EMMETSBERG MUNICIPAL AIRPORT

AIRPORT DEVELOPMENT PLAN

EMMETSBURG MUNICIPAL AIRPORT

Prepared For
Emmetsburg Airport Commission
City of Emmetsburg

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AIRPORT AND COMMUNITY BACKGROUND

INTRODUCTION

The Emmetsburg Airport Commission retained Professional Design Services to prepare an Airport Development Plan for the Emmetsburg 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 Emmetsburg 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 achieve 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.

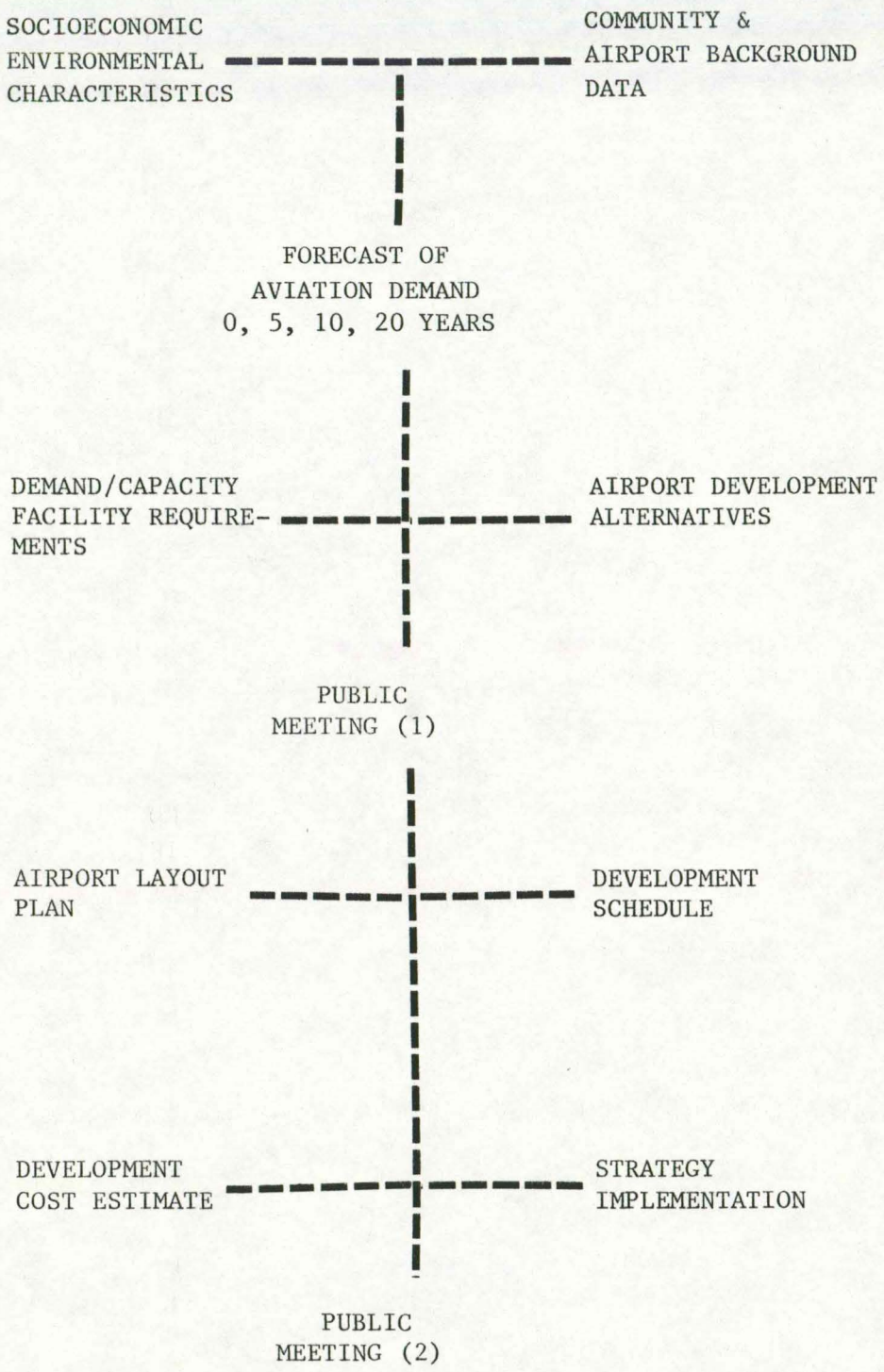


FIGURE 1-1 Airport Development Plan Planning Process

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 six sections, the first of which summarizes relevant background information used in the preparation of latter study elements.

COMMUNITY CHARACTERISTICS

Physical Setting:

The City of Emmetsburg was originally platted in 1858 and replatted in 1871 with the construction of the Milwaukee Railroad. The community was selected as the county seat for Palo Alto County and was incorporated as the City of Emmetsburg in 1871.

The land area is characterized by level to gently rolling prairie interspersed with glacial lakes. Emmetsburg is located at the south end of Five Island Lake. The West Branch of the Des Moines River provides the primary source of drainage for the county and flows in a southeasterly direction and to the west of the airport.

Soils were formed from glacial till and drift, glacial outwash, alluvium, organic deposits, wind deposited sands and lacustrine sediments. The major soil types found are noted as follows:

- Esterville sandy loam
- Esterville loam
- Linder loam
- Biscay clay loam

These soils are characterized by a 0-2 percent slope and have limitations that reduces the choice of plants and require certain conservation practices.

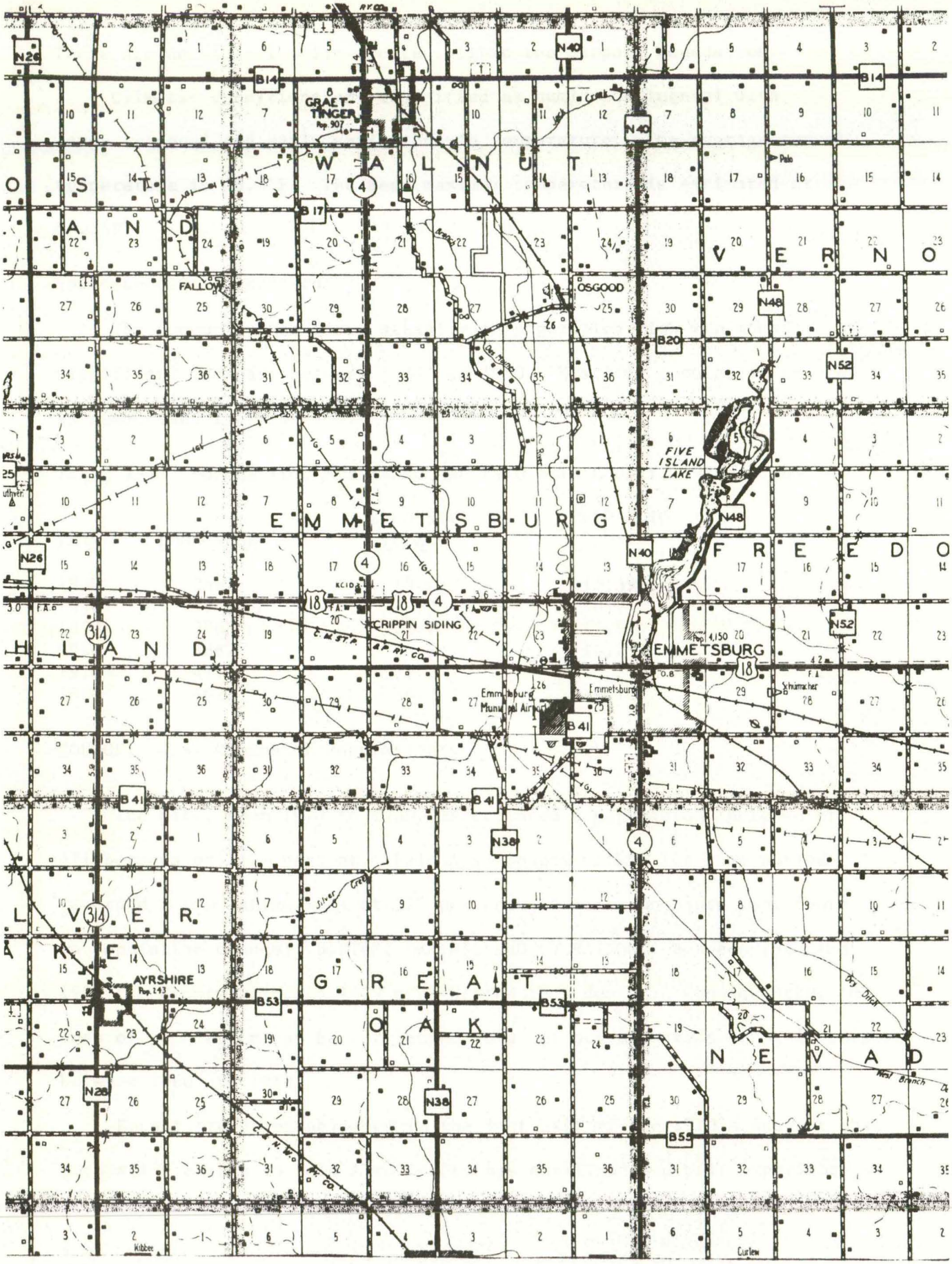


FIGURE 1-2: PROJECT LOCATION MAP

very modest rate of growth over the next twenty years. The City of Emmetsburg is expected to experience a population increase as well. By the year 2000, an estimated 5375 persons are expected to reside in the community.[1]

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

- Travel Distance
- Accessibility
- Cost Per Unit of Travel
- Type and Value of Cargo
- 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 Services

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

Employment by industry for the years 1960, 1970, and 1980 are presented in Table 1-2.

[1] SOURCE: NIROG: 1981 COMPREHENSIVE PLAN

TABLE 1-2: EMPLOYMENT BY INDUSTRY, PALO ALTO COUNTY, 1960 - 1980

INDUSTRY	NUMBER OF PERSONS 1960	1970	1980
Agriculture, Forestry & Fisheries	1887	1147	1088
Construction	227	225	268
Manufacturing	320	450	550
Transportation, Communication and Utilities	240	230	305
Wholesale Trade	196	210	285
Retail Trade	748	835	865
Finance, Insurance, and Real Estate	109	120	152
Service	884	1171	1283
Government	166	174	225
Industry Not Reported	73	---	---

SOURCE: U.S. Census of Population

Employment by travel tendency is summarized in Table 1-3 for Palo Alto County.

TABLE 1-3: EMPLOYMENT BY TRAVEL TENDENCY, PALO ALTO COUNTY, 1960 - 1980

TRAVEL TENDENCY	NUMBER OF PERSONS EMPLOYED BY YEAR 1960	1970	1980	% CHANGE 1960-1980
High	1370	1798	1983	+44.7
Medium	1280	1390	1418	+10.8
Low	2127	1377	1393	-34.5

From 1960 to 1980 there has been a dramatic decrease in the number of persons employed in low travel industries and a corresponding increase of employment in high travel industries.

The travel tendency trends established from 1960 to 1980 are expected to continue. The dominance of agriculture within the airport service will continue. However, as noted in Table 1-2, the economy is becoming more

diversified with agricultural employment decreasing as economies of scale dictate fewer and larger farming operations.

Community Land Use:

Existing land use patterns and community growth directions are characteristics which may have an impact on the future operations and service level of the airport. The 1981 Comprehensive Plan for the City of Emmetsburg indicates that recent urban growth has been concentrated primarily north and east of U.S. Highway 18 and west of Five Island Lake. Scattered in-fill development has occured south of the CMSTP Railroad right of way.

Existing land use patterns in and around the airport are generally compatible. Past and anticipated industrial development in the south west area of the City is considered compatible with the airport. Reference may be made to Figure 2-3. The immediate vicinity of the airport agricultural land uses are found to the west and north. A gravel mining operation is located south of the airport.

Future land uses are noted in Figure 2-4. Reference to the 1981 Comprehensive Plan suggests that the areas most suitable for industrial development are to the east and north of the airport. Such land use in the vicinity of the airport provide an opportunity to explore the possiblity of an air industrial park.

Consideration should also be given to the annexation of the airport to the City at the time a proposed area for annexation (reference 1981 Comprehensive Plan) is brought into the City.

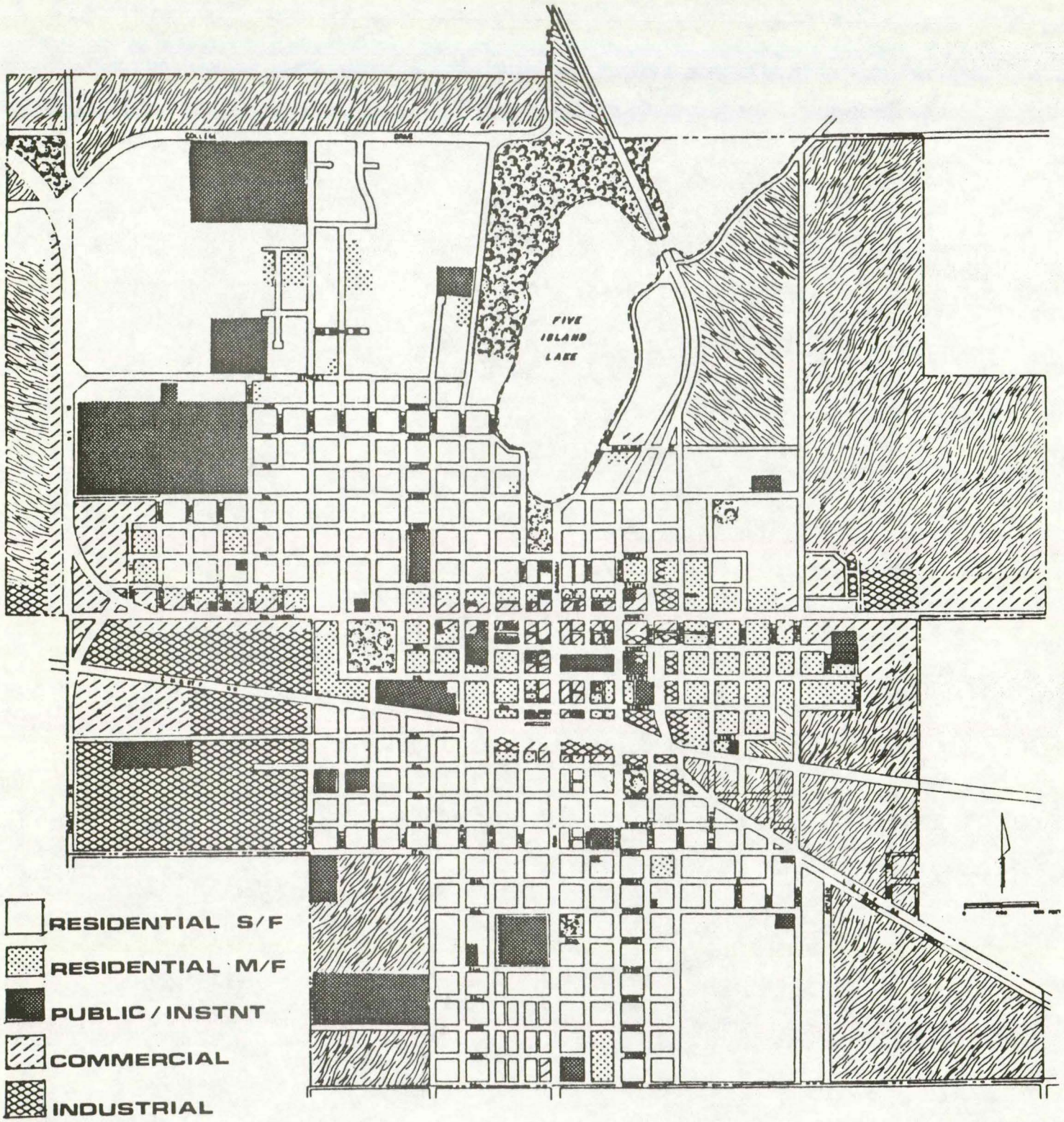


FIGURE 1-3: EXISTING LAND USE
EMMETSBURG

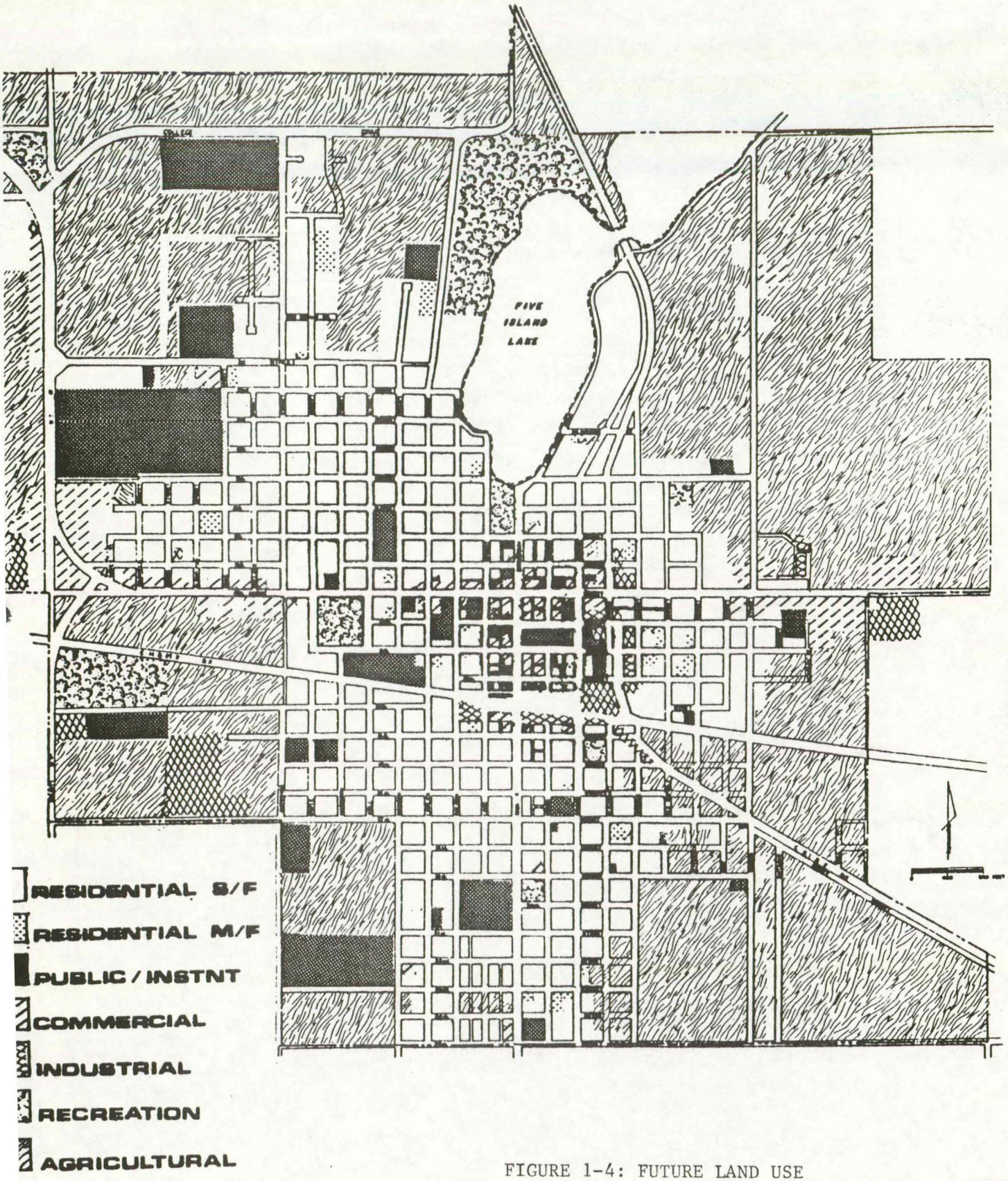


FIGURE 1-4: FUTURE LAND USE
EMMETSBURG

Community Financial Setting:

The airport is but one component of the community's infrastructure. While many general aviation airports generate sufficient revenue to satisfy annual operating and maintenance expenditures, few are able to undertake major capital type improvements without assistance and or bond issues. The airport in essence competes for limited resources with other components of the community.

