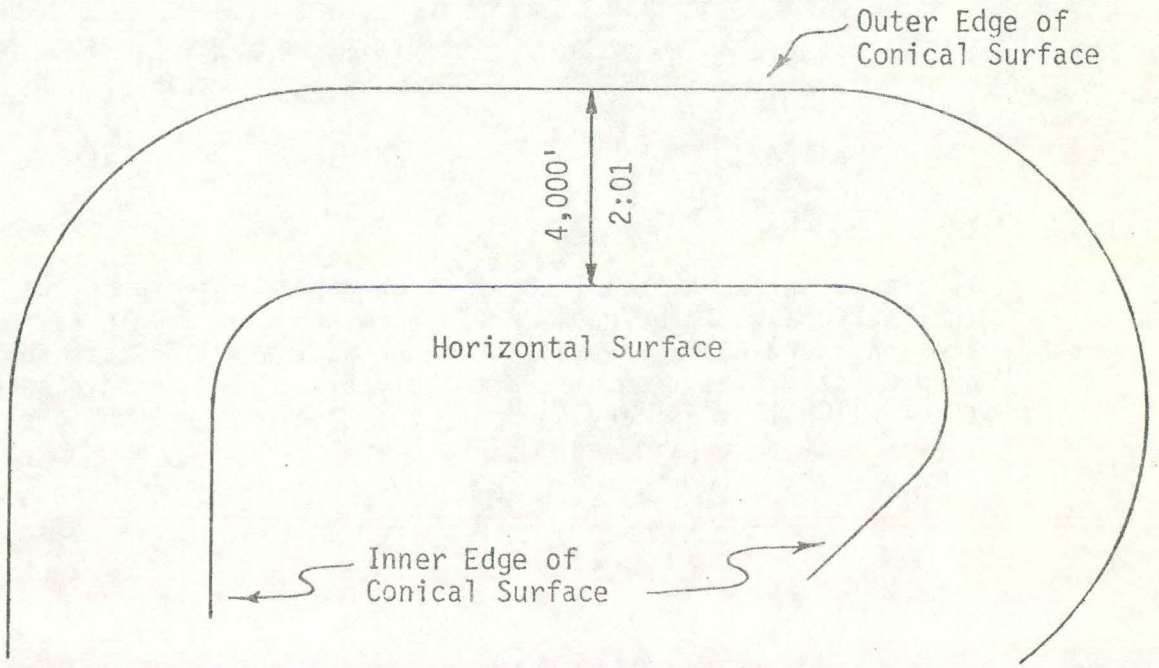
1. Imaginary surfaces establish areas where any object penetrating that surface would be considered an obstruction to air navigation. The imaginary surface establishes an imaginary line that separates ground activities from aircraft activities. In order to select the applicable imaginary surface, the type of approach to each runway must be considered.

A. Horizontal Surface: The horizontal surface is a plane 150 feet above the established airport elevation. It is constructed by swinging arcs of specific radii from the center of each end of the primary surface and by connecting the arcs by lines tangent to those arcs.

- Visual Radius of 5,000 feet
- NPI Radius of 10,000 feet. (Runway larger than Utility)
- NPI Radius of 5,000 feet. (Utility Runway)



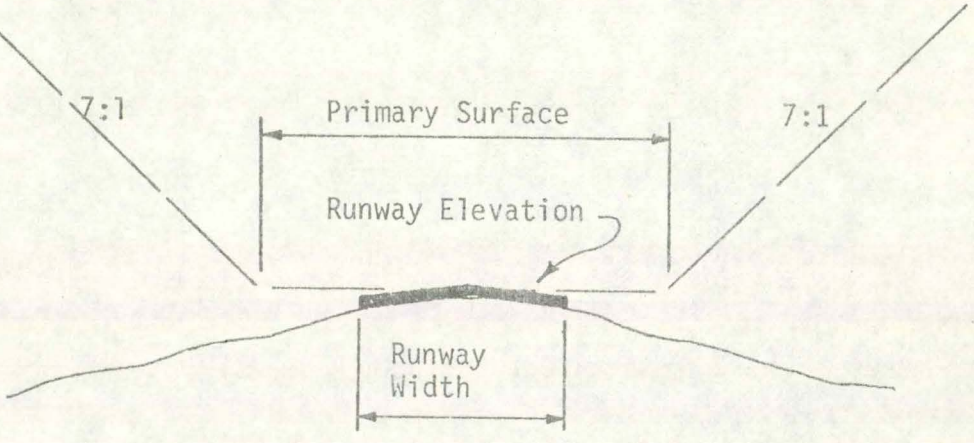

B. Conical Surface: The conical surface extends outward and upward from the periphery of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet at the ends and 7:1 laterally.



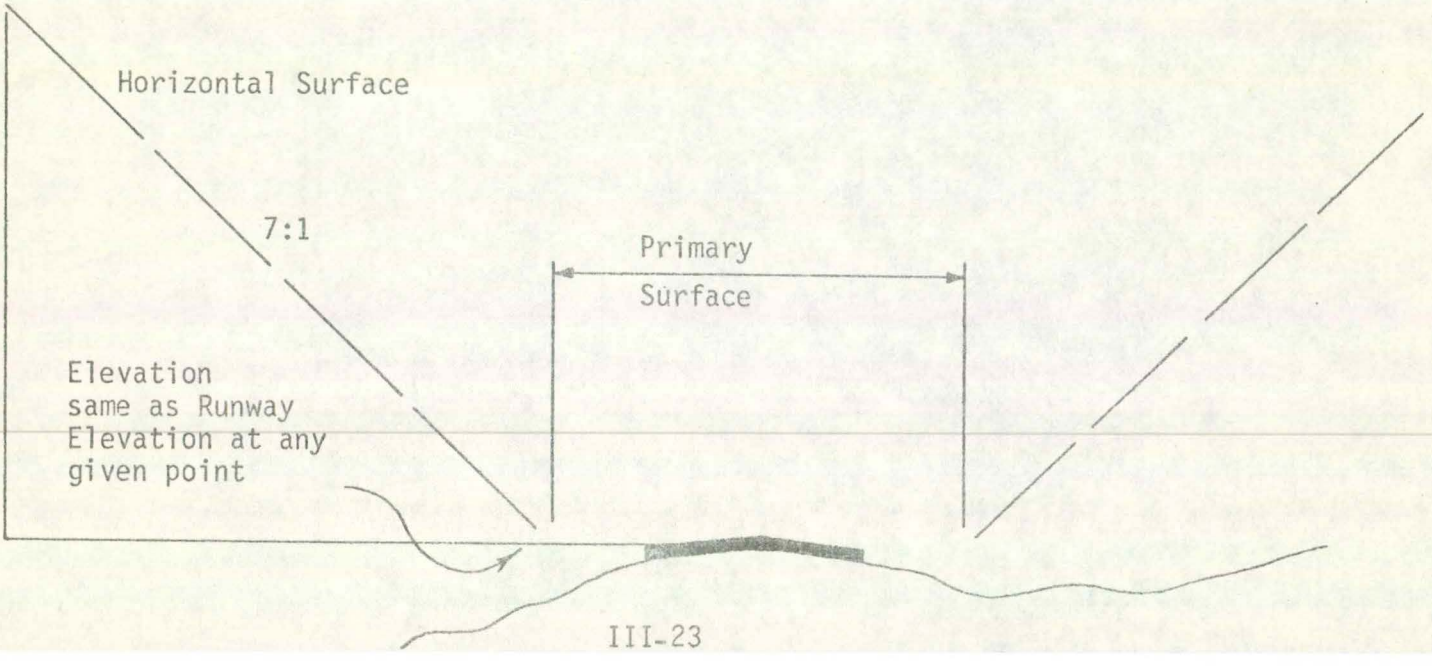
C. Primary Surface: The primary surface is longitudinally centered on the runway and extends 200 feet beyond the runway end in the case of a paved runway. The primary surface end coincides with the runway end in the case of a turf runway. The width of the primary surface varies with the approach.

| | Width | End of Runway |
|---|---|---|
| Visual | 250' | 200' |
| NPI | 500' | 200' |

The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline.




D. Transitional Surface: The transitional surface extends upward at a slope of 7:1 from the edge of the primary surface and approach surfaces. They extend outward and upward from the runway centerline and runway centerline extended until they intersect with the horizontal surface.



X and Y vary in dimension and are determined by the distance required for an imaginary line at a 7:1 slope, to intersect with the primary surface.

E. Approach Surface: The approach surface is longitudinally centered on the extended runway centerline. The inner edge of the approach surface coincides with primary surface and expands uniformly outward to a width determined by the type of approach:

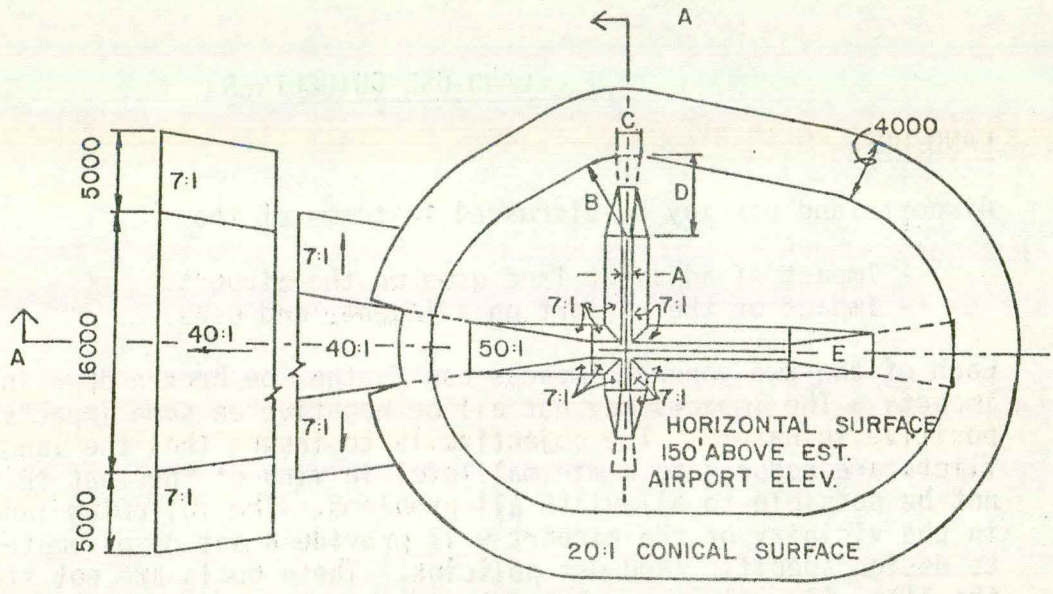
| | | |
|---|---|---|
| Visual: | 250' x 5,000 x 1,250' | |
| NPI: | 500' x 10,000 x 3,500' | (Runway larger than Utility w/visability minimum as low as 3/4 of a mile) |
| NPI: | 500' x 5,000 x 2,000' | (Utility runways) |

