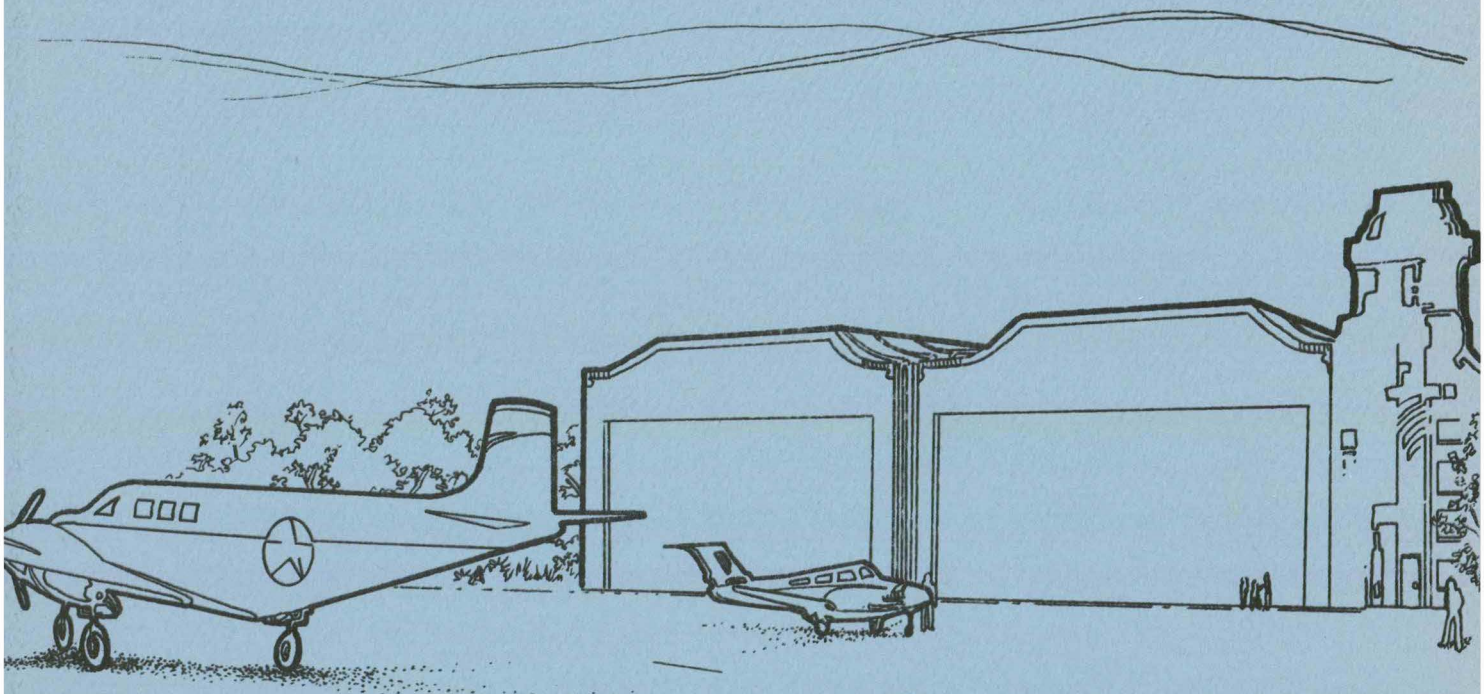
EAGLE GROVE
Airport Development Plan



Eagle Grove Municipal Airport
Eagle Grove, Iowa

AIRPORT DEVELOPMENT PLAN

Prepared for
Eagle Grove Airport Commission

by
Professional Design Services
Ankeny, Iowa

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

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I. COMMUNITY AND AIRPORT BACKGROUND

ECTION I: COMMUNITY AND AIRPORT BACKGROUND

A. INTRODUCTION:

The Eagle Grove Airport Commission retained Professional Design Services to prepare an Airport Development Plan for the Eagle Grove Municipal Airport. The Plan was accomplished under the Airport Development Planning Program sponsored by the Iowa Department of Transportation. Specific objectives of the scope of work are summarized as follows:

- -To provide an effective graphic presentation of the ultimate development of the airport over a 20-year planning period, 1980-2000.
- -To establish a schedule of priorities and phasing for the various improvements proposed in the plan.
- -To provide a plan that is consistent with other community goals and objectives of Eagle Grove as well as the State of Iowa DOT, and the Federal Aviation Administration.
- -To provide a tool for decision making at the local level.
- -To provide an ultimate development plan which is feasible, acceptable and can be implemented within existing and future financial constraints of the community.

To acheive the above objectives, the airport development planning process outlined in Figure One was developed. Consideration of alternative airport sites was not a factor herein nor was the preparation of an environmental impact assessment report a part of the scope of work.

It should be noted that the airport planning process is a continual effort. As such, the City is encouraged to update the plan on a periodic basis. The airport should be a functional part of the community's infrastructure so as to ensure a high degree of compatibility.

The report is presented in five sections, the first of which summarizes relevant background information used in the preparation of latter study elements.

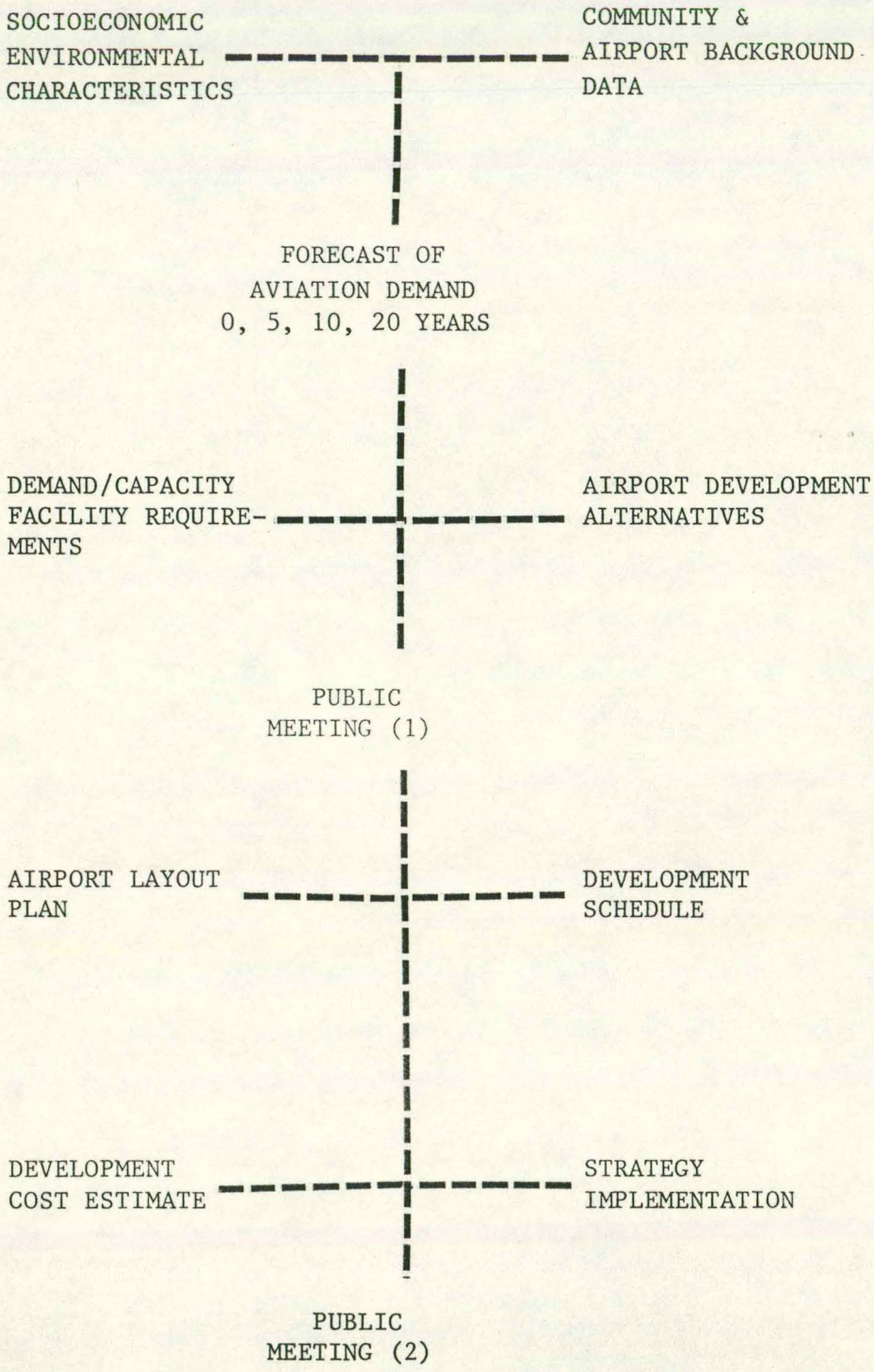


FIGURE ONE: Airport Development Plan Planning Process

B. COMMUNITY BACKGROUND

The Eagle Grove Municipal Airport is a significant part of the community infrastructure. The airport supports and is supported by a number of community facilities.

Fire Protection and Law Enforcement

Smaller general aviation airports generally rely upon a fire district or associated community facilities for crash rescue and fire protection. Eagle Grove is served by a 20 man volunteer Fire Department located in City Hall on Broadway Street. The following equipment is avaiable:

Equipment

1971-Ford-750 gpm pump
500 gallon tank
City owned
1971-Ford-750 gpm pump
500 gallon tank
Township owned
1965-Ford-Same as above
1959-Ford-250 gpm pump
1,000 gallon tank
Township owned
1952-Ford-150 gpm portable pump
1,000 gallon tank
Township owned

Security at the airport facility is provided by Wright County.

Utilities

Water and sewer needs are served on site by well and septic tank/leach field systems. These systems are in good condition and are anticipated to serve the modest needs anticipated over the twenty year planning period.

Propane gas is avaiable from on-site storage facilities. Iowa Public Service provides electrical power. Northwestern Bell telephone service is available in the terminal building.

Land Use

The airport is located 2½ miles north of Eagle Grove surrounded by agricultural and farmstead land uses. No encrouchments are anticipated from urban land uses from Eagle Grove or the City of Goldfield located 1 mile north.

Other Modes of Transportation

The City is served by the Chicago and Northwestern Transportation Company. The Company provides rail switching service on a daily basis or as needed. Seven motor freight carriers provide service to the community. Umthun Trucking Company is locally based and employs 387.

State Highway 17 serves as the major arterial access to the site. The community is approximately 16 miles east, via U. S. Highway 20 and 13 miles north, via State Highway 17, of Fort Dodge, Iowa.

C. SOCIOECONOMIC BACKGROUND

Socioeconomic characteristics of the community and its hinterland have a direct relationship to aviation demand at the airport. The information and data summarized herein was obtained from the Eagle Grove Comprehensive Plan draft copy (1980) supplied by MIDAS Council of Governments.

POPULATION

As can be determined from the table below Eagle Grove is anticipated to maintain a reasonably stable grow rate. In the high category projection an increase of 21% is the maximum expected increase from the 1980-2000 year planning period.

Table 1: Population Projections, Eagle Grove, 1975-2000

Year	Low	Medium	High
1970	4489	4489	4489
1975	4793	4907	4590
1980	4887	5021	4742
1985	4980	5134	4468
1990	5074	5247	5225
1995	5168	5360	5452
2000	5261	5473	5747

Table 2: Population Projections, Wright County Communities, 1970-2000

PLACE	1980	1985	1990	1995	2000
Belmond	2374	2405	2423	2420	2410
Clarion	2935	2952	2960	2947	2931
Dows	812	831	846	853	854
Eagle Grove	4861	5052	5185	5238	5238
Galt	37	34	32	30	30
Goldfield	803	843	872	885	886
Rowan	212	208	205	202	200
Woolstock	200	194	190	187	185
Unincorporated	4549	4301	4115	3978	3910
TOTAL	16,783	16,820	16,828	16,740	16,644

ECONOMIC BASE

The propensity to use air as a mode of transportation is dependent upon a number of factors. In addition to socio-economic factors such as income, occupation, family size, the following are also factors:

- -Travel Distance
- -Accessibility
- -Time
- -Cost Per Unit of Travel
- -Reason for Making the Trip
- -Number of Persons
- -Type and Value of Cargo
- -Availability of Aircraft
- -Regulations
- -Aviation Interest
- -Availability of Other Transportation Modes

Occupation or employment by industry provides some insight into travel tendencies. The ENO Foundation catagorized industry by travel tendency as follows:

High Travel:
Mining, Manufacturing, Government Business Service

Medium Travel:
Construction, Wholesale and Retail Trade, Professional Services, Finance, Insurance and Real Estate

Low Travel:
Agriculture, Forestry, Transportation, Communication, Utilities, Repair Service, Recreation, Amusement, Printing

Eagle Grove local labor force and manufacturing characteristics are as follows:

LOCAL MANUFACTURING CHARACTERISTICS

Number of manufacturing plants in community: 15
Number of manufacturing plants with unions: 0
Number of manufacturing employees in community: 410
Number of work stoppages in the last 5 years: 0

Major Community Employers

Boone Valley CO-OP Processing Association
Employment: 130
Union: None
Products: soybean meal, oil, feed

M & M Livestock Products
Employment: 41
Union: None
Products: feed & supplement

Umthun Trucking Company
Employment: 387
Union: None
Products: Hauling service

Erickson Manufacturing
Employment: 45
Union: None
Products: Hog feeding, farrowing, finishing equipment

D. AREA AIRPORTS

Wright County is fortunate to have three public airport facilities. In addition to the Eagle Grove Municipal Airport, public airports are found at Clarion and Belmond. Other airports in the immediate area are those located at Fort Dodge, Webster City, and Humboldt. Of the airports noted here, all are within the state system of airports with the exception of Eagle Grove and Belmond.

The Iowa DOT in the 1978 SASP outlined a methodology to evaluate which airports should be included in the State Systems Plan. Also considered was the role of each of these airports and the level of service provided.

System Candidate Airports:

Eagle Grove
Belmond
(Airports not in the state system, but eligible to become part of the system when justification can be shown.)

Basic Utility Airports:

Humboldt
Clarion
(A basic utility airport is one that accommodates 95% of the propeller aircraft under 12500 pounds.)

General Utility Airports:

Webster City
(A general utility airport is one that accommodates all propeller aircraft of less than 12500 pounds.)

Basic Transport Airport:

(An airport capable of accommodating 95% of all aircraft weighing 60000 pounds or less.)

Air Carrier Airport:

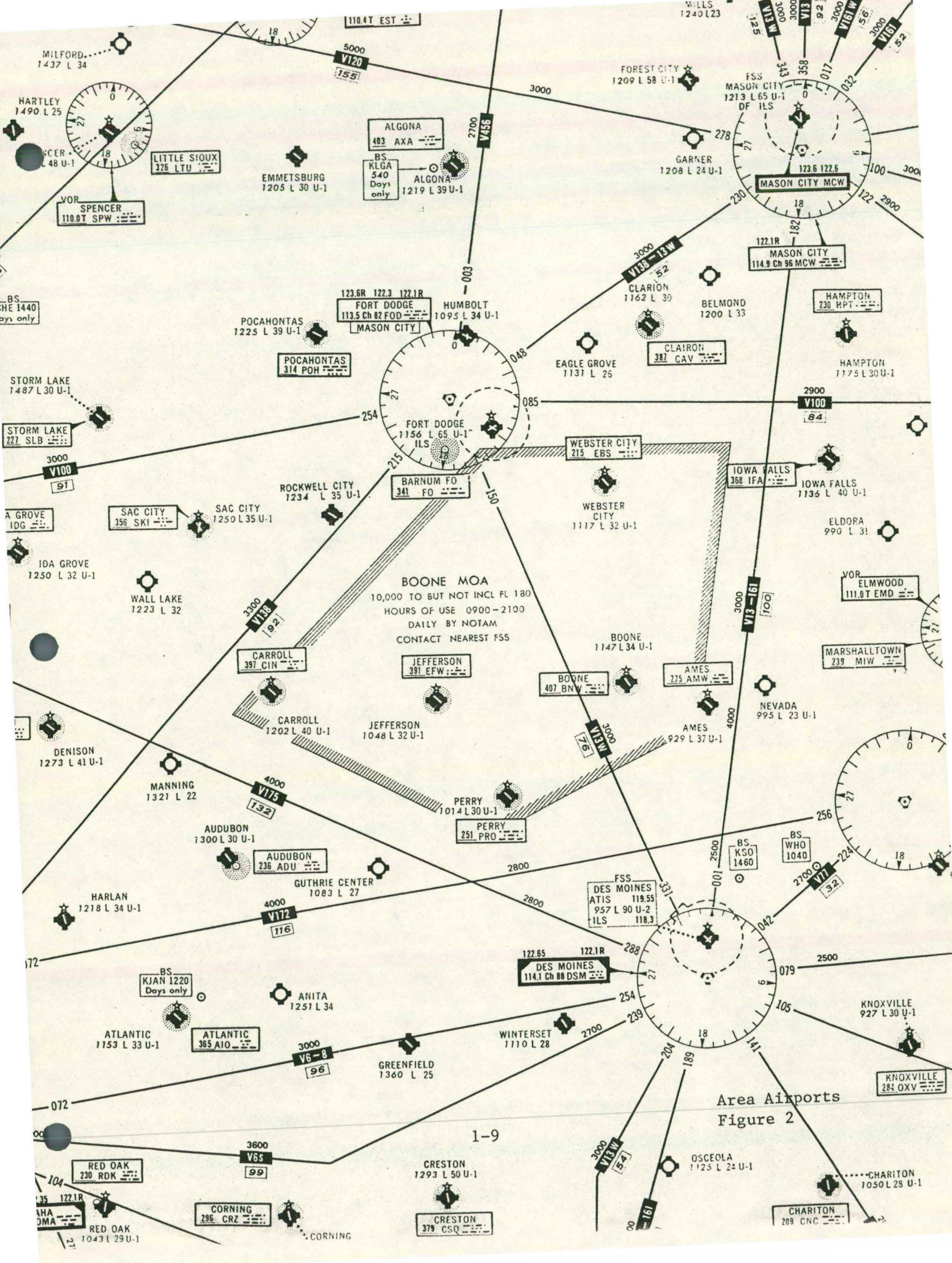
Fort Dodge (Airport served by a certified air carrier-a certified air carrier is one holding a certificate of public convenience and necessity issued by the Civil Aeronautics Board, authorizing the performance of scheduled air transportation over specified routes.)

