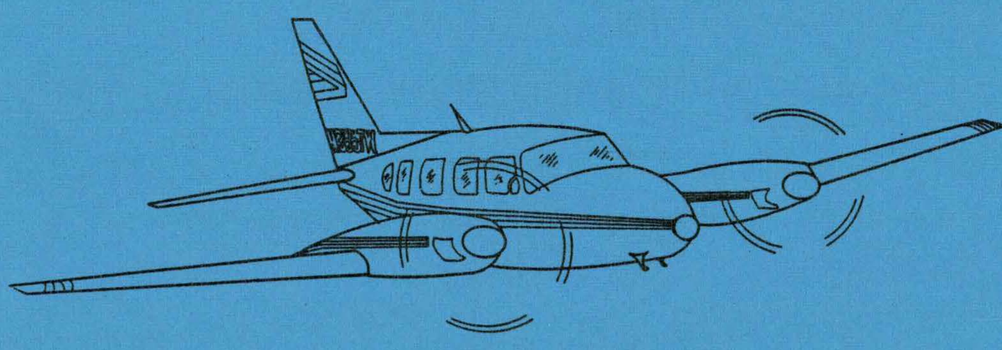
AIRPORT DEVELOPMENT PLAN

FOR

ALGONA, IOWA

1988



CONSULTING ENGINEERS
MARSHALLTOWN, IOWA
AMES, IOWA

AIRPORT DEVELOPMENT PLAN
ALGONA, IOWA
1988

AIRPORT COMMISSION
Don Heupel, Chairman
Dr. Monte Grandgeorge
Louis McEnroe
Robert Riedel
James Schenck

CITY ADMINISTRATOR
Michael J. Johnson

AIRPORT MANAGER
Peter O'Leary

This Airport Development Plan was prepared between January 1988 and February 1989. Its purpose is to serve as a guide for the orderly development and growth of the Algona Municipal Airport. The study was financed in part through a grant from the Air and Transit Division of the Iowa Department of Transportation.

I hereby certify that this plan was prepared by me or under my direct personal supervision and that I am a duly registered Professional Engineer under the laws of the State of Iowa.

William R. Grabe

WILLIAM R. GRABE, P.E.
IOWA REGISTRATION NO. 9221

Feb. 14, 1989
DATE

Prepared by
Clapsaddle-Garber Associates
Consulting Engineers
Marshalltown, Iowa

CGA PN 4086.03

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

PAGE

I. DATA COLLECTION

COMMUNITY CHARACTERISTICS

PHYSICAL SETTING:

The city of Algona is located in Kossuth County at the intersection of U.S. Highways 18 and 169. The community has rail service provided by the Chicago and Northwestern Transportation Company. Interstate Highway 35 is located 45 miles east of Algona, and the Minnesota border is located 41 miles north of Algona. Reference may be made to Figure 1.1.

Area topography consists of nearly level to moderate slopes characteristic of the Clarion-Nicollet-Canisteo Soil Association. Area drainage is provided by the East Fork of the Des Moines River located NW of Algona and one (1) mile SE of the Algona airport. The river flows in a southerly direction. Surface water in close proximity to Algona includes Smith Lake and other small lakes along the Des Moines River.

Climatic conditions are classified as humid continental with large seasonal and daily variations in temperature. The average winter temperature is 18.9 degrees Fahrenheit. The average summer temperature is 71.1 degrees Fahrenheit. The mean maximum temperature is 83 degrees Fahrenheit.

HISTORIC SETTING:

The community of Algona was founded on December 2, 1856 by Asa C. Call. The first industry, a saw and grist mill, had begun operation in 1855 and is no longer in operation.

POPULATION CHANGE:

The community of Algona has shown a steady population growth of approximately 5% over each of the last three decades.

TABLE 1.1 HISTORIC POPULATION GROWTH, ALGONA, 1900-1980

Year	Population	% Change	Year	Population	% Change
1900	2,911	-----	1950	5,415	9.3
1910	2,908	-0.1	1960	5,702	5.3
1920	3,724	28.1	1970	6,032	5.8
1930	3,985	7.0	1980	6,289	4.3
1940	4,954	24.3			

SOURCE: U.S. Census of Population, 1900-1980

Population change by age group provides an indicator of economic conditions within a community.

TABLE 1.2 POPULATION CHANGE BY AGE GROUP, ALGONA, 1960-1980

Age Group	1960	1970	1980	% Change, 1960-1980
65+	789	1,018	1,064	34.9
55-64	592	589	619	4.6
45-54	589	647	561	-4.8
35-44	679	621	597	-12.1
25-34	647	609	899	38.9
15-24	647	797	1,064	64.5
5-14	1,112	1,260	987	-11.2
0-4	647	491	498	-23.0
TOTAL	5,702	6,032	6,289	

SOURCE: U.S. Census of Population, 1960-1980

Because of the cyclic fashion of population trends and the steady growth in the recent past in the city of Algona, it would be anticipated that a 5% growth in town population every ten (10) years would be a fair projection. As can be seen in Table 1.3, some 7280 residents could reside in Algona by the year 2010.