The approach slope also varies:

| | |
|---|---|
| Visual: | 20:1 |
| NPI: | 34:1 (Larger than Utility) |
| NPI: | 20:1 (Utility Runways) |

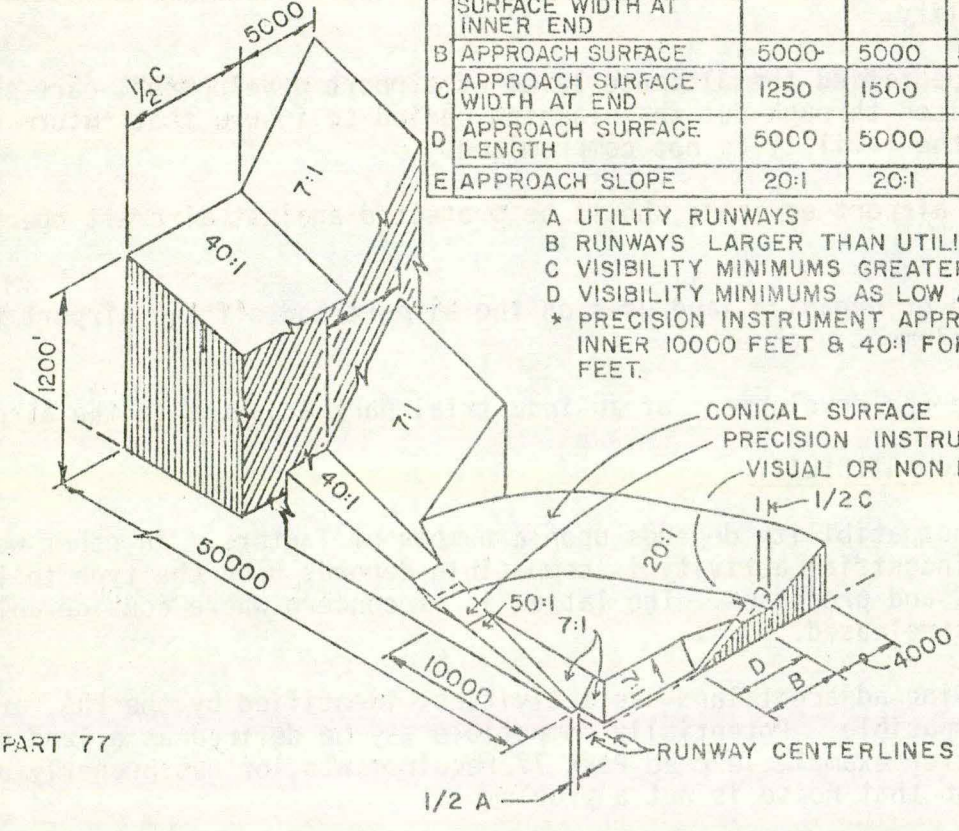
The clear zone represents that portion of the approach surface on the ground. The inner edge of the approach surface coincides with the primary surface. The clear zone extends outward uniformly to a width determined by a point which is 50 feet above the ground elevation or runway end elevation.

| | | |
|---|---|---|
| Visual: | 250' x 1,000 x 450' | Utility Runway |
| NPI: | 500' x 1,000 x 800' | Utility Runway |




| | ITEM | DIMENSIONAL STANDARDS (in feet) | | | | | |
|---|---|---|---|---|---|---|---|
| | | VISUAL RUNWAY | | NON-PRECISION INSTRUMENT RUNWAY | | | PRECISION INSTRUMENT RUNWAY |
| | | A | B | A | B | | |
| | | | | | C | D | |
| A | WIDTH OF PRIMARY SURFACE & APPROACH SURFACE WIDTH AT INNER END | 250 | 500 | 500 | 500 | 1000 | 1000 |
| B | APPROACH SURFACE | 5000 | 5000 | 5000 | 5000 | 10000 | 10000 |
| C | APPROACH SURFACE WIDTH AT END | 1250 | 1500 | 2000 | 3500 | 4000 | 16000 |
| D | APPROACH SURFACE LENGTH | 5000 | 5000 | 5000 | 10000 | 10000 | * |
| E | APPROACH SLOPE | 20:1 | 20:1 | 20:1 | 34:1 | 34:1 | * |

A UTILITY RUNWAYS
B RUNWAYS LARGER THAN UTILITY
C VISIBILITY MINIMUMS GREATER THAN 3/4 MILE
D VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
* PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10000 FEET & 40:1 FOR AN ADDITIONAL 40000 FEET.




Source: FAR PART 77

FIGURE 10

# AIRPORT IMAGINARY SURFACE

## F. LAND USE GUIDELINES

### LAND USE

Airport land use may be discussed in terms of the

- Impact of adjacent land uses on the airport
- Impact of the airport on adjacent land uses.

Each of the two general impacts can further be broken down into specific impacts. The impacts may not all be negative as some impacts are quite positive in nature. The objective is to insure that the land uses conflicts are reduced to a minimal level in view of the fact that it will not be possible to alleviate all problems. The following land use goals in the vicinity of the airport will provide a set of parameters upon which to design specific land use policies. These goals are not static nor is the list all inclusive. Through-out the planning period, goals are expected to change to meet unforeseen demand.

### GOALS

-The airport and associated imaginary surfaces should be protected from encroachment of land uses that might impair operational capabilities of the facility.

-Having identified the ultimate level of airport development, care should be exercised through-out the planning period to insure that future expansion of the facility is not compromised.

-Adjacent airport environs should be protected against aircraft operations and noise.

-Establish or organize land uses on the airport and off the airport that will complement each other.

-Encourage the development of an industrial park adjacent to the airport.

### LAND USE COMPATIBILITY

Land use compatibility depends upon a number of factors. In other words, to say that industrial activity is compatible depends upon the type to include structures and processes. The latter is of concern where considerable amounts of heat is released.

The following adjacent land use activities, identified by the FAA, are potentially compatible. Potentially compatible may be defined as a land use that does not, for example, exceed Part 77 requirements, or has properly been designed so that noise is not a problem.

Natural Corridors

| | | |
|---|---|---|
| Rivers | Canals | Natural Buffer Areas |
| Lakes | Drainage Basins | Forest Reserves |
| Streams | Flood Plain Areas | Land Reserves and Vacant Land |

Open Space Areas

| | |
|---|---|
| Memorial Parks and Pet Cemeteries | Archery Ranges |
| Water & Sewage Treatment Plants | Golf Driving Ranges |
| Water Conservation Areas | Go-Cart Tracks |
| Marinas, Tennis Courts | Skating Rinks |
| Golf Courses | Passive Recreation Areas |
| Park & Picnic Areas | Reservation/Conservation Areas |
| Botanical Gardens | Sod and Seed Farming |
| Bowling Alleys | Tree and Crop Farming |
| Landscape Nurseries | Truck Farming |

Industrial and Transportation Facilities

| | |
|---|---|
| Textile & Garment Industries | Foundaries |
| Fabricated Metal Products Industries | Saw Mills |
| Brick Processing Industries | Machine Shops |
| Clay, Glass, Stone Industries | Office Parks |
| Chemical Industries | Industrial Parks |
| Tire Processing Companies | Public Buildings |
| Food Processing Plants | Auto Storage |
| Paper Printing & Pbulishing Inds. | Parking Lots, Gas Stations |
| Public Workshops | Railroad Yards |
| Research Labs | Warehouse & Storage Buildings |
| Wholesale Distributors | Freight Terminals |
| Bus, Taxi & Trucking Terminals | |

Airport and Aviation Oriented Facilities

| | | |
|---|---|---|
| Airparks | Aerial Survey Labs | Aerospace Industries |
| Banks | Aircraft Repair Shops | Airfreight Terminals |
| Hotels | Aircraft Factories | Aviation Research & Testing Labs |
| Motels | Aviation Schools | Aircraft and Aircraft Parts Manufacturers |
| Restaurants | Employee Parking Lots | |

Commercial Facilities

| | |
|---|---|
| Retail Businesses | Professional Services |
| Shopping Centers | Gas Stations |
| Parking Garages | Real Estate Firms |
| Finance & Insurance Companies | Wholesale Firms |

The compatibility of each of these land use activities depends upon the proximity of the specific land use to the airport; the level of sound proofing and the type, height, and location of building structures.

The land uses identified herein as being compatible are not all inclusive nor is the list intended to suggest that such community land uses be located in the vicinity of the airport. Such land uses, when incorporated into the comprehensive growth and management plan, will insure a degree of compatibility within the vicinity of the airport.

# SECTION IV

# SOCIOECONOMIC/ENVIRONMENTAL FEASIBILITY

## A. Airport Development Alternatives

### Alternative One

| | | |
|---|---|---|
| RW 14/32 | N 33 W | 60' x 3,500' |
| Crosswind | N 40 E | 60' x 2,800' (3500') |

The existing runway is 60' x 3,000'. To bring the runway to basic utility length would require an extension of 500 feet. It is not feasible to extend the runway on Runway End 14 because of existing development. It would be possible to accommodate an extension on Runway End 32 provided one of the following two actions were taken:

1. Construction of the runway over the existing channel of the Blue Grass Creek; or

2. Relocate the channel of the Blue Grass Creek

The present runway provides for a 91 percent wind coverage at the 12 m.p.h. crosswind component value. A crosswind runway is thus justified. Because of topographic, drainage, and land use constraints, alternative crosswind locations are limited. A 60 degree separation between runway facilities is required.

Alternative One provides for a crosswind runway on an alignment of N 40 E. The runway facility would be located north of a tributary of the Blue Grass Creek. The runway would be 60' x 2800' and would be connected to the terminal area by a 30' wide taxiway. The taxiway would require the construction of a bridge or the placement of a pipe. The crosswind runway provides for a 73.9% wind coverage.

Future extension to a general utlility length of 4100'± of either of the runway facilities is questionable.

### Alternative Two

| | | |
|---|---|---|
| RW 14/32 | N 33 W | 60' x 3500' |
| Crosswind | N 37 E | 60' x 2800' (3500') |

Extension of the primary runway in Alternative Two is the same as proposed in Alternative One. The terminal area, would remain in the same general location.

Alternative Two provides for a crosswind runway south of the tributary to Blue Grass Creek. The runway alignment is N 37 E. The runway as proposed, is 60' x 2800' and would be connected to the terminal area by a 30' wide taxiway. The taxiway location would require the crossing of the tributary to the Blue Grass Creek and the Creek itself.