TABLE 3 : AREA AIRPORT FACILITIES

Airport	Length	Width	Surface	Lighting	VASI	REIL	NDB	VOR ILS
Fort Dodge								
RW 6/24	6500	140	Asph	HIRL	4	yes	yes	yes
RW 12/30	4400	100	Asph	HIRL				
Eagle Grove								
RW 13/31	3000	60	PCC	MIRL	-	yes	-	-
RW 1/19	2600	125	Turf	LIRL	-	-	-	-
Clarion								
RW 14/32	3500	60	Asph	MIRL	-	yes	-	-
RW 8/26	1800	200	Turf	-	-	-	-	-
Humboldt								
RW 12/30	3400	60	Asph	MIRL	-	-	-	-
Webster City								
RW 14/32	3775	75	Asph	MIRL	-	-	yes	-
RW 18/36	2150	75	Turf	-	-	-	-	-
Belmond								
RW 17/35	3300	100	Turf	LIRL	-	-	-	-

Source: 1978 IDOT SASP
FAA FORM 5010

VASI=Visual Approach Slope Indicator
REIL=Runway End Identifier Lights
NDB=Non-Directional Radio Beacon
VOR=Very High Frequency Omnidirectional Range
ILS=Instrument Landing System


MILFORD
1437 L 34
HARTLEY
1490 L 25
VOR
SPENCER
110.0T SPW
LITTLE SIOUX
326 LTU
EMMETSBURG
1205 L 30 U-1
ALGONA
403 AXA
BS
KLGA
540
Days only
ALGONA
1219 L 39 U-1
110.4T EST
V120
155
5000
3000
V456
2700
003
FOREST CITY
1209 L 58 U-1
FSS
MASON CITY
1213 L 65 U-1
DF ILS
GARNER
1208 L 24 U-1
123.6 122.6
MASON CITY MCW
122.1R
MASON CITY
114.9 Ch 96 MCW
V13 W
V13
V161 W
V161
V138 — 13W
V100
V13 — 161
CLARION
1162 L 30
BELMOND
1200 L 33
HAMPTON
230 HPT
HAMPTON
1175 L 30 U-1
123.6R 122.3 122.1R
FORT DODGE
113.5 Ch 82 FOD
MASON CITY
HUMBOLT
1095 L 34 U-1
POCAHONTAS
1225 L 39 U-1
POCAHONTAS
314 POH
EAGLE GROVE
1131 L 25
CLARION
387 CAV
STORM LAKE
1487 L 30 U-1
STORM LAKE
227 SLB
FORT DODGE
1156 L 65 U-1
ILS
WEBSTER CITY
215 EBS
IOWA FALLS
368 IFA
IOWA FALLS
1136 L 40 U-1
ROCKWELL CITY
1234 L 35 U-1
BARNUM FO
341 FO
SAC CITY
356 SKI
SAC CITY
1250 L 35 U-1
WEBSTER
CITY
1117 L 32 U-1
ELDORA
990 L 31
IDA GROVE
1250 L 32 U-1
WALL LAKE
1223 L 32
BOONE MOA
10,000 TO BUT NOT INCL FL 180
HOURS OF USE 0900 – 2100
DAILY BY NOTAM
CONTACT NEAREST FSS
VOR
ELMWOOD
111.0T EMD
V138
92
CARROLL
397 CIN
JEFFERSON
391 EFW
BOONE
1147 L 34 U-1
BOONE
407 BNW
AMES
275 AMW
MARSHALLTOWN
239 MIW
CARROLL
1202 L 40 U-1
JEFFERSON
1048 L 32 U-1
AMES
929 L 37 U-1
NEVADA
995 L 23 U-1
DENISON
1273 L 41 U-1
MANNING
1321 L 22
V175
132
PERRY
1014 L 30 U-1
PERRY
251 PRO
AUDUBON
1300 L 30 U-1
AUDUBON
236 ADU
GUTHRIE CENTER
1083 L 27
BS
KSO
1460
BS
WHO
1040
V77
32
HARLAN
1218 L 34 U-1
V172
116
FSS
DES MOINES
ATIS 119.55
957 L 90 U-2
ILS 118.3
122.65 122.1R
DES MOINES
114.1 Ch 88 DSM
BS
KJAN 1220
Days only
ANITA
1257 L 34
ATLANTIC
1153 L 33 U-1
ATLANTIC
365 AIO
V6 — 8
96
GREENFIELD
1360 L 25
WINTERSET
1110 L 28
KNOXVILLE
927 L 30 U-1
KNOXVILLE
284 OXV
Area Airports
Figure 2
RED OAK
230 RDK
RED OAK
1043 L 29 U-1
V6S
99
CORNING
296 CRZ
CORNING
CRESTON
1293 L 50 U-1
CRESTON
379 CSQ
V13 W
54
OSCEOLA
1125 L 24 U-1
CHARITON
1050 L 28 U-1
CHARITON
209 CNC

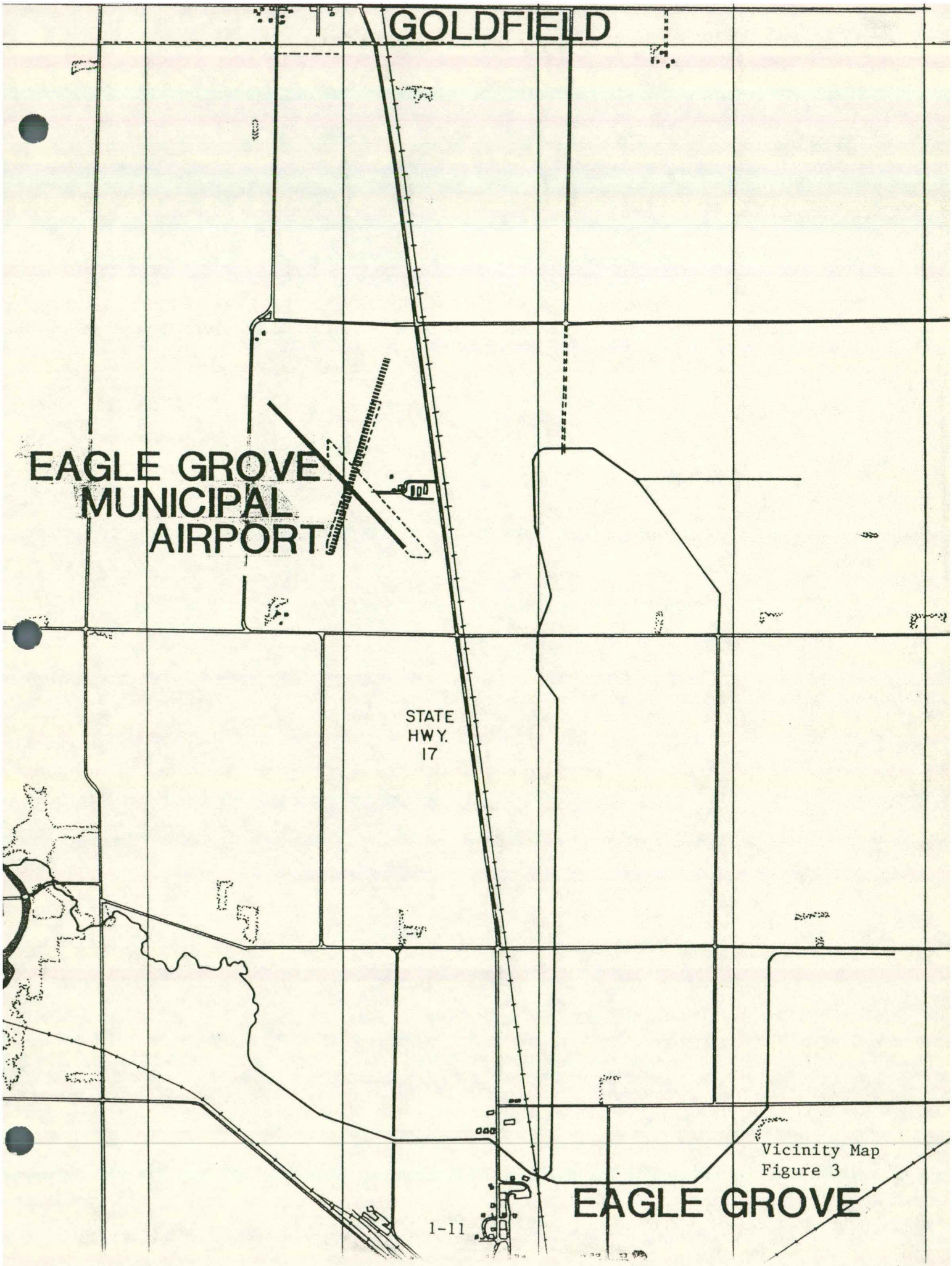
E. EAGLE GROVE MUNICIPAL AIRPORT

The Eagle Grove Municipal Airport is located three miles north of the community at approximately 1131 feet above sea level. The airport latitude is 42°41'00"N. The longitude is 93°55'00"W.

A brief description of existing facilities follows:

Runway	Length	Surface	Lighting	Bearing
13/31	60' x 3000'	P.C.C.	MIRL	N 44° W
1/19	140' x 2380'	Turf	LIRL	N 16° E

- Windcone, Unicom, RW 13/31 REILS
- Hangars - 3, 5 unit T-hangars
- FBO shop & terminal bldg. 71' x 80'
  (terminal area space 17' x 32' within FBO shop)
- Fuel Pumps - 2
- Airport Category - Bu II



Vicinity Map
Figure 3

II. FORECAST OF AVIATION DEMAND

SECTION II: FORECAST OF AVIATION DEMAND

A. INTRODUCTION

The Forecast of aviation demand is used to identify development parameters for an airport facility. Such forecasts are intended to identify an ultimate level of service required of an airport. In addition, the forecasts suggest when a given airport facility improvement is needed.

Because of the data base, lack of historic indicators and the small numbers dealt with, a decision made locally could drastically alter any estimates made herein. As experience would indicate, decisions are made to relocate aircraft from one airport to another for reasons ranging from personal to cost and service.

It should be noted that aircraft are not necessarily based within the County where registered. To provide an insight into trends beyond a specific airport and county, state and regional trends have also been summarized.

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 4

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 states share of the national total is decreasing from 2.34 percent in 1960 to an estimated 1.47 percent in 1997.

EAGLE GROVE MUNICIPAL AIRPORT

Of the 15 registered aircraft with an Eagle Grove mailing address, all have a gross weight under 6000 pounds with exception of a Piper Navajo, (PA 31). Two of the 15 aircraft are twin engine aircraft: PA 31 and Beech Baron. Reference may be made to the following table regarding the approximate gross weights.

TABLE 5 : REGISTERED AIRCRAFT, WRIGHT COUNTY, 1/15/80, Eagle Grove Mailing Address

NAME	NAME & MODEL	APPROXIMATE GROSS WEIGHT
Moeller, Kendall J.	Cessna 150	1,600
Christenson	PA-22 (Tri pacer)	1,800
Umthun Trucking Co. Inc.	Beech Baron	5,400
Williams, Floyd W.	Williams WXM	N/A
Ellsworth Freight Lines	PA 31 (Navajo)	6,500
Williams, Floyd	Homebuilt	N/A
Derscheid, Glen	Piper 0546	1,750
Garrett, Don R.	Aero Commander 100	
Williams, Floyd	Homebuilt	N/A
Moeller, Kendall	Cessna 150	1,600
Watson, Tommy	Cessna 172	2,300
Larsen Farm Drainage Sys.	Cessna 172	2,300
Williams, Floyd	PA 12 (Super Cruiser)	2,150
Christenson	PA 28 180 (cherokee Arrow)	2,750
Gangestad, John	PA 28-151	2,325

Source: IDOT- Aeronautics Division, 1/15/80

Since 1/15/80, 5 of the above aircraft have moved. However, as of 4/15/80, 4 new aircraft have located on the field.

Roger Oppedahl	Decathalon	1,750
Bruce Beyer	Cessna-150	1,600
Amy Amensen	Cessna 172	2,300
Mike Engstrom	Cherokee 180	2,400

WRIGHT COUNTY TRENDS:

As of January 15, 1980, there were 48 aircraft registered in Wright County. Of these 48 aircraft, 15 or 31.3 percent reported an Eagle Grove mailing address while 16 or 33.3 percent reported a Clarion mailing address. The remaining aircraft registraints were distributed throughout the county as noted in the following table:

TABLE 6 : DISTRIBUTION OF REGISTERED AIRCRAFT
WRIGHT COUNTY, 1/15/80

Registrant Address	Aircraft	Percent	Allocation
Eagle Grove	15	31.3	Eagle Grove
Goldfield	2	4.2	Eagle Grove
Clarion	16	33.3	Clarion
Rowan	1	2.2	Clarion
Belmond	7	14.6	Belmond
Dows	3	6.2	Clarion
Woolstock	4	8.2	Eagle Grove
	48	100.0	

Source: IDOT 1/15/80

As previously noted, there are 3 public airports in Wright County. For planning purposes, it is assumed that 43.7 percent of the registered aircraft would use the Eagle Grove facility while 41.7 percent and 14.6 percent would use the Clarion and Belmond facilities respectively.

The number of aircraft registered in Wright County is expected to increase throughout the twenty year planning period. The 1978 State Airport Systems Plan estimated the following numbers of registered aircraft: 35 by 1982, 38 in 1987, and 44 by 1997. These estimates appear somewhat low.

It is obvious that such numbers can vary substantially in a very short time. Additionally, it is apparent that while geographic proximity to a facility is one good criterion for allocating aircraft, it can not serve as a primary basis of projecting future aircraft. Personal preferences, FBO services, airfield services, hangar types and other factors account for the deviation from this allocation procedure.

However, a reasonable assumption can be made that the number of aircraft based at Eagle Grove will most likely fall somewhere between the current number of based aircraft (10) and a theoretical distribution of registered airmen in the county (21). For purposes of projecting future aircraft, an estimated demand of 15 based aircraft is assumed to exist in the base year of the projections. According to a proportionate rate of increase in based aircraft at Eagle Grove as projected in the 1978 SASP, the following is anticipated:

TABLE 7: PROJECTED BASED AIRCRAFT, EAGLE GROVE AIRPORT
1980-2000

Year	Based Aircraft
1980	15
1981	15
1982	16
1983	16
1984	16
1985	16
1990	18
1995	19
2000	21

The allocation identified above is primarily based upon geographic proximity and assumes that as the Eagle Grove facility is upgraded more airmen currently based at Clarion will relocate their aircraft to the more convenient airfield. This hypothesis was confirmed with at least one and possibly two airmen contacted in Eagle Grove who currently base their aircraft at Clarion.

Under these assumptions, the allocation method would theoretically find a present demand for 15 aircraft based at Eagle Grove. An actual count on 4/15/80 revealed that 10 aircraft were based at the facility. Approximately one month earlier, about 14 aircraft were based at Eagle Grove.

According to the 1978 SASP, 98 registered airmen were recorded in Wright County. Applying the percentage rate increases projected in the SASP, the following number of registered airmen are anticipated.