Table 1-4 summarizes historic airport expenitures from 1978 through 1982.

TABLE 1-4: AIRPORT EXPENDITURES, 1978 - 1982

Expenditure	1978	1979	1980	1981	1982
Salaries		3,000	2,265	4,200	4,900
Insurance	1,181	2,883	2,788	2,445	1,315
Insurance-Tort	208	1,165			
Repairs & Maint. of Bldg.	365	147	997	421	4,300
Utilities	420	608	653	669	1,578
Supplies	4	49	1	49	34
Capital Improv.-Bldg.	53,925	3,463	1,225	2,500	
Misc.	13	2,344	1,038	917	255
Capital Improv.-Land	135,089	9,851		2,681	3,322
Total	$191,207	$23,510	$8,967	$13,882	$15,704

Fiscal year ending June 30

Source: Annual Audit - City of Emmetsburg

TABLE 1-6 shows the revenue and expenditures for the City of Emmetsburg as of June 30, 1982. Also summarized are current general obligation and special assessment bonds as of June 30, 1982

CITY OF EMMETSBURG, IOWA

Airport Capital Projects Fund

Statement of Revenues, Expenditures, and

Changes in Fund Balance - Budget (NON-GAAP Basis) and Actual

Year Ended June 30, 1982

	1982		
	Budget	Actual	Variance-favorable (unfavorable)
Revenues:			
Miscellaneous	$26,500	26,372	(128)
Expenditures:			
Home and community environment			
Transportation sub-program			
Construction contracts	264	458	(194)
Engineering and other	2,500	1,090	1,410
Total expenditures	2,764	1,548	1,216
Excess of revenues over expendutures	23,736	24,824	1,088
Other financing (uses):			
Operating transfers (out)	-	(1,088)	(1,088)
Excess of revenues over expenditures and other uses	23,736	23,736	-
Fund balance at beginning of year	(23,736)	(23,736)	-
Fund balance at end of year	$ -	-	-

Source: Annual Audit, 1982, P.44

TABLE 1-5: AIRPORT CAPITAL PROJECT FUND-1982

TABLE 1-6 STATEMENT OF REVENUE AND EXPEDITURES-EMMETSBURG

Combined Statement of Revenues, Expenditures, and Changes in Fund Balance - All Governmental Fund Types

Year Ended June 30, 1982

	Governmental Fund Types					(Memorandum Only)	
	General	Special Revenue	Debt Service	Capital Projects	Special Assessments	1982	1981
Revenues:							
Taxes and special assessments (Note 2)	$436,348	77,242	132,088	-	14,457	660,135	616,681
Licenses and permits	10,585	-	-	-	-	10,585	10,837
Intergovernmental	69,606	193,046	-	-	-	262,652	231,102
Charges for services	11,037	-	-	-	-	11,037	13,954
Fines and forfeits	10,730	-	-	-	-	10,730	8,970
Use of money and property	25,697	6,886	584	3,362	9,724	46,253	46,461
Miscellaneous	10,181	-	-	28,026	-	38,207	24,339
Total revenues	574,184	277,174	132,672	31,388	24,181	1,039,599	952,344
Expenditures:							
Community protection program							
Police	163,414	-	-	-	-	163,414	162,522
Traffic safety	9,062	-	-	-	-	9,062	4,581
Fire department	13,369	-	-	-	-	13,369	10,769
Civil defense	1,819	-	-	-	-	1,819	1,608
Street lighting	38,798	-	-	-	-	38,798	30,445
IPERS, social security and group insurance	-	25,795	-	-	-	25,795	24,857
Principal on debt	-	-	5,000	-	-	5,000	4,000
Interest on debt	-	-	1,650	-	-	1,650	1,830
Total community protection program	226,462	25,795	6,650	-	-	258,907	240,612
Human development program							
Animal control	2,520	-	-	-	-	2,520	2,364
Library	41,728	-	-	-	-	41,728	32,662
Band	1,515	-	-	-	-	1,515	1,352
Parks	21,399	8,552	-	-	-	29,951	24,375
Swimming pool	29,504	5,379	-	-	-	34,883	46,024
Recreation	16,508	-	-	-	-	16,508	21,099
IPERS, social security and group insurance	-	7,093	-	-	-	7,093	7,991
Total human development	113,174	21,024	-	-	-	134,198	135,867
Home and community environment program							
Comfort station	4,177	-	-	-	-	4,177	3,870
Airport	16,683	-	-	38,784	-	55,467	12,904
Roadway maintenance	105,773	86,295	-	88,710	5,992	286,770	504,771
IPERS, social security paid and group insurance	-	16,503	-	-	-	16,503	16,184
Principal on debt	-	-	65,000	-	-	65,000	65,000
Interest on debt	-	-	41,328	-	-	41,328	47,852
Total home and community environment	126,633	102,798	106,328	127,494	5,992	469,245	650,581

Policy and administration	$ 84,349	11,634	-	-	-	95,983	80,519
Total expenditures	550,618	161,251	112,978	127,494	5,992	958,333	1,107,579
Excess (deficiency) of revenues over expenditures	23,566	115,923	19,694	(96,106)	18,189	81,266	(155,235)
Other financing sources (uses):							
Proceeds of general obligation bond issue	-	-	-	-	-	-	141,298
Operating transfers in-net	18,409	-	-	106,208	-	124,617	170,035
Operating transfer (out) net	-	(80,406)	-	-	(23,176)	(103,582)	(180,113)
Total other financing sources (uses)	18,409	(80,406)	-	106,208	(23,176)	21,035	131,220
Excess (deficiency) of revenues and other sources over expenditures and other uses	41,975	35,517	19,694	10,102	(4,987)	102,301	(24,015)
Fund balance at beginning of year as originally reported	203,443	169,208	9,097	(12,264)	4,469	373,953	268,149
Prior years adjustment	-	-	-	-	-	-	129,819
As restated	203,443	169,208	9,097	(12,264)	4,469	373,953	397,968
Fund balance at end of year	$245,418	204,725	28,791	(2,162)	(518)	476,254	373,953

TABLE 1-6 Cont.

See notes to financial statements

3. CHANGES IN LONG-T .M DEBT

The following is a summary of bond transactions of the City for the year ended June 30, 1982:

	General Obligation	Special Assessment	Total
Bonds payable at July 1, 1981	$790,000	44,000	834,000
New bonds issued: 1980 public improvement	-	25,000	25,000
Bonds retired	(70,000)	(13,000)	(83,000)
Bonds payable at June 30, 1982	$720,000	56,000	776,000

Bonds payable at June 30, 1982 are comprised of the following individual issues:

General Obligation Bonds:

$60,000 1972 Fire Station serial bonds due in annual installments of $3,000 to $5,000 to 1988; interest from 4 to 4 3/4%	$ 35,000
$145,000 1970 Sewer Construction serial bonds are due in annual installments of $10,000 to $15,000 to 1984; interest from 5 2/10 to 6 2/10%	40,000
$83,000 1973 Street Construction serial bonds due in annual installments of $3,000 in 1976 and $10,000 thereafter until maturity in 1984; interest from 4 1/4 to 4 3/4%	20,000
$150,000 1974 Street Construction serial bonds due in annual installments of $10,000 to $15,000 to 1988; interest from 5 to 5 7/10%	60,000
$170,000 1974 Sewer Construction serial bonds due in annual installments of $10,000 and $25,000 to 1991; interest from 5 5/10 to 6 1/10%	150,000
$90,000 1975 Street Construction serial bonds due in annual installments of $5,000 to $10,000 to June 1, 1989; interest from 5 7/10 to 5 9/10%	60,000
$300,000 1975 Sewer Construction serial bonds due in annual installments of $15,000 to $25,000 to June 1, 1991; interest from 5 3/4 to 6 1/4%	225,000
$140,000 1980 General Obligation bonds due in annual installments of $10,000 and $20,000 to 1990; interest from 5 7/10 to 6 4/10%	130,000
	$720,000

Special Assessment Bonds:

$42,000 1974 Street Improvement serial bonds due in annual installments of $4,000 to $5,000 to 1984; interest from 6 1/2 to 6 9/10%	$ 10,000
$65,000 1976 Street Improvement serial bonds due in annual installments of $7,000 to $8,000 to 1984; interest from 6 to 6 3/10%	23,000
$25,000 1980 Public Improvement serial bonds due in annual installments of $2,000 to $3,000 to 1990; interest from 9.3/4 to 10%	23,000
	$ 56,000

The annual requirements to amortize all debt outstanding as of June 30, 1982 including interest payments of $189,642 are as follows:

Annual Requirements to Amortize Long-Term Debt
June 30, 1982

Year Ending June 30,	General Obligation	Special Assessment	Total
1983	119,818	18,382	138,200
1984	125,301	18,400	143,701
1985	115,304	12,357	127,661
1986	101,019	3,658	104,677
1987	101,863	4,462	106,325
1988-1991	330,130	14,948	345,078
	$893,435	72,207	965,642

TABLE 1-6 Cont.

State System Of Airports:

The 1982 IOWA AVIATION SYSTEM PLAN identifies 80 airports which will serve the needs of the state. In addition, there are 41 publicly-owned airports that are classified as "local service airports."

A local service airport is eligible for state planning safety project funding, but not development funding. These airports could, provided there was a substantial increase in activity, be placed in a higher category of development.

The state system is based upon a hierarchy of airports each providing an increasing service capability.

Basic Utility (BU):	Those airports designed to accommodate 95 percent of all aircraft weighing 12,500 pounds or less.
General Utility (GU):	Those airports designed to accommodate 100 percent of all aircraft with a gross landing or take-off weight of 12,500 pounds or less.
Basic Transport (BT):	Those airports accommodating aircraft weighing 60,000 pounds or less and commuter airline service aircraft.
General Transport (GT):	General Transport airports will accommodate all aircraft weighing 150,000 pounds or less and major airline turbojet aircraft.

The state system consists of four general transport airports and 16 basic transport category airports. Of the 60 utility category airports, 33 are classified as general utility airports and 27 basic utility facilities.

Emmetsburg is classified as a basic utility category airport, while Estherville, Algona, and Pocahontas are classified as general utility facilities. Spencer is classified as a basic transport category airport.

EMMETSBURG MUNICIPAL AIRPORT

Summary:

The Emmetsburg Municipal Airport is located on 174 acres at 43°06'-12" N Latitude and 94°42' 24" W Longitude. The facility is owned by the City of Emmetsburg and is operated under the jurisdiction of a five member airport commission. The facility is attended 24 hours a day with full services being available through-out that period.

The facility supports three runways of which two are turf facilities. The primary runway, RW 13/31, consists of a hard surfaced runway stressed to 29000 pounds (single wheel-gross weight). RW 13/31 is 3000 feet in length and 50 feet in width. The runway is lighted with a meduim intensity runway light system (MIRL). A simple abbreviated visual approach slope indicator (SAVASI) is also operational.

Runways 4/22 and 17/35 are turf facilities. RW 4/22 is 3190 feet in length and 130 feet in width. RW 17/35 is 2555 feet in length and 150 feet in width.

A non-precision instrument approach (NPI) has been established on RW 13/31. A non-directional radio beacon (NDB) is operational.

The terminal area access is provided from U.S. Highway 18 via County Road B41. A gravel parking lot can accommodate up to 40 vehicles. A terminal area office is provided within a structure which also serves as a place of residence for the airport manager. Two tee type hangar structures are located on the airport each with a capacity for five and ten aircraft. A conventional hangar facility is capable of storing three aircraft. The airport also owns a quonset type structure used by Gjerde Flying Service for its spraying activities. Seven other structures are located on airport property which are owned by private individuals on ground leased from

the airport. Of the seven tiedowns, three are hard surfaced while the remaining four are located on turf.

Obstructions noted on FAA Form 5010 are summarized as follows:

TABLE 1-7 RUNWAY OBSTRUCTIONS

Centerline	RW 4/22 Road/Road	RW 13/31 Tree/Antenna	RW 17/35 Fence/Road
Distance from RW End	8/35	1100/1400	30/0
Height above RW End	- -	25/58	4/-
Obstruction CLN Slope	0:1/0:1	36:1/20:1	8:1/0:1

Source: FAA Form 5010 - June 8, 1982

The Iowa Department of Transportation (IDOT) conducts an airport sufficiency rating analysis for each airport within the state on an annual basis. Each rating item is assigned a maximum point value with a total maximum 100 points. The basic rating is determined from an analysis of three categories:

1. Structural Adequacy

   Structural adequacy measures the ability of the landing areas, taxiways, and aprons to withstand aircraft wheel loads and climatic conditions.

2. Safety

   Safety measures the capability of the airport to provide facilities which maximize aircraft safety. Safety related features are concerned primarily with the geometric relationships of facilities on and around an airport.

3. Service

   Service measures the capability of the airport to accommodate specified types and volumes of aircraft.

Each of the above three categories are broken down into sub categories

or rating items. Paved surfaces are evaluated as follows:

1. Wearing Surface: Bituminous concrete and bituminous wearing surface are evaluated by considering irregular profile and cross section, alligator cracking, ravelling, bleeding, cracking, and rutting.
2. Base/Subbase: The structural adequacy is evaluated by computing the ratio of the projected twenty year operational activity to the 20-year operational capacity of the existing runways strength.
3. Drainage: Drainage is evaluated by how well the water is being carried away from the runway surface and base/subbase.

The evaluation of airport safety items are based primarily upon the dimensional characteristics of airport facilities to include runway length and width, lateral clearances, primary surface geometrics, etc.

1. Runway Surface Condition: the runway surface condition is evaluated in terms of roughness, friction and rutting.
2. Lateral and Runway Safety Area
3. Primary Surface Geometrics
4. Lateral Clearances
5. Vertical and Horizontal Sight Distance
6. Approach Obstructions

The above items are defined and discussed in Section Three:"Facility Requirements."

Airport service capabilities are evaluated in terms of the airports ability to provide an adequate level of service. Each of the subcategories are discussed in Section Three.

1. Runway Length

2. Runway Lighting

3. Airport Capacity

4. Airfield Lighting and Navigational Aids

5. Aprons - Terminal and Parking

6. Land Area

A generalized configuration of the airport layout and relationship to the City of Emmetsburg is depicted in Figure 1-6.

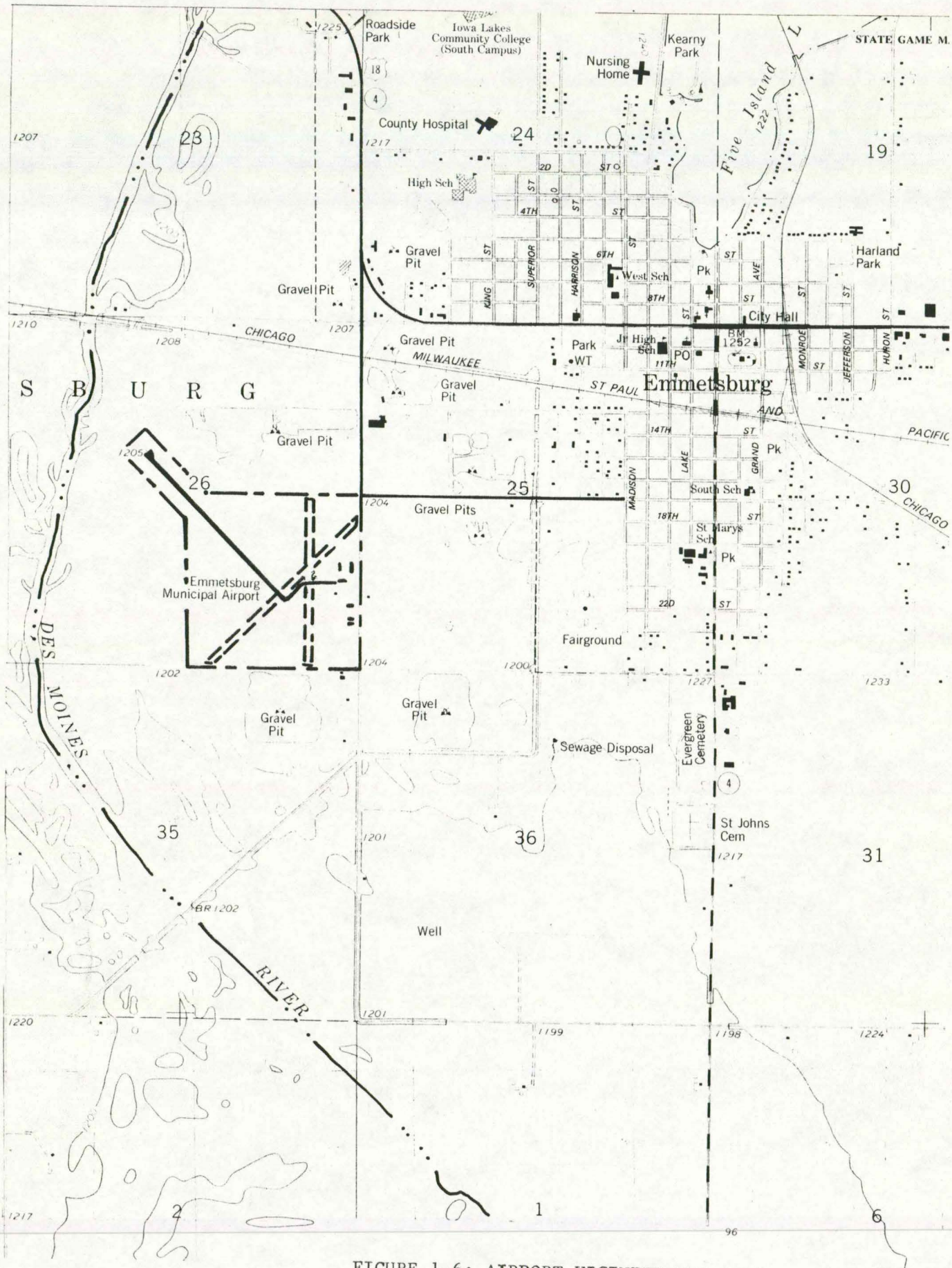


FIGURE 1-6: AIRPORT VICINITY MAP

EMMETSBURG MUNICIPAL SUFFICIENCY RATING:

	MAXIMUM RATING	ACTUAL SUFFICIENCY RATING
STRUCTURAL ADEQUACY		
RUNWAY		
Wearing Service	8.0	7.1
Base/Subbase	10.0	8.8
Drainage	6.0	5.3
TAXIWAY/APRONS	6.0	6.0
TOTAL	30.0	27.2
SAFETY		
RUNWAY		
Length	5.0	3.5
Width	4.0	2.5
Surface Condition	9.0	8.5
PRIMARY SURFACE GEOMETRICS	11.0	9.9
APPROACH OBSTRUCTIONS	7.0	6.4
TURNAROUNDS/TAXIWAYS	4.0	3.3
TOTAL	40.0	34.1
SERVICE		
RUNWAY		
Length	8.0	5.6
Lighting	5.0	3.5
CAPACITY	4.0	4.0
AIRFIELD LIGHTING	5.0	1.0
APRONS-TERMINAL/PARKING	4.0	4.0
LAND AREA	4.0	4.0
TOTAL	30.0	22.1

Items rated below tolerable standards by the IDOT are summarized as follows:

1. Safety
   Runway 17/35 - Length (40% of maximum)
2. Service
   Runway 17/35 - Length (40% of maximum)
   Airfield Lighting (20% of maximum)

EMMETSBURG = Design Class 12; 13000 - Annual Operations

II. FORECAST OF AVIATION DEMAND

FORECAST OF AVIATION DEMAND

INTRODUCTION

The forecast of aviation demand provides a basis by which to estimate short and long range numbers of based aircraft and operation activity at the Emmetsburg Municipal Airport. The mathematical values obtained reflect changes within key variables over a period of time within the airport service area. The more significant variables influencing future numbers of based aircraft and operations are noted as follows:

I. BASED AIRCRAFT
   - A. Population (size, change and characteristics)
   - B. Economic Base (industry and employment)

II. AIRCRAFT OPERATIONS
   - A. Number of Airmen (pilots)
   - B. Economic Base (industry and employment)

In addition to the key variables noted above, there are other factors which have a pronounced impact upon present and future numbers of based aircraft and operational activity. These factors relate to the availability of services (fix base operator, air taxi operator) as well as aircraft storage facilities found at the airport.

While the need to travel can be satisfied in a number of ways and by various modes, travel by air offers a convenient, safe, and cost effective way to transport personnel and cargo. The decision to travel or transport an item from one point to another is based upon a number of factors to include those summarized below:

- Distance
- Accessibility
- Cost Per Unit of Travel
- Reason for Making Trip, Length of Stay
- Number of Persons

- Type and Value of Cargo
- Availability of Other Modes of Travel
- Aviation Interest

The forecast of aviation activity represents a trend line along which actual occurrences are anticipated. The procedure for estimating future numbers of based aircraft is based upon a step down from a regional area projection within the State of Iowa. Operational estimates are made from findings at other facilities, local input, and methodologies developed by Iowa State University.

REGISTERED AND BASED AIRCRAFT

National Trends:

Nationwide forecasts indicate a continued growth in the number of registered aircraft, registered pilots and aircraft operations. In 1970 there were 131,700 registered U.S. aircraft. By 1979, this number reached 198,000 and is projected to approach 430,000 by the year 2000.

The number of registered pilots nationwide increased from 720,028 in 1970 to 844,100 in 1979. By the year 2000, 1,331,300 persons are expected to be registered pilots.

TABLE 2-1: NATIONAL TRENDS, REGISTERED AIRCRAFT AND PILOTS: 1970-2000

	Year					
	1970	1979	1980	1985	1990	2000
Registered Aircraft	131,700	198,800	208,600	261,900	310,800	430,000
Registered Airmen	720,028	844,100	899,700	1,038,800	1,155,800	1,331,300

SOURCE: IDOT 1982 IOWA AVIATION SYSTEM PLAN

Total annual operations are also expected to increase from 134,100,000 operations in 1980 to 290,000,000 by the year 2000. General aviation aircraft operations are expected to experience an average annual increase of 3.4 percent through the year 2000.

Statewide Trends

The Iowa Department of Transportation anticipates a future growth in the number of registered aircraft within the State. A continued growth in the number of registered pilots is also expected.

TABLE 2-2: REGISTERED AIRCRAFT - STATE OF IOWA: 1960 - 2000

YEAR	NUMBER	YEAR	NUMBER
1960	1700	1985	3400
1970	2600	1990	3800
1975	2800	2000	4500
1980	3000		

SOURCE: IDOT 1982 IOWA AVIATION SYSTEM PLAN

TABLE 2-3: REGISTERED AIRMEN - STATE OF IOWA: 1965 - 2000

YEAR	NUMBER	Per 10,000 Population
1965	7,963	29
1970	12,432	44
1975	10,802	38
1980	11,731	40
1985	12,043	40
1990	12,353	40
2000	12,812	40

SOURCE: IDOT 1982 IOWA AVIATIONS SYSTEMS PLAN

The IDOT projection of registered aircraft was based upon a simple linear regression analysis of historic trends. Projections of registered pilots were based on the ratio of average county pilots to total state population for the period 1970 - 1977. IDOT estimates of future general aviation activity in the 1982 Systems Plan are somewhat lower than the estimates presented in the 1978 Plan.

Regional Trends:

Table 2-4 summarizes historic numbers of registered aircraft for the years 1972 through 1982 for Clay, Buena Vista, Dickinson, Emmet, Kossuth, Humboldt, Pocahontas, and Palo Alto Counties. As noted, the number of registered aircraft in the 8 county area has experienced a modest increase.

TABLE 2-4: REGISTERED G-A AIRCRAFT, EIGHT COUNTIES; 1972 - 1982

YEAR	8 COUNTY TOTAL	PALO ALTO COUNTY AIRCRAFT	PERCENT OF TOTAL
1972	195	10	5.1
1973	162	10	6.2
1974	164	12	7.3
1975	174	13	7.4
1976	201	12	5.0
1977	205	18	8.8
1978	228	26	11.4
1979	217	25	11.5
1980	279	24	8.6
1981	207	24	11.6
1982	260	25	9.6
			8.4% Average

SOURCE: FAA, Census of U.S. Civil Aircraft, 1972 - 1976
IDOT, Aeronautics Division, 1977 - 1982

An insight into potential numbers of aircraft that may be based at Emmetsburg can be obtained from observing regional trends. A second degree linear equation was utilized to fit a trend line to observed data for years 1972 to 1982. Reference may be made to Figure 2-1: "Registered G-A Aircraft, Eight County Area, 1972 - 1982". As noted in the graph, the calculated trend line approximates actual observations. Future numbers of registered aircraft through the year 2002 were estimated using the equation $Yc = a + bx + cx^2$

where: Y = Number of Aircraft
X = Year
a = 204.4
b = 8.75
c = 0.396

TABLE 2-5 summarizes the growth of registered aircraft within the eight county area for the years 1982 through 1986, 1992, 1997, and 2002.

TABLE 2-5: REGISTERED G-A AIRCRAFT, EIGHT COUNTIES, 1982 - 2002

YEAR	EIGHT COUNTY TOTAL
1982	258
1983	272
1984	285
1985	300
1986	315
1992	405
1997	512
2002	642

Clay, Buena Vista, Dickinson, Emmet, Kossuth, Humboldt, Pocahontas, Palo Alto

The calculated values through 1992 are within anticipated increases; however, the values for 1997 and 2002 may be somewhat high unless there is a significant increase in population or change in the economic development patterns of the region.

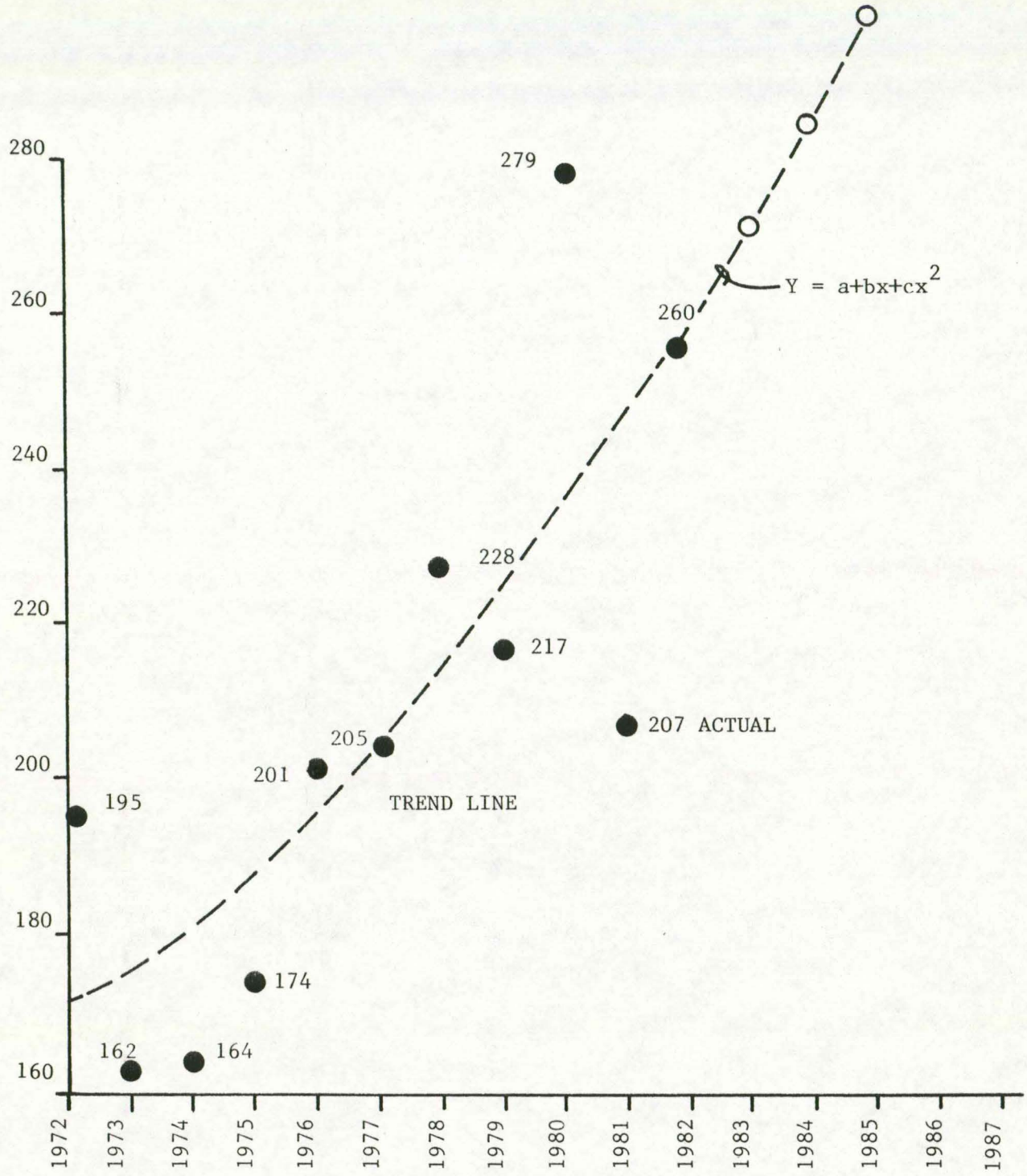


FIGURE: 2-1 REGISTERED AIRCRAFT, EIGHT COUNTIES, 1972-1987

Population totals for the eight counties changed little from 1970 to 1980. There were 127,269 persons residing in the eight counties in 1970. In 1980, 127,542 persons resided in the eight county area. With the exception of Clay, Dickinson, and Buena Vista, the remaining six counties experienced a population loss. Population trends are significant in that there is a correlation between population (numbers) and aircraft.

Table 2-6 summarizes the ratio of registered aircraft to county population in 1980.

TABLE 2-6: RATIO OF AIRCRAFT TO POPULATION - EIGHT COUNTIES - 1980

COUNTY	POPULATION	REGISTERED AIRCRAFT	AIRCRAFT PER 10,000 POP.
Clay	19,576	33	16.85
Buena Vista	20,774	32	15.40
Dickinson	15,629	35	22.39
Emmet	13,336	22	16.47
Kossuth	21,891	53	24.11
Humboldt	12,246	35	28.58
Pocahontas	11,369	25	21.99
Palo Alto	12,721	26	20.43
TOTAL	127,542	261	20.46 Average

SOURCE: U.S. Census of Population - 1980
IDOT Aeronautic Division

As noted, the region recorded an average of 20.46 registered aircraft per 10,000 population. Palo Alto County at 20.43 registered aircraft per 10,000 population was close to the regional average. This number is well above the state wide average of 13.67 aircraft per 10,000 population.

PALO ALTO COUNTY TRENDS

The Emmetsburg Municipal Airport Service Area coincides, for the most

part, with Palo Alto County. As noted in Table 2-4, the number of registered aircraft within the Palo Alto County experienced a modest rate of growth from 1972 through 1978. The period from 1978 to 1982 reflects stability with typical increases and decreases of one aircraft from year to year.

Because of the data base and the small numbers dealt with, a decision made locally could drastically alter any estimates made, herein. The validity of the estimates come from the long term trend within the area. As historical data would indicate, decisions are made to relocate aircraft from one airport to another for reasons ranging from personal, to cost and services. Such events, while affecting a specific airport, do not influence overall regional trends.

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

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

SOURCE: 1978, SASP, p. 38

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

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

SOURCE: 1978, SASP, p. 39

Current registered aircraft owners with a Palo Alto County mailing address are summarized in Table 2-7. Of the 22 aircraft, 18 have an Emmetsburg mailing address. Three aircraft record a West Bend address while two reported a Ruthven mailing address. An update of Table 2-7 in July 1983 by the Airport Manager revealed a loss of six aircraft (from Table 2-7) and a gain of two new aircraft for a net loss of four aircraft. Such annual variations are common at smaller general aviation airports for reasons previously discussed.

TABLE 2-7: REGISTERED AIRCRAFT - PALO ALTO COUNTY - 1983

NAME	MAILING ADDRESS	NUMBER
Gjerde, Alan	Emmetsburg	1065B
Kuivanen, Gordon	Emmetsburg	1345L
Durnell, Morris		
Hofstad, Gerald	Emmetsburg	2112D
Leuer, John	Emmetsburg	2150E
Kragt, Dr.		
Meyer Farm Ltd.		
Voight	Emmetsburg	222CB
Dicks Typewriter Sale & Service	West Bend	28347
Emmetsburg Aero Club	Emmetsburg	34728
Emmetsburg Cardinal	Emmetsburg	35914
Davis, Wayne	Emmetsburg	39845
Palo Alto Flyers	Emmetsburg	733RG
Molitor, Roger	Ruthven	7186R
Christensen, Frank	West Bend	7655X
Gjerde, Alan	Emmetsburg	7717V
Fogary Flying Svs.	West Bend	87986
Rustad, Curtis	Ruthven	8850N
O'Leary, William	Emmetsburg	9102S
Kerber, Phil	Emmetsburg	9382N
O'Leary, Robert	Emmetsburg	9403W
Johannsen, Donald	Emmetsburg	97751
Gjerde, Alan	Emmetsburg	9862R
Underwood, Darol	Emmetsburg	6765H
Place Gilbert	Emmetsburg	174GP

SOURCE: IOWA DOT - June 1983
Aeronautics Division

An estimate of the number of aircraft to be registered in Palo Alto County and based at the Emmetsburg Municipal Airport are presented in the following table.

TABLE 2-8: BASED AIRCRAFT, EMMETSBURG MUNICIPAL AIRPORT, 1982 - 2002

YEAR	LOW	BASED AIRCRAFT ANTICIPATED TREND	HIGH
1982	25	22	22
1983	25	23	23
1984	24	24	24
1985	24	24	25
1986	24	25	26
1992	24	29	34
2002	25	40	54

LOW: 20.4 aircraft per 10,000 population

HIGH: 8.4% of regional non-linear trend line

A zero to minimal growth in the number of aircraft based at Emmetsburg is expected through 1986. The remaining fifteen years of the twenty year planning period is expected to experience modest increase in the number of based aircraft. By the year 2002 some forty aircraft are expected to be based at the facility. The actual number of based aircraft is expected to deviate above and below the anticipated trend line. Reference may be made to Figure 2-2.

The future mix of based aircraft is expected to consist of single and light twin engine aircraft having a gross landing or take off weight of 6000 pounds or less. The 1983 based aircraft mix consisted of twenty-one single engine aircraft and one light twin.

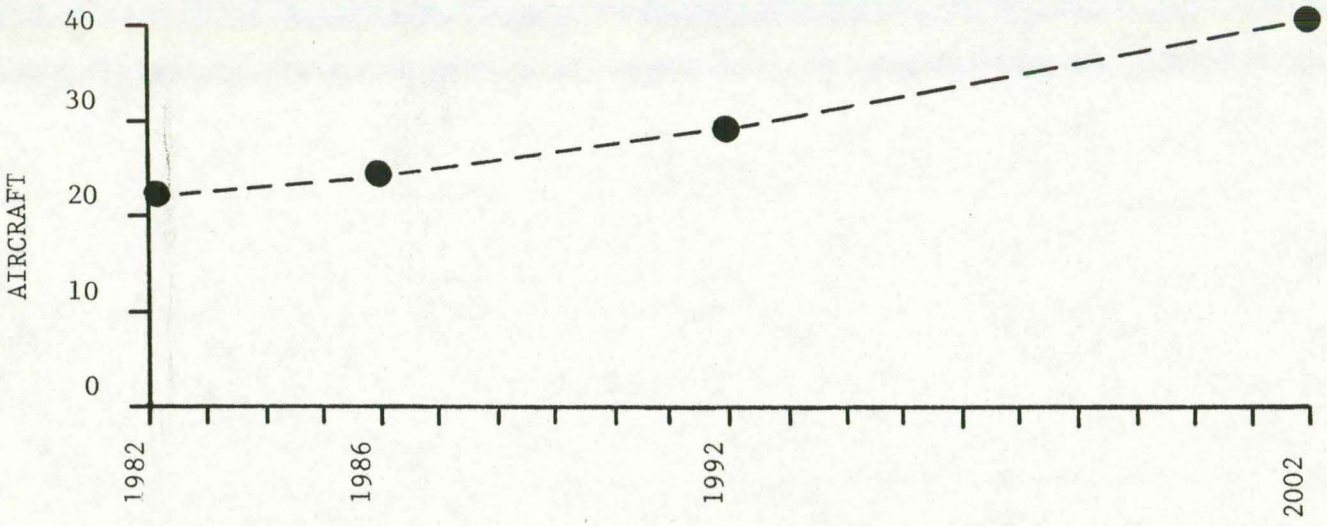


FIGURE 2-2: BASED AIRCRAFT, EMMETSBURG, 1982 - 2002

AIRCRAFT OPERATIONS

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 an operation. A "touch and go", for example, counts as two operations.