TABLE 1.3 POPULATION ESTIMATE, ALGONA, 1980-2010

Year	Estimated Population	% Change
1980	6,289	-
1990	6,603	5.0
2000	6,934	5.0
2010	7,280	5.0

The State Demographer prepares a population projection for all counties within the State of Iowa based on economic conditions and general population trends. Table 1.4 summarizes population change for Kossuth County and seven area counties.

TABLE 1.4 POPULATION TRENDS, EIGHT COUNTIES, 1980-2010

County	1980	1985	1990	1995	2000	2010	1980 % of Total
				Year			
Emmet	13,336	13,300	13,300	13,300	13,400	13,500	11.6
Hancock	13,833	13,600	13,600	13,600	13,700	13,800	12.1
Humboldt	12,246	12,000	11,800	11,700	11,600	11,500	10.7
Kossuth	21,891	21,500	21,400	21,400	21,600	21,700	19.1
Palo Alto	12,721	12,300	12,200	12,100	12,100	12,100	11.1
Pocahontas	11,369	11,000	10,700	10,600	10,500	10,400	9.9
Winnebago	13,010	12,300	11,800	11,500	11,300	11,200	11.3
Wright	16,319	15,900	15,800	15,600	15,700	15,800	14.2
	114,725	111,900	110,600	109,800	109,900	110,000	100.0
Kossuth as % of total	19.1	19.2	19.3	19.5	19.7	19.7	

SOURCE: Office of the State Demographer, Office for Planning and Programming, Iowa Population Projections, July 1984

A very slight population decrease (0.9%) for Kossuth County is expected between the period form 1980 to 2010. This includes a low of 21,400 residents between 1990 and 1995, and a recovery of population through the year 2010. Typical of Iowa, the rural farm population has continued to decline while the larger communities have increased in population.

A 4.1% population decrease is expected in the eight county area between 1980 and 2010, while Kossuth County's share of the population in those same eight counties is expected to have a 0.6% rise over that same 30 year period.

Population change is attributed to three components: births, deaths, and migrations. The out-migration of persons of child-bearing years will have a pronounced impact upon future population growth. Most persons leaving the area within this age group do so because of job opportunities. Persons of retirement age seek warmer climates.

TABLE 1.5 BIRTHS, DEATHS, MIGRATION - KOSSUTH COUNTY

Period	Births	Deaths	Out-Migration
1960-1970	4,843	2,306	4,914
1970-1980	3,293	2,230	2,109
1980-1985	1,718	1,073	1,036

SOURCE: Iowa Department of Health

Although there are many factors contributing to in or out-migration, the most significant local factor relates to job opportunities within the community. Where new job opportunities can be created, the community will be able to induce a population increase from in-migration as well as from an increase in the number of persons of child-bearing age who choose to remain in the community.

EMPLOYMENT CHARACTERISTICS:

Occupation or employment by industry provides an insight into travel tendencies. The END Foundation categorized 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, Communications, Utilities, Repair Services, Recreation, Amusement, Printing

An indication of travel tendency within the eight county region can be obtained from reference to Tables 1.6 and 1.7. Winnebago County has the greatest number of persons employed in those industries having a high travel tendency. Winnebago County is followed in turn by Kossuth, Wright, Emmet, and Hancock Counties. As noted, 37% of the employment in Kossuth County was in those industries with a high travel tendency while 26% were categorized as having a medium travel tendency. Included in the low travel tendency in addition to the industries noted above were people classified as domestic workers and self-employed individuals.

Of the eight county region, 46 percent of the total civilian labor force was employed in those industries with high travel tendency.

TABLE 1.6 LABOR FORCE COMPOSITION - EIGHT COUNTIES - 1987

Category	Emmet	Hancock	Humboldt	Kossuth
- Civilian Labor Force	5,070	6,140	5,410	9,440
- Percent Unemployed	8.1	4.6	4.2	5.9
- Nonagricultural	3,750	3,380	3,090	5,550
- Self-employed, Domestic	450	690	530	1,140
- Manufacturing	650	990	630	1,070
- Construction	120	50	70	190
- Transportation, Communication and Public Utilities	320	150	160	130
- Wholesale Trade	210	280	300	560
- Retail Trade	700	530	580	1,180
- Finance, Insurance and Real Estate	140	140	170	330
- Service and Mining	850	480	510	1,060
- Government	770	740	670	1,050
- Agriculture	630	1,150	840	1,910