TABLE 8 : PROJECTED REGISTERED AIRMEN

Year	Wright County	Eagle Grove
1980	105	46
1981	108	47
1982	110	48
1983	111	49
1984	112	49
1985	113	49
1990	117	51
1995	122	53
2000	127	55

C. AVIATION OPERATIONS AND OPERATIONS MIX

ANNUAL ITINERANT AND LOCAL OPERATIONS

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

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

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

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

- Total Annual Aircraft Operation
  - Total Annual Local
  - Total Annual Itinerant
- Peak Day and Peak Hour Operations

Aircraft Operations are a function of the following:

- Based Aircraft
- Airmen
- Airport Facilities
- Aircraft Maintenance Services
- Airport Management
- Socioeconomic Characteristics of the Airport Service Area

Without a daily log of operational activity, an estimate of total annual itinerant and local operations is most often derived from local sources or from a random survey. The 1976 SASP found that community population, based aircraft and registered airmen in the county were variables which had a high degree of correlation with operations. The model developed in the 1976 SASP was also used in the 1978 SASP to estimate aircraft operations.

Log(Annual Total Operations) = 2.614 + 0.501 log(Based Aircraft x County Airmen)

The same variables were used to estimate itinerant operations.

Log(Annual Itinerant Operations) = 1.865 + 0.605 log(Based Aircraft x County Airmen)

It should be noted that the models accounted for 88 and 95 percent of the variation respectively. Reference may be made to pages 39 and 41 of the 1978 Iowa SASP.

Total annual aircraft operations at Eagle Grove were estimated as follows:

TABLE 9 : TOTAL ANNUAL AIRCRAFT OPERATIONS:

Year

1980:	Anti-Log 2.614 + 0.501 log(15 x 46)	= 10,870
1985:	(16 x 49)	= 11,589
1990:	(18 x 51)	= 12,543
1995:	(19 x 53)	= 13,138
2000:	(21 x 55)	= 15,960

Total annual itinerant aircraft operations were estimated as follows:

TABLE 10: TOTAL ANNUAL ITINERANT OPERATIONS

Year

1980:	Anti-log 1.865 + 0.605 log (15 x 46)	= 3,824
1985:	(16 x 49)	= 4,131
1990:	(18 x 51)	= 4,544
1995:	(19 x 53)	= 4,807
2000:	(21 x 55)	= 5,222

Local annual operations were estimated as the difference between total annual and total itinerant operations.

TABLE 11: TOTAL ANNUAL LOCAL OPERATIONS

Year	
1980	7,046
1985	7,458
1990	7,999
1995	8,331
2000	10,738

PEAK-HOUR OPERATIONS:

Peak hour operations for Eagle Grove were obtained from a least-squares regression line developed by the IDOT (p. 42 1978 SASP) which explained the relationship between total annual and peak hour operations.

TABLE 12: PEAK HOUR AND PEAK DAY OPERATIONS

Year	Annual Operations		Peak Hour	Peak Day (.0049)
1980	10,870	(.0019)	21	53
1985	11,589	(.0019)	22	56
1990	12,543	(.0018)	23	61
1995	13,138	(.0018)	24	64
2000	15,960	(.0018)	29	78

Peak Hour operation data is used to assess airport capacity. Reference to FAA AC 150/5060-3A, "Airport Capacity Criteria Used In Long-Range Planning" reveals the following generalities concerning airport capacity:

Runway Configuration:

1. Single Runway:
   a. Arrivals = Departures
   b. Aircraft Mix One
   c. Practical Hourly Capacity (PHOCAP)
      (1.) IFR: 53 Operations/Hour
      (2.) VFR: 99 Operations/Hour
   d. Practical Annual Capacity (PANCAP) 215,000 Operations/year
2. Intersecting Runways:
   a. Arrivals = Departures
   b. Aircraft Mix One
   c. Practical Hourly Capacity (PHOCAP)
      (1.) IFR: 61 Operations/Hour
      (2.) VFR: 99 Operations/Hour
   d. Practical Annual Capacity (PANCAP) 220,000 Operations/year

These capacity estimates were based upon the following:

-Weather: 90% VFR and 10% IFR
-Aircraft Mix One: 90% D + E Aircraft
10% C Aircraft
-Peaking Factors & Training: Daily Peaking Factor-15%
Touch and Go Activity-60%
-Terminal Location: Centrally Located
-IFR Weather: Full instrumentation
-Taxiways: Taxiway exit rating one (meaning required taxiways are available)
-Runway Use: Assumed that at least 50% of the aircraft mix could use each runway.

With only an NDB, the IFR capacity is ten operations per hour rather than 61 with full instrumentation. There would appear to be no operational capacity problems at Eagle Grove.

AIRCRAFT OPERATIONS MIX:

At rural general aviation airports, the mix of aircraft using the facility is often of greater significance than the total number of annual aircraft operations. The various types of aircraft have been grouped by class for purposes of planning and identifying the general level of airport development to meet the operational mix. These classes are as follows:

*Class A- Heavy 4 engine jets
*Class B- Smaller jets in excess of 25000 pounds and piston or turboprop aircraft having a weight of 36000 pounds or more.
*Class C- Heavy twins and small executive jets in excess of 8000 pounds.
*Class D- Light twins and high performance singles
*Class E- All other single-engine aircraft

The FAA finds justification for a general utility airport where there are 500 or more itinerant operations by aircraft with a gross weight (landing or takeoff) of 6,000 pounds. (NOTE: See FAA AC 5300-4B).

Nearly all aircraft operations at Eagle Grove are expected to be made by Class D & E aircraft.

Ellsworth Freight Lines, operating out of Eagle Grove currently bases a PA 31 Navajo, 6,500 lb. twin at Clarion. It is possible that with improvement of the Eagle Grove facility the aircraft could be based locally. Total operations generated by this aircraft are not anticipated to exceed the 500/year threshold.

Umthun Trucking Co. Inc. also bases a light twin Beech Baron at Clarion airport. In conversations with the pilot a possibility in the long term exists for upgrading the corporate plane to a heavier twin exceeding the 6000 lb. figure. Umthun averages between 350 to 400 operations per year. Neither of the above circumstances appears to warrant current or future facilities being constructed to the larger General Utility Standards.

D. AIR PASSENGER AND AIR CARGO

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 13: AIR PASSENGERS

Year	Passengers
1980	5,736
1985	6,206
1990	6,816
1995	7,211
2000	7,833

Air Cargo

The tonnage of air freight was estimated at eight pounds per enplaned passenger or one ton per 250 enplaned passengers.

TABLE14 : AIR CARGO

Year	Air Cargo in Tons
1980	22.9
1985	24.8
1990	27.3
1995	28.8
2000	31.3

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.

Eagle Grove Municipal Airport

Phase One	1980-1984	Basic Utility, Stage II
	1985-1989	Basic Utility, Stage II
	1990-2000	Basic Utility, Stage II

The community is encouraged to update the activity forecast at five year intervals. The addition or deletion of 2 or more aircraft, especially twin engine, could alter the needs at the airport.

III. FACILITY REQUIREMENTS

SECTION III: FACILITY REQUIREMENTS

A. INTRODUCTION

Section Three summarizes relevant information about certain key airport facilities required to meet aviation demand expectations as presented in Section Two. The purpose herein is to identify unmet needs. A latter section of the report examines feasibility. This section also sets forth design parameters to be used in the evaluation of alternative airport development concepts.

Thus, within each of the three planning phases,

Phase I 1980-1984
Phase II 1985-1989
Phase III 1990-2000

the need to upgrade a specific facility component can be identified. The community is urged to monitor aviation activity throughout the twenty-year planning period. Every effort should be made to insure that only the facilities needed are implemented so that the airport is not "over-built". Such monitoring of activities will also provide an indication when a facility improvement is needed earlier than scheduled because of unanticipated increase in aviation activity.

B. RUNWAYS AND TAXIWAYS

Wind Coverage

For utility airports, a 12 m.p.h. crosswind 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 primary runway (N 44° W) provides a coverage of 73.4%. The crosswind runway (N 16°E) provides a coverage of 75.3%. Wind coverage by both runways would total 92%. As such no consideration was given to the construction of an additional runway since wind coverage between the two alignments would afford sufficient safety and usability vis a vis additional costs.

Although it is apparent that the crosswind runway provides slightly higher coverage, one will note that a greater percentage of higher velocity crosswinds would be encountered. Also, it should be noted that the crosswind runway would be utilized to greater advantage in the summer months when winds tend to be out of the south. In terms of safety, winter months pose the highest threat to both small and large aircraft resultant from increased wind velocity and reduced visability conditions.

Obviously no alternative alignments for the newly paved primary runway were considered. Crosswind Runway 1/19 currently maintains a 60° separation from Runway 13/31. This situation is considered desirable and should be maintained to avoid "duplicate" wind coverage. As such even though slight increases in wind coverage result with alignments aimed at a more northerly bearing (maximum coverage at N 5°E) this alternative was ruled out. Additionally, large grain elevator structures located northwest of the crosswind runway would pose added burdens to aircraft navigation.

Aligning the crosswind runway to the extreme NNE or NE also resulted in reduced wind coverage and presented potential conflicts with existing farmsteads located off each runway end.

In summary, it is recommended that current runway alignments be maintained.

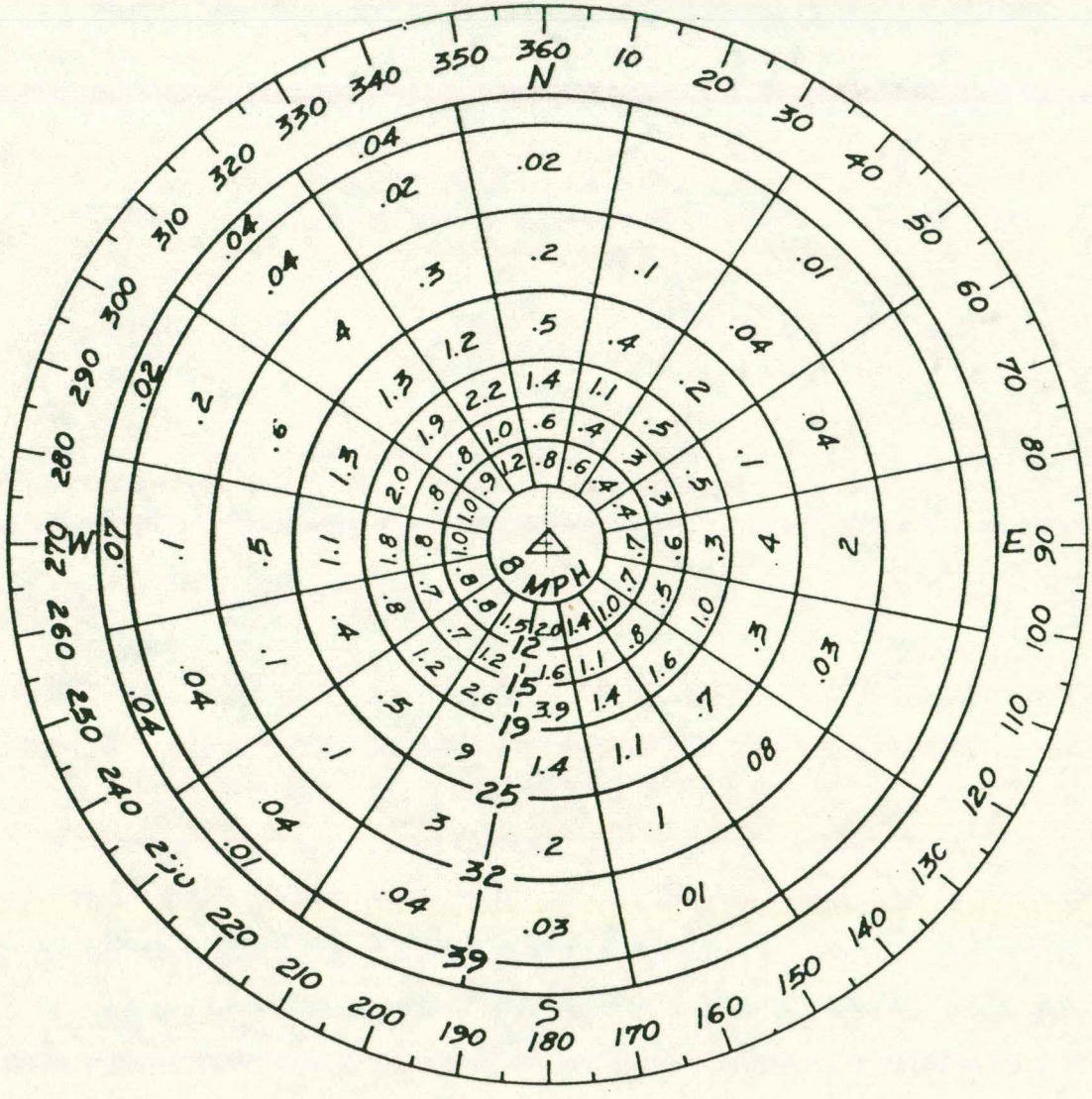


FIGURE 4 : WIND ROSE DATA

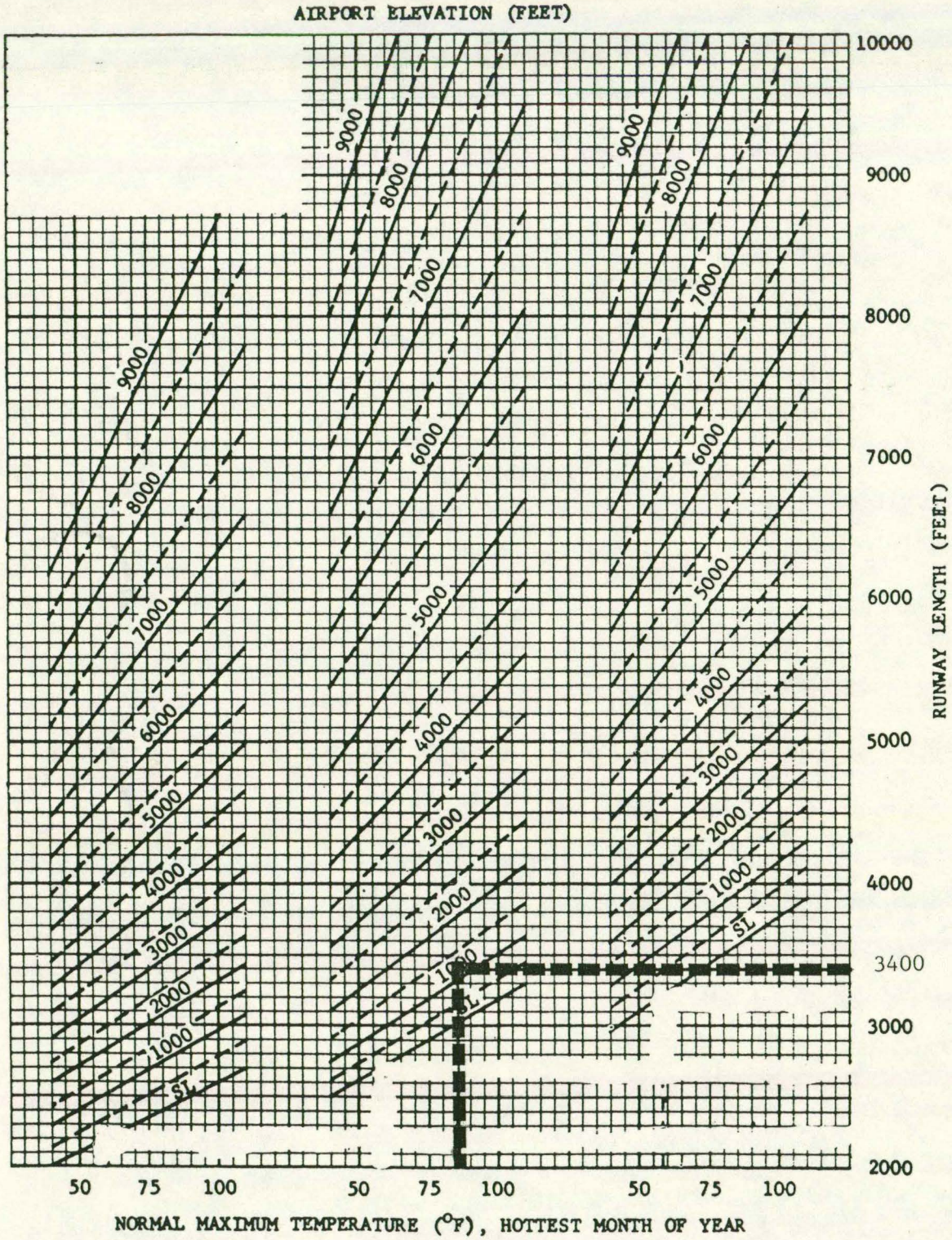
Source: Ft. Dodge Municipal Airport
Period: 1963 to 1967

RUNWAY LENGTH:

Runway length requirements were obtained from FAA AC 150/5300-4B, CHG. 2, page 14 referenced herein as Figure 6. The runway length curves are based upon performance information from aircraft flight manuals and assume the following:

- Zero headwind component
- Maximum certified takeoff and landing weights
- Optimum flap setting for the shortest runway length
- Relative humidity and runway gradient were accounted for by increasing the takeoff or landing distance of the groups most demanding aircraft by 10 percent
- Airport elevation (variable)
- Mean daily maximum temperature (variable)

FIGURE 5 : RUNWAY LENGTH CURVES



Given the following:

- Elevation: 1131 feet
- Temperature: 84°F

the runway length needs at Eagle Grove are as follows:

- Basic utility - Stage II - 3400'

The desired length of the primary runway and crosswind runway is 3400 feet. Where it is not feasible to construct the runways to the desired length, no less than 80 percent of the desired length should be constructed. As such, the minimum length recommended for either runway is 2720 feet.