## Alternative Three

Alternative one and two are based upon the assumption that the Bluegrass Creek Channel can be relocated. A third alternative should be considered in the event that approval from the Natural Resources Council can not be obtained or the cost is prohibitive.

Alternate three assumes a physical length of 3500 feet on the primary runway and the construction of a crosswind runway as noted in alternative two. Displaced thresholds would be used on each end of the primary runway. The runway on both ends would extend to the creek banks.

This alternative provides 3500 feet of improved surface for take-off purposes only.

It should also be noted that the desired length for the crosswind runway is 3,500 feet. A length of 2800 feet is considered minimal. The plan depicts a length of 3,000 feet being most feasible if the crosswind runway is found feasible at all.

## Alternative Four

Alternative four consists of a no project alternative. The scenario here is that no major expansion of the airport will take place, other than maintenance of the existing facilities and expansion to the terminal area as needed.

Constraints and Opportunities

1. Alternative One: The crosswind runway location, as depicted, offers little opportunity for any significant increase in length. In addition, existing land use and topography allow little flexibility in orientation from the general alignment of N 40 E. The farmstead to the north of the runway, along with topographic features, dictate the centerline location of the runway from the north. The tributary to Blue Grass Creek dictates the general location from the south. The general alignment as a whole is dictated by drainage ways and topography. The runway is further contained by land use development of the west while the tributary acts as a constraint to the east.

2. Alternative Two: As with Alternative One, drainage and topographic constraints are of significance. The proposed runway in Alternative Two is located south of the tributary to Blue Grass Creek. The tributary acts as a constraint to the north while topographic constraints exist on the south. The alignment as a whole is less affected by drainage and topographic constraints. Extension of the proposed runway beyond the minimum length of 2800 feet could be obtained to the east. Blue Grass Creek inhibits any extension to the west. Alternative Two appears to offer the most opportunity for development.

3. Alternative Three: Recommended if alternative two above can not be implemented due to financial constraints and a low benefit to cost ratio.

4. Alternative Four: Recommended only if the proposed actions in alternative two can not be implemented and financial or other constraints preclude implementation of alternative three.

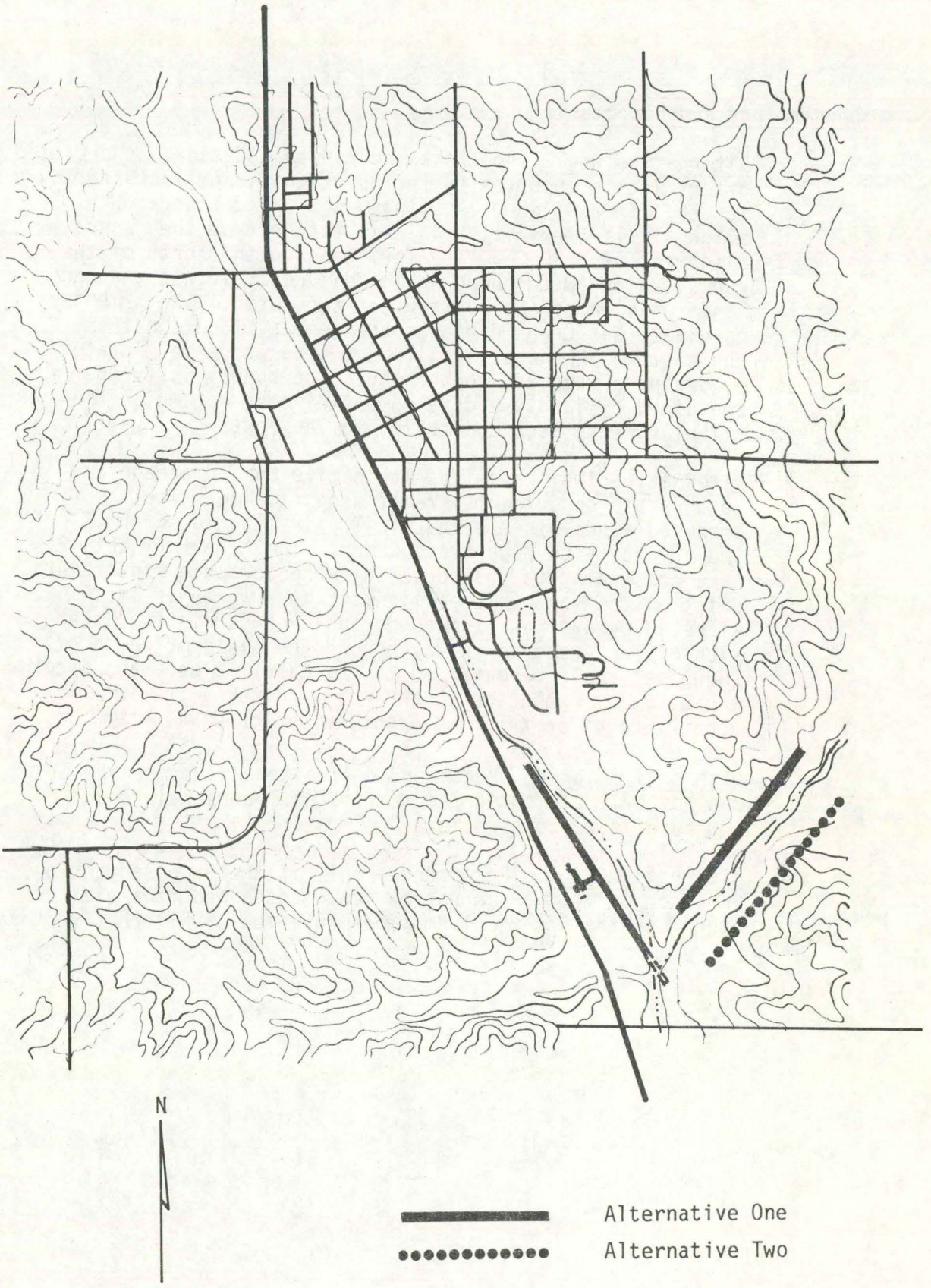



FIGURE 11

AIRPORT ALTERNATIVES ONE & TWO

## B. Socioeconomic Environmental Feasibility

### Impact upon the Natrual Environment

The airport is located south and adjacent to the City of Audobon along Bluegrass Creek. The land adjacent to Bluegrass Creek has considerable relief. The airport soils indicate that the site is subject to flooding. Flooding did occur in 1958, when the airport was under flood waters for a short period of time.

There are no known endangered species of wildlife or vegetation in the vicinity of the airport. There are no large bodies of water that might attract migratory birds.

The airport is served by City water. Sanitary sewer service has not been extended to the airport. The airport is served by a septic tank.

Extension of the primary runway as proposed will require crossing or relocation of Bluegrass Creek. It appears more feasible to relocate the channel. The extension and relocation will result in the destruction of the existing habitat along the creek. The relocation will, however, result in the re-establishment of comparable habitat.

The proposed crosswind runway will parallel a tributary of Bluegrass Creek. A crossing of Bluegrass Creek will be required. It may not be necessary to cross the tributary provided the channel was moved to the north.

Erosion by wind and water during construction can be minimized by acceptable construction practices. A detailed assessment of the impact of potential flooding should be made prior to construction.

### Impact Upon the Human Environment

No effort has been made to assess the impact of aircraft noise upon the community of Audubon. It should be noted that commercial/industrial land uses are concentrated on the north. A low density commercial land use pattern is found along U.S. Highway 71. Land to the east and south is primarily agricultural in nature. Nearly all aircraft operation are expected to be by single engine or light twin aircraft.

The proposed actions will not result in the displacement of any residence or business. The proposed action will, however, remove a certain number of acres from agricultural production.

The proposed actions are expected to have no long term effect upon air quality through increased aircraft operations. Short term impacts may be the result during construction.

## Unavoidable Environmental Impacts

The following are unavoidable:

1. Increase by noise from aircraft operation
   (Single and light twin engine piston & turbo-prop aircraft)
2. Increase in aircraft emissions
3. Conversion of agricultural land

The above are not considered to have a significant adverse impact. There are no public lands involved. The wildlife habitat is expected to be more stable as land disturbed by agricultural practices will be converted. Where the runway parallels Bluegrass Creek and the tributary, some reduction in the level of sedimentation might be found. Temporary minor soil erosion during construction of the airport is expected.

## Short Term Effects and Long Term Benefits

The airport will provide long term benefits to the community. Short term effects will result from construction:

1. Temporary airborn dust
2. Noise from construction equipment
3. Disruption of farming operations

The proposed actions will enable the airport to serve 95 percent of the aircraft with a gross weight under 12,500 pounds. Air as a mode of transportation is of increasing importance. The development of the airport is consistent with community development goals.

## Irreversible or Irretrievable Commitment of Resources

The commitment of materials, labor, and capital represents an irreversible and irretrievable commitment of resources. In addition, the land area used for construction of the runway or any paved surface represents a long-term commitment of a resource which may not necessarily be reclaimed for agricultural purposes.

Soils found in the vicinity of Audubon Airport are summarized as follows:

133 - The COLO SERIES consist of deep, poorly drained soils formed in moderately fine textured alluvium on bottom land. The soil has a moderate to high shrink-swell potential. In addition to the shrink-swell problem, the soil has severe limitations for building site development. This soil is also subject to flooding.

54 - The ZOOK SERIES consists of poorly drained, fine textured soils that formed in alluvium on flood plains under prairie vegetation. This soil is subject to flooding and has high to moderate shrink-swell potential.

220 - The NODAWAY SERIES consists of moderately well drained soils formed in silty alluvium on bottom lands. The soil has a moderate shrink-swell potential. This soil is also subject to flooding.