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

1. operates within the local traffic pattern or within sight of the control tower;

2. is known to be departing for or arriving from local practice areas; or

3. executes simulated instrument approaches of low passes at the airport.

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

1. Total annual aircraft operations
   - Total annual local
   - Total annual itinerant

2. Peak day and peak hour operations

Aircraft operations are a function of the following elements:

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

Without a daily log of operational activity, an estimate of total annual itinerant and local operations are most often derived from a random survey or local sources. A high degree or correlation has typically been found between aircraft operations and service area population, based aircraft and registered airmen.

Table 2-9 summarizes the historic and future number of airmen to population from 1965 through the year 2000.

TABLE 2-9: REGISTERED PILOTS - IOWA, 1965 - 2000

YEAR	IOWA PILOTS	PILOTS / 10,000 POPULATION
1965	7,963	29
1970	12,432	44
1975	10,802	38
1980	11,731	40
1985	12,043	40
1990	12,353	40
2000	12,812	40

SOURCE: IDOT 1982 IOWA AVIATION SYSTEM PLAN

The 1980 ratio of forty airmen per 10,000 population was used to estimate future numbers of resident airmen in Palo Alto County. As noted in Table 2-9, the Iowa DOT anticipates the ratio of airmen to population to remain constant through the year 2000. Deviation from the state wide average will vary from county to county with various social and economic characteristics of the population being key variables. In addition, local efforts to attract residents to aviation will also provide a basis in which local numbers may exceed the state wide average.

Reference may be made to Table 2-10 concerning future numbers of airmen in Palo Alto County. As noted, the number of airmen is expected to remain somewhat stable through the year 2002.

TABLE 2-10: AIRMEN - PALO ALTO COUNTY, 1982 - 2002

YEAR	POPULATION	AIRMEN	YEAR	POPULATION	AIRMEN
1982	12,311	49	1986	11,718	47
1983	12,106	48	1992	11,853	47
1984	11,901	48	2002	12,177	49
1985	11,696	47			

Total annual aircraft operations were computed utilizing the following equation:

$$\text{Log (Total Annual Operations)} = 2.614 + 0.501 \text{ Log (Based Aircraft X Airmen)}$$

The same variables were used to estimate itinerant operations:

$$\text{Log (Total Itinerant Operations)} = 1.865 + 0.605 \text{ Log (Based Aircraft X Airmen)}$$

The above models were obtained from the 1978 Iowa State Airport System Plan Update prepared by the Engineering Research Institute, Iowa State University. The models (equations) accounted for 88 and 95 percent of the variation respectively.

TABLE 2-11: GENERAL AVIATION OPERATIONS, EMMETSBURG MUNICIPAL AIRPORT
1982 - 2002

YEAR	ANNUAL OPERATIONS	ANNUAL ITINERANT OPERATIONS	ANNUAL LOCAL OPERATIONS
1982	13,594	5009	8,585
1986	13,906	5148	8,758
1992	15,289	5773	9,516
2002	18,341	7191	11,220

Some 13,757 annual aircraft operations were estimated for 1983. A very modest growth is anticipated through the year 2002 with total annual operations placed at 18,341. The number of itinerant operations are expected to increase by 43.6 percent over the twenty year planning period to 7191 by 2002. Local operations will increase from 8585 in 1982 to 11,220 by 2002 or by 30.7 percent.

The majority of aircraft operations are expected to be made by single and light twin engine aircraft. For planning purposes the following assumptions were made:

1. Aircraft Approach Categories:
   A. Category A Aircraft: Speed less than 91 knots
   B. Category B Aircraft: Speed 91 knots or more but less than 121 knots

2. Airplane Design Group:
   A. Airplane Design Group I : Wingspan up to but not including forty-nine feet.
   B. Airplane Design Group II: Wingspan up to but not including seventy-nine feet.

The majority of aircraft operations are expected to be made by aircraft with an approach speed of 91 knots or less and a wingspan under 49 feet. Sioux Valley Hospital and General Telephone Company make occasional flights to Emmetsburg using a King Air. Total operations by heavy twins are below 500 annual itinerant operations per year.

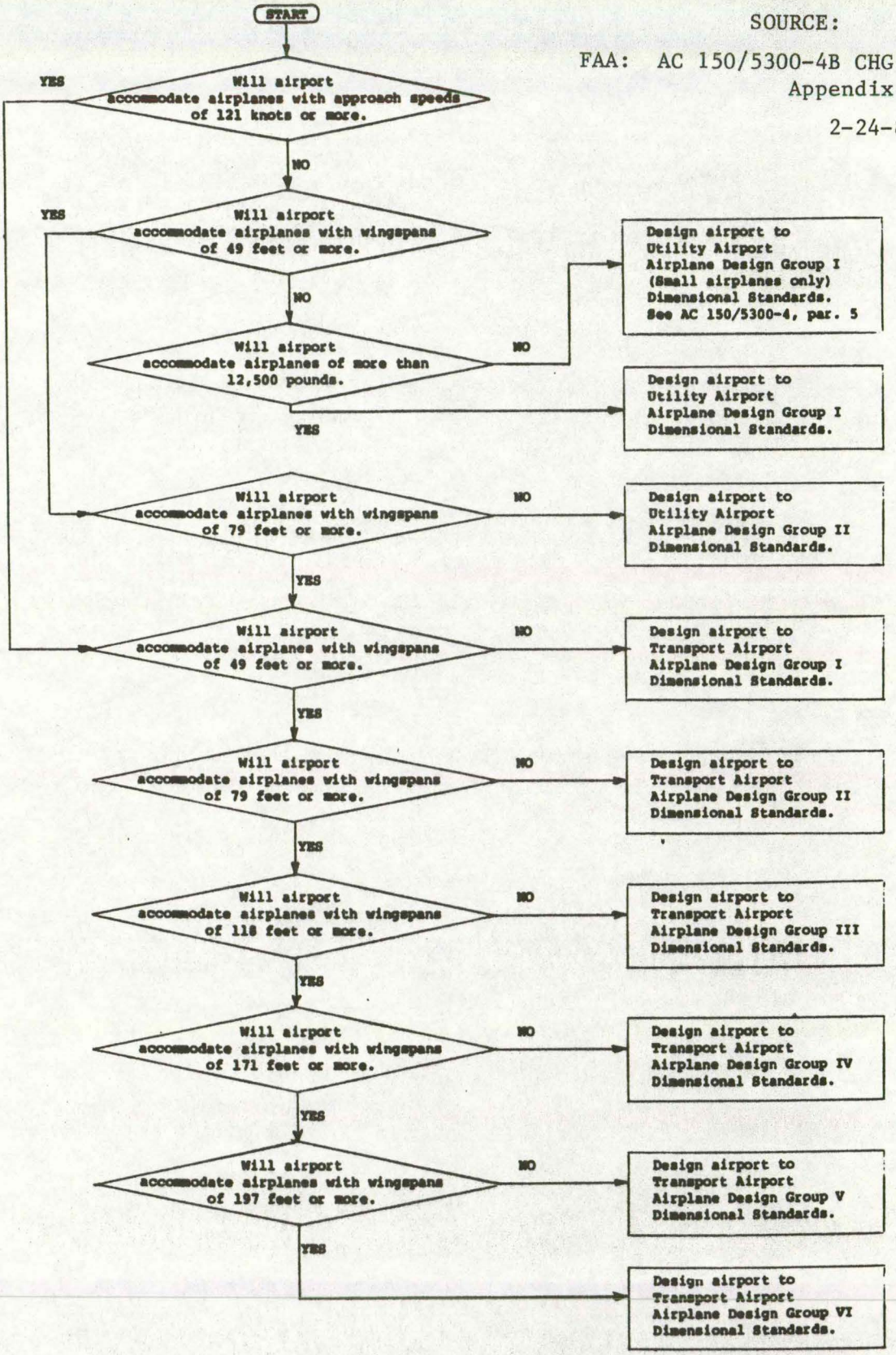
Based upon the forecast of based aircraft and aircraft operations, the Emmetsburg Municipal Airport should be designed to Basic Utility - Stage Two Standards or Airplane Design Group I. Reference may be made to Figure 2-3.

FIGURE 2-3: **AIRPLANE DESIGN GROUP CONCEPT**

SOURCE:

FAA: AC 150/5300-4B CHG 6
Appendix 1

2-24-83



AIR PASSENGERS AND AIR FREIGHT

Passengers:

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

TABLE 2-12: AIR PASSENGERS, 1983 - 2002

YEAR	AIR PASSENGERS
1983	7,623
1986	7,722
1997	8,660
2002	10,682

Air Freight:

The tonnage of air freight was estimated at eight pounds per enplaned passengers.

TABLE 2-13: AIR FREIGHT, 1983 - 2002

YEAR	AIR FREIGHT
1983	15.2 Tons
1986	15.4 Tons
1992	17.3 Tons
2002	21.4 Tons

COMMUTER AIR CARRIER / AIR TAXI SERVICE

The Airline Deregulation Act of 1978 provided for the phase out of the Civil Aeronautics Board (CAB) control over pricing, market entry and market exit. Consequently, there has been a pronounced effect upon air service in Iowa with hte communities of Ottumwa and Clinton being served at present by commuter air carriers. Certificated air service by major carriers is also expected to be replaced by commuter service in Fort Dodge, Mason City, Dubuque and Burlington.

The Iowa DOT concluded in the 1982 State Airport Systems Plan that commuter air carrier service to Iowa communities, other than those with prior air carrier service, appears marginal.

> "Although commuter air service has been established in several very small markets in Iowa (Clinton, Marshalltown and Spencer), the prospects for the expansion of such services in Iowa are limited"
>
> Source: IDOT, 1982 Iowa Aviation Systems Plan, p.27

The air taxi is the most appropriate carrier of air passengers and cargo for Emmetsburg. Gjerde Flying Service is based at the Emmetsburg Municipal Airport offering air taxi and air ambulance service.

III. FACILITY REQUIREMENTS

AIRPORT FACILITY REQUIREMENTS

INTRODUCTION

Section Three outlines those facilities required to meet and satisfy anticipated aviation activity through the year 2002. Facility requirements outlined herein are based upon Federal Aviation Administration (FAA) and Iowa Department of Transportation (IDOT) standards. It should be noted that the Iowa Department of Transportation has taken exception to conformance with FAA guidelines in some cases. The most salient of these relate to the crosswind runway.

> "FAA standards suggest that crosswind runways at utility airports should be paved whereas the premise here is that these will remain unpaved."
>
> (1978 IDOT SASP, p.54)

Such deviation by the IDOT is based upon the assessment of future funding levels for airport improvements in the State of Iowa. Whereas the FAA standards represent the ultimate level of development, the IDOT maintains that such deviation from FAA guidelines is an appropriate subject for detailed review within the planning process.

The objective herein is to identify those facility needs which will enhance the operational capability and safety of the existing airport site in a viable and prudent manner.

As noted in Section II, the airport should ultimately be developed to Basic Utility-Stage II standards. Section Three examines the existing level of service provided by each air and landside component of the airport.

Runway Alignment

Runway alignment is based upon a number of factors. The most salient of these is the level of wind coverage provided. Other factors often are of equal importance. Among these are topography, cultural features, physical features, land ownership and environmental considerations.

The optimum runway orientation is one which will provide the airport a 95 percent level of wind coverage at a crosswind component value of 12 m.p.h. (10.5 knots) for utility airports and 15 m.p.h. for larger than utility airports. It would be desirable to orient a single runway so as to obtain the 95 percent wind coverage. In Iowa, the wind is so varied that a crosswind runway is required to supplement coverage obtained from the primary runway.

Since there is no wind data available for the Emmetsburg Municipal Airport, wind data tabulated at the Worthington Municipal Airport was used for determining wind coverage by the existing runway alignments. Reference may be made to Figure 3-1 regarding the percentage of wind by knots and direction.

The orientation for the existing runway facilities is as follows:

Primary Runway	RW 13/31	N 43°25'W (true)
Crosswind Runway	RW 04/22	N 46°30'E (true)
Crosswind Runway	RW 17/35	N 0° (true)

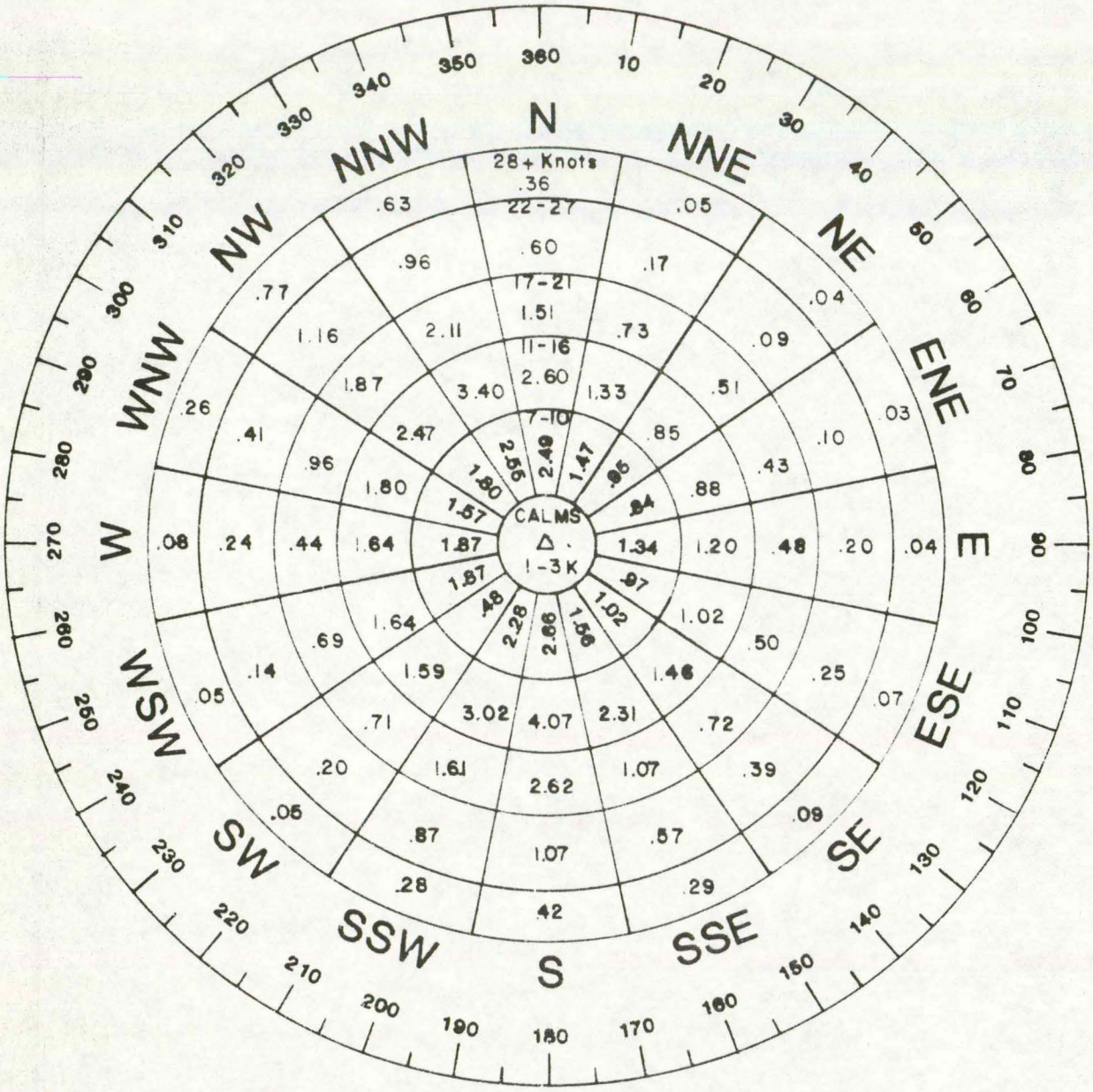
Based upon Worthington data and a 10.5 knot crosswind component value, the primary runway provides 75.7% coverage. It should be noted that local topographic conditions may alter local wind characteristics somewhat.

The crosswind runway should be aligned so as to obtain required length and optimum wind coverage within site and environmental constraints.

The IDOT, as a rule of thumb, recommends a 60 degree separation between runway facilities. Although this is not a standard, it does minimize a duplication of wind coverage. Such consideration is relevant where funding is limited and a maximum return is expected from the investment in crosswind runway facilities.

Runway 17/35 is considered fixed. The two existing turf facilities should be assessed in terms of wind coverage, ultimate length requirements, etc. and a single crosswind runway orientation selected.

Based upon wind conditions and runway length requirements, a runway orientation of N 20° E would provide the best supplemental coverage.



ALL WEATHER

Δ CALM - 10.82%
1-3 KNOTS - 3.12%
VFR - 83.02%
IFR* - 16.98%

*(≤ 1000,3)

Source: Worthington Municipal Airport (Republic Airlines)

FIGURE 3-1: ALL WEATHER WIND ROSE

Runway Length and Width

The runway length requirement at a given airport facility is a function of the aircraft fleet using the facility. As previously noted, an airport developed to Basic Utility Standards would generally satisfy aviation demand over the twenty-year planning period. Basic transport category aircraft would be expected to utilize area BT airport facilities.

Runway length requirements were obtained from FAA AC 150/5300-4B, CHG. 6, page 13 referenced herein as Figure 3-2. The runway length curves are based upon performance information from aircraft flight manuals and assumes 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.

Runway elevation and temperature (normal maximum in degrees Fahrenheit) are left as variables.