The width of both runways should be no less than 75 feet for a general utility runway and 60 feet for a basic utility runway.

TABLE 15 : RUNWAY LENGTH AND WIDTH SUMMARY

	Basic Utility, Stage II
Primary Runway	60' x 3400'
Crosswind Runway	60' x 3400'

TAXIWAY:

Taxiways are used to facilitate the movement of aircraft to and from the runway and provide access to apron and hangar facilities. Taxiways are presented in terms of:

- Full parallel Taxiway
- partial parallel taxiway
- exit or slub taxiway
- apron and hangar access taxiway

At most general aviation airports, a full parallel taxiway system is not found unless there is considerable aviation activity. While capacity is often used to justify the construction of a full or partial parallel taxiway, the FAA finds justification for a full system based upon safety considerations alone. The IDOT in the 1978 SASP recommends the following level of taxiway development at utility airports:

- A partial paved parallel taxiway serving one end of the primary runway is considered part of the fundamental level of development where annual operations are between 30,000 and 50,000.
- A full paved parallel taxiway is required where annual operations exceed 50,000.

The minimum recommended separation between the taxiway and runway centerlines is 200 feet. In addition, the taxiway should be so located that no part of the aircraft penetrates the obstacle Free Zone (OFZ) of the runway - which is the intermost 250 feet of the primary surface width for a non-precision or visual runway. The taxiway width should be no less than 40 feet at general utility airports and 30 feet at basic utility runways.

Where it is not feasible to construct a full or partial parallel taxiway, runway turn arounds are recommended. A typical turnaround recommended for implementation is depicted in the following figure.

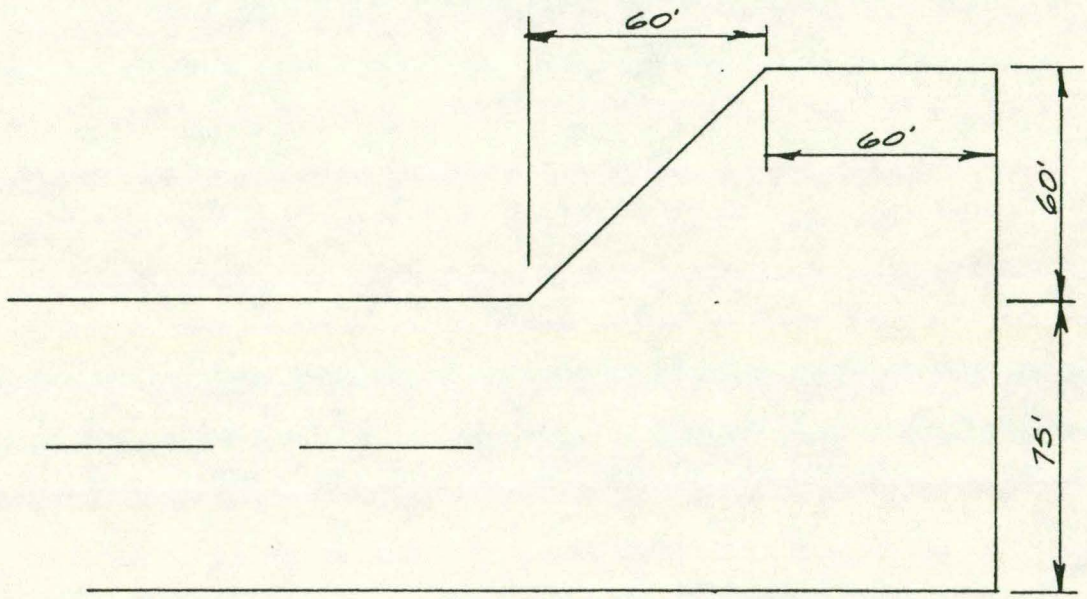


FIGURE 6 : TYPICAL TURNAROUND

TABLE 16 : TAXIWAY SUMMARY

Primary Runway.....	Stub from runway with 30' width desirable
Crosswind Runway.....	Justification questionable, ultimate stub from runway 30' width possible

RUNWAY AND TAXIWAY DESIGN CONSIDERATIONS:

From the forecast of aviation demand, a runway pavement strength which would support an aircraft with a gross weight strength (single wheel) of 12500 pounds would appear to meet aviation demand expectations. It is not the intent herein to specify an engineering design for the hard surfaced areas. However, for purposes of estimating, it will be assumed that all new construction will consist of a rigid (Portland Cement Concrete-PCC) rather than a flexible pavement design. The ultimate design may; however, consist of a flexible pavement. Reference should be made to FAA AC 150/5320-6C, "Airport Pavement Design and Evaluation" regarding a more detailed discussion. A typical pavement cross section is depicted in the following figure.

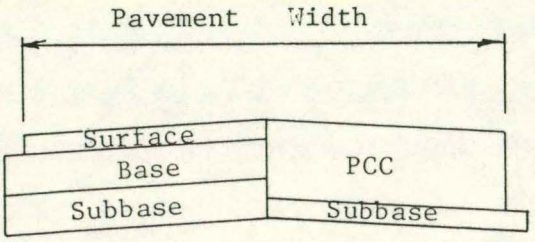


FIGURE 7 : TYPICAL PAVEMENT CROSS SECTION

A rigid pavement designed to serve aircraft with a gross weight of 12500 pounds or more should be no less than 6 inches thick. A minimum subbase thickness of 4 inches is generally required except where soil conditions are poor.

The 6 inch PCC rigid pavement will accommodate aircraft up to 30,000 pounds gross weight. The final design must be based upon a sufficient number of soil borings and soil tests.

TABLE 17: PAVEMENT DESIGN SUMMARY

1. The assumption is made herein that the pavement design will consist of 6 inch PCC surface course and a 4 inch subbase for the following new construction:
   - Runway, Apron, taxiway
2. The final design may consist of either a flexible or rigid pavement.

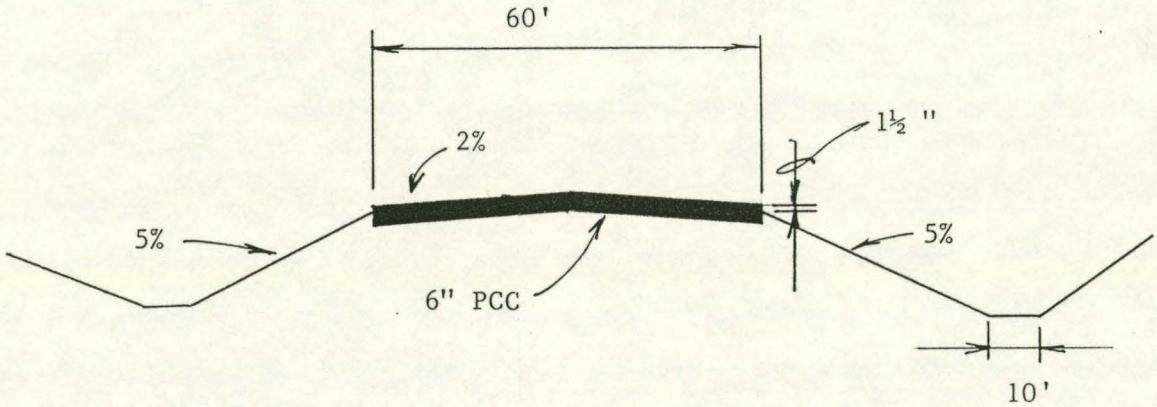


FIGURE 8: PAVEMENT DESIGN, RW 13/31

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

- Runway grade changes should be such that any two points 5 feet above the runway centerline will be visible along the entire length of the runway where a full parallel taxiway does not exist. Where a full parallel taxiway does exist, the criteria may be reduced to one half the runway length rather than the entire runway length.

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

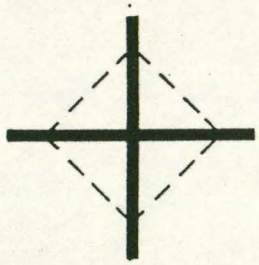


FIGURE 9 : RUNWAY VISIBILITY ZONE

- Runway grades; terrain etc. must be such that a line of sight is maintained within the visibility zone of the intersecting runways 5 feet above the centerlines. Reference may be made to FAA AC 150/5300-4B concerning the location of runway visibility points.

Maximum grade changes should not exceed two percent where vertical curves are required. The length of the vertical curve should not be less than 300 feet for each percent grade change. No vertical curves are required when the grade change is less than 0.4 percent.

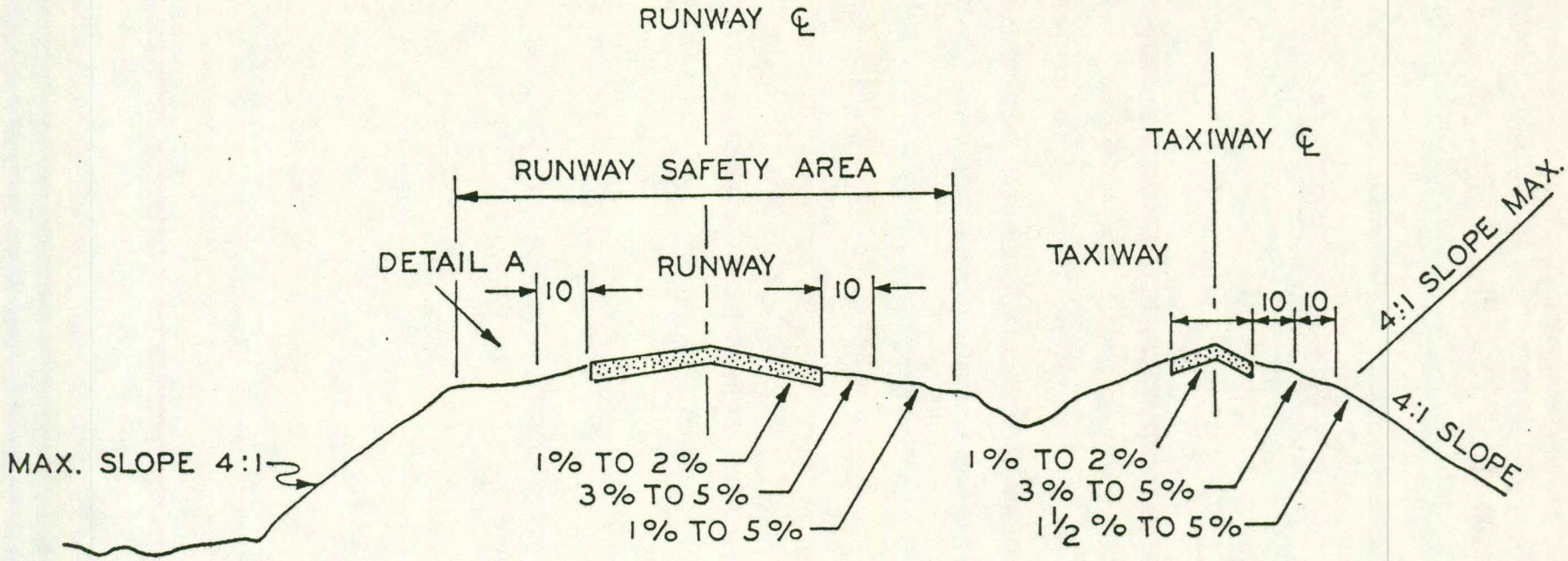
Traverse grades on the runway should be at least one percent and no more than two percent. Within ten feet of the pavement edge, the grade should have a minimum slope of three percent and not to exceed five percent. Reference may be made to figure 10 concerning a typical runway cross section.

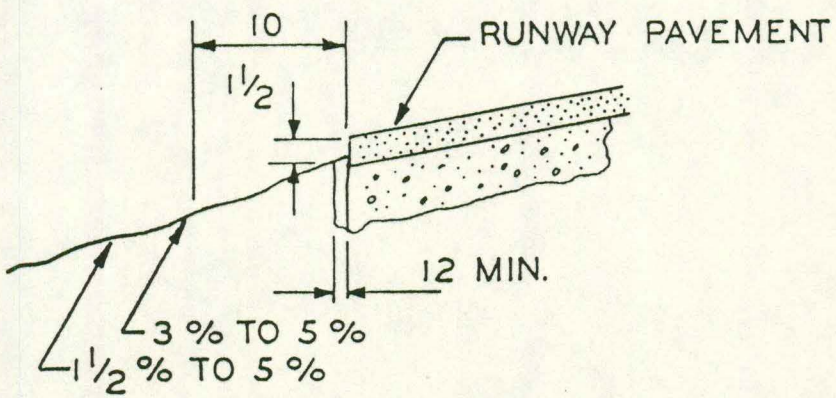
A graded area beyond the runway surface is referred to as the runway safety area. The area, located symmetrically about the runway, extends outward from the runway centerline 75 feet and 200 feet beyond the runway ends. The primary function of the runway safety area is to provide a degree of safety should an aircraft veer off the runway. The traverse grade should not exceed five percent.

LATERAL WIDTHS AND CLEARANCES:

The following are criteria for separation of airport facilities that should be taken into consideration.

- Runway centerline to taxiway centerline	200'
- Runway centerline to building restriction line (BRL) and airplane tiedown area	250'
- Runway centerline to property line (PL)	250'
- Taxiway centerline to airplane tiedown area and to fixed or movable obstacle	50'
- Taxiway centerline to hangar structure one way traffic	37.5'





DETAIL A

TYPICAL CROSS SECTION

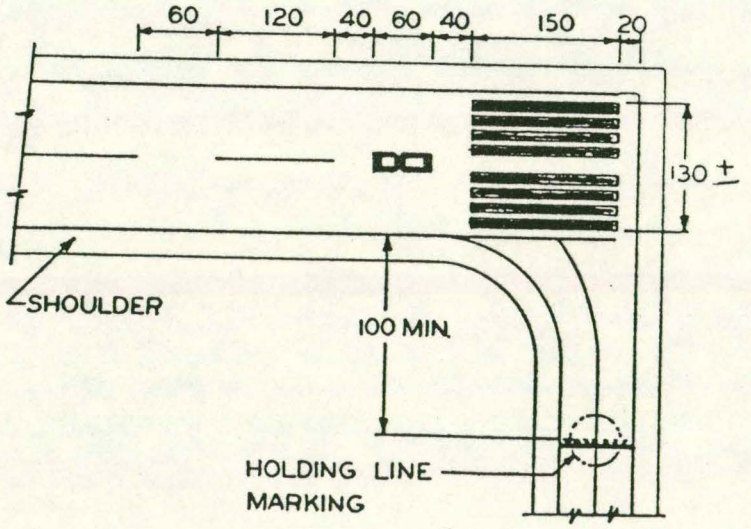
FIGURE 10

PAVEMENT MARKINGS

Non-precision instrument (NPI) markings are recommended for installation on both runways. A non-precision instrument runway is one to which a straight-in non-precision approach has been approved. NPI 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 centerline from the approach end and recorded to the nearest 10 degrees with the last zero omitted.
- Threshold markings:
  Threshold markings consist of eight 150' x 12' stripes. Each stripe is separated by 3 feet except the center where the separation is 16 feet. Where the runway is less than 150 feet, the width of the stripes and separation is reduced proportionally.

Taxiways are marked by a continuous stripe, 6 inches in width, along the taxiway centerline. Holding lines are located on the taxiway 50 feet from the runway edge. Additional information on pavement markings may be obtained from FAA AC 150/5340-1D.



NON PRECISION INSTRUMENT RUNWAY

FIGURE 11: PAVEMENT MARKINGS

C. LANDING AND NAVIGATIONAL AIDS

RUNWAY AND TAXIWAY LIGHTING

A medium intensity runway light system (MIRL) is in operation on RW 13/31.

Runway lights are used to outline the edges of the runway during periods of darkness or low visibility. Each runway edge light fixture emits a white light except on instrument runways where yellow is substituted for white on the last 2000 feet or one-half the runway length which ever is less. The yellow lights are located on the end opposite the landing threshold or instrument approach end. The edge light fixtures should be located no more than ten feet from the defined runway edge and spaced 200 feet on center. The runway light stake should be no less than 30 inches high due to snow removal and grass cutting. The lights, located on both sides of the runway should be directly across from each other and perpendicular to the runway centerline. Special requirements exist at runway intersections.

Two groups of threshold lights, the second part of a runway light system, are located symmetrically about the runway centerline. The threshold lights emit an 180 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. The two groups of lights contain no less than three fixtures for a VFR runway and four fixtures for an IFR runway. The outer most light is located in line with the runway edge lights. The remaining lights are placed on ten foot centers towards the runway centerline extended.

Taxiway edge lights should be located no more than 10 feet from the taxiway edge on 200-foot centers.