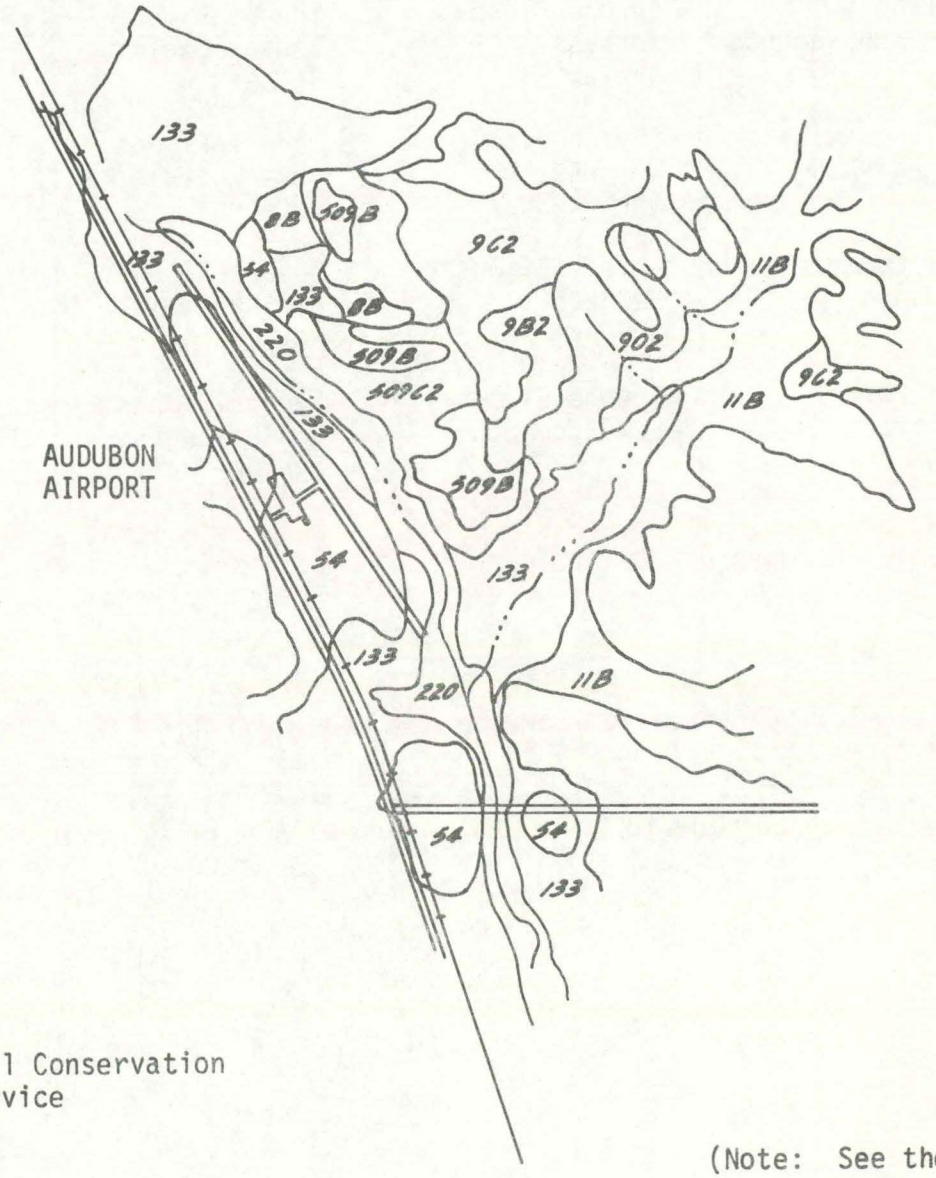
Source: Soil Conservation Service

The following summarizes limitations by soil type for building site developments on and in the vicinity of the airport.

| | ZOOK (54) | COLO (133) | NODAWAY (220) |
|---|---|---|---|
| Shallow Excavations | Severe Wetness | Severe Wetness | Moderate Wetness, Floods |
| Dwellings Without Basements | Severe-Floods Wetness Shrink-Swell | Severe-Floods Shrink-Swell Wetness | Severe-Floods |
| Dwellings with Basements | Severe-Floods Wetness Shrink-Swell | Severe-Floods Shrink-Swell Wetness | Severe-Floods |
| Small Commercial Buildings | Severe-Floods Wetness Shrink-Swell | Severe-Floods Shrink-Swell Wetness | Severe-Floods |
| Local Roads and Streets | Severe-Floods Low Strength | Severe-Floods Low Strength Shrink-Swell | Severe-Floods Frost Action |
| Lawns, Landscaping and Golf Fairways | Severe Floods Low Strength | Occas: Moderate Wetness Frequent: Floods | Occas: Moderate-Floods Frequent: Severe-Floods |

Source: Soil Conservation Service

Reference may be made to Figure 12 regarding the location of soils described above.



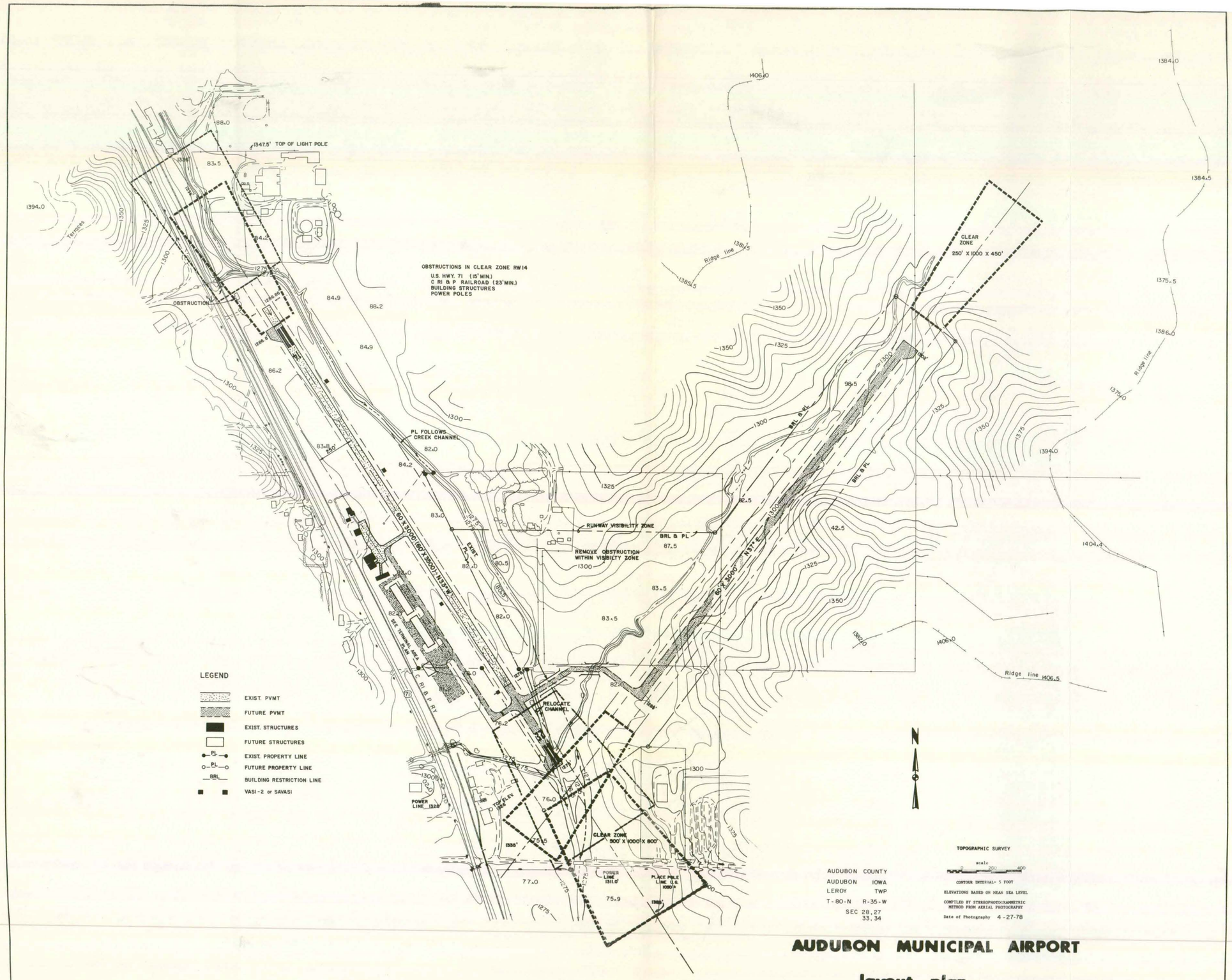

Source: Soil Conservation Service

(Note: See the preceding pages for a description of each soil.)

Figure 12 : Soils

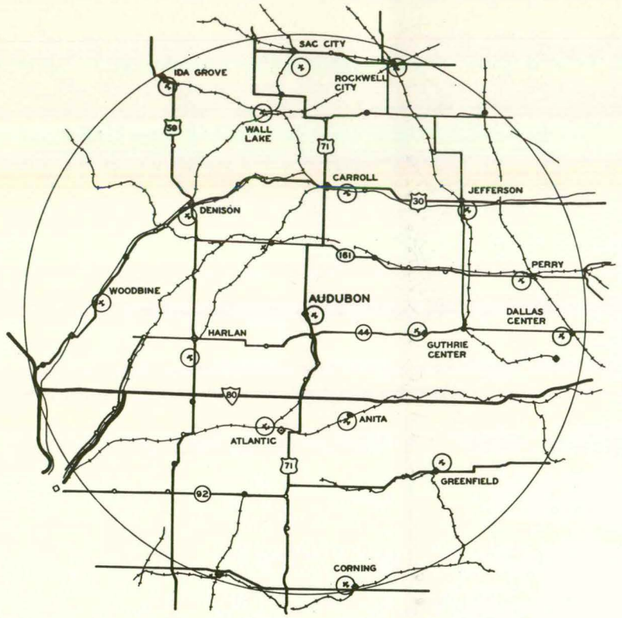
# V

# AIRPORT LAYOUT PLAN




# AUDUBON MUNICIPAL AIRPORT

## layout plan



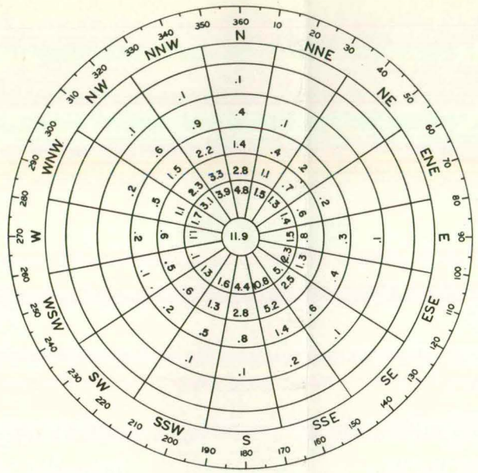

NORTH

VICINITY MAP

SCALE: 1" = 13 MI.