Given the following:

- Elevation: 1205 feet (ASL)
- Temperature: 85.9°F (Sioux City)

The runway length requirement for the Emmetsburg Municipal Airport is as follows:

- Basic Utility Stage Two Airport: 3400 feet (Figure 3-2)

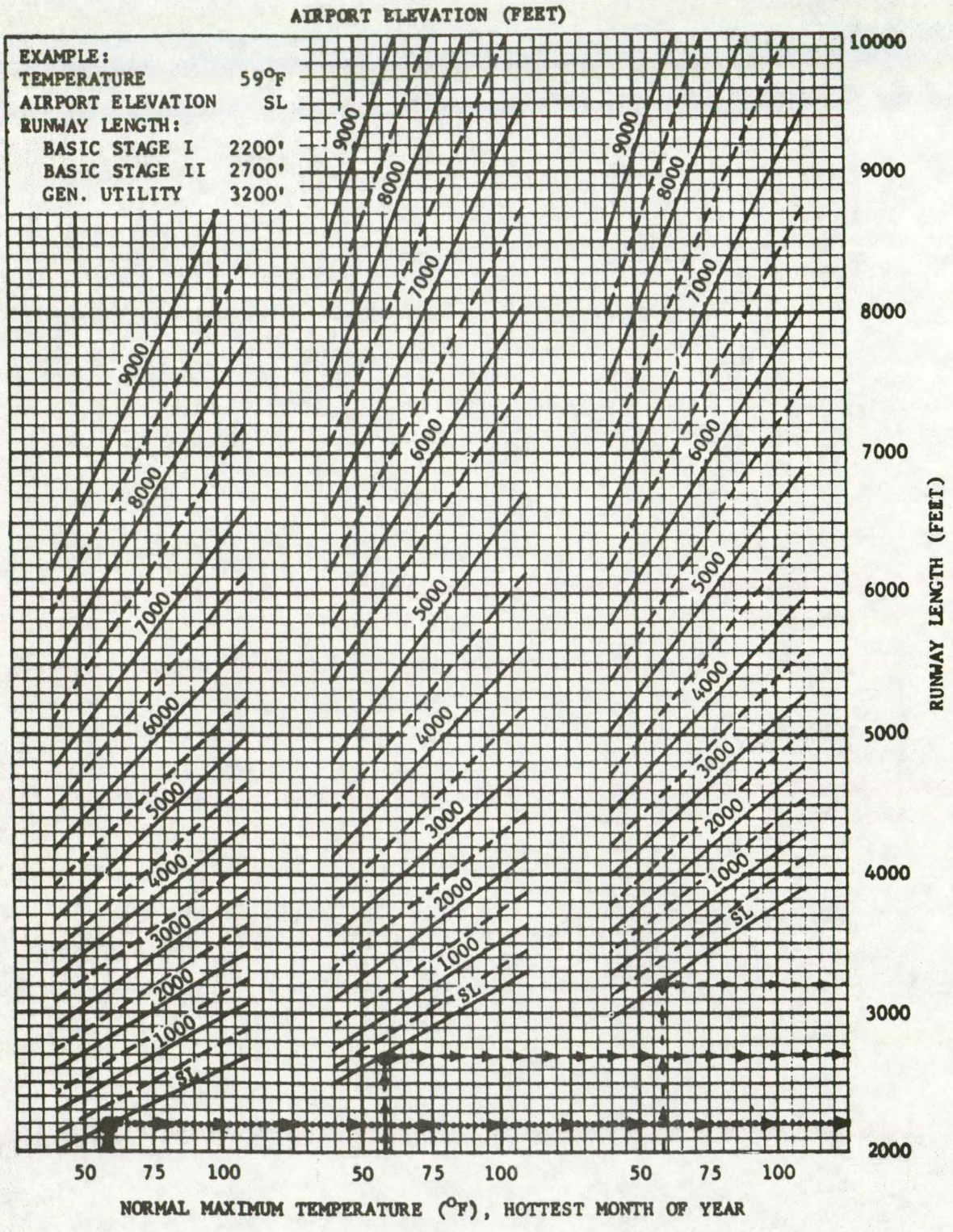


FIGURE 3-2

RUNWAY LENGTH

Where it is not feasible to construct a runway to the desired length, no less than 80 percent of the desired length should be constructed. While the crosswind runway should be the same length as the primary runway, it should in no case be less than 2720 feet.

For planning purposes an ultimate length of 3400 feet is recommended. Based upon anticipated use, it would not appear to be cost effective to extend the runay length beyond 3400 feet.

The runway width should be no less than 60 feet for a basic utility runway (airplane design group I with a non precision approach).

Taxiway

The IDOT finds justification for a partial parallel taxiway system when total annual operations are between 30,000 and 50,000. A full parallel system is justified when operations are in excess of 50,000 annually.

Based upon the forecast of aviation demand and IDOT criteria, there would appear to be no justification for the construction of a parallel taxiway.

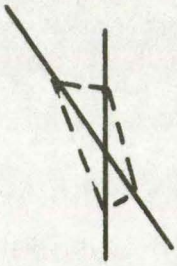
The FAA finds justification for a parallel taxiway based upon the criteria of safety. For planning purposes, a full parallel taxiway will be shown on the Airport Layout Plan (ALP). However, the taxiway would be expected to receive a low priority in terms of implementation.

The taxiway should be no less than 25 feet in width. Existing and future taxiways providing access to hangar facilities need not be more than 20 feet in width.

Runway Grade Change and Visibility

Consideration must be also 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:



Visibility Zone

Figure: 3-4 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

Runway Grade Change and Visibility

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- 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:

Visibility Zone

Figure: 3-4 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.

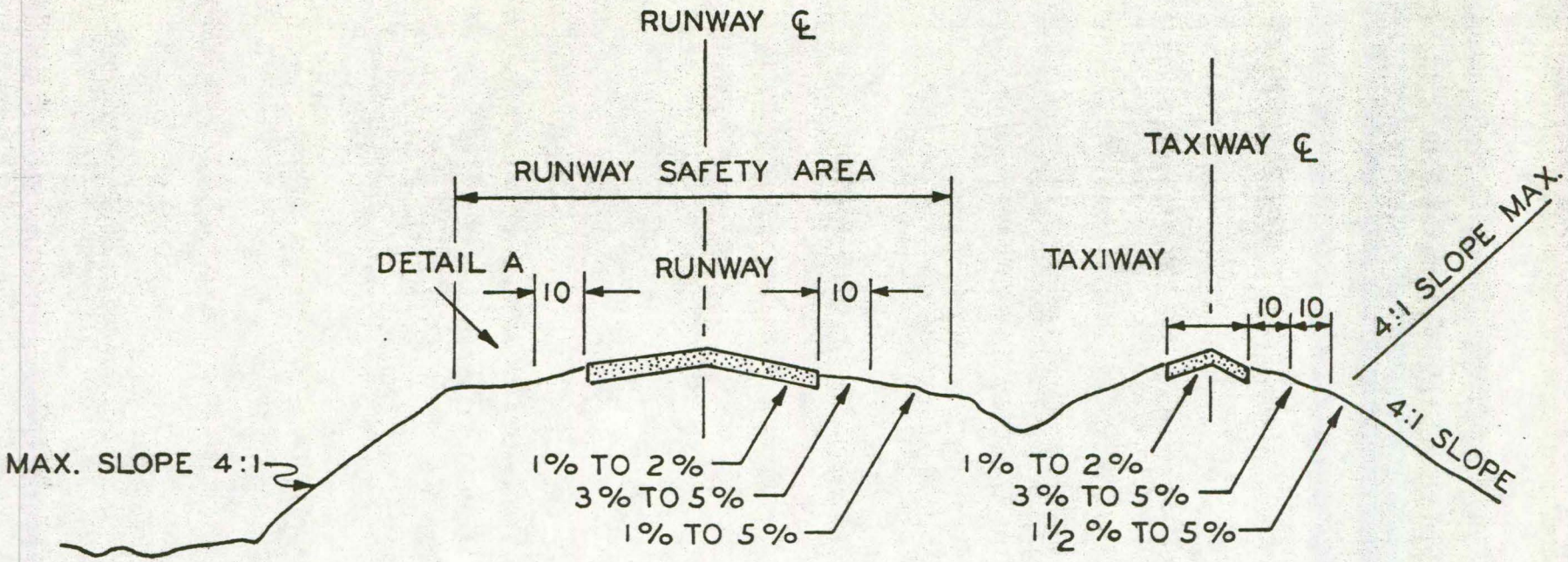
Traverse grades on the runway should be at least one percent and no more than two percent. Within ten feet of the pavement edge, the grade should have a minimum slope of three percent and not to exceed five percent. Reference may be made to Figure 3-5 concerning a typical runway cross section.

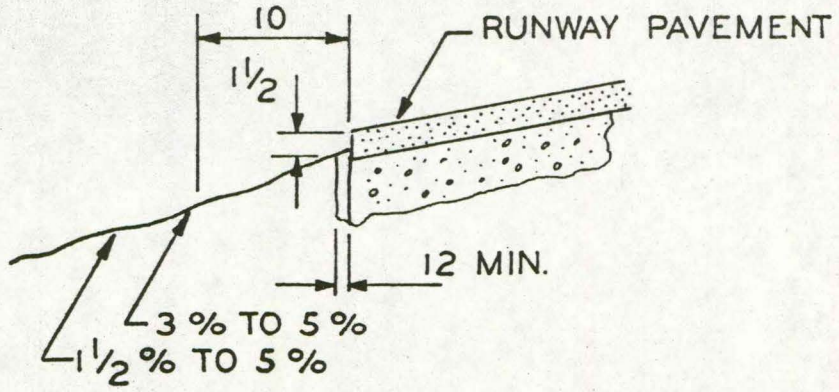
A graded area beyond the runway surface is referred to as the runway safety area. The area, located symmetrically about the runway, extends outward from the runway centerline 120 feet and 240 feet beyond the runway ends. The primary function of the runway safety area is to provide a degree of safety 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 at Emmetsburg:

- Runway centerline to taxiway centerline	225'
- Runway centerline to building restriction line (BRL) and airplane tiedown area	200' (Min. + 7:1)
- 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' min.
- Runway safety area width	240'





DETAIL A

TYPICAL CROSS SECTION

FIGURE 3 - 5

Runway and Taxiway Pavement Design

From the forecast of aviation demand, a runway pavement strength which would support an aircraft with a gross weight strength (single wheel) of 12,500 pounds would appear adequate to meet aviation demand expectations. It is not however the intent herein to specify an engineering design for the hard surfaced areas.

The "As-Built" drawings prepared in 1966 depict a flexible pavement consisting of 2 inch bituminous surface course, 9 inch aggregate base course and a 6 to 9 inch compacted subgrade for RW 13/31. RW 13/31 was resurfaced in 196?

Generally, a rigid pavement designed to serve aircraft with a gross weight of 12,500 pounds or more should be not less than six (6) inches thick. A minimum subbase thickness of four (4) inches thick is generally required except where soil conditions are poor. A six (6) inch PCC rigid pavement will accommodate aircraft up to 30,000 pounds gross weight.

Reference may also 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 figure 3-5.

Pavement Markings

Non-precision instrument (NPI) markings are recommended for installation on RW 13/31. 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 100 feet from the runway edge. Additional information on pavement markings may be obtained from FAA AC 150/5340-1D.

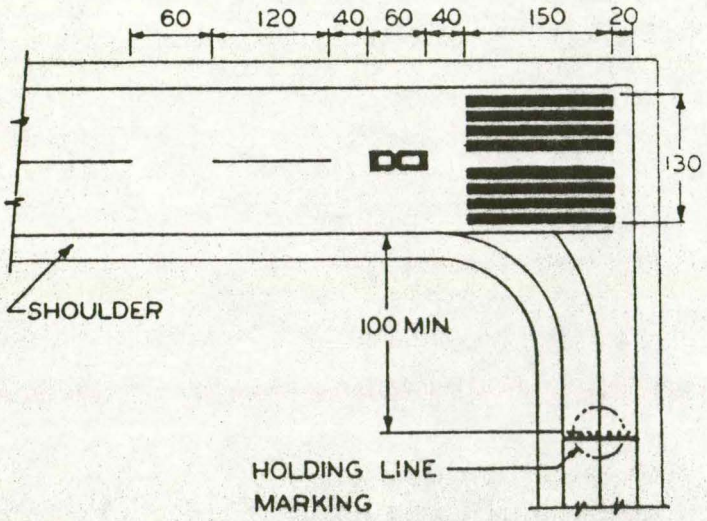


Figure 3-6 NPI MARKINGS

Runway and Taxiway Lighting

A medium Intensity Runway Light System (MIRL) is currently in operation on RW 13/31. The existing turf runways are not lighted. The existing system on RW 13/31 consists of a L-833 transformer and stake mounted L-802 and L-822 light fixtures.

A medium intensity light system should also be installed on the cross-wind runway.

Runway lights are used to outline the edges of the runway during periods of darkness or low visibility. Each runway edge light fixture emits a white light except on instrument runways where yellow is substituted for white on the last 2000 feet or one-half the runway length wheich 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 Simple Abbreviated Approach Slope Indication (SAVASI) is in operation on RW 13/31. The color light beams enable the pilot to determine if his approach is high, on course, or low. The SAVASI benefits the facility because of potential noise impacts and structures in the area. Installation of a VASI system is recommended by IDOT when there are 10,000 or more annual operations. A 2 light unit system is referenced as a VASI 2.

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 from the first box.

Runway End Identifier Lights, REIL

Runway End Identifier Lights (REIL'S) should be in operation on each runway end. REIL's should be located in line with the threshold lights,

75 feet from the runway edge. IDOT recommends installation of a REIL system when the annual operations exceed 3000.

Reference may be made to FAA AC 150/5340-14B, AC 150/5300-2C, and AC 150/5340025 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 to 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 tee is in operation.

NON-DIRECTIONAL RADIO BEACON, NDB AND TERMINAL VERY HIGH FREQUENCY OMNIRANGE, TVOR

An NDB system allows an aircraft equipped with an automatic direction finder, (ADF), to "home" in on the signal. An NDB is currently at Emmetsburg.

A non-precision instrument approach could also be established by the location of a VOR facility on or near the airport. The TVOR provides alignment and position location information. Guidance to a point in space is provided where a pilot must establish visual contact with the runway to accomplish the landing. A TVOR may be justified where annual instrument approaches exceed 300.

TERMINAL AREA

Aircraft Hangar Facilities

The assumption is made that all aircraft based at the Emmetsburg

Municipal Airport would be kept in hangars. Existing hangar facilities to include capacity are summarized in the following table.

TABLE 3-2 EXISTING HANGAR FACILITIES

Hangar Unit Number	Type	Capacity
one	Tee	5
Two	Conventional	3
Three	Tee	10
Four	Conventional	1 (Spray op.)

The four hangar structures have a storage capacity for 19 aircraft subject to aircraft size and stacking procedures used in the conventional hangars. The maintenance shop, located in Unit 2, is used for storage.

To accommodate future numbers of based aircraft, it is recommended that a 6 unit tee hangar be constructed within Phase One, 1983-1987. An additional 10-15 units may be needed in Phase Three, 1992-2002. An alternative may be to consider use of the existing shop area for storage if and when a new fixed base operator shop is constructed. Subject to aircraft size, the existing shop may accommodate up to two aircraft. This storage may be used as an interim solution to hangar needs. It should also be noted that hangar demand will vary from year to year based not only upon aircraft ownership, but cost per unit as well. The cost of comparable space at area airports will also influence the demand for hangar facilities at Emmetsburg. Futhermore, a number of aircraft owners may choose to tiedown their aircraft rather than lease hangar space should the cost be beyond what the owner is willing to pay.

Consideration should also be given to the construction of a new aircraft (FBO) maintenance shop. The IDOT recommends a minimum 60 feet by 80 feet facility. The FBO shop should not be considered for purposes of aircraft storage.

Terminal Building

At many utility airports, terminal building functions are most often provided for within the FBO maintenance facility. The 1978 SASP recommends the following minimum space at general utility airports:

- A public waiting room and services area of 500 square feet
- A pilot's briefing area of 180 square feet
- An airport administrator's office of 180 square feet
- A separate structure provided a new facility is required of a minimum 1000 square feet

Automobile Parking

The IDOT recommends a hard surfaced area capable of accommodating a number of parking spaces equal to the number of based aircraft. Based upon the forecast of based aircraft, it would appear that an improved surface lot to accommodate upwards of 40 vehicles may be needed by the year 2002.

Apron Tiedowns

An apron area should be maintained to provide for improved surface tiedowns as well as queuing space for aircraft movement. Since all based aircraft are expected to be in hangars, the primary concern is with itinerant aircraft. The following methodology was used to estimate the number of tiedowns required through the year 2002.

Year	Annual Itinerant Operations	Avg/Day	10% Increase For Busy Day	50% on Ground At Any One Time
1982	5009	14	1	8
1987	5148	14	1	8
1999	5773	16	2	9
2002	7191	19	2	11

In addition to the improved surface tiedowns, a number of unimproved tie-down spaces may be maintained in order to accommodate itinerant summer traffic exceeding the average day estimates.

TABLE 3-3 TIEDOWN NEEDS, 1982 - 2002

Year	Improved Tiedowns	Unimproved Tiedowns
1982	8	-0- (5 existing)
1987	8	-0-
1992	9	-0-
2002	11	-0-

Through the year 2002 an additional eight improved surface tiedowns should be constructed.

Access Road

The 1978 SASP recommends that the primary access road to the terminal area be hard surfaced. The width should be no less than 22 feet in width with provisions for shoulder and drainage. County Road B41 is hard surfaced providing access from U.S. Highway 18 and State Highway 4.

Consideration may be given to hard surfacing of a 24 stall parking lot and drive (from parking lot to B-41). An area to accommodate 16 additional stalls should be set aside or maintained with a gravel surface for overflow parking.

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.