The taxiway edge lights which emit a blue light define the lateral limits of the system. Reflectors may be used in lieu of taxiway lights where activity is minimal.

Reference may be made to the following FAA Advisory Circulars:

AC 150/5340-24	Runway and Taxiway Edge Lighting Systems
AC 150/5340-27	Air-to-Ground Radio Control of Airport Lighting Systems

VISUAL APPROACH SLOPE INDICATOR, VASI:

A 2-box VASI system is recommended for installation on the primary and crosswind runways. The VASI-2 consists of two (2) light units which emits a red and white beam of light. The color beams enable the pilot to determine if his apporach is high, on course, or low. The VASI-2 would benefit the facility because of potential noise impacts and structures in the area.

The VASI-2 is located on the left side of the approach to the runway. Ideally, the first light box is located 50 feet out from the runway edge and 500 feet from the threshold. The second light box should be located 700 feet from the first box.

RUNWAY END IDENTIFIER LIGHTS, REIL:

Runway End Identifier Lights are in operation on RW 13/31 and should be installed on the crosswind runway in line with the threshold lights, 75 feet from the runway edge. Reference may be made to FAA AC 150/5340-14B, AC150/5300-2C and AC 150/5340-25 concerning VASI and REIL design requirements.

AIRPORT BEACON LIGHT:

An airport beacon light is not in operation at the airport. The FAA recommends a 10-inch rotating beacon light at general utility airports. The beacon light, which emits alternating white and green flashes of light, should be located no closer than 750 feet from a runway centerline. Reference may be made to FAA AC 150/5340-21 and 150/5300-2C.

SEGMENTED CIRCLE AND LIGHTED WIND TEE:

A segmented circle and lighted wind indicator is recommended for installation at the airport.

NON-DIRECTIONAL RADIO BEACON, NDB:

The NDB system allows an aircraft equipped with an automatic direction finder, (ADF), to "home" in on the signal.

A Terminal Very High Frequency Ominrange (TVOR) may be justified where annual instruments approaches exceed 300.

D. TERMINAL AREA

Apron and Hangar Access

The existing apron area is minimal in size and supports a small aircraft refueling area and no formal tiedown space. Access to the apron is provided by a stub taxiway from Runway 13/31.

The apron should logically provide area for improved surface tiedowns for based and itinerant aircraft as well as queuing space for aircraft movement. Itinerant and apron area tie-down needs through the planning period were arrived at as follows.

The assumption was made that nearly all based aircraft will be in hangars, provided hangar space is available at a competitive and reasonable cost. Some individuals may choose to tie aircraft down rather than lease hangar space. It is anticipated that the projected apron area could accomodate such aircraft with itinerant aircraft overflow, if any, occuring onto, adjacent improved gravelled surfaces.

Itinerant tiedown spaces were estimated on the basis of projected itinerant annual operations.

TABLE 18: TIE DOWN NEEDS, 1980-2000

Planning Period	Annual Operations Itinerant	Tie Downs (1.1 x Avg. Ops/Day x .5)
I 1980-'84	4,131	6
II 1985-'89	4,544	7
III 1990-2000	5,222	8

The area required for apron improvements can be estimated by using an average of 300 square yards per itinerant aircraft and 300 square yards for based aircraft.

TABLE 19 : MINIMUM APRON AREA NEEDS, 1980-2000

Planning Period	Itinerant Tiedowns	Apron Area Requirements
I	6	2,160 Sq. Yds.
II	7	2,520 sq. yds.
III	8	2,880 sq. yds.

The actual apron area may be somewhat less depending upon financial constraints. For example, some tiedowns may be constructed on improved gravel surface areas adjacent the apron. Improved surface access needs to hangars from the apron area is subject to finalization of the terminal area development plan. Generally, a 20 foot wide taxiway with stubs to each hangar unit will provide an adequate level of service.

Hangars

The three existing T-hangar structures are designed for a capacity of 5 aircraft/structure or a total of 15. They are in reasonably good shape and should be serviceable for a number of years if properly maintained. It was noticed that several doors appeared to be improperly secured and subject to movement under stiff winds.

Although the twenty year forecast indicates based aircraft will approximate 21, it should be again noted that this is an average estimate and real aircraft numbers will vary above and below this amount.

For this reason, it is recommended that a six unit nested tee type hangar be constructed as soon as is feasible to accomodate interim needs and long term demand as follows:

TABLE 20: HANGAR NEEDS, 1980-2000

Planning Period	Hangar Stalls	Units
I 1980-'84	1	1
II 1985-'89	1	
III 1990-2000	4	
Total	6 (21)	

A variety of prefab hangars are available. The nested tee type hangar is an efficient unit and could be used to advantage at Eagle Grove. A hangar stall with a clear door of 40 feet and a clear depth of 30 feet will accomodate most aircraft expected to be based at the facility. Umthun and Ellsworth trucking firms may potentially wish to base their twin aircraft at Eagle Grove. These as well as other owners of larger aircraft may wish to have access to free-standing larger conventional hangars. For this reason, the terminal area plan should provide for such opportunities.

TABLE 21

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

The existing FBO hangar and terminal/adminstrative building meet or exceed IDOT sizing requirements. Periodic maintenance and remodeling should be all that is needed for these combined structures.

Vehicle Parking

Adjacent to the terminal building the IDOT recommends a minimum of 6 parking spaces along along with one space per based aircraft at basic utility airports. All parking areas should be granular surfaced at a minimum and positioned strategically to serve the terminal and hangar areas.

TABLE 22 : VEHICLE PARKING NEEDS

Planning Period		Terminal	Hangar	Total
I	1980-1984	6	15	21
II	1985-1989	6	17	23
III	1990-2000	7	21	29

It appears most feasible to construct all parking spaces within Phase I.

Airport Manager's Residence

The existing residence located northeast of the terminal area could serve as a temporary managers residence. It appears as though the structure would need additional space and remodeling to adequately house a typical family.

A more practical alternative to this may be to rent the existing structure and maintain a modest level of repairs until the useful life of the structure is acheived; and at that time remove the building. In the interim a modular or mobile home unit could be located on the site to serve as the managers residence.

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 fo mobile objects.

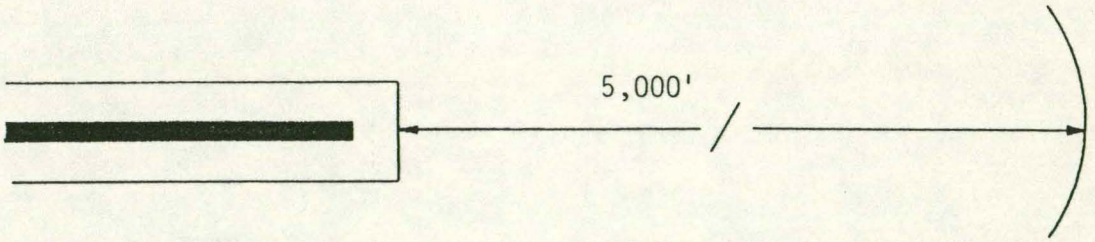
- Interstate Highway	17 feet
- Public Roadway	15 feet
- Private Road	10 feet or height of the highest mobile object
- Railroad	23 feet

IMAGINARY SURFACES

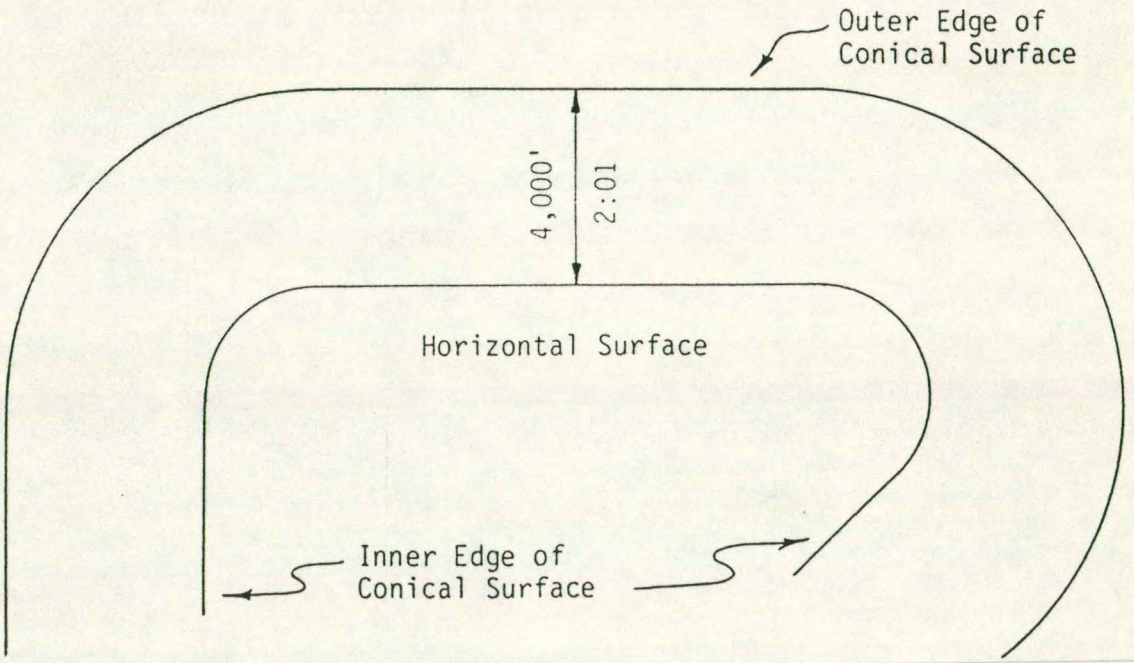
1. Imaginary surfaces establish areas where any object penetrating that surface would be considered an obstruction to air navigation. The imaginary surface establishes an imaginary line that separates ground activities from aircraft activities. In order to select the applicable imaginary surface, the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



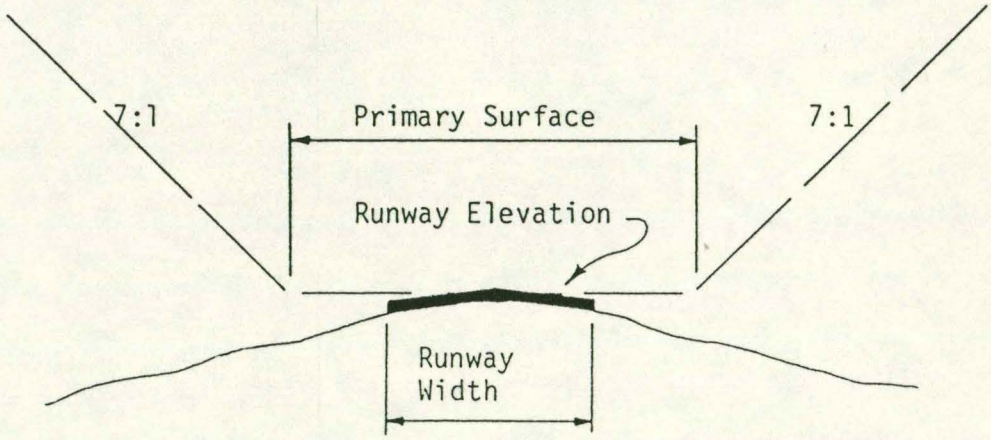
B. Conical Surface: The conical surface extends outward and upward from the periphery of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet at the ends and 7:1 laterally.



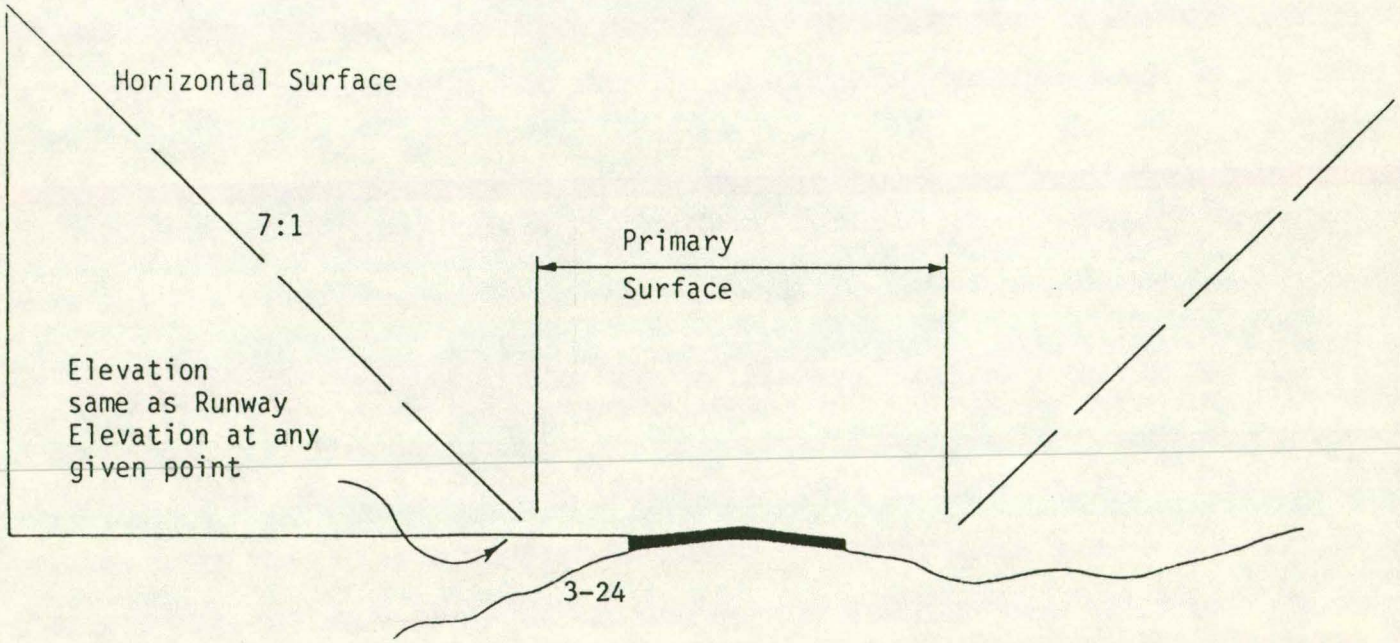
C. Primary Surface: The primary surface is longitudinally centered on the runway and extends 200 feet beyond the runway end in the case of a paved runway. The primary surface end coincides with the runway end in the case of a turf runway. The width of the primary surface varies with the approach.

	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:

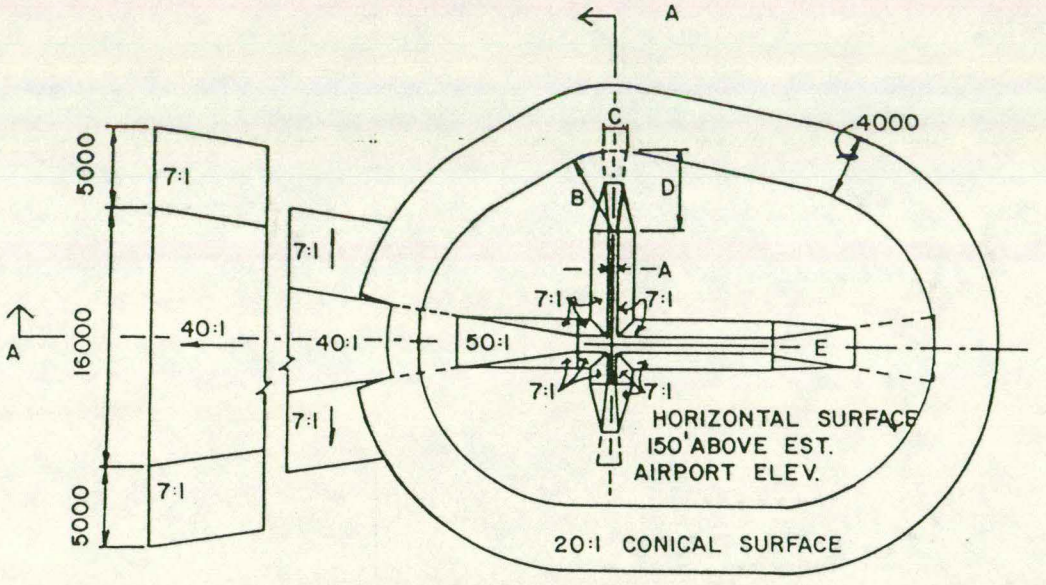
Visual:	250' x 5,000 x 1,250'	
NPI:	500' x 10,000 x 3,500'	(Runway larger than Utility w/visability minimum as low as 3/4 of a mile)
NPI:	500' x 5,000 x 2,000'	(Utility runways)

The approach slope also varies:

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

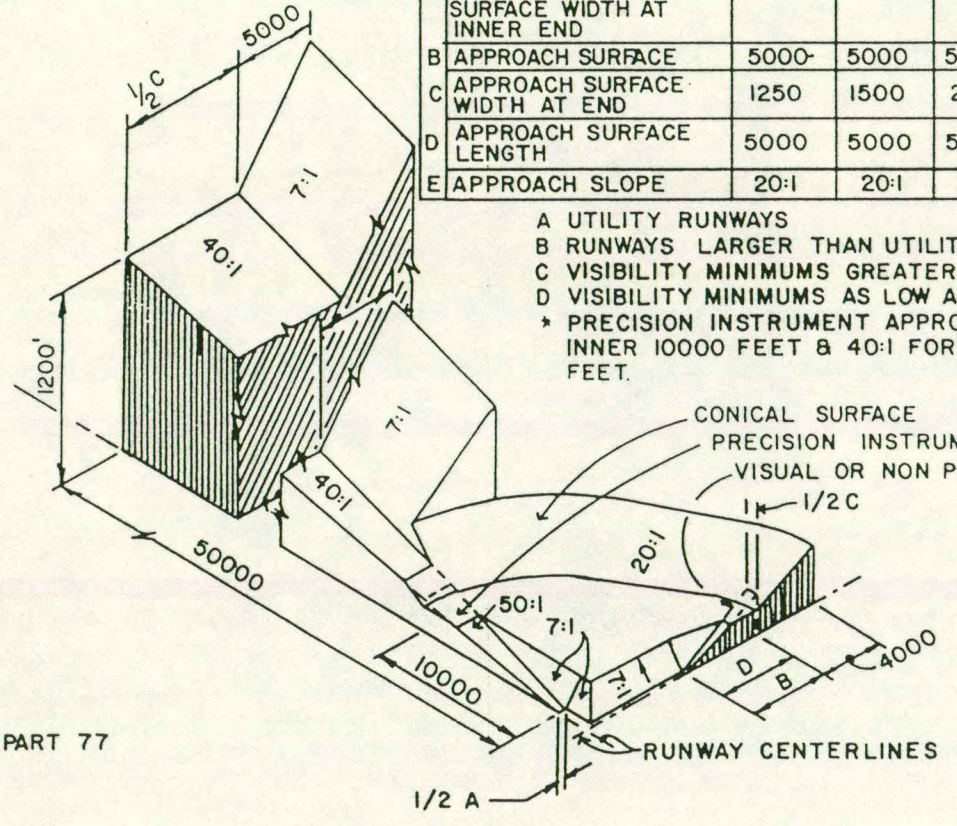
The clear zone represents that portion of the approach surface on the ground. The inner edge of the approach surface coincides with the primary surface. The clear zone extends outward uniformly to a width determined by a point which is 50 feet above the ground elevation or runway end elevation.