0 6.5 13 26

AIRPORT




WIND ROSE

OMAHA 1951-1960

| RUNWAY DATA | RUNWAY 14/32 | | RUNWAY 3/21 | | | |
|---|---|---|---|---|---|---|
| | EXISTING | FUTURE | EXISTING | FUTURE | | |
| EFFECTIVE RUNWAY GRADIENT | 0.31 % | 0.34 % | | 0.57 % | | |
| % WIND COVERAGE | 90.9 % | 90.9 % | | 62.5 % | | |
| INSTRUMENT RUNWAY | NPI | NPI | | VISUAL | | |
| APPROACH SURFACE | RW14 : 20:1, RW32 : 36:1 | 20:1 | | 20:1 | | |
| RUNWAY LENGTH | 3000' | 3500' | | 2800'(3000') | | |
| RUNWAY WIDTH | 60' | 60' | | 60' | | |
| RUNWAY STRENGTH | 15000'lbs SW | 15000 lbs SW | | 12500 lbs SW | | |
| RUNWAY SAFETY AREA WIDTH | 120' | 120' | | 120' | | |
| RUNWAY LIGHTING | LIRL | MIRL | | MIRL | | |
| NAVIGATIONAL AIDS | REIL | REIL, VASI-2 | | NONE | | |
| RUNWAY MARKINGS | BASIC | NPI | | BASIC | | |
| RUNWAY END ELEVATIONS | RW14 1286.8' | SAME | | RW 3 : 1285' ± | | |
| | RW32 1278.7' | 1275' ± | | RW 21 : 1302' ± | | |

| AIRPORT DATA | | |
|---|---|---|
| | EXISTING | FUTURE |
| AIRPORT ELEVATION | 1286' | 1302' |
| AIRPORT LOCATION POINT COORDINATES | LATITUDE 41° 42' 9" W<br>LONGITUDE 94° 55' 16" W | |
| NORMAL MEAN MAX. TEMP. | 87.° F | 87° F |
| % WIND COVERAGE | 90.9 % | 97.6 % |
| AIRPORT NAVIGATIONAL AIDS | NDB | NDB |
| AIRPORT ACREAGE | 46 | 128 |
| FBO FACILITIES | YES | YES |
| AIRPORT LANDING AIDS | REIL, LIRL | MIRL VASI-2 REIL |
| BEACON | YES | YES |
| SEGMENTED CIRCLE | NO | YES |
| LIGHTED WIND TEE | NO | YES |
| EASEMENTS | | YES |

| REV. NO. | DATE | BY | CHK. | DESCRIPTION |
|---|---|---|---|---|
| | | | | REVISIONS: |

# AUDUBON MUNICIPAL AIRPORT
# AIRPORT DEVELOPMENT PLAN

OTTO & CULVER
a Professional Corporation
Engineers Architects Land Surveyors

DESIGNED: J.L.S.
DRAWN: K.E.B.
CHECKED:
APPROVED:

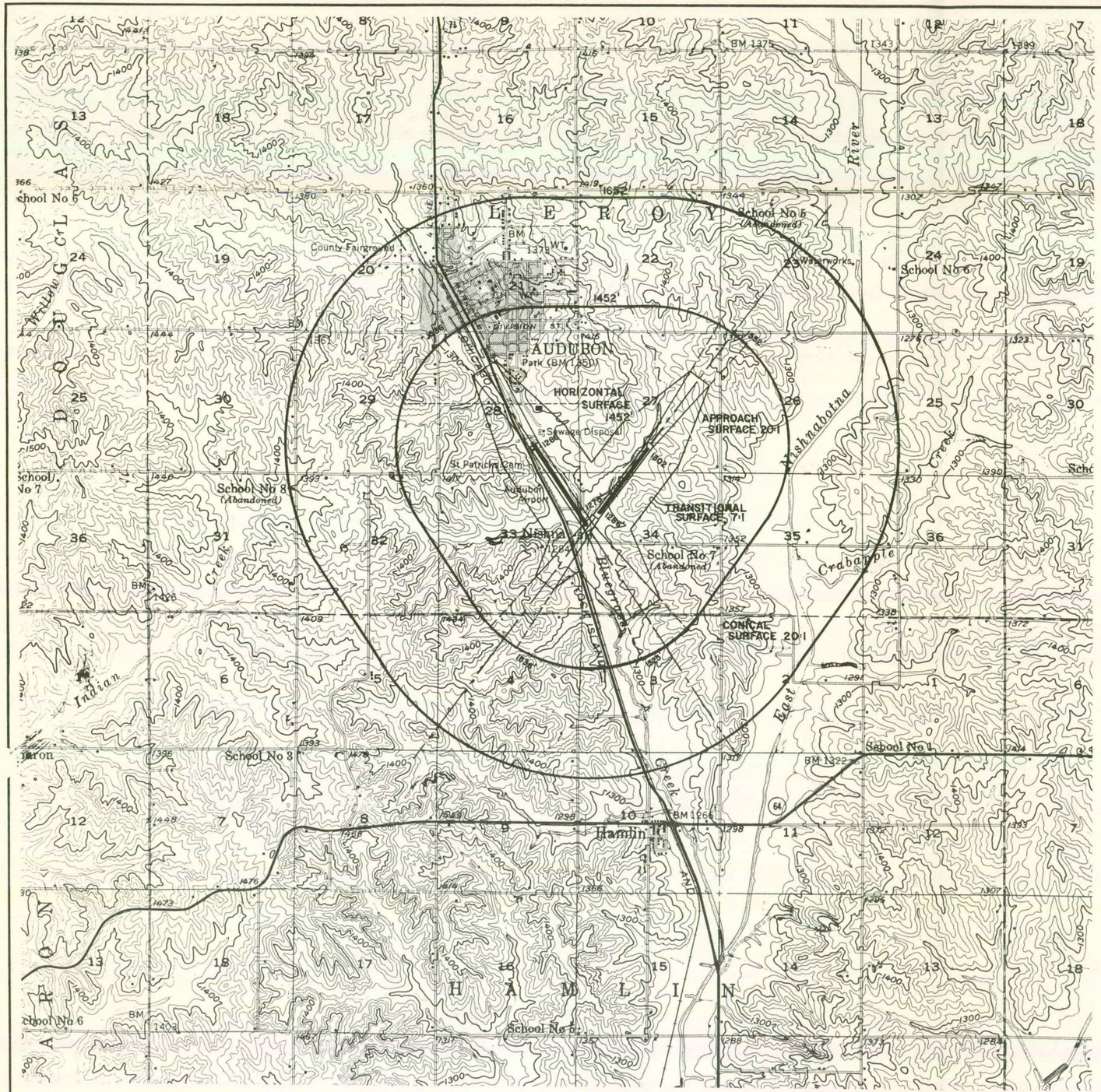
DATE:

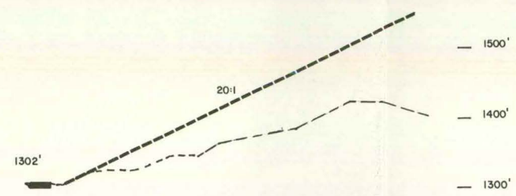
SCALE: AS SHOWN

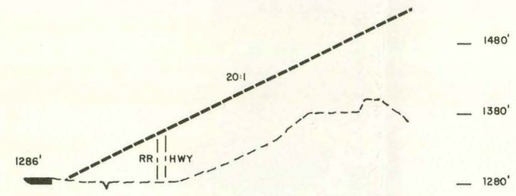
ALP DATA SHEET

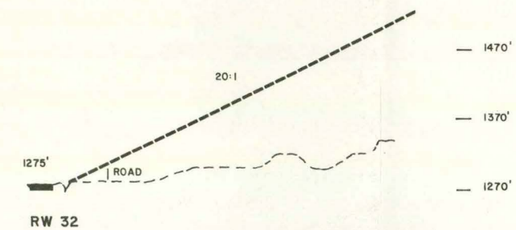
DWG. NO. 0-780150-3

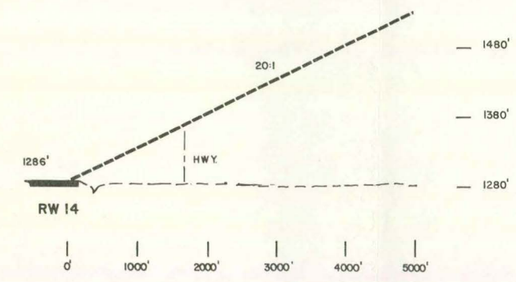
REV. NO.



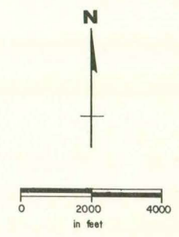




HORIZONTAL SCALE : 1"= 1000'
VERTICAL SCALE : 1"= 100'

ESTABLISHED AIRPORT ELEV. 1452' ASL




| REV. NO. | DATE | BY | CHK. | DESCRIPTION |
|---|---|---|---|---|
| | | | | REVISIONS: |

# AUDUBON MUNICIPAL AIRPORT
# AIRPORT DEVELOPMENT PLAN

OTTO & CULVER
a Professional Corporation
Engineers Architects Land Surveyors

DESIGNED: JLS
DRAWN:
CHECKED:
APPROVED:

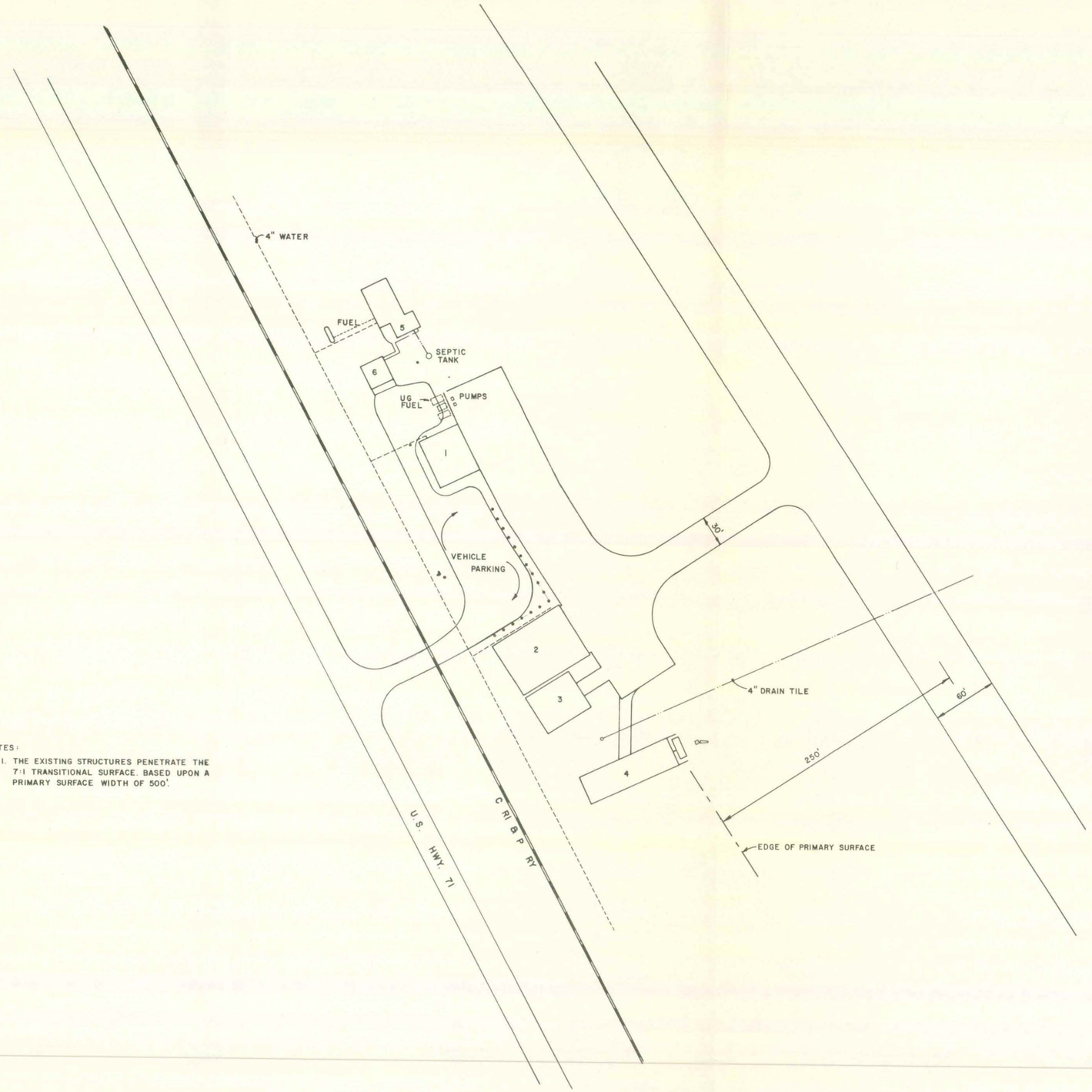
DATE:

SCALE: AS SHOWN

FAR Part 77

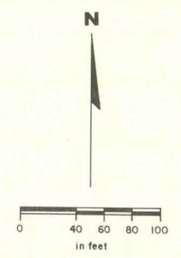
DWG. NO.

REV. NO.




LEGEND

| | |
|---|---|
| 1 | FBO SHOP 46' X 40' |
| 2 | CONVENTIONAL HANGAR 72.3' X 54.3' |
| 3 | CONVENTIONAL HANGAR 48.3' X 40' |
| 4 | TEE TYPE HANGAR 90.5' X 28.5' |
| 5 | FBO RESIDENCE |
| 6 | RESIDENTIAL GARAGE |
| | EXISTING STRUCTURES |




NOTES:

1. THE EXISTING STRUCTURES PENETRATE THE 7:1 TRANSITIONAL SURFACE. BASED UPON A PRIMARY SURFACE WIDTH OF 500'.

| REV. NO. | DATE | BY | CHK. | DESCRIPTION |
|---|---|---|---|---|
| | | | | REVISIONS: |

# AUDUBON MUNICIPAL AIRPORT
# AIRPORT DEVELOPMENT PLAN

OTTO & CULVER
a Professional Corporation
Engineers Architects Land Surveyors

DESIGNED:
DRAWN:
CHECKED:
APPROVED:

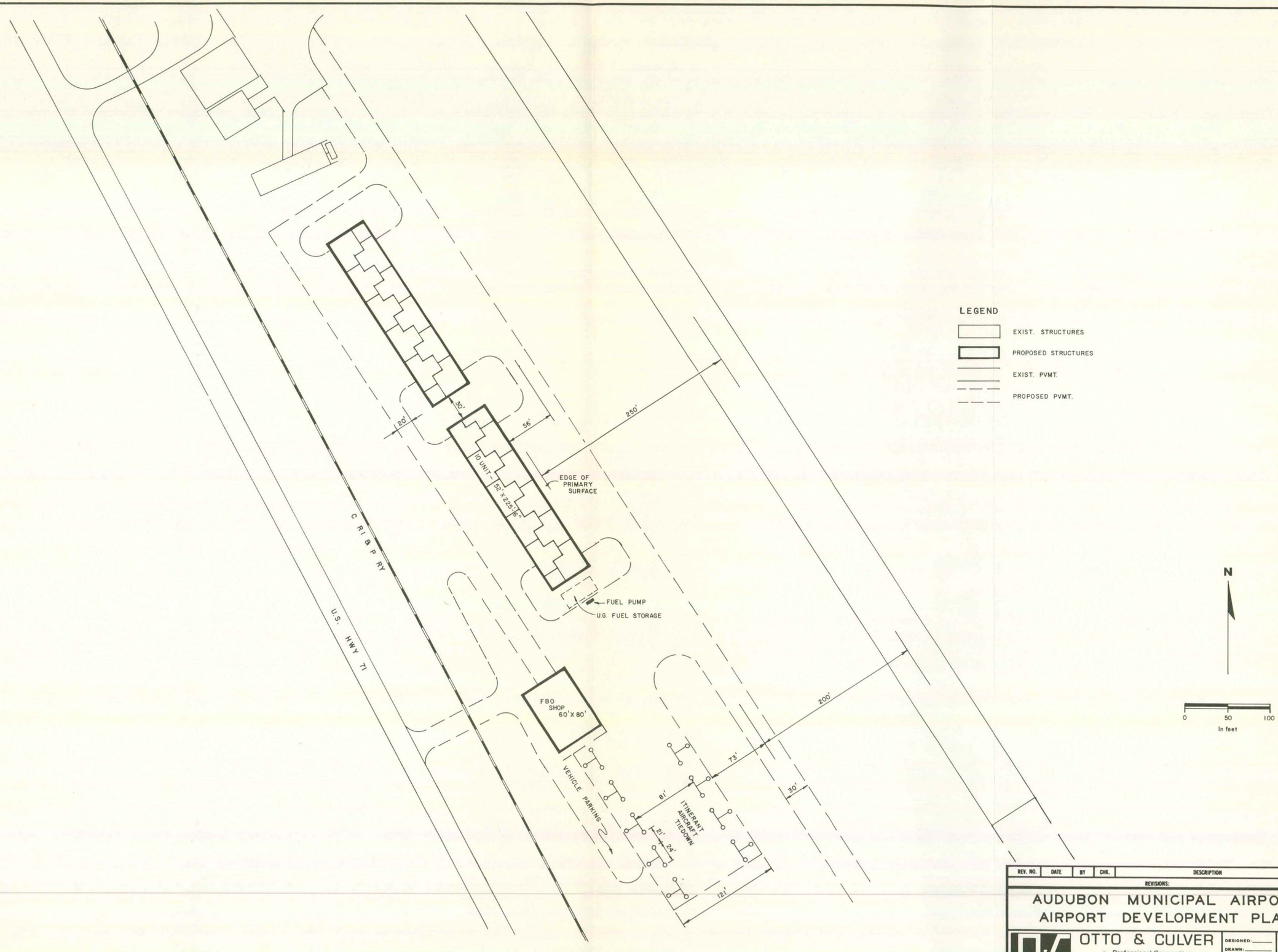
DATE:

SCALE: AS SHOWN

TERMINAL AREA PLAN

DWG. NO. 0-780150-

REV. NO.




| REV. NO. | DATE | BY | CHK. | DESCRIPTION |
|---|---|---|---|---|
| | | | | REVISIONS: |

# AUDUBON MUNICIPAL AIRPORT
# AIRPORT DEVELOPMENT PLAN

OTTO & CULVER
a Professional Corporation
Engineers Architects Land Surveyors

DESIGNED:
DRAWN:
CHECKED:
APPROVED:

DATE:

SCALE: AS SHOWN

TERMINAL AREA EXPANSION

DWG. NO. 0-780150-

REV. NO.

# VI

# DEVELOPMENT SCHEDULE AND STRATEGY FOR IMPLEMENTATION

# A. INTRODUCTION

The development schedule is based upon the forecast of aviation demand and the facilities needed to satisfy the anticipated demand over a twenty year period. There are, however, other factors that must also be considered. The more salient of these relate to financial constraints at the local level as well as the availability of state and federal assistance.

While certain of the proposed actions may be desirable, they are not critical to the airport and thus are of a lower priority than others. Where financial resources are limited, some emphasis must be placed upon those components having the greatest benefit as well as the best chance of funding.

The development schedule proposed herein, is subject to change over the twenty year period. Should aviation demand expectations not be achieved or such demand exceeds expectations, the proposed actions may be required within a different phase. As with all planning efforts, the final product should be reviewed on a periodic basis.

In addition, the airport owner is not obligated to implement the recommendations as outlined. This document is intended to provide direction for development of the airport. Also, financial assistance from state and federal programs is not guaranteed. The development schedule is divided into two 5 year phases and one 10 year phase.

PHASE ONE: 1979-1983
PHASE TWO: 1984-1988
PHASE THREE: 1989-1998

## B. DEVELOPMENT SCHEDULE AND COST ESTIMATES

PHASE ONE: 1979-1983

1. Land Acquisition:

   A. Fee Title: 18 Acres: (RW 14/32)
   B. Easements: 14.922 Acres: (RW 32)
      7.81 Acres: (RW14)

2. Runway Construction:

   A. RW 14/32
      (1) 60' x 640': 38,400 S.F.
   B. Turnarounds
      (1) Each end: 5400 S.F.
   C. Relocate Channel of Bluegrass Creek
      (1) 1,100' ± (Assuming approval is obtained)

3. Runway Landing Aids:

   A. RW 14/32
      (1) Install medium intensity runway lights, (MIRL): 3500 L.F.
      (2) Relocate runway end identifier lights, (REIL's): Each end
      (3) Install visual approach slope - 2 box, (VASI-2): Each end
      (4) Segmented circle, lighted wind cone

4. Runway Pavement Markings:

   A. Non-precision Instrument, (NPI)
      (1) Displaced threshold

5. Perimeter Fence:

   A. Fence: 1950 L.F.

6. Taxiway and Apron Construction:

   A. Taxiway
      (1) Parallel to RW 14/32, 1510' x 30': 45,300 S.F.
      (2) Internal: 10,560 S.F.
   B. Apron
      (1) Area: 43,475 S.F.
      (2) Tiedowns: 9 spaces (27 anchors)

7. Fuel Storage and Pumps:

   A. Relocate

8. F.B.O. Shop:

   A. 60' x 80'

9. Nested Tee Hangar: - 10 Unit:

   A. 52' x 225' ±
   B. Paving - 20' from hangar

10. Access Road and Vehicle Parking:

   A. 15,580 ft.$^2$ - Rock surface

11. Utilities to F.B.O. Shop:

   A. Water, Telephone, Electrical
   B. Septic Tank

12. Place Power Line U.G. RW 32

   A. 1050 ft.

PHASE TWO: 1984 - 1988

1. Expand terminal area as needed. Because of financial and other constraints, it may be necessary to move from phase one either the proposed terminal area expansion or runway extension.