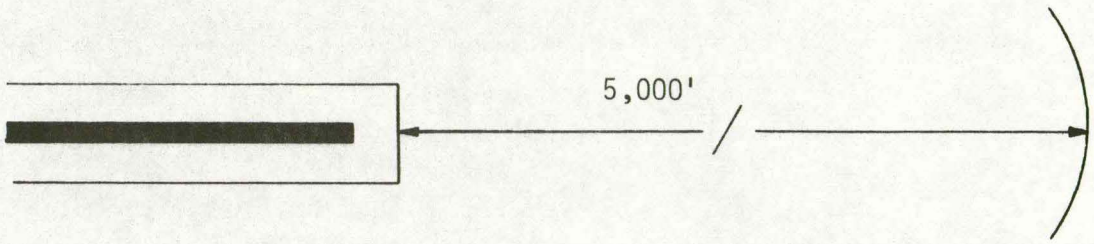
-Interstate Highway	17 feet
-Public Roadway	15 feet
-Private Road	10 feet or height of the highest mobile object
-Railroad	23 feet

Imaginary Surfaces

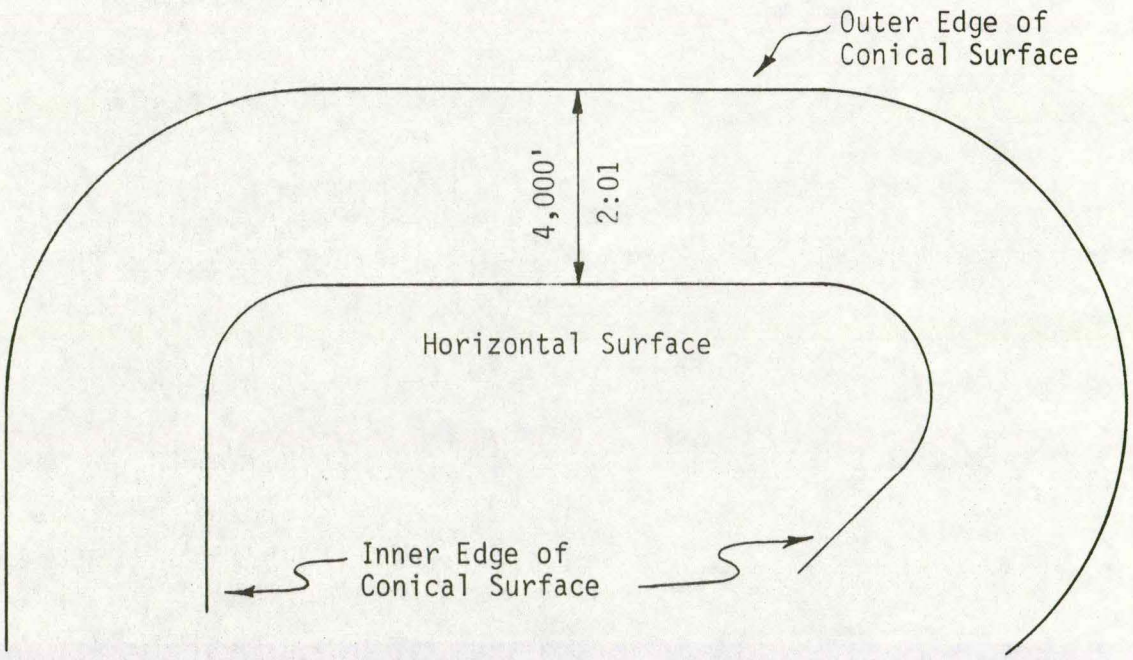
Imaginary surfaces establish areas where any object penetrating that surface would be considered an obstruction to air navigation. The imaginary surface establishes an imaginary line that separates ground activities from aircraft activities. In order to select the applicable imaginary surface, the type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



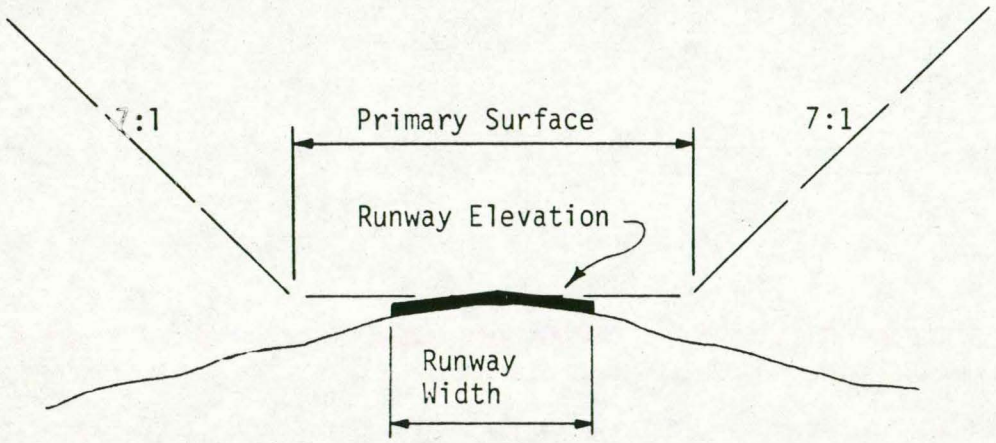
B. Conical Surface: The conical surface extends outward and upward from the periphery of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet at the ends and 7:1 laterally.



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.

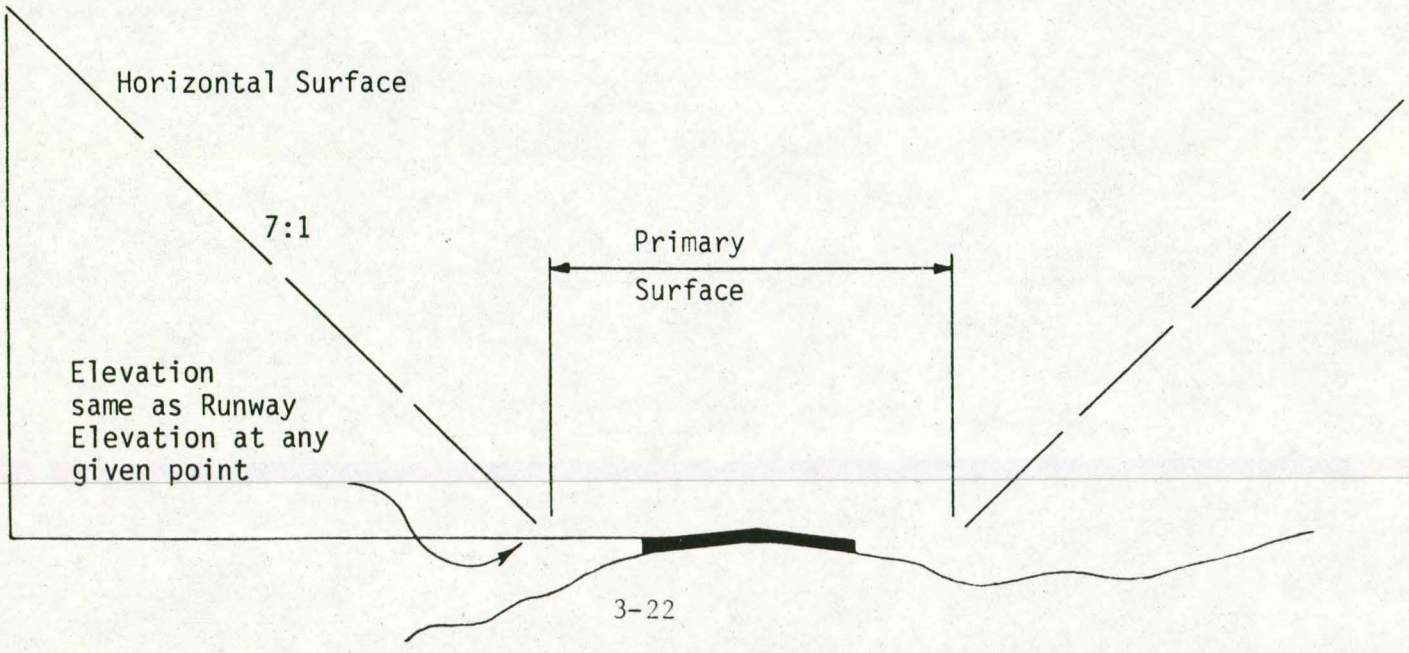
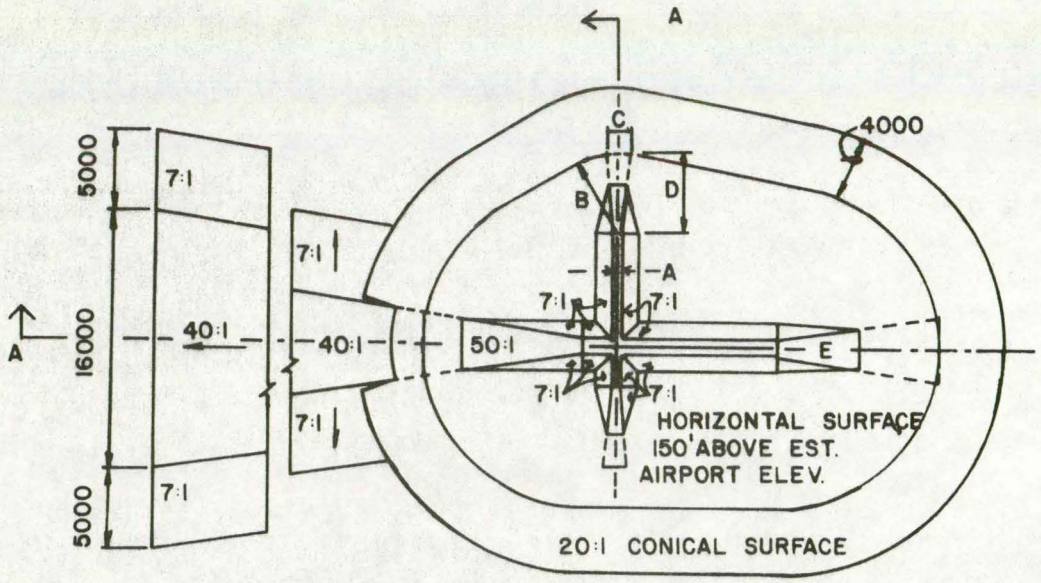
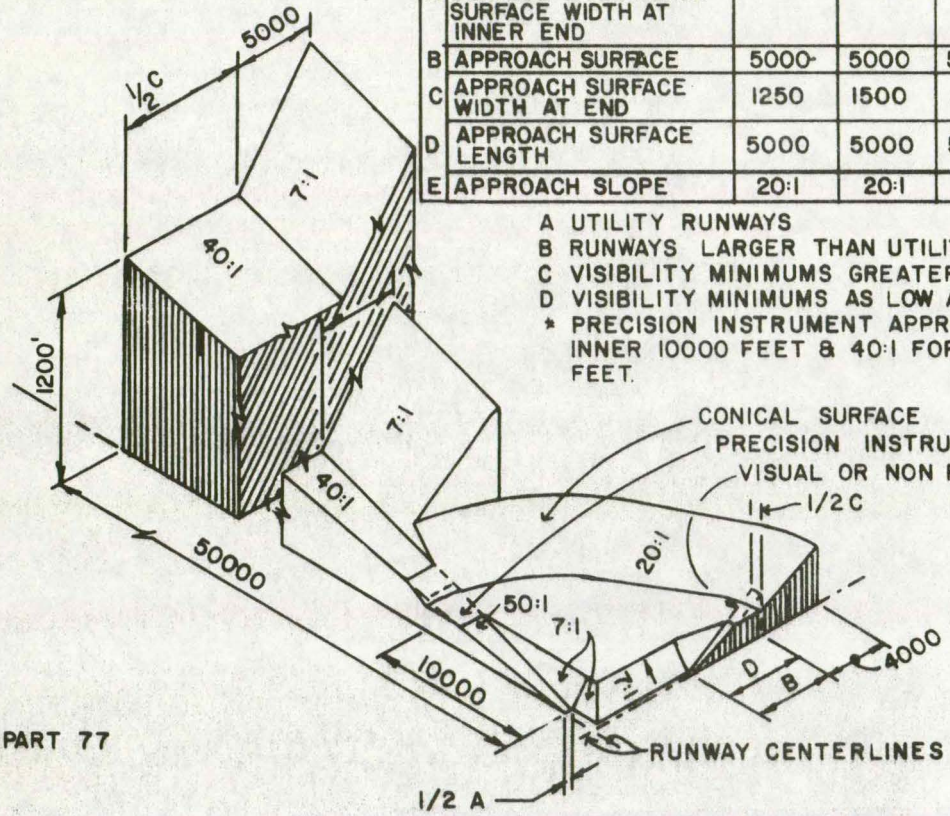


FIGURE 3-7



	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.



ce: FAR PART 77

AIRPORT IMAGINARY 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 longi udinally 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/visibility 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

Clear Zone

The clear zone represents that portion of the approach surface or the ground. The inner edge of the clear zone 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 the runway end elevation. The trapezoidal shaped clear zone area should be under control of the airport owner and maintained free of obstructions and concentrations of people.

Reference may be made to FAA AC 150/5300-4, Chg. 6, Appendix 6 for applicable dimensions. Typical clear zone configurations are noted as follows:

Utility Runways:

- Visual Approach: 250' x 1000' x 450' (8.035 acres)
- Non Precision Instrument Approach: 500' x 1000' x 800' (14.922 Acres)
- Visual Approach opposite non-precision instrument approach: 500' x 1000' x 650' (13.2 Acres)

Obstacle Free Zone (OFZ)

The obstacle free zone consists of the volume of space above the runway, approach area and inner-transitional surface. The runway OFZ extends 200 feet beyond each end of the runway and to a width of 250 feet for non-precision instrument and visual runways.

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

Clearway

The clearway is an area 500 feet in width extending from the runway end outward and upward at a slope not exceeding 1.25% above which no objects or terrain may penetrate. The clearway should be under control of the airport owner and generally extends no more than 1000 feet from the runway end.

Hazard Determination

All objects which penetrate the imaginary surfaces of the airport are considered an obstruction and a hazard to air navigation unless a FAA aeronautic study should be made where a proposed action is thought to be a hazard to air navigation.

FAA AC 150/5300-4B CHG 6 summarizes minimum standards for identifying and preventing airport hazards on the airport.

- All objects which prevent operational clearance for terminal navigational facilities.
- All objects, including parked aircraft, within 7 feet plus 0.75 feet times the wing span of the most demanding aircraft from the taxiway centerline, except for frangibly mounted NAVAIDS. For example:

  King Air C90-1 (50.3 feet x 0.75 + 7 feet = 44.725')

- All objects, including parked aircraft, within 7 feet plus 0.63 times the wing span of the most demanding aircraft from a taxiway centerline.

LAND USE

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 areas 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 use conflicts are reduced to a minimal level in view of the fact that it may 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. Throughout 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 throughout 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.

Land Use Compatibility

Land use compatibility depends upon a number of factors. In other words to imply that an industrial activity is compatible depends upon the type to include 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.

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, should insure a degree of compatibility within the vicinity of the airport.

Land Area Requirements

An adequate amount of land should be made available to support airport functions and accommodate required facilities. Such land should be owned in fee simple title. Clear zone and aviation easements should also be acquired.

-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 Cemetaries	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	Foundries
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 & Publishing 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 Ships	Airfreight Terminals
Hotels	Aircraft Factories	Aviation Research and 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

IV. AIRPORT DEVELOPMENT ALTERNATIVES

AIRPORT DEVELOPMENT ALTERNATIVES

INTRODUCTION

A detailed examination of all aspects associated with the selected development concept is not considered herein. Such consideration is typically accomplished within an environmental impact assessment process. This process is beyond the scope of work.

The IDOT does not, in all cases, require the preparation of an environmental assessment for a proposed action prior to implementation. Should FAA assistance be sought, an indepth assessment may be required. Reference may be made to FAA Order 1050.1C Appendix 6 concerning the preparation of an environmental assessment.

This section examines the various development scenarios initially identified as being available for consideration. The development concept selected for implementation should represent the most feasible and prudent course of action. The terms feasible and prudent are separate criteria and refer to sound engineering principles if it can be constructed. However, it may not be prudent because of environmental, social, or economic consequences. Generally, the action selected for implementation is the one which is most feasible and prudent and outweights the benefits of all other alternatives.

The major actions being contemplated are summarized as follows:

1. Extension of RW13/31 - 400 feet
2. Orientation and location of the crosswind runway.
3. Terminal area development

The study gave no consideration to alternative airport sites, alternative alignment for the primary runway or relocation of the terminal area.

Extension to Runway 13/31:

The primary runway, RW 13/31, represents an existing facility component for which no alternative alignment exists that would increase the service level of the airport. The major consideration given was to the runway width and length.

As noted in Section III, the runway width should be no less than 60 feet. However, the IDOT does not consider a project to increase runway width a high priority at those locations where student traffic is low and/or a crosswind runway exists. While the runway width may be increased from 50 feet (existing) to 60 feet, such may be considered a low priority item.

An extension of RW 13/31 may be accomplished on either end. However, an extension of RW 13 appears to be the most prudent choice provided runway construction would not obstruct flood water flows. Whereas an extension of RW 31 would not potentially obstruct flood water flow, there may be some conflict with existing and future non-airport development.

The merits of extending RW 31 are noted as follows:

1. Land for the extension is currently owned by the airport. Therefore, no land acquisition would be required.
2. Approximately 3.2 acres of land would be required for clear zone easement.

The major disadvantages are as follows:

1. The clear zone would fall outside existing airport property and would encompass existing structures.
2. A radio tower located within the clear zone would penetrate the approach slope and would require relocation.

3. Construction of a new taxiway from the extended runway end to the proposed apron would be required.

The advantages to extending RW 13 are noted as follows:

1. Potential for land use conflicts appears to minimal.
2. The cost of constructing a turnaround is less than that of taxiway construction as proposed in an extension of RW 31.

The most significant disadvantages are as follows:

1. Approximately 4.8 plus acres would need to be acquired.
2. The runway would extend towards the Des Moines River (West Branch) and in no case could the runway elevation be such that it would inhibit flood water flows.

In either development scenario, a clear zone easement of not less than 13.6 acres would be required off RW 13. The cost of runway construction would be the same for each alternative. Related construction items and associated costs for alternatives are summarized in the following table.

TABLE 4-1: DEVELOPMENT ALTERNATIVES - CONSTRUCTION ITEMS AND COSTS

ALTERNATIVE ONE - EXTEND RW 13			
1.	Land Acquisition	$15,850.00	
2.	Clear Zone Protection	7,300.00	
3.	Runway Extension	32,000.00	
4.	Pavement Markings	4,100.00	
5.	Turnaround Construction	8,700.00	
6.	Runway Lighting	3,400.00	
	Total		$71,350.00
ALTERNATIVE TWO - EXTEND RW 31			
1.	Clear Zone Protection	$ 9,150.00	
2.	Runway Extension	32,000.00	
3.	Runway Lighting	3,400.00	
4.	Pavement Markings	4,100.00	
5.	Taxiway Construction	18,000.00	
6.	Taxiway Lighting	2,000.00	
7.	Taxiway Marking	320.00	
8.	Relocate Radio Tower	500.00	
	Total		$69,470.00

Iowa department of water, air and waste management

January 26, 1984

Jerry Searle
Professional Design Services
P.O. Box 191
Ankeny, IA 50021

Dear Mr. Searle:

This letter is intended to summarize our visit yesterday concerning the proposed development of the Emmetsburg municipal airport.