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 12
AIRPORT IMAGINARY SURFACE

IV. AIRPORT DEVELOPMENT ALTERNATIVES

SECTION IV: AIRPORT DEVELOPMENT ALTERNATIVES

A. INTRODUCTION

Section Four summarizes various development alternatives as well as key environmental concerns. The IDOT does not, in all cases, require the preparation of an environmental assessment for a proposed development prior to implementation. As such, the key environmental concerns summarized herein, provide only an overview of those elements typically addressed in FAA Order 1050.1C Appendix 6. Should assistance from the FAA be sought, a "full blown" environmental assessment may be required.

B. AIRPORT ALTERNATIVES

No consideration was given to an alternative alignment for the primary runway, RW 13/31. The orientation of N 44° 12' 36" W was considered fixed. The present length of 3000 feet should be extended to 3400 feet. The runway provides, (at a 12 mph crosswind component value), wind coverage of 73.4%. Extension of RW 13/31 would appear most feasible on RW End 13. Additional land would be required in order to accommodate the extension, as well as, safety area and approach slope requirements. The County Road would be closed when such an extension project was initiated. A non-precision instrument approach was recommended only to Runway End 31.

The ultimate orientation of the crosswind runway should maximize the level of wind coverage. In considering alternative crosswind runway alignments, the following criteria were considered:

1. Maintain a 60 degree separation between runway facilities as required by the IDOT.

2. Minimize impact upon area farm operations.

3. Minimize need for additional land by utilizing existing airport property.

4. Obtain the best supplemental wind coverage.

5. The orientation should be such that 3400 feet of runway and clear zone requirements could be obtained without requiring a road closure.

When considering the above criteria, it appeared that the most suitable alignment was N 15° 47' 24" E. The present turf runway has a bearing of N 16°E. This alignment accomplished the following:

1. Utilizes the greatest amount of existing airport land.

2. Does not require a road closure.

3. Moves the approach surface away from the City of Goldfield.

4. Maintains a 60 degree separation between runway facilities.

The combined wind coverage is 92 percent. The present location of hangar structures, as well as the access road and utilities, provided parameters for the identification of alternative terminal area concepts. No consideration was given to a relocation of the terminal area. In preparing a terminal area development concept, an effort was made to organize the land and air side in a more functional manner. The following criteria were used:

1. Maintain the present FBO shop.

2. Expand the itinerant apron around existing fuel pumps and terminal building activities.

3. Provide an improved access and queuing area to the existing hangars and FBO shop.

4. Identify a location for the construction of future tee and conventional hangars.

The Airport Commission has taken steps to implement a tall structures ordinance. The tall structures ordinance will allow the Airport Commission to control the height of structures within the immediate vicinity of the airport.

Existing land use in the vicinity of the airport is at present devoted to agricultural uses. Agriculture is expected to remain the primary land use activity in and adjacent to the airport.

A no project alternative was not considered herein, as being a viable and prudent choice.

C. SOCIOECONOMIC ENVIRONMENTAL FEASIBILITY

NEED: The need for the proposed actions are supported by the anticipated levels of aviation activity summarized in Section II. The airport should, ultimately, be developed as a basic utility airport facility.

ALTERNATIVES: As previously indicated, a "No Project Alternative" is not considered a viable alternative. A relocation alternative was not considered in view of the ability of the existing site to meet the long term needs of the airport.

ENVIRONMENTAL CONSEQUENCES:

1. Noise: FAA Order 1050.16 Appendix 6, Chapter 5, Paragraph 47, Page 26, states: "No noise analysis is needed for proposals involving utility or basic transport type airports whose forecast of operations do not exceed 90,000 annual adjusted propeller operations or 700 annual adjusted jet operations."

2. Compatible Land Use: In general, agricultural land uses are compatible with the operation of an airport. The proposed improvements are consistent with such planning as has been carried out.

3. Social Impacts: The proposed actions will not involve the relocation of any existing residence or place of business.

4. Induced Socioeconomic Impacts: The proposed actions may have a positive impact upon the effort to diversify the local economy.

5. Air Quality: The proposed actions are not expected to have any negative impact upon the Clean Air Amendments of 1977.

6. Water Quality: Provided mitigating measures to control erosion during construction are followed, the proposed actions will have no significant detrimental impact upon water quality.

7. DOT, Section 4(F): There are no Section 4(F) lands proposed for acquisition.

8. Historical, Architectural, Archaeological and Cultural Resources: There are no known historical or cultural resources which would be affected by the proposed actions.

9. Biotic Communities: The proposed actions will have no significant impact upon biotic communities.

10. Endangered and Threatened Species of Flora and Fauna: There are no known endangered or threatened species in the vicinity of the airport.

11. Wetlands: There are no wetlands in the immediate vicinity of the airport.

12. Flood Plain: The airport is not located within or adjacent to a flood plain.

13. Prime and Unique Farmland: The proposed actions will remove certain amounts of farmland from production.

14. Energy Supply and Natural Resources: The proposed actions are expected to have no significant impact upon energy supplies and other natural resources.

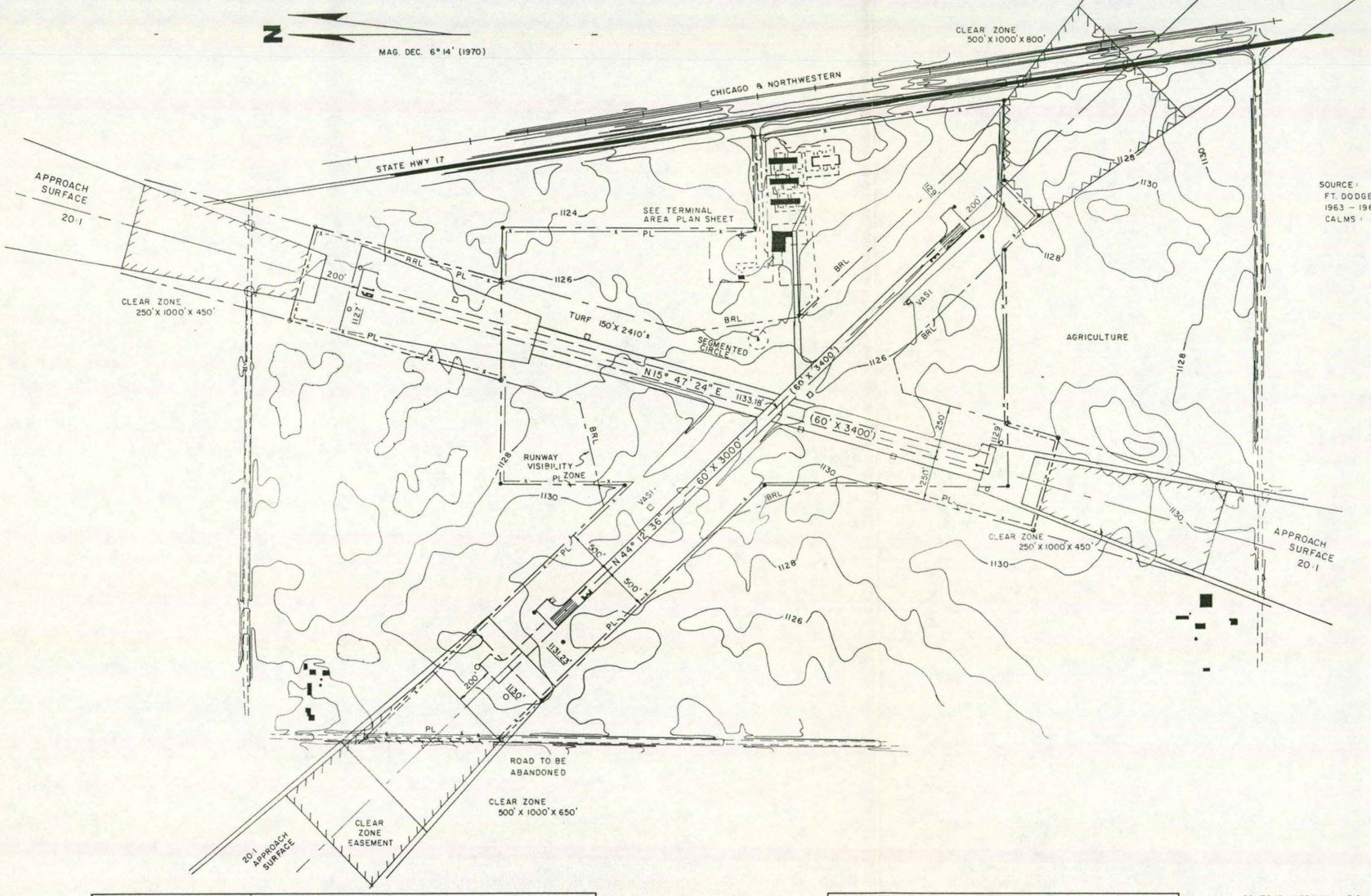
15. Light Emissions: No detrimental impacts are expected.

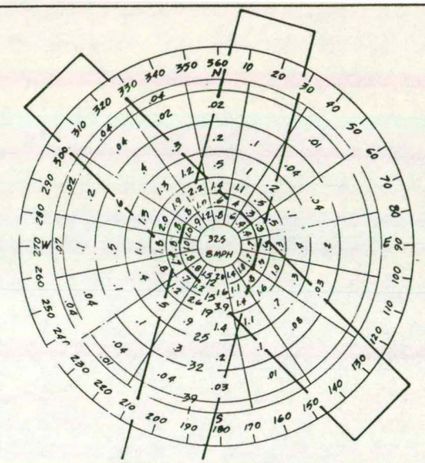
16. Solid Waste: No detrimental impact is expected.

17. Construction Impacts: Such impacts resulting from construction are of a short term nature and should have no detrimental impact provided mitigating measures are employed.

The above outlines subject matter typically contained within an Environmental Assessment. As previously noted, the Iowa DOT does not require a "full blown" Environmental Assessment. As such, no indept analysis was accomplished for items 1 through 17 above. Should any of the above have an impact or be impacted by the proposed actions, a detailed evaluation of the impact should be accomplished prior to proceeding with implementation.

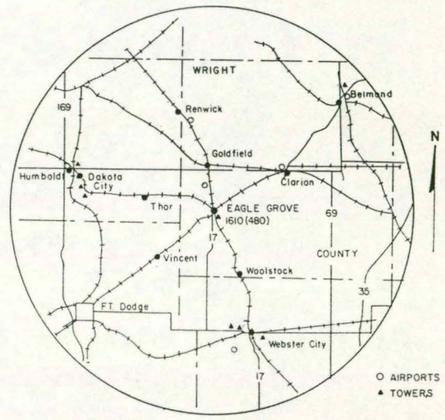
V. AIRPORT PLANS





SOURCE:
FT. DODGE MUNICIPAL AIRPORT
1963 – 1967
CALMS: 0-8 mph = 32.5 %

ALL WEATHER WIND ROSE in mph



0 5 10 in miles

LOCATION MAP

LEGEND	EXISTING	ULTIMATE
FENCE	x — x	x — x
CONTOUR	1122	1122
PROPERTY LINE P.L.	PL	PL
FACILITIES		
EASEMENT		
BUILDING RESTRICTION LINE BRL	BRL	BRL
STRUCTURES	■	□
BEACON	✦	☼
VASI-2	■ ■	□ □
REIL	●	○

CONTOUR INTERVAL : 2 foot
SOURCE : ASSOCIATED ENGINEERS
AIRPORT LAYOUT PLAN 1976

0 300 600
1" = 300'

RUNWAY DATA TABLE	RUNWAY 13/31		RUNWAY 1/19	
	EXISTING	ULTIMATE	EXISTING	ULTIMATE
EFFECTIVE GRADIENT %	0.1 %	SAME	0.2 %	SAME
WIND COVERAGE % (12 mph)	73.4 %	SAME	75.3 %	SAME
INSTRUMENT RUNWAY	VISUAL	NPI	VISUAL	VISUAL
PAVEMENT STRENGTH	12500 LB SW	SAME	TURF	12500 LB SW
APPROACH SURFACE	20:1	SAME	20:1	SAME
RUNWAY LIGHTING	MIRL	SAME	—	MIRL
RUNWAY MARKING	BASIC	NPI	—	NPI (BASIC)
NAVIGATIONAL AIDS	REIL	REIL VASI-2	—	REIL VASI-2

AIRPORT DATA	EXISTING	ULTIMATE
AIRPORT ELEVATION (ASL)	1133'	1133'
AIRPORT LOCATION POINT: LAT.	42° 43' N	SAME
LONG.	93° 55' W	
MEAN MAX. TEMP	84° F	SAME
AIRPORT & TERMINAL NAV. AIDS	—	NDB BEACON

NOTES:
ALL OBSTACLES TO BE REMOVED WITHIN CLEAR ZONE WHICH PENETRATE APPROACH SURFACE

DATE	REVISION	BY

REVISIONS

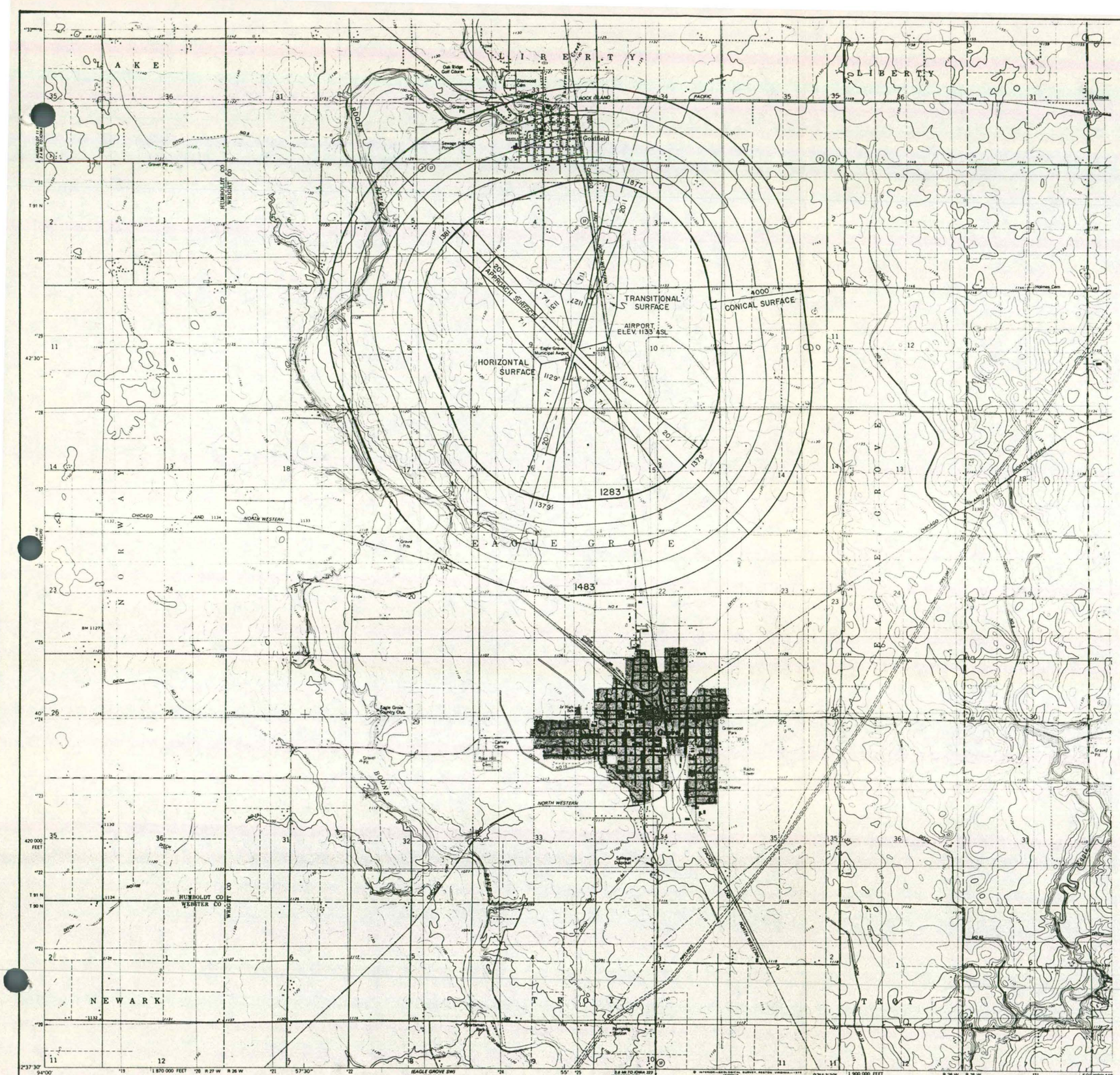
EAGLE GROVE MUNICIPAL AIRPORT
AIRPORT DEVELOPMENT PLAN

professional design services inc.