PHASE THREE: 1989 - 1999

1. Land Acquisition:

   A. Fee Title: 63.79 Acres (RW 3/21)
   B. Easements: 2.0 Acres (RW 3)
   8.035 Acres (RW 21)

2. Runway Construction:

   A. RW 3/21
   (1) 60' x 3,000': 180,000 S.F.
   B. Turnarounds
   (1) RW End 21: 5,400 S.F.

3. Taxiway Construction:

   A. Taxiway
   (1) 870' x 30': 26,100 Ft.$^2$
   B. Pipe
   (1)
   C. Bridge
   (1)

4. Runway Landing Aids:

   A. RW 3/21
   (1) Install medium intensity runway lights, (MIRL): 3000 L.F.

5. Runway Pavement Markings:

   A. Visual

6. Perimeter Fence:

   A. 7525 L.F.

7. Taxiway Construction:

   A. Taxiway
   (1) Internal: 14,360 Ft.$^2$

8. Nested Tee Hangar - 10 Units

   A. 52' x 225' $\pm$

ALTERNATIVE TWO

PROJECT COST ESTIMATE

PHASE ONE: 1979 - 1983

Item 1 Land Acquisition & Fencing

A. Land Acquisition ( Fee Title )

| | |
|---|---|
| a. Runway 14/32 | |
| 18 acres @ $2,000 | $36,000 |
| b. Land Surveys | 3,000 |
| c. Legal & appraisal fees | 3,000 |
| Total Land Acquisition | $42,000 |

B. Fencing

| | |
|---|---|
| a. 1,950 L.F. @ $2.20 | $ 4,290 |
| b. 1 gate (24') @ $500 | 500 |
| c. Engineering, Legal, admin. | 1,200 |
| d. Contingency | 480 |
| Total Fencing | $ 6,470 |

Total Item 1

Land Acquisition and fencing ---------- $ 48,470

Item 2 Clear Zone Protection

A. Clear Zones (Easement)

| | |
|---|---|
| a. Runway 14 | |
| 7.81 Acres @ $600 | $ 4,686 |
| b. Runway 32 | |
| 14.922 Acres @ $600 | 8,954 |
| c. Land surveys | 2,500 |
| d. Legal & Appraisal Fees | 3,000 |

Total Item 2

Clear Zone Protection ---------- $ 19,140

Item 3 Grading, Drainage and Seeding

A. Grading

| | |
|---|---|
| a. Runway 14/32 | |
| 4000 CY @ $2.50 | $10,000 |
| b. Relocate channel of Bluegrass Creek (1,100 L.F.) | |
| 11,000 CY. @ $3.00 | 33,000 |
| c. Engr. Legal, Admin. | 10,750 |
| d. Contingency | 4,300 |
| Total Grading | $58,050 |

B. Drainage

a. Runway End 32
6" PERF. Subdrain
1,300 L.F. @ $2.50---------$ 3,250

b. 8" Drain tile
400 L.F. @ $3.00---------- 1,200

c. 12" Corr Pipe
20 L.F. @ $10.00---------- 200

d. Intakes
2 each @ $650---------- 1,300

e. Engr., Legal, Admin.------- 1,500

f. Contingency---------- 600
Total Drainage $ 8,050

C. Seeding and Fertilizing

a. 10 AC @ $400.00----------$ 4,000

b. Engr., Legal, Admin.------- 1,000

c. Contingency---------- 400
Total Seeding $ 5,400

Total Item 3

Grading, Drainage & Seeding----------$ 71,500

Item 4 Construct Runway Extension, Turnarounds, Taxiway & Apron

A. Construct Runway & Turnarounds

a. Runway End 32
6" P.C.C. Runway
(60' x 640')
4,270 SY @ $14.00---------$59,780

b. Runway Ends 14 & 32
6" P.C.C. Turnarounds
1,600 SY @ $16,00--------- 25,600

c. Subgrade preparation
6,000 SY. @ $1.00--------- 6,000

d. 4" Granular Subbase
660 CY @ $15.00---------- 9,900

e. Engr., Legal, Admin.------ 25,350

f. Contingency---------- 10,150
Total Runway & Turn-around construction $136,780

B. Construct Taxiways

a. Runway 14/32
Parallel Taxiway
6" P.C.C. (30' x 1510')
5040 SY @ $14.00----------$ 70,560

b. Terminal Taxiways
6" P.C.C.
1,180 SY. @ $14.00-------- 16,520

c. Subgrade Preparation
6,400 SY. @ $1.00--------- 6,400

d. 4" Granular Subbase
700 CY @ $15.00---------- 10,500

e. Engr., Legal, Admin.------$ 26,000
f. Contingency---------- 10,400
Total Taxiway Constr. $140,380

C. Construct Apron
a. 6" P.C.C. Apron
4,850 SY. @ $14.00--------$ 67,900
b. Subgrade Preparation
5000 SY @ $1.00---------- 5,000
c. 4" Granular Subbase
550 CY. @ $15.00---------- 8,250
d. Mooring Eyes
27 @ $50.00---------- 1,350
e. Engr., Legal, Admin.------ 20,650
f. Contingency---------- 8,250
Total Apron Constr. $111,400

Total Item 4

Construct Runway Extension, Turnarounds, Taxiway & Aprons----$388,560

Item 5 Construct Access Road & Vehicle Parking Area

A. Access Road and visitor parking
a. Grading
600 CY @ $2.50----------$ 1,500
b. 3" Gravel surfacing
200 CY @ $15.00--------- 3,000
c. Driveway Pipe
18" CMP
40 LF. @ $15.00--------- 600
d. Engr., Legal, Admin.---- 1,300
e. Contingency---------- 500

Total Item 5

Construct Access Road & Visitor Parking----------$ 6,900

Item 6 Lighting & Navaids

A. Medium intensity runway lighting (Runway 14/32)
a. Med. Int. Runway Fixtures
Stake Mounted
32 Ea. @ $150.00---------$ 4,800
b. Med. Int. Runway Fixtures
Base Mounted
4 ea. @ $250.00---------- 1,000
c. Med. Int. Threshold Fixtures
16 ea. @ $160.00--------- 2,560
d. Med. Int. Taxiway Fixtures
29 ea. @ $150.00--------- 4,350
e. Trench (9")
9,000 L.F. @ $0.50------- 4,500
f. Underground Cable - 5000 volt
19,000 LF @ $0.50-------- 9,500

g. Regulator & Service Entrance
Lump sum----------$4,000
h. Radio Control
Lump sum---------- 2,000
i. Engr., Legal, Admin.---------- 8,200
j. Contingency---------- 3,300
Total lighting $44,210

B. Navaids
a. Lighted Wind Cone & Segmented Circle
Lump Sum----------$ 5,000
b. Visual Approach Slope Indicator VASI-II
Lump Sum---------- 10,000
c. Relocate runway end identifier lights
Lump sum---------- 2,000
d. Engr., Legal, Admin.---------- 4,250
e. Contingency---------- 1,700
Total Navaids $ 22,950

Total Item 6

Lighting & Navaids----------$67,160

Item 7 Runway Marking

A. Non-Precision Inst. Marking, Runway End Numbers, Centerline & displaced threshold marking
a. Runway marking
2,300 S.Y. @ $6.00----------$13,800
b. Engr., Legal, Admin.--------- 3,450
c. Contingency---------- 1,400

Total Item 7

Runway Marking----------$18,650

Item 8 Fueling Facilities

A. Fueling Facilities
a. Relocate fuel storage tanks and pumps
Lump sum----------$ 6,000
b. Engr., Legal, admin.--------- 1,500
c. Contingency---------- 600

Total Item 8

Fueling Facilities----------$ 8,100

Item 9 Terminal Buildings

A. F.B.O. Shop

a. Metal Building (60' x 80') with water, telephone, electrical & Septic tank 4800 SF. @ $15.00---------- $ 72,000

b. Engr., Legal, Admin.---------- 18,000

c. Contingency---------- 7,200

Total F.B.O. Shop $ 97,200

B. Nested Tee Hangar

a. 10 Unit Tee Hangar (52' x 225') 11,700 s.f. @ $12.00----------$140,400

b. Engr., Legal, Admin.---------- 35,100

c. Contingency---------- 14,000

Total nested tee hangar $189,500

Total Item 9

Terminal Buildings----------$286,700

## PHASE ONE

## COST SUMMARY

| | | |
|---|---|---|
| Item 1 | Land Acquisition & Fencing | $ 48,470 |
| Item 2 | Clear Zone Protection | 19,140 |
| Item 3 | Grading, Drainage, Seeding | 71,500 |
| Item 4 | Construct Runway Extension, Turnarounds, Taxiway & Apron | 388,560 |
| Item 5 | Construct Access Road & Vehicle Parking Area | 6,900 |
| Item 6 | Lighting & Navaids | 67,160 |
| Item 7 | Runway Marking | 18,650 |
| Item 8 | Fueling Facilities | 8,100 |
| Item 9 | Terminal Buildings | 286,700 |
| | | $915,180 |

PHASE THREE: 1989 - 1999

Item 1 Land Acquisition & Fencing

A. Land Acquisition (Fee Title)
   a. Runway 3/21
      63.79 acres @ $2,000 ----------$127,580
   b. Land Surveys---------- 4,500
   c. Legal & Appraisal Fees--------- 3,500
      Total Land Acquisition $135,580

B. Fencing
   a. 7525 LF @ $2.20----------$ 16,555
   b. 2 Gates @ $500---------- 1,000
   c. Engr., legal, admin.---------- 4,390
   d. Contingency---------- 1,755
      Total Fencing $ 23,700

Total Item 1

Land Acquisition & Fencing----------$ 159,280

Item 2 Clear Zone Protection

A. Clear Zones (Easement)
   a. Runway 3
      2.0 ac @ $600----------$ 1,200
   b. Runway 21
      8.035 Ac @ $600---------- 4,820
   c. Land surveys---------- 2,500
   d. Legal & Appraisal Fees--------- 3,000

Total Item 2

Clear Zone Protection----------$ 11,520

Item 3 Grading, Drainage & Seeding

A. Grading
   a. Runway 3/21
      80,000 CY @ $2.50----------$ 200,000
   b. Engr., Legal, Admin.---------- 50,000
   c. Contingency---------- 20,000
      Total Grading $ 270,000

B. Drainage
   a. Runway 3/21
      6" PERF subdrain
      6,200 LF @ $2.50 ----------$ 15,500
   b. 8" Drain Tile
      400 LF. @ $3.00----------$ 1,200
   c. 12" Corr Pipe
      20 LF @ $10.00---------- 200

d. Intakes
4 ea. @ $650----------$ 2,600
e. 24" cross runway pipe
200 LF. @ $20.00---------- 4,000
f. Engr., Legal, Admin.---------- 5,900
g. Contingency---------- 2,350
Total Drainage $ 31,750