Category	Palo Alto	Pocahontas	Winnebago	Wright
- Civilian Labor Force	4,990	4,750	7,550	7,690
- Percent Unemployed	3.8	3.6	3.4	4.3
- Nonagricultural	2,770	2,630	7,080	5,160
- Self-employed, Domestic	590	700	840	1,030
- Manufacturing	170	450	3,830	1,270
- Construction	30	80	130	240
- Transportation, Communication and Public Utilities	120	40	140	470
- Wholesale Trade	270	410	190	470
- Retail Trade	440	380	690	790
- Finance, Insurance and Real Estate	130	120	200	240
- Service and Mining	640	550	1,110	810
- Government	970	610	800	870
- Agriculture	920	940	720	1,050

SOURCE: Iowa Department of Job Service, Jan. 1988

TABLE 1.7 EMPLOYMENT BY TRAVEL TENDENCY - 1987

County	High Travel	%	Medium Travel	%	Low Travel	%
Emmet	2,270	47	1,170	24	1,400	29
Hancock	2,210	45	720	15	1,990	40
Humboldt	1,810	41	1,120	25	1,530	34
Kossuth	3,180	37	2,260	26	3,180	37
Palo Alto	1,780	42	870	20	1,630	38
Pocahontas	1,610	38	990	23	1,680	39
Winnebago	5,740	66	1,210	14	1,700	20
Wright	2,950	41	1,740	24	2,550	35

Employment by industry within the city of Algona is summarized in the following table.

TABLE 1.8 EMPLOYMENT BY INDUSTRY, ALGONA, 1980

Industry	Number
- Agriculture, Forestry, Fisheries	76
- Mining	6
- Construction	166
- Manufacturing	562
- Durable Goods	412
- Transportation	87
- Communication and Public Utilities	120
- Wholesale Trade	201
- Retail Trade	591
- Finance, Insurance, and Real Estate	136
- Business and Repair Services	102
- Personal, Entertainment, and Recreation Services	189
- Professional and Related Services	521
- Health	175
- Education	242
- Public Administration	86

SOURCE: U.S. Department of Commerce, Bureau of the Census "General Social and Economic Characteristics" 1980

Within the City of Algona employment breakdown according to travel tendency results in 26% with high travel tendency, 57% with medium travel tendency, and 17% with low travel tendency.

TRADE AREA:

The trade area for the City of Algona is defined in this report to include all of Kossuth County, and those portions of other counties not directly served by a closer community of similar or larger size. This defined zone of influence extends into Emmet, Hancock, Humboldt, Kossuth, Palo Alto, Pocahontas, and Wright Counties. The only Iowa County that borders Kossuth County that does not affect the Algona trade area is Winnebago County.

The regional taxable sales for the nine counties mentioned above is shown in Table 1.9. Kossuth County ranked first with $94,109,441 (21.6%) of taxable sales in their regional area.

TABLE 1.9 TAXABLE SALES, EIGHT REGIONAL COUNTIES, FY ENDING MARCH 31, 1987

County	Sales	Percent of Total
Emmet	$ 60,219,679	13.8
Hancock	48,961,905	11.2
Humboldt	49,335,113	11.3
Kossuth	94,109,441	21.6
Palo Alto	37,729,656	8.7
Pocahontas	32,172,795	7.4
Winnebago	50,193,204	11.5
Wright	63,295,295	14.5
Total	$463,017,088	100.0

SOURCE: Iowa Department of Revenue, "Retail Sales and Use Tax Report - FY Ending March 31, 1987"

Taxable sales within Kossuth County by community are presented in Table 1.10 for the fiscal year ending March 31, 1987.

TABLE 1.10 RETAIL SALES, KOSSUTH COUNTY, FY ENDING MARCH 31, 1987

Place	Sales	Number of Businesses
Algona	$63,179,845	1,207
Bancroft	7,550,048	210
Burt	1,194,237	83
Lu Verne	481,393	62
Swea City	3,082,584	194
Titonka	3,575,622	171
Wesley	2,969,496	97
Whittemore	2,425,355	138
Fenton	1,257,154	87
Lakota	586,358	73
Ledyard	735,464	62
Lone Rock	527,354	44
Non-Permit	906,394	7
Other	5,638,137	616
Total County	$94,109,441	3,051

SOURCE: Iowa Department of Revenue, "Retail Sales and Use Tax Report - FY Ending March 31, 1987"

INDUSTRIAL DEVELOPMENT:

The City of Algona has several major manufacturers as can be seen in Table 1.11 below.