Since the airport is on the flood plain of the West Fork Des Moines River, a Flood Plain Development Permit from this Department is required before construction. We will look at the following two aspects of the development before issuing a permit.

1. Is the proposed construction in the floodway? That is, will the proposed construction increase flood elevations on the river? If the extension of the NW-SE runway is on the SE end, this will not be a problem.

2. Will the proposed development be elevated enough to provide adequate flood protection? Of course, a runway extension must be the same elevation as the existing runway, but other proposed development must be elevated. Tie down aprons and hangars should be elevated at least 1 ft. above the 50 year flood elevation. Other new buildings should be elevated at least 1 ft. above the 100 year flood elevation.

I have enclosed an application form. This form should be completed and returned along with two sets of certified engineering plans. These plans should consist of a map of the area showing the location and elevation of all proposed work. If the NW-SE runway is extended to the NW, we will need some cross sections of the river and upstream bridges so that we can determine the floodway. Please contact me for specific locations of these cross sections if you go this route.

If you have any questions, please give me a call at 515/281-6817.

Sincerely,

PROGRAM OPERATIONS DIVISION

Richard A. Fosse

Richard A. Fosse
Staff Engineer
Flood Plain Permits Branch

RAF:mla/FPPW026F03.01

Enclosure
cc: Region 3

(4-4

As noted, the extension of RW 31 is slightly less costly than an extension to the northwest. These costs are based upon those costs associated with construction.

Where an alternative exists that provides for a clear zone void of buildings and other structures, that alternative generally would represent the most prudent choice. The primary concern is to avoid those situations that could present future limitations to the operation and development of the airport by off airport land uses.

In summary, this report proposes an extension of RW 13. The extension of RW 13 requires the approval of the Iowa Department of Water, Air and Waste Management.

The crosswind runway should be the same length as the crosswind runway and in no case less than 80 percent or 2,720 feet. The proposed orientation would nearly allow implementation requiring only minimal land acquisition.

Approval by the Iowa Department of Water, Air and Waste Management would be required for any improvements and construction projects undertaken.

Agricultural Activities:

The land area not specially set aside for airport or industrial use should be maintained as agriculture land (row cropping). This land use is generally compatible with the operation of an airport facility.

Crosswind Runway:

As noted in Section Three, a second runway is required so as to provide the desired wind coverage. A minimum 60 degree separation between runway facilities is recommended by the IDOT. Orientation of the crosswind runway should be such that the maximum supplemental wind coverage can be obtained from the crosswind runway.

A crosswind runway, N20^{o}E, was selected as the best alternative available based upon the following factors:

1. Relationship to the primary runway
2. Site conditions
3. Adjacent land uses
4. Wind coverage

Other alternatives considered were the continued development of one of the two existing turf runways. Potential land use conflicts presented major constraints to designating one of the two existing turf runways for future development. Wind coverage and relationship to existing airport development were also considered in the recommendation to phase out RW4/22 and 17/35.

The development of a crosswind runway is considered a low priority item. It is expected that the runway will be maintained as a turf facility throughout the twenty-year (20) planning period. The Airport Layout Plan (ALP) depicts the ultimate development. Initial consideration given to the crosswind runway should be the acquisition of land in fee title to accommodate the runway facility and clear zone protection (Fee title or easement).

1. Land Acquisition - Fee Title

   Southwest: 10.9 Acres $\pm$
   Northeast: 3.1 Acres $\pm$

2. Clear Zone Protection - Easement or Fee Title

   Southeast: 5.2 Acres $\pm$
   Northeast: 5.2 Acres $\pm$

Agricultural land uses are expected to be maintained to the southwest. The clear zone of the crosswind runway to the northwest would encompass an existing gravel mining operation.

Terminal Area:

The terminal area of the airport represents an investment made over a number of years by both the public and private sector. While it may be more desireable to locate the terminal area closer to the mid-point of the primary runway or intersection with the crosswind runway, the relocation cost could not be justified. As such, no alternative site for terminal area functions was considered.

The primary concern herein was to set forth a long range development concept for the existing terminal area complex. The development concept stresses the maintenance of existing facilities and reservation of space for future construction. The most salient need is for an expanded apron area and tiedowns. Hangars would be constructed as demand warrants.

The terminal area may also be expanded to include the reservation of space for an industrial park. The industrial area would be located north of the terminal area and east of County Road B-41. This site may offer an opportunity to provide an industrial prospect with a site having access to the runways and yet be accessible from the community and U.S. Highway 18. It would also appear that utilities could be extended to the site. The most significant factor may be the opportunity to provide the property at below market prices thereby providing an additional incentive to locate in the community. Approximately 17 acres would be available for development.

The Iowa Department of Water, Air and Wast Management has set forth the following development requirements:

1. Apron and Hangars:

   Elevated one (1) foot above 50 year flood elevation.

2. Industrial Park and Other Structures:

Elevated one (1) foot above 100 year flood elevations.

Need:

The need for the proposed actions are based upon present and future levels of aviation activity summarized in Section II. In addition to the alternatives previously discussed, the following alternative was also available.

1. No Project Alternative

A no project alternative would not allow the airport to satisfy aviation demand expectations.

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, industrial, agricultural, and open space land uses are compatible with the operation of the airport. The proposed actions are consistent with such community 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. The proposed actions will require the removal of crop land from production.

4. Induced Socioeconomic Impacts: The proposed actions may have a positive impact upon industrial development in the community.

5. Air Quality: The proposed actions are not expected to have any negative impact upon the Clean Air Act 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 know 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: The airport lies within the flood plain of the West Branch of the Des Moines River. Land adjacent to the river is under cultivation with the exception of tree growth along the river bank. Elsewhere, there are a number of ponds created as a result of gravel mining.

12. Flood Plain: The airport lies within the Des Moines River (West Branch) flood plain. Approval from the Iowa Department of Water, Air and Waste Management is required prior to construction.

13. Prime and Unique Farmland: The proposed actions will remove certain amounts of farm land 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.

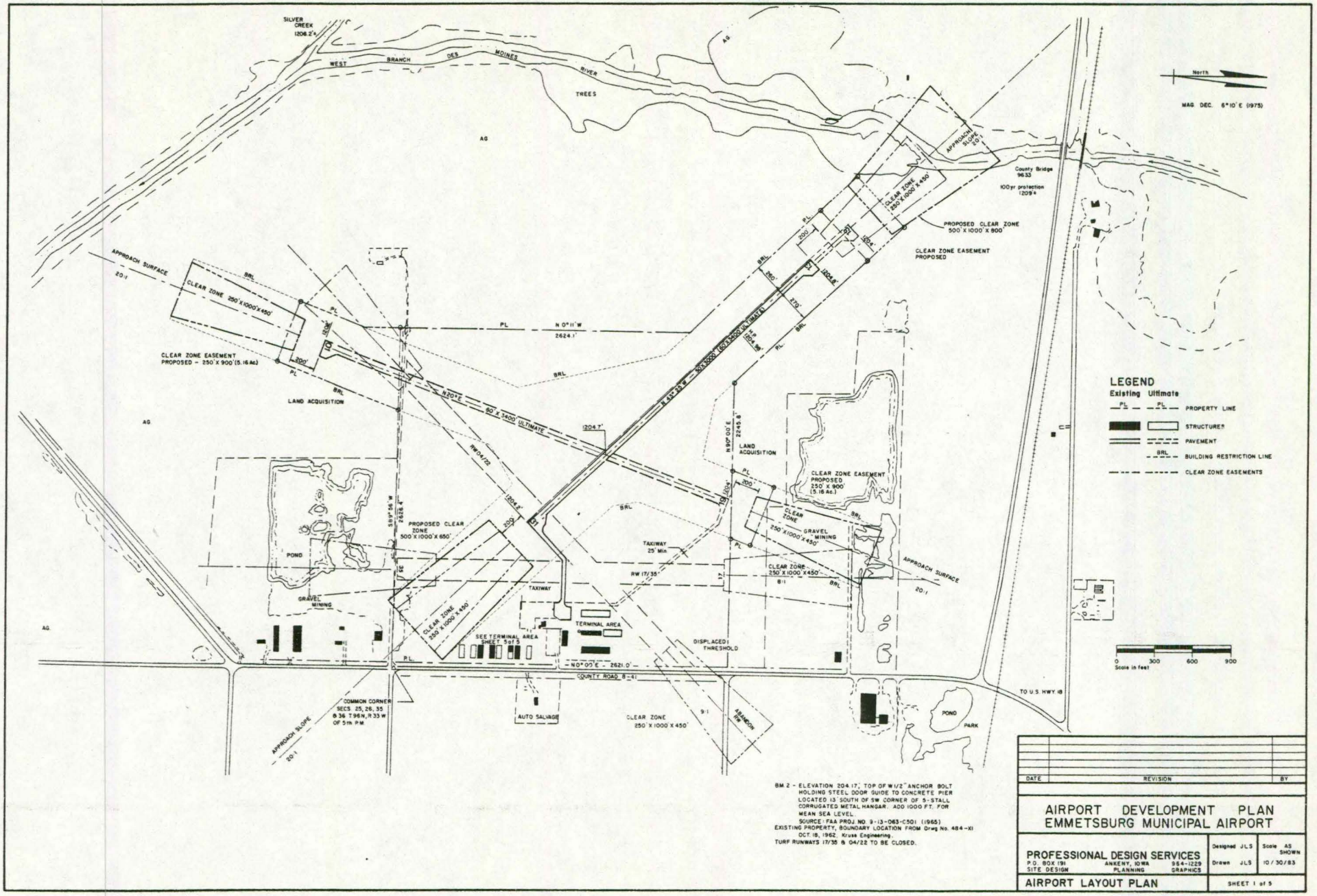
15. Light Emissions: No detrimental impacts are expected.

16. Solid Waste:

17. Construction Impacts: Such impacts resulting from construction are of a short term nature and should have not 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 dot require a full-blown Environmental Assessment. As such, no in depth analysis was accomplished for items 1 through 17 above. Should any of the above have an impact or be impacted by the proposed actions, detailed evaluation of the impact should be accomplished prior to proceeding with implementation.

V. AIRPORT PLANS



BM 2 - ELEVATION 204.17', TOP OF W 1/2" ANCHOR BOLT HOLDING STEEL DOOR GUIDE TO CONCRETE PIER LOCATED 13' SOUTH OF SW CORNER OF 5-STALL CORRUGATED METAL HANGAR. ADD 1000 FT. FOR MEAN SEA LEVEL.
SOURCE: FAA PROJ. NO. 9-13-063-C501 (1965)
EXISTING PROPERTY BOUNDARY LOCATION FROM Dwg No. 484-XI OCT. 18, 1962, Kruse Engineering.
TURF RUNWAYS 17/35 & 04/22 TO BE CLOSED.

DATE	REVISION	BY

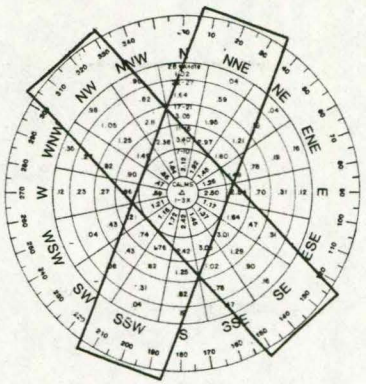
AIRPORT DEVELOPMENT PLAN
EMMETSBURG MUNICIPAL AIRPORT

PROFESSIONAL DESIGN SERVICES
P.O. BOX 191 ANKENY, IOWA 964-1229
SITE DESIGN PLANNING GRAPHICS

Designed JLS | Scale AS SHOWN
Drawn JLS | 10/30/83

AIRPORT LAYOUT PLAN | SHEET 1 of 5

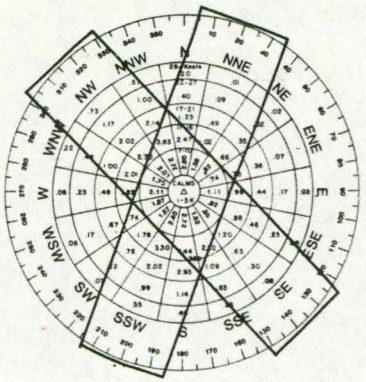
WIND ROSE



IFR TO CAT I – 15.39%

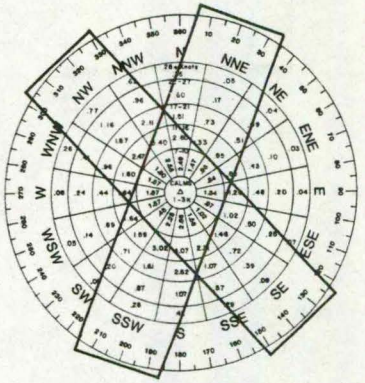
△ CALM = 11.26%
1-3 KNOTS = 2.93%

*(200, 1/2)



VFR – 83.02%

△ CALM = 10.24%
1-3 KNOTS = 3.39%

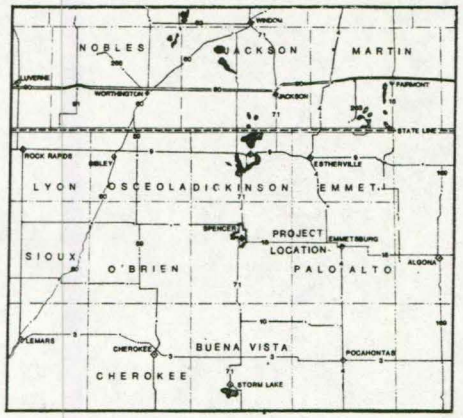


ALL WEATHER

△ CALM = 10.82%
1-3 KNOTS = 3.12%
VFR = 83.02%
IFR* = 16.98%

*(≤ 1000, 3)

SOURCE: NORTH CENTRAL AIRLINES
WORTHINGTON, MINNESOTA
PERIOD: JAN. 1969-DEC. 1971



SCALE 1"=13MILES

LOCATION MAP

RUNWAY DATA	RUNWAY 13/31		RUNWAY 01/19	
	EXISTING	FUTURE	EXISTING	FUTURE
EFFECTIVE RUNWAY GRADIENT	0.02 %	0.08 %		0.08 %
% WIND COVERAGE (12 MPH)	75.7 %	SAME		76.3%
INSTRUMENT RUNWAY	NPI	SAME		VISUAL
APPROACH SURFACE	20:1	20:1		20:1
RUNWAY LENGTH	3000'	3400'		3400'
RUNWAY WIDTH	50'	60'		60'
RUNWAY STRENGTH-Gross Weight	29000lbs (sw)	SAME		12500lbs (sw)
RUNWAY SAFETY AREA	120'-Width	120'-Width, 240'-RWEnd		120'-Width, 240'-RWEnd
RUNWAY LIGHTING	MIRL	SAME		MIRL
LANDING AIDS	SAVASI	SAVASI, REIL		SAVASI, REIL
RUNWAY MARKINGS	BASIC	NPI		BASIC

RUNWAY DATA	RUNWAY 4/22		RUNWAY 17/35	
	EXISTING	FUTURE	EXISTING	FUTURE
EFFECTIVE RUNWAY GRADIENT	N.A.		N.A.	
% WIND COVERAGE (12 MPH)	N.A.		N.A.	
INSTRUMENT RUNWAY	NO		NO	
APPROACH SURFACE	20:1		20:1	
RUNWAY LENGTH	3190'	TO BE CLOSED	2555'	TO BE CLOSED
RUNWAY WIDTH	130'		150'	
RUNWAY STRENGTH	TURF		TURF	
RUNWAY SAFETY AREA	N.A.		N.A.	
RUNWAY LIGHTING	NONE		NONE	
LANDING AIDS	NO		NO	
RUNWAY MARKINGS	NO		NO	

AIRPORT DATA		
	EXISTING	FUTURE
AIRPORT ELEVATION	1205' ASL	SAME
AIRPORT LOCATION POINT	LONG	94° 42' 24" W
A L P COORDINATES	LAT	43° 06' 12" N
MEAN MAX. TEMP.	85.9° F	SAME
% WIND COVERAGE (combined 12 mph)		95 %
AIRPORT NAVIGATIONAL AIDS	NDB	NDB
AIRPORT ACREAGE	174 Acres	
F B O FACILITIES	YES	YES
FUEL	YES	YES
BEACON	NO	YES
SEGMENTED CIRCLE	NO	YES
LIGHTED WIND TEE	YES	YES
EASEMENTS		YES

EXHIBIT 5-2

DATE	REVISIONS	BY

REVISIONS

AIRPORT DEVELOPMENT PLAN
EMMETSBURG MUNICIPAL AIRPORT

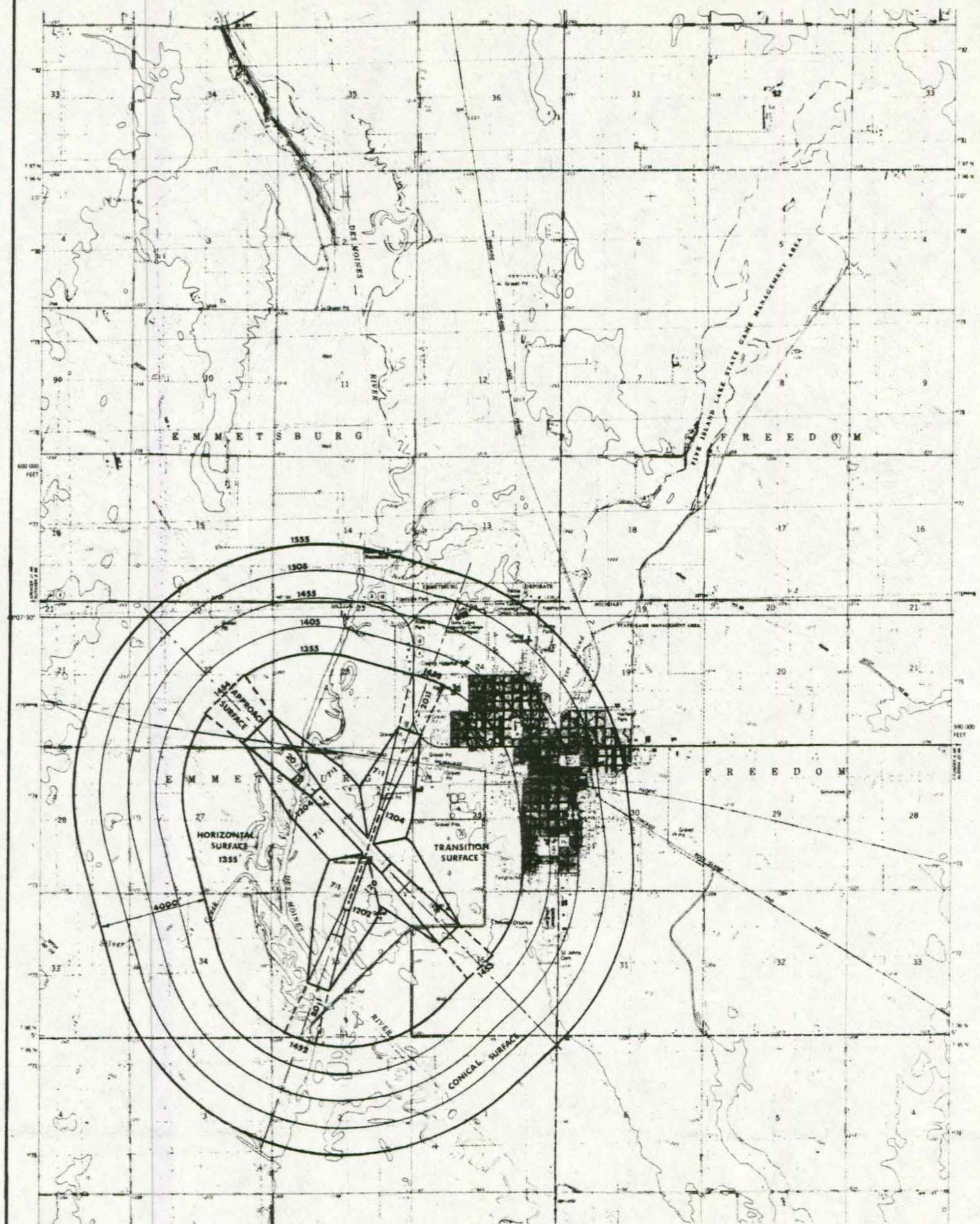
PROFESSIONAL DESIGN SERVICES
P.O. BOX 191 AMKENY, IOWA 964-1229
SITE DESIGN PLANNING GRAPHICS