C. Seeding & Fertilizing
a. 30 Ac. @ $400----------$ 12,000
b. Engr., Legal, Admin.---------- 3,000
c. Contingency---------- 1,200
Total Seeding $ 16,200

Total Item 3

Grading, Drainage & Seeding----------$317,950

Item 4 Construct Runway, Turnaround, & Taxiways

A. Construct Runway & Turnaround
a. Runway 3/21
6" P.C.C. Pavement
(60' x 3,000')
20,000 SY @ $14.00----------$280,000
b. Runway end 21
6" P.C.C. Turnaround
800 SY. @ $16.00---------- 12,800
c. Subgrade preparation
21,000 SY. @ $1.00---------- 21,000
d. 4" Granular Subbase---------- 36,000
2400 CY. @ $15.00
e. Engr., Legal, Admin.---------- 87,450
f. Contingency---------- 35,000
Total Runway & Turnaround Construction $472,250

B. Construct Taxiways
a. Runway connecting taxiway
6" P.C.C. (30' x 870')
1000 SY. @ $14.00----------$ 14,000
b. Terminal Taxiway
6" P.C.C.
1600 Sy @ $14.00---------- 22,400
c. Subgrade preparation
2700 S.Y. @ $1.00---------- 2,700
d. 4" Granular subbase
300 CY @ $15.00---------- 4,500
e. Taxiway drainage pipes
(1500 AC D.A.)
Twin 131" x 85" pipe arch
240 LF. @ $100---------- 24,000
f. Taxiway bridge (10 Sq. Mi. D.A.)
40' wide x 50' lg.
2000 SF. @ $40.00---------- 80,000

g. Engr., Legal, Admin.----------$ 36,900
h. Contingency---------- 14,760
Total taxiway Construction $199,260

Total Item 4

Construct runway, turnaround and taxiways----------$671,510

Item 5 Lighting

A. Medium intensity runway lighting (Runway 3/21)
a. Med. int. runway fixtures (stake mounted)
28 ea. @ $150.00----------$ 4,200
b. Med. Int. Runway Fixtures (Base mounted)
4 ea. @ $250.00---------- 1,000
c. Med. Int. Threshold Fixtures
16 ea. @ $160.00---------- 2,560
d. Med. Int. Taxiway Fixtures
20 ea. @ $150.00---------- 3,000
e. Underground Cable 5000 volt
19,000 LF @ $0.50---------- 9,500
f. Engr. Legal, admin.---------- 5,100
g. Contingency---------- 2,000

Total Item 5

Lighting----------$ 27,360

Item 6 Runway Marking

A. Centerline stripping & runway numbers
a. Lump sum----------$ 5,000
b. Engr., Legal, Admin.---------- 1,250
c. Contingency---------- 500

Total Item 6

Runway Marking----------$ 6,750

Item 7 Terminal Building

A. Nested Tee Hangar
a. 10 unit tee hangar (52' x 225')
11,700 SF/ @ $12.00----------$ 140,400
b. Engr., Legal, Admin.---------- 35,100
c. Contingency---------- 14,000

Total Item 7

Terminal Building----------$ 189,500

## PHASE THREE

## COST SUMMARY

| | | |
|---|---|---|
| Item 1 | Land Acquisition & Fencing | $ 159,280 |
| Item 2 | Clear Zone Protection | 11,520 |
| Item 3 | Grading, Drainage & Seeding | 317,950 |
| Item 4 | Construct Runway, Turnaround & Taxiways | 671,510 |
| Item 5 | Lighting | 27,360 |
| Item 6 | Runway Marking | 6,750 |
| Item 7 | Terminal Building | 189,500 |
| | Total Phase Three | $1,383,870 |

The cost estimates are preliminary in scope and are not based upon detailed engineering plans and specifications. The primary purpose of preparing long range costs is to provide the sponsor with some indication of total capital needs at the airport over the twenty year planning period.

No effort was made to anticipate future levels of inflation. The costs are based upon 1978-79 dollar values. Inflationary trends are expected to cause a significant increase in the cost of each item as well as total estimated cost by phase. A more realistic cost can be obtained by multiplying phase two costs by 1.45 and phase three costs by 2.0.

As previously noted, the sponsor is under no obligation to implement the proposed actions. For example, should anticipated aviation demand not be realized, there would be no need to construct the 10 unit tee hangar in phase three. Also, there is considerable variation in hangar costs depending upon whether or not such items as full partitions, personnel doors, electrically operated doors, etc. are included. The sponsor is; however, encouraged to implement the actions as depicted, provided that the action is prudent and feasible at the time of implementation.

Engineering, legal and administrative costs were estimated at 25% of the construction cost. To this, was added a 10% contingency cost. Twenty year development costs are summarized in the following table.

TABLE 20

DEVELOPMENT COST SUMMARY

1979-1998

| | |
|---|---|
| Phase One<br>1979 - 1983<br>Total Cost | $ 915,180 |
| Phase Two<br>1983 - 1988<br>Total Cost | $ 0 |
| Phase Three<br>1989-1998<br>Total Cost | $1,383,870 |
| Total 20 Year Development Cost | $2,299,050 |

## C. Airport Revenues and Expenditures

As with most small general aviation airports, the annual O & M expenditures equal or exceed revenue generated by the airport. In Iowa, those airports having title to considerable amounts of farm land, may have revenues in excess of O & M expenditures. In nearly all cases, such income is not adequate to implement major capital improvements. The second major source of revenue is from the rental or lease of hangar stalls or space. Since most hangar income goes either to the F.B.O. or to the retirement of hangar construction costs, this income is usually not available for other improvements.

An objective of the airport management should be to generate airport revenue in the amount that will meet annual O & M expenditures.

## D. State and Federal Assistance

The Department of Transportation, Federal Aviation Administration, provides financial assistance for a number of airport components under the Airport and Airway Development Act of 1970. At present, the federal rate of participation is at 80%. In general, eligible items include all airport requirements except those that specifically benefit the private sector. For example, hangar structures and pavement twenty from the hangar is not eligible. Vehicle parking lots and internal road systems are not eligible. Terminal buildings are not eligible except at CAB certificated air carrier airports.

Airport components recommended for implementation over the twenty year planning period that are eligible are as follows:

- Land acquisition
- Runway construction
- Taxiway and apron construction
- Access road improvements
- Runway end identifier lights (REIL)
- Medium intensity runway lights (MIRL)
- Visual approach slope indicator (VASI-2) (SAVASI)
- Grading, seeding, etc.

The Department of Transportation, Aeronautics Division, State of Iowa, also provides grants-in-aid to airports within the state airport systems plan. At present, the rate of participation is 70 percent for eligible items. Airport components eligible for state assistance are the same as those eligible for federal assistance.

Total assistance, available from FAA and State sources, has historically not exceeded 1.2 million dollars annually. Reference may be made to the following table concerning projected assistance expected to be made available through 1983.

TABLE 21

SUMMARY OF STATE AND FEDERAL ASSISTANCE
GENERAL AVIATION

| Year | Federal | State | State Safety Reserve | Total |
|---|---|---|---|---|
| 1978 | 656,000 | 526,000 | 25,000 | 1,207,000 |
| 1979 | 700,000 | 587,000 | 25,000 | 1,312,000 |
| 1980 | 700,000 | 644,000 | 25,000 | 1,369,000 |
| 1981 | 700,000 | 704,000 | 25,000 | 1,404,000 |
| 1982 | 700,000 | 762,000 | 25,000 | 1,487,000 |
| 1983 | 700,000 | 825,000 | 25,000 | 1,550,000 |

Source: IDOT: Improvement Program, 1978-1983, Page A-7

As noted in Table 21, the availability of funds is limited. When considering all state system plan airports, not much assistance is available if such funds were to be distributed evenly. Thsu, it is important for local airport sponsors to demonstrate and document the need for which assistance is being sought.

Historic participation by the state and federal agencies is summarized in the following table.

TABLE 22

STATE AND FEDERAL ASSISTANCE TO AUDUBON

| Entity | Year | Funds |
|---|---|---|
| Federal | 1957 | $ 11,499.00 |
| State | 1956 | 4,000.00 |
| State | 1957 | 872.99 |
| State | 1959 | 67.05 |
| State | 1960 | 63.60 |
| State | 1968 | 384.10 |
| State | 1971 | 32,500.00 |
| State | 1974 | 1,000.00 |
| State | 1976 | 2,500.00 |
| State | 1978 | 8,050.00 |

Source: 1978 State Airport Systems Plan

Total federal assistance to Audubon through 1978 consisted of a $11,499.00 grant made in 1957. State assistance through 1978 totals $49,437.74.

Because of site limitations, it does not appear that the FAA would participate in an expansion of the airport at present or in the immediate future. As such, it would be reasonable to assume that only local resources and state assistance would be available.

## E. Feasibility

The feasibility of the proposed actions are dependent upon the availability of state financial assistance. Local financial constraints must also be taken into account at the time implementation of the action is being proposed. It is assumed that federal funds would not be available.

The State of Iowa Airport Systems Plan did not propose relocation of the airport, although the site has some limitations. The Airport Development Plan also reasons that relocation would be very speculative based upon financial constraints as known today. Therefore, the objective has been to develop the most efficient facility within the constraints at hand.

A major objective should be to properly light and mark all obstructions as well as to obtain 3,500 feet of runway length on Runway 14/32. Expansion of the terminal area facilities to accommodate the needs of the F.B.O. and individual aircraft owner is also a high priority.

The construction of the crosswind runway is thought to be a low priority item because of financial constraints. It would be reasonable to assume that the crosswind runway would not be operational until well into Phase Three.

Relocation of the crossing of Bluegrass Creek Channel will also be necessary in order to extend the primary runway, RW 14/32 to 3,500 feet without displaced thresholds. Approval of the Iowa Natural Resource Council is required prior to the construction of the primary and crosswind runways. The Iowa Natural Resource Council also indicated that comments from the Iowa Conservation Commission must also be obtained where a channel change is being proposed.

Should the City elect to develop the airport based upon Alternative 3 the cost of channel relocation could be eliminated. Also, the number of acres required for clear zone easements would be reduced. However, the state generally does not participate in runway construction costs on that portion of the runway beyond the threshold.

The most feasible strategy, from a cost basis, would appear to be limiting airport improvements to a 3500 foot primary runway with displaced thresholds on each end and expansion of the terminal area as needed. As such, no consideration would be given to relocation of the Bluegrass Creek Channel, nor construction of the crosswind runway.

The costs developed for Alternative Two have been broken out by item and can be used to determine the cost for Alternative Three and Four or any combination of improvements.