DESIGNED: JLS DATE: 5/1/80
DRAWN: JLS SCALE: AS SHOWN

AIRPORT LAYOUT PLAN

SHEET 1 OF 4



0 2000 4000
in feet

DATE	REVISION	BY

REVISIONS

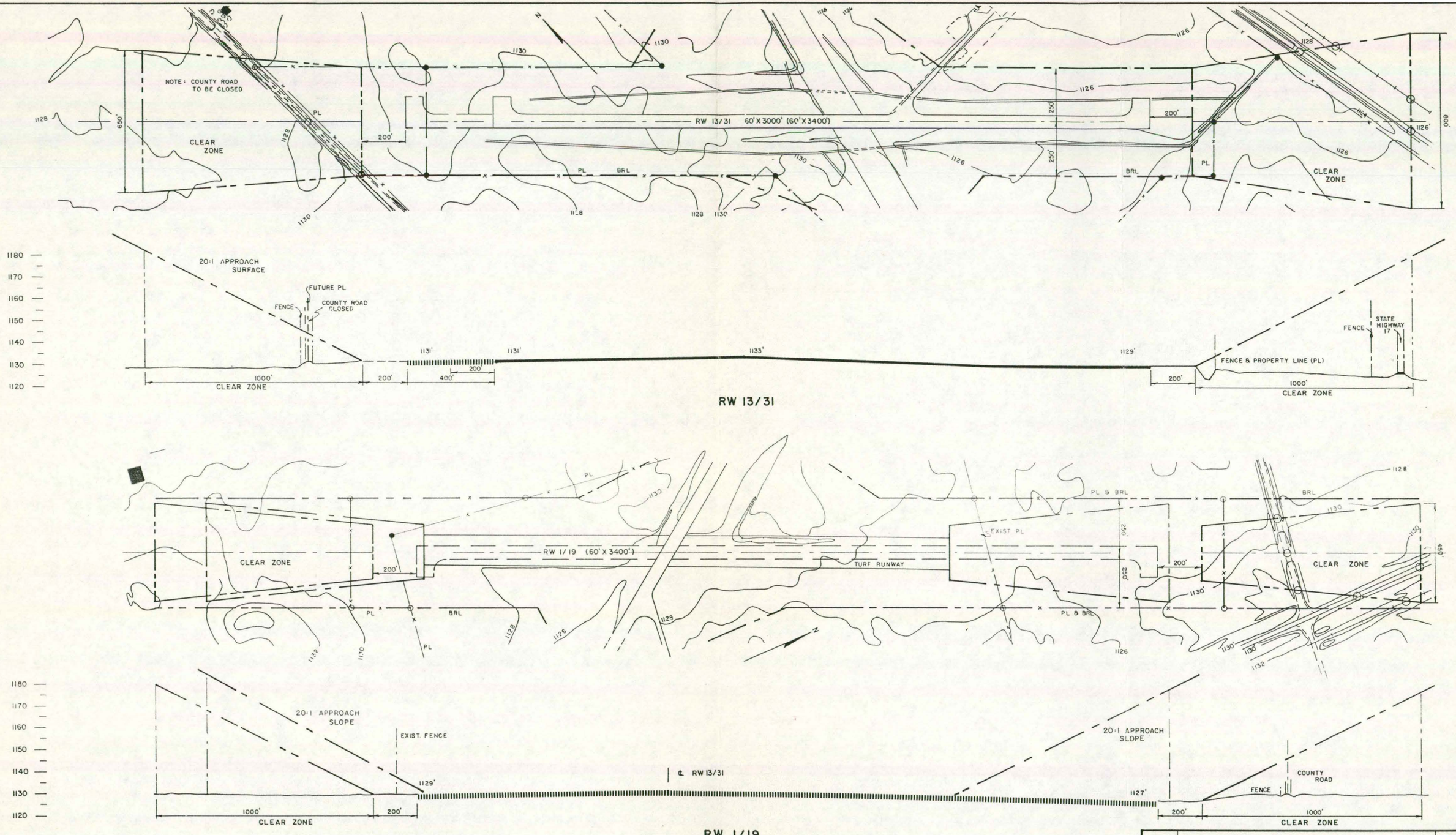
EAGLE GROVE MUNICIPAL AIRPORT
AIRPORT DEVELOPMENT PLAN

professional design services inc.

DESIGNED JLS	DATE 5/1/80
DRAWN JLS	SCALE AS SHOWN

AIRPORT AIRSPACE

SHEET 2 OF 4



RW 13/31

RW 1/19

DATE	REVISIONS	BY

REVISIONS

0 20 40 VERTICAL

0 200 400 HORIZONTAL

SCALE IN FEET

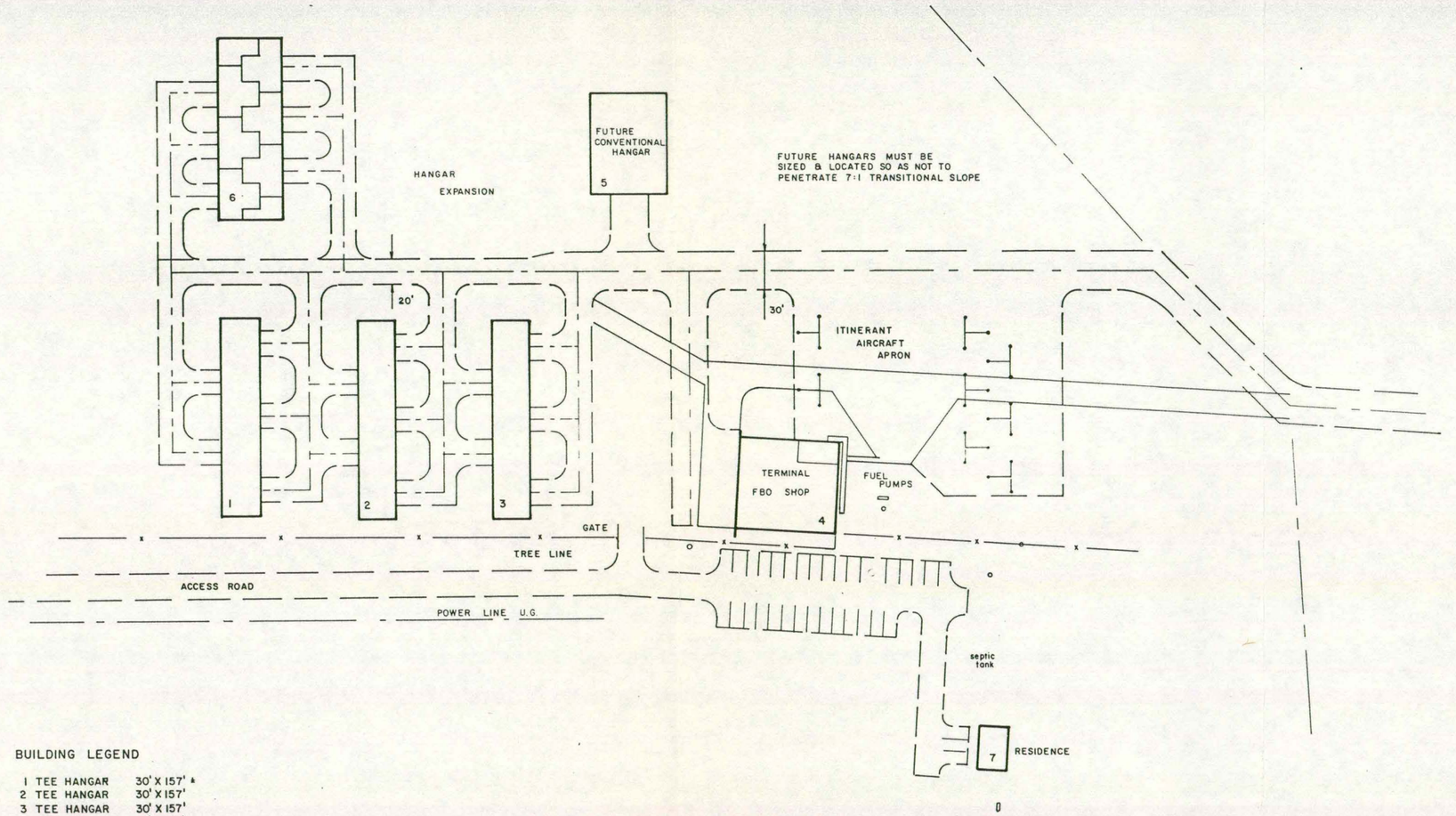
EAGLE GROVE MUNICIPAL AIRPORT
AIRPORT DEVELOPMENT PLAN

professional design services inc.

DESIGNED JLS DATE 5/1/80
DRAWN JLS SCALE AS SHOWN

CLEAR ZONE

SHEET 4 OF 4



BUILDING LEGEND

1	TEE HANGAR	30' X 157'
2	TEE HANGAR	30' X 157'
3	TEE HANGAR	30' X 157'
4	FBO SHOP	71' X 80'
5	FUTURE CONVENTIONAL HANGAR	
6	FUTURE TEE HANGAR	52' X 143'-6"
7	RESIDENCE	

REVISIONS		

EAGLE GROVE MUNICIPAL AIRPORT
AIRPORT DEVELOPMENT PLAN

professional design services inc.

DESIGNED JLS | DRAWN JLS | DATE 5/1/80 | SCALE AS SHOWN

TERMINAL AREA PLAN

SHEET 4 OF 4

VI. DEVELOPMENT SCHEDULE STRATEGY FOR IMPLEMENTATION

SECTION VI: DEVELOPMENT SCHEDULE STRATEGY FOR IMPLEMENTATION

A. INTRODUCTION

The development schedule is a listing of improvements needed at the airport over the twenty year planning period in order to satisfy anticipated aviation activity. The development schedule is divided into two five-year phases and one ten-year phase.

PHASE ONE:	1980 - 1984
PHASE TWO:	1984 - 1989
PHASE THREE:	1990 - 2000

There are a number of factors which must be considered in the establishment of the initial development schedule. These factors are:

1. Absolute need
2. Availability of financial assistance
3. Anticipated changes in aviation activity
4. Local financial constraints

While a number of the proposed actions may be desirable, they are not critical to the operation of the airport and should be considered a lower priority than others. In maintaining flexibility, the development schedule should be reviewed along with the aviation forecasts at five (5) year intervals. The development schedule should be revised to reflect changing aviation demand levels when such reviews are accomplished.

B. DEVELOPMENT SCHEDULE AND COST ESTIMATES

PHASE ONE: 1980 - 1984

ITEM 1 Land Acquisition and Fencing

A.	Land Acquisition (Fee Title)		
	1.) RW 13/31 6.3 Acres	$ 25,200	
	2.) Land Survey	1,500	
	3.) Legal and Appraisal Fees	2,500	
	TOTAL LAND ACQUISITION		$ 29,200
B.	Fencing		
	1.) 1800 L.F. at $1.75	$ 3,150	
	2.) Engr. Legal, Admin.	5,000	
	3.) Contingency	350	
	TOTAL FENCING		8,500
	TOTAL ITEM 1 LAND ACQUISITION AND FENCING		$ 37,700

ITEM 2 Clear Zone Protection

A.	Clear Zone Easements		
	1.) RW End 13 10.3 Acres ±	$ 8,240	
	2.) Land Survey	500	
	3.) Legal, Appraisal Fee	1,510	
			$ 10,250
	TOTAL ITEM 2 CLEAR ZONE PROTECTION		$ 10,250

ITEM 3 Grading, Drainage & Seeding

A.	Grading		
	1.) RW End 13 (60x400; 80x80; 200 overrun)	$ 9,600	
	2.) Taxiway (10'x300')	750	
	3.) Taxiway (30'x620')	3,450	
	4.) Apron (3357 yd^2) (825 yd^2)	4,650	
	5.) Engr., Legal, Admin.	11,000	
	6.) Contingency	3,550	
	TOTAL GRADING		$ 33,000

B.	Drainage (RW 13 Extension, Apron, Taxiway)		
	1.) Subdrain	--	
	2.) Drain Tile	--	
	3.) R.C.P. Pipe	$ 1,500	
	4.) Intakes	--	
	5.) Engr, Legal, Admin.	1,000	
	6.) Contingency	250	
	TOTAL DRAINAGE		$ 2,750
C.	Seeding & Fertilizing		
	1.) RW 13: 2.8 Acres at $300	$ 840	
	2.) Engr. Legal, Admin.	500	
	3.) Contingency	160	
	TOTAL SEEDING		$ 1,500
	TOTAL ITEM 3 GRADING, DRAINAGE, SEEDING		$ 37,250

ITEM 4 Construct Runway Extension, Taxiways and Apron (Apron: Itinerant; FBO Shop)

A.	Construct Runway Extension-RW 13		
	1.) P.C.C. Runway Extension (60'x400') (80x80) 3440 (5") S. Y. at 14.00	$ 48,160	
	2.) Subgrade Preparation 3440 S.Y. at 1.00	3,440	
	3.) Granular Subbase 750 Tons at 8.00	6,240	
	4.) Engr., Legal, Admin.	10,500	
	5.) Contingency	9,160	
	TOTAL RUNWAY EXTENSION		$ 77,500
B.	Construct Taxiways		
	1.) Widen Existing Taxiway (10'x300') PCC 334 S.Y. at 14.00	$ 4,676	
	2.) New Taxiway (30'x620') PCC 2067 S.Y. at 14.00	28,938	
	3.) Subgrade Preparation 2395 S.Y. at 1.00	2,395	

4.)	Granular Subbase 550 Tons at 8.00	$ 4,400	
5.)	Engr., Legal, Admin.	7,500	
6.)	Contingency	6,091	
	TOTAL TAXIWAY CONSTRUCTION		$ 54,000

C. Construct Apron (Itinerant, FBO Shop, Apron and Taxiway

1.)	P.C.C. Apron (4,182 yd^2) 4182 S.Y. at 14.00	$ 58,548	
2.)	Subgrade Preparation 4182 S.Y. at 1.00	4,182	
3.)	Granular Subbase 900 Ton at 8.00	7,200	
4.)	Mooring Eyes 24 at 50 each	1,200	
5.)	Engr., Legal, Admin.	12,500	
6.)	Contingency	10,870	
	TOTAL APRON		$ 94,500
	TOTAL ITEM 4 CONSTRUCT RUNWAY EXTENSION, TAXIWAY & APRON		$226,000

ITEM 5 Lighting and Navaids

A. Medium Intensity Runway Lights, RW 13/31

1.)	RW 13 Extension Stake Mounted 2 Fixtures at 50 each	$ 100	
	Base Mounted 2 Fixtures at 100 each	200	
2.)	Relocate Existing Threshold Lights RW 13 Lump Sum	500	
3.)	Trench (9") 2200 L.F. at 1.25	2,750	
4.)	Underground Cable 5KV 4400 L.F. at .50	2,200	
5.)	Relocate Taxiway Fixtures 18 at $25 each	450	
6.)	Medium Intensity Taxiway Fixtures 14 at $50 each	700	
7.)	Engr., Legal, Admin.	3,000	
8.)	Contingency	1,100	
	TOTAL LIGHTING		$ 11,000