Designed JLS Scale AS SHOWN
Drawn JLS 10/30/83

ALP DATA SHEET

SHEET 2 of 5

5 - 2



0 2000 4000 6000
SCALE: 1" = 2000'

ESTABLISHED AIRPORT ELEVATION: 1206'

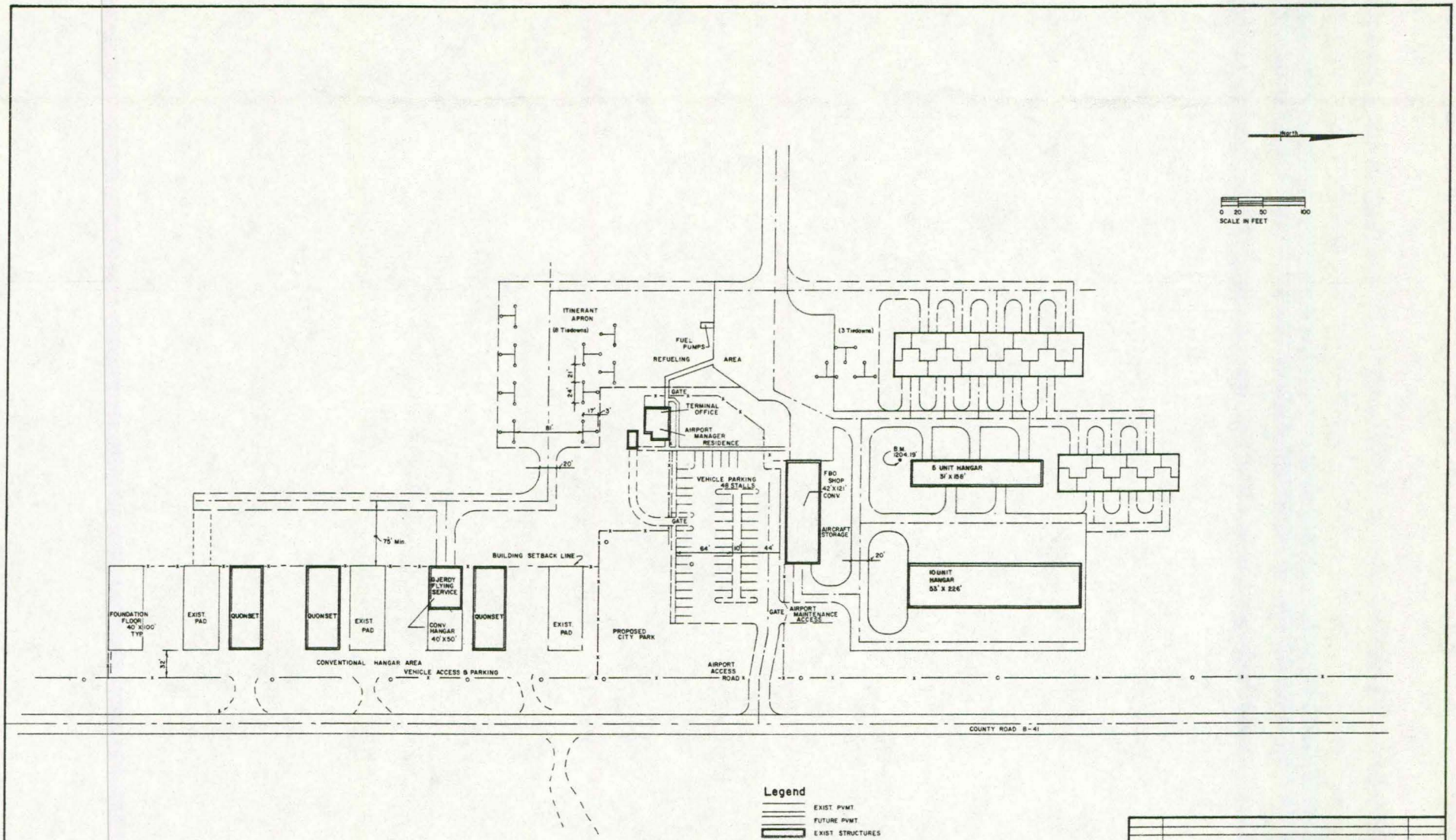
DATE	REVISION	BY

AIRPORT DEVELOPMENT PLAN EMMETSBURG MUNICIPAL AIRPORT		
PROFESSIONAL DESIGN SERVICES P.O. BOX 191 ANKENY, IOWA 964-1229 SITE DESIGN PLANNING GRAPHICS	Designed JLS Drawn JLS	Scale AS SHOWN 10/30/83
AIRPORT AIRSPACE	SHEET 3 of 5	

EMMETSBURG MUNICIPAL AIRPORT
CLEAR ZONE PLAN & PROFILE

AIRPORT DEVELOPMENT PLAN
PROFESSIONAL DESIGN SERVICES

SHEET 4 OF 5
10/30/85



TERMINAL AREA DEVELOPMENT CONCEPT – 20 YEAR
1983 – 2003

DATE	REVISION	BY

AIRPORT DEVELOPMENT PLAN
EMMETSBURG MUNICIPAL AIRPORT

PROFESSIONAL DESIGN SERVICES
P.O. BOX 191 ANKENY, IOWA 964-1229
SITE DESIGN PLANNING GRAPHICS

Designed JLS Scale AS SHOWN
Drawn JLS 10/30/83

AIRPORT TERMINAL AREA

SHEET 5 of 5

VI. DEVELOPMENT SCHEDULE STRATEGY FOR IMPLEMENTATION

DEVELOPMENT SCHEDULE

INTRODUCTION

The development schedule is a listing of improvements needed at the airport over the twenty-year (20) 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:	1983-1987
PHASE TWO:	1988-1992
PHASE THREE:	1992-2002

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 certain 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 5 year intervals. The development schedule should then be revised to reflect changing aviation demand levels.

The costs are based upon 1983 dollars and are not inflated. Certain of the items listed are subject to negotiation. The actual cost for clear zone protection and land acquisition may differ from the quantity and cost noted herein.

A cost estimate for Phase Three items was not prepared.

DEVELOPMENT SCHEDULE AND ESTIMATED COST

Item No.	Description	Quantity	Units	Unit Price	Total Price
		PHASE ONE: 1983-1987			
	ITEM 1 --- RUNWAY OVERLAY				
	A. Runway 13/31 (50' x 3000')				
1.	Crack Filling	4000	L.F.	1.25	$ 5,000.00
2.	Full Depth Patching	500	S.Y.	15.00	7,500.00
3.	2" A.C. Runway Overlay	1900	Tons	35.00	66,500.00
4.	2" A.C. Turnaround Overlay	70	Tons	35.00	2,450.00
5.	Contingencies		10%		8,145.00
6.	Eng., Legal, & Administration		15%		13,405.00
	B. TOTAL OVERLAY				$103,000.00
	ITEM 2 --- LAND ACQUISITION				
	A. Fee Title				
1.	Land in Fee Title	4.86	Acres	2,500.00	$ 12,150.00
2.	Survey & Appraisal Fees		F.S.		1,000.00
					$ 13,150.00
	B. Fencing				
1.	Field Fence	1330	L.F.	1.75	$ 2,327.50
2.	Contingencies		10%		233.00
3.	Eng., Legal, & Administration		15%		439.50
	C. Total Fencing				$ 3,000.00
	ITEM 3 --- RUNWAY EXTENSION				
	A. Runway 13 (50' x 400')				
1.	Subgrade Preparation	2320	S.Y.	1.25	$ 2,787.50
2.	6" Granular Subbase	700	Tons	9.00	6,300.00
3.	2" Bit. Base Course	240	Tons	30.00	7,200.00
4.	2" Bit. Surface Course	250	Tons	35.00	8,750.00
5.	Contingencies		10%		2,503.74
6.	Eng., Legal, & Administration		15%		4,458.76
	B. Total Runway Extension				$ 32,000.00

ITEM 4 --- PAVEMENT MARKINGS (OVERLAY)

A. NPI Markings

1.	Runway Markings	12000	S.F.	0.35	$ 4,200.00
2.	Contingencies		10%		420.00
3.	Eng., Legal, & Administration		15%		780.00
B.	Total Pavement Marking				$ 5,400.00

ITEM 5 --- PAVEMENT MARKING (EXTENSION)

A. NPI Markings

1.	Runway Markings	9200	S.F.	0.35	$ 3,220.00
2.	Contingencies		10%		322.00
3.	Eng., Legal, & Administration		15%		558.00
B.	Total Pavement Marking				$ 4,100.00

ITEM 6 --- TURNAROUND CONSTRUCTION

A. Runway End 13

1.	Subgrade Preparation	600	S.Y.	1.25	$ 750.00
2.	6" Granular Subbase	190	Tons	9.00	1,710.00
3.	2" Bit. Base Course	65	Tons	30.00	1,950.00
4.	2" Bit. Surface Course	70	Tons	35.00	2,450.00
5.	Contingencies		10%		686.00
6.	Eng., Legal, & Administration		15%		1,154.00
B.	Total Turnaround Construction				$ 8,700.00

ITEM 7 --- RUNWAY LIGHTING

A. Extend Existing MIRL System

1.	Trenching & Backfilling	900	L.F.	1.00	$ 900.00
2.	5 KV #8 Cable	1800	L.F.	0.25	450.00
3.	Edge Light Fixtures	4	Each	125.00	500.00
4.	Relocate Threshold Lights		L.S.		800.00
5.	Contingencies		10%		265.00
6.	Eng., Legal, & Administration		15%		485.00
B.	Total Runway Lighting				$ 3,400.00

ITEM 8 -- BEACON

A. Beacon

1.	Lump Sum				$ 5,000.00
B.	Total Beacon				$ 5,000.00

ITEM 9 --- CLEAR ZONE PROTECTION

A. Easements

1.	Easement - Rnwy. 13	13.6	Acres	500.00	$ 6,800.00
2.	Survey, Legal, & Appraisal		L.S.		500.00
B.	Total Clear Zone				$ 7,300.00
		TOTAL PHASE ONE =			$185,050.00

PHASE TWO: 1988-1992

ITEM 1 --- APRON

A. Itinerant Apron

1.	Subgrade Preparation	4400	S.Y.	1.25	$ 5,500.00
2.	4" Granular Subbase	1000	Tons	9.00	9,000.00
3.	5" P.C.C. Paving	4400	S.Y.	15.00	66,000.00
4.	Tie-Down Anchors	27	Each	50.00	1,350.00
5.	Contingencies		10%		8,185.00
6.	Eng., Legal, & Administration		15%		13,965.00
B.	Total Apron				$104,000.00

ITEM 2 --- HANGAR CONSTRUCTION

A. T Hangar

1.	T Hangar	6	Units	12,000.00	$ 72,000.00
2.	Contingencies		10%		7,200.00
3.	Eng., Legal, & Administration		15%		11,800.00
B.	Total Hangar				$ 91,000.00

ITEM 3 --- TERMINAL TAXIWAY CONSTRUCTION

A. To Hangar Units

1.	Subgrade Preparation	615	S.Y.	1.25	$ 768.75
2.	6" Granular Subbase	200	Tons	9.00	1,800.00
3.	5" P.C.C. Paving	615	S.W.	15.00	9,225.00
4.	Contingencies		10%		1,179.00
5.	Eng., Legal, & Administration		15%		2,027.25
B.	Total Terminal Taxiway				$ 15,000.00
		TOTAL PHASE TWO =			$210,000.00

PHASE THREE: 1993-2002

ITEM 1. Land Acquisition and Fencing

Fee Title: 16.1 acres

ITEM 2. Clear Zone Protection

Fee Title or Easement: 10.4 acres

ITEM 3. Turf Runway

Grading and Seeding

ITEM 4. Itinerant Apron

Construction Apron and Install 3 Tie-Downs

ITEM 5. Hangar

10 unit Tee Hanger

ITEM 6. Vehicle Parking Lot

48 Stalls

Apron contruction in Phase Two is expected to satisfy the need throughout the year 2002. Construction of additional apron area as noted on the terminal area plan should be undertaken at the time the proposed 10 unit tee hangars would be constructed. Conventional hangars would likely be constructed by the private sector and at a time when there was a need for such facilities. At that time, the Airport Commission may consider extending a taxiway from the proposed apron to serve those units.

The highest priority item found in Phase Three is the proposed land acquisition project. Obtaining such area, as noted on the ALP to include clear zone protection, should be given consideration as soon as local match monies and a grant-in-aid becomes available. However, the first priority is normally given to the primary runway and maintenance of the present investment.

Other improvements considered a low priority and for which no grants-in-aid are available are related to the construction of a hard surfaced vehicle parking lot. Also associated with the parking lot construction is the construction of a new access drive, fencing, sidewalks and lighting.

STATE AND FEDERAL ASSISTANCE

Federal Assistance:

The Airport Improvement Program (ALP) signed into law in September of 1982 replaced the former Airport Development Aid Program (ADAP). Emmetsburg is included in the National Airport System Plan (NASP) which now is known as the National Plan of Integrated Airport Systems. The cumulative total federal assistance available nationwide for the years FY 83 to FY 87 is 4.8 billion dollars.

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

State Assistance:

The Iowa Department of Transportation provides grants-in-aid for airport improvements to those airports included in the state system of airports. Airports not included are referenced as system candidate airports are eligible for planning and safety related assistance.

At the present time, the rate of participation is 70 percent on eligible items. Airport components eligible for assistance are the same as those eligible for federal assistance.

Reference may be made to Table 6-1 regarding an estimate of assistance available through 1989 from state, federal and local sources.

TABLE 6-1

IOWA AIRPORT IMPROVEMENT PROGRAM
ESTIMATED RESOURCES AVAILABLE [1]
$000's

AIR CARRIER	1984	1985	1986	1987	1988	1989
Federal (90%) [2]	2,500	2,893	3,119	3,360	3,495	3,633
Local Match (10%) [3]	277	321	346	373	388	403
Total	2,777	3,214	3,462	3,733	3,883	4,036
GENERAL AVIATION & OTHER COMMERCIAL SERVICE						
Construction						
Federal-formula (90%)	1,326	1,512	1,686	1,686	1,686	1,686
-discretionary (90%)	1,000	800	800	800	800	800
Local Match (10%) [3]	258	256	276	276	276	276
Subtotal	2,584	2,568	2,762	2,762	2,762	2,762
State (70%)	849	820	840	865	890	913
Local Match (30%) [4]	364	351	360	370	381	391
Subtotal	1,213	1,171	1,200	1,235	1,271	1,304
Total Construction	3,797	3,739	3,962	3,997	4,033	4,066
Safety						
State (50%) [4]	60	60	60	60	60	60
Local Share (50%)	60	60	60	60	60	60
Total	120	120	120	120	120	120

Notes: [1] This does not include possible federal-aid discretionary funds for reliever airports.
[2] This amount is the sum of the allocations for 4 locations.
[3] Includes only estimates of local funds needed to match federal and state funds. Does not include 100% locally financed improvements.
[4] State funds reserved for cooperative safety improvements. 50% state; 50% local.

Source: IDOT. Improvement Program - 1984 to 1989

IMPLEMENTATION

Phase Construction:

The ability to implement the development program is dependent upon the availablity of state and federal assistance. The local match required would have to come from sources other than airport generated revenue. Airport revenue would, for the most part be used to meet annual airport operating and maintenance costs.

I. PHASE ONE: 1983-1987

PROJECT ONE: Runway Overlay and Pavement Markings

Total Cost	State (70%)	Local (30%)	Private
$108,400	$75,880	$32,520	$ -0-

PROJECT TWO: Land Acquisition and Fencing, Clear Zone Protection, Runway Extension, Turnaround and Runway Lighting, Beacon

Total Cost	State (70%)	Local (30%)	Private
$ 76,650	$53,655	$22,995	$ -0-

II. PHASE TWO: 1988-1992

PROJECT ONE: Apron

Total Cost	State (70%)	Local (30%)	Private
$104,000	$72,800	$31,200	$ -0-

PROJECT TWO: Hangar, Taxiway Access

Total Cost	State	Local	Private
$210,000	$ -0-	$ -0-	$210,000

To implement Phase One improvements, approximately 55,515 dollars in local governmental match would be required. Should Emmet County choose to participate, each local entity may contribute $27,757.50. Consideration may be given to the establishment of a capital improvements fund so that annual contributions may be made. Such would allow the accumulation of local match monies over a period of time to be made available at the time a grant-in-aid was offered and accepted.

Phase Two assumes that the private sector would construct the proposed six unit tee hangar as well as the associated taxiway. Consequently no local match or grant-in-aid would be required. An estimated $31,200 in local match would be required to implement the construction of an itinerant aircraft apron to include 9 tie-down spaces. The apron (4391 S.Y.) would be located south and adjacent to the existing apron. If the County contributed one half of the local match, the City would need $15,600 in local capita improvements project funds to implement Phase Two projects.