B.	Navaids and Landing Aids		
	1.) Relocate REIL, RW 13	$ 750	
	2.) Install VASI-2, RW 13/31	12,000	
	3.) Construct Segmented Circle, Lighted Wind Tee	4,000	
	4.) Install Beacon Light	6,000	
	5.) Install NDB	10,000	
	6.) Engr., Legal, Admin.	6,000	
	7.) Contingency	5,250	
	TOTAL NAVAIDS		$ 44,000
	TOTAL ITEM 5 LIGHTING AND NAVAIDS		$ 55,000

ITEM 6 Runway Markings

A.	Non-Precision Instrument, Numbers, & Centerline		
	1.) 21000 S.F. at 0.25	$ 5,250	
	2.) Engr., Legal, Admin.	1,700	
	3.) Contingency	850	
	TOTAL PAVEMENT MARKINGS		$ 7,800
	TOTAL ITEM 6 RUNWAY MARKINGS		$ 7,800

PHASE ONE COST SUMMARY

Item 1	Fee Acquisition and Fencing	$ 37,700
2	Clear Zone Easements	10,250
3	Grading	37,250
4	Paving	226,000
5	Lighting and Navaids	55,000
6	Marking	7,800
	TOTAL PHASE ONE	$374,000

PHASE TWO: 1985 - 1989

ITEM 1 Hangar Construction

A.	6 Unit Nested Tee Hangar		
	1.) (52'x143' -6")	$ 75,000	
	2.) Engr., Legal, Admin.	10,000	
	3.) Contingency	11,000	
	TOTAL ITEM 1 HANGAR CONSTRUCTION		$ 96,000

ITEM 2 Construct Taxiway

A.	P.C.C. Taxiway to existing and proposed hangar		
	1.) P.C.C. Taxiway (20'width) 4113 S.Y. at $14	$ 57,582	
	2.) Subgrade Preparation 4113 S.Y. at $1	4,113	
	3.) Granular Subbase 950 Tons at $8	7,600	
	4.) Engr., Legal, Admin.	12,000	
	5.) Contingency	10,705	
	TOTAL TAXIWAY		$ 92,000
	TOTAL ITEM 2 TAXIWAY CONSTRUCTION		$ 188,000

PHASE TWO COST SUMMARY

Item 1	Hangar Construction	$ 96,000
2	Taxiway Construction	92,000
TOTAL PHASE TWO		$ 188,000

PHASE THREE: 1990 - 2000

ITEM 1 Land Acquisition and Fencing

A. Land Acquisition and Fencing			
1.) Crosswind Runway: 16.2 Acres ±	$ 64,800		
2.) Land Survey	3,000		
3.) Legal and Appraisal Fees	2,500		
TOTAL LAND ACQUISITION		$	70,300
B. Fencing			
1.) 4,280 L.F. at $1.75	$ 7,490		
2.) Engr., Legal, Admin.	5,000		
3.) Contingency	1,210		
TOTAL FENCING			13,700
TOTAL ITEM 1 LAND ACQUISITION AND FENCING		$	84,000

ITEM 2 Clear Zone

A. Clear Zone Easements			
1.) RW End 1: 6.9 Acres ±	$ 5,520		
2.) RW End 19: 6.9 Acres ±	5,520		
3.) Land Survey	1,210		
4.) Legal Appraisal Fee	3,750		
TOTAL ITEM 2 CLEAR ZONE PROTECTION		$	16,000

ITEM 3 Grading, Drainage and Seeding

A. Grading			
1.) RW 1/19: 7,100 at 3.00	$ 21,300		
2.) Engr., Legal, Admin.	8,200		
3.) Contingency	3,700		
TOTAL GRADING		$	33,200

B. Seeding and Fertilizing			
1.) RW 1/19	$ 4,800		
2.) Engr., Legal, Admin.	1,800		
3.) Contingency	1,200		
TOTAL SEEDING			$ 7,800
TOTAL ITEM 3 GRADING, DRAINAGE, SEEDING			$ 41,000
ITEM 4 Construct Runway			
A. Construct Runway			
1.) PCC			
24500 S.Y. at $14.00	$ 343,000		
2.) Subgrade Preparation			
24500 S.Y. at $1.00	24,500		
3.) Granular Subbase (4")			
5400 Tons at $8.00	43,200		
4.) Engr., Legal, Admin.	40,000		
5.) Contingency	62,300		
TOTAL RUNWAY			$ 513,000
TOTAL ITEM 4 CONSTRUCT RUNWAY			$ 513,000
ITEM 5 Lighting and Navaids			
A. Medium Intensity Runway Lights			
1.) RW 1/19			
Stake Mounted 50 Fixtures			
at $50 each	$ 2,500		
2.) Trench (9")			
8200 L.F. at 1.25	10,250		
3.) Underground Cable			
5KV 16,400 L.F. at .50	8,200		
4.) Engr., Legal, Admin.	5,000		
5.) Contingency	4,050		
TOTAL LIGHTING			$ 30,000
B. Navaids			
1.) Install VASI-2	$ 12,000		
2.) Install REIL	8,000		
3.) Engr., Legal, Admin.	4,000		

4.) Contingency	$ 3,000		
TOTAL NAVAIDS		$	27,000
TOTAL ITEM 5 LANDING AND NAVAIDS		$	57,000

ITEM 6 Runway Marking

A. Basic			
1.) 20,000 S.F. at 0.25	$ 5,000		
2.) Engr., Legal, Admin.	1,250		
3.) Contingency	750		
TOTAL PAVEMENT MARKING		$	7,000
TOTAL ITEM 6 RUNWAY MARKINGS		$	7,000

PHASE THREE COST SUMMARY

Item 1	Land and Fencing	$	84,000
2	Clear Zone		16,000
3	Grading		41,000
4	Paving		513,000
5	Lighting and Navaids		57,000
6	Marking		7,000
TOTAL PHASE THREE		$	718,000

C. AIRPORT REVENUE AND EXPENDITURES

As with most small general aviation airports, the annual O & M expenditures equal or exceed revenues generated by the airport. In Iowa, those airports having title to considerable amounts of farmland may have revenues in excess of O & M expenditures. In nearly all cases, such income is not adequate to implement major capital improvements.

Reference may be made to the following table regarding a statement of fund balance for the period ending June 30, 1979.

TABLE 23: STATEMENT OF RECEIPTS AND EXPENDITURES

Receipts	
General Obligation Bond Sales	$ 425,000.00
Interest	12,088.00
	437,088.00
Expenditures	
Capital Outlay	
Land	96,800.00
Land Appraisal	2,631.70
Engineering Fees	64,642.25
Interest	152.88
Bond Commission	8,500.00
Legal Fees	676.15
Runway Construction Cost	72,114.80
	$ 245,517.80
Fund Balance - June 30, 1979	$ 191,570.22

Source: City of Eagle Grove

Airport revenue by fiscal year are summarized in Table 24. Expenditures are summarized in Table 25.

TABLE 24: AIRPORT REVENUE

SOURCE:	1977-1978	1976-1977	1975-1976
Sale of Crops	6855.02	7303.58	2542.00
Hangar Rent	3368.00	4725.00	740.00
Telephone Reim	306.97	-	-
Sale of Gas	154.70	829.24	-
Insurance Claims	-	554.17	-
	10,684.69	13,417.99	3,282.63

Source: City of Eagle Grove

TABLE:25: AIRPORT EXPENDITURES

	1977-1978	1976-1977	1975-1976
Payroll	5999.49	3287.08	1200.16
New Tractor	-	-	7842.42
Engineering Service	-	-	2000.00
Equipment Maint.	-	235.57	938.87
Utilities	3227.74	544.86	753.88
Supplies/ Tele.	-	110.72	710.73
Farm Expense	-	-	646.23
Gasoline	-	909.14	521.16
Propane	-	511.31	319.97
Insurance	295.00	1326.00	83.00
Carpet/House	-	243.76	47.73
Workmen's Comp.	-	-	47.00
Group Insurance	318.20	127.50	-
Operating Supplies	2794.63	1423.21	-
Bldg. Maint.	4987.34	2032.30	-
Capital Improvements	3345.50	1617.14	-
Legal Fee	2263.18	65.00	-
Hangar Tarp	8162.00	-	-
	31,393.08	12,433.59	15,111.15

D. STATE AND FEDERAL ASSISTANCE

The Department of Transportation, Federal Aviation Administration, makes available, grants-in-aid to eligible airport sponsors, under the Airport and Airway Development Act of 1970. The 1976 Amendments to the act, currently provide up to 80 percent of the total cost on eligible items in FY 1979 and 1980. In general, eligible items include all airport requirements except those that specifically benefit the private sector. For example, hangar structures and taxiways 20 feet from the hangar, are not eligible. Parking lots and internal road systems are not eligible. Terminal buildings are not eligible except at CAB certificated air carrier airports.

- Land Acquisition
- Runway Construction
- Runway Lighting
  Apron Area Construction

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 facility components. Airport components eligible for state assistance are the same as those eligible for federal assistance.

Total assistance, available from FAA and State sources for general aviation airports, has historically not exceeded 1.2 million dollars annually. Competition for these funds is quite intense. Reference may be made to the following table concerning an estimate of future state and federal assistance for general aviation airports in Iowa.

TABLE 26: SUMMARY OF STATE AND FEDERAL ASSISTANCE: G-A AIRPORTS

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 the above table, the availability of funds are limited. When considering all state system plan airports, not much assistance is available if such funds were to be distributed evenly.

Federal and state assistance made available to the City of Eagle Grove is summarized in the following table:

TABLE 27: STATE AND FEDERAL GRANTS IN AID TO EAGLE GROVE

STATE		1958	$ 89.55
Total			$ 89.55
FEDERAL			
	-4701	1947	$ 8,200
	-4702	1947	5,192
Total			$13,392

Source: IDOT

E. FEASIBILITY

In summary, the proposed actions appear feasible only if state and federal assistance were made available. Also, it is assumed that the private sector would construct the hangar facilities.

Revenue generated by the airport is expected to do no more than retire annual O&M costs at the airport. The local match to a state or federal grant-in-aid could come from a variety of sources with a general obligation bond being most often used.

It is conceivable that Phase Three improvements may be implemented only in part. For example, land acquisition may be accomplished along with improvements limited to the establishment of a turf runway.

Twenty year airport development costs are summarized in the following table:

TABLE 28: TWENTY YEAR DEVELOPMENT COST

Period	Project Cost
Phase One (1980-1984)	$ 374,000
Phase Two	188,000
Phase Three	718,000

The cost estimate was prepared based upon 1980 construction cost estimates. As such, implementation of the proposed development schedule is subject to the following constraints and opportunities:

1. Availability of state and federal assistance
2. Local financial constraints
3. Absolute need and priorities

APPENDIX A

DEFINITIONS AND ABBREVIATIONS

Air Carrier - A person who undertakes directly, by lease, or other arrangement, to engage in air transportation.

Airport Development Aid Program - ADAP provides public sponsors financial aid for airport development. As a condition precedent to granting ADAP funds, an airport must be included in the National Airport Plan. The federal aid grant agreement requires that the airport sponsor operate the airport, as a public airport for a twenty-year period following the grant.

Airport and Airways Development Act of 1970 - The official legislation enabling the annual obligation authority of the Airport Development Aid Program during the period of July 1, through June 30, 1980, under the Federal Aviation Act of 1958.

Aircraft Operation - The airborne movement of aircraft in controlled and noncontrolled airport terminal areas and about given enroute fixes or at other points where counts can be made.

Airport Advisory Service - A service provided by Flight Service Stations at airports not served by a control tower. This service consists of providing information to landing and departing aircraft concerning wind direction and velocity, favored runway, altimeter setting, pertinent known traffic, pertinent known field conditions, airport taxi routes and traffic patterns, and authorized instrument approach procedures.

Airport Traffic Control Tower (ATCT) - A central operations facility in the terminal air traffic control system, consisting of a tower cab structure, including an associated IFR room if radar equipped, using air/ground communications and/or radar, visual signaling and other devices to provide safe and expenditous movement of terminal air traffic.

Certified Route Air Carrier - One of a class of air carriers holding certificates of public convenience and necessity issued by the Civil Aeronautics Board. These carriers are authorized to perfrom scheduled air transportation on specified routes and a limited amount of non-scheduled operations.

Commuter Air Carrier - An air taxi operator which (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed, or (2) transports mail by air pursuant to current contract with the Post Office Department (FAR 298.3).

Enplanements, Revenue Passenger - The total number of revenue passengers boarding aircraft, including originating, stopover, and transfer passengers.

Fixed-Wing Aircraft - Aircraft having wings fixed to the airplane fuselage and outspread in flight, i.e., nonrotating wings.

Flight Plan - Specified information relating to the intended flight of an aircraft, that is filed orally or in writing with air traffic control.

Flight Service Station (FSS) - A central operations facility in the national flight advisory system utilizing data interchange facilities for the collection and dissemination of NOTAMS, weather, and administrative data, and providing pre-flight and in-flight advisory service and other services to pilots, via air/ground communication facilities.

Freight, Air - Property other than express and passenger baggage transported by air.

General Aviation - That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity from the Civil Aeronautics Board, and large aircraft commercial operators.

IFR Conditions - Weather conditions below the minimum prescribed for flight under Visual Flight Rules.

Instrument Approach - An approach during which the pilot is dependent entirely upon instruments and ground-based electronic and communication systmes for orientation, position, altitude, etc.

Instrument Flight Rules (IFR) - FAR rules that govern the procedures for conducting instrument flight.

Instrument Landing System (ILS) - A system which provides in the aircraft, the lateral, longitudinal, and vertical guidance necessary for landing.

Local Operation - A local operation is performed by an aircraft that: (1) operates in the local traffic pattern or within sight of the tower; (2) is known to be departing for or arriving from flight in local practice areas; or (3) executes simulated instrument approaches or low passes at the airport.

Navigational Aid (NAVAID) - Any facility used in, available for use in, or designed for use in aid of air navigation, including landing areas, lighting; and apparatus or equipment for disseminating weather information, for signaling, for radio direction finding, or for radio or other electronic communication and any other structure or mechanism having a similar purpose for guiding or controlling flight in the air or the landing or takeoff of aircraft.

Piston-Powered Aircraft - An aircraft operated by an engine in which pistons moving back and forth work upon a crank shaft or other device to create rotational movement.

Precision Approach - An instrument approach conducted in accordance with directions issued by a controller referring to the surveillance radar display until the aircraft is turned onto final runway.

Turbojet - Aircraft operated by jet engines incorporating a turbine-driven air compressor to take in and compress the air for the combustion of fuel, the gases of combustion (or the heated air) being used to both rotate the turbine and to create a thrust producing jet.

Turboprop - Aircraft operated by turbine-propelled engines. The propeller shaft is connected to the turbine wheels, which operate both the compressor and the propeller.

Unicom - Frequencies authorized for aeronautical advisory services to private aircraft. Only one such stations is authorized at any landing area. The frequency 123.0 mcs is used at airports served by airport traffic control towers and 122.8 mcs is used for other landing areas. Services available are advisory in nature, primarily concerning the airport services and airport utilization.

VFR Conditions - Basic weather conditions prescribed for flight under Visual Flight Rules.

VFR Flight - Flight conducted in accordance with Visual Flight Rules.

VOR or Very High Frequency Omnirange Station - A specific type of range operating at VHF and providing radial lines of position in any direction as determined by bearing selection within the receiving equipment. (NOTE: This facility emits a nondirectional "reference" modulation and a rotating pattern which develops an "avariable" modulation of the same frequency as the reference modulation. Lines of position are determined by comparision of phase of the variable with that of the reference.

LIST OF ABBREVIATIONS

ATC - Air Traffic Control

ATCT - Airport Traffic Control Tower

CAB - Civil Aeronautics Board

DME - Distance Measuring Equipment

DOT - Department of Transportation

DWG - Dual Wheel Gear

DTWG - Dual Tandem Wheel Gear

FAA - Federal Aviation Administration

FAR - Federal Aviation Regulations

FAS - Flight Advisory Service

FBO - Fixed Base Operator

FSS - Flight Service Station

HIRL - High Intensity Runway Lights

IDOT - Iowa Department of Transportation

IFR - Instrument Flight Rules

ILS - Instrument Landing System

MEA - Minimum En Route IFR Altitude

MIRL - Medium Intensity Runway Lights

MSL - Mean Sea Level

NASA - National Aeronautics and Space Administration

NAVAID - Navigational Aid or Air Navigational Facility

NOTAMS - Notice to Airmen

NTS - Not to Standard or Scale

OPS - Operations

REIL - Runway End Identifier Lights

STOL - Short Takeoff and Landing

SWG - Single Wheel Gear

TACAN - Tactical Air Navigation

TVOR - Terminal Very High Frequency Omnidirectional Radio Range

UNICOM - Air to Ground Radio Communication Facilities