TABLE 1.11 MAJOR INDUSTRIES & BUSINESSES, ALGONA, 1986

Name	Product/Service	Employment
Snap-On Tools Corp.	Industrial Tool Boxes Electronic Testing Equipment	560
George A. Hormel & Company	Meat Processing	164
Algona Food Equipment	Food Processing Equipment	35
Universal Manufacturing Co.	Remanufacture of Ford Engines	99
Kossuth Fabricators(KOFAB)	Food Processing and Metal Pre-Fabrication Equip.	14
Pioneer Hi-Bred	Seed Corn	29
Druggist Mutual	Insurance Headquarters	80
Kossuth County Hospital	Health Care Services	100
Barco Manufacturing	Manufacture Wood Pallets	21

SOURCE: Iowa Development Commission, "Community Quick Reference - April 1988"

The City of Algona currently has two developed industrial parks. The first, the Algona Industrial Park, has 25 available acres and is located along U.S. Highway 18 in the northeast area of town within the city limits. It is served by a 12 inch water main, a 3 inch gas line, a 12 inch sewer line, 3 phase - 13,800 primary voltage electrical, and has rail service. The second, the Airport Industrial Park, has 20 available acres and is located along U.S. Highway 18 1.5 miles west of the city. It is served by a 6 inch water main, and 3 phase - 13,800 primary voltage electrical. A 3 inch gas line, and a 12 inch sewer line are located 1 mile east of the industrial park.

AREA AIRPORT FACILITIES

STATE SYSTEM OF AIRPORTS:

The 1985 IOWA AVIATION SYSTEM PLAN identifies 79 airports which will serve the needs of the state. In addition, there are 33 publicly-owned airports that are classified as "local service airports."

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 Transportation 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 20 basic transport category airports. Of the 88 utility category airports, 55 are classified as general utility airports and 33 as basic utility facilities.

Algona, Forest City, and Fort Dodge are classified as basic transport category airports. Pocahontas and Estherville are classified as general utility category airports. Humboldt and Emmetsburg are classified as basic utility category airports.

AIRPORT SERVICE AREA:

The airport service area for Algona was defined as the immediate area around Algona including 100% of Kossuth county, and portions of Emmet, Hancock, Humboldt, Palo Alto, Pocahontas, and Wright Counties. This service area takes into account the classifications, and lengths of runways of the nearby airports with respect to Algona's airport. The area outside of the Algona airport service area would be mainly served by the Forest City, Spencer, Fort Dodge, Estherville, and Pocahontas, Iowa airports, as well as the Fairmont, Minnesota airport. This airport would encompass townships and communities. Reference may be made to Table 1.12.

TABLE 1.12 AIRPORT SERVICE AREA POPULATION

	Year 1980	1970	1960
EMMET COUNTY	1,367	1,342	1,571
Townships:			
Denmark	810	833	1,012
Communities:			
Ringsted	557	509	559
HANCOCK COUNTY	1,439	1,521	1,842
Townships:			
Major	656	657	783
Boone	303	426	571
Communities:			
Corwith	480	438	488
HUMBOLDT COUNTY	2,809	2,980	3,455
Townships:			
Delana	699	760	909
Humboldt	733	798	922
Wacousta	381	443	552
Communities:			
Ottosen	92	93	92
Bode	406	372	430
Livermore	490	510	545
Lu Verne	8	4	5
KOSSUTH COUNTY	21,891	22,937	25,314
Townships:			
Buffalo	1,000	1,016	1,162
Burt	1.072	998	1,089
Cresco	1,241	762	735
Eagle	171	209	315
Fenton	795	940	1,072
Garfield	425	501	505
German	356	461	535
Grant	202	265	305
Greenwood	1,416	1,474	1,492
Harrison	1,125	1,149	1,243
Hebron	196	266	388
Irvington	419	508	654
Ledyard	849	1,010	1,204
Lincoln	255	373	498
Lotts Creek	373	461	587
Lu Verne	580	615	809
Plum Creek	338	297	406
Portland	311	370	429

(Table 1.12 continued on next page)

TABLE 1.12 AIRPORT SERVICE AREA POPULATION CONTINUED

	Year 1980	1970	1960
KOSSUTH COUNTY CON'T			
Townships Con't:			
Prairie	372	518	573
Ramsey	309	376	466
Riverdale	400	471	523
Seneca	295	359	500
Sherman	340	397	456
Springfield	194	268	337
Swea	275	346	484
Union	349	447	521
Wesley	880	898	1,032
Whittemore	1,064	1,150	1,292
Communities:			
Algona	6,289	6,032	5,702
Titonka	607	599	647
Burt	689	608	620
Lone Rock	169	166	175
West Bend	17	12	17
Fenton	394	403	440
Bancroft	1,082	1,103	1,000
Swea City	813	774	805
Lakota	330	385	459
Ledyard	215	240	289
Lu Verne	350	313	373
Wesley	598	548	514
Whittemore	647	658	741
PALO ALTO COUNTY	15,649	13,673	14,081
Townships:			
Vernon	215	318	403
Independence	285	378	467
Emmetsburg	3,381	3,006	2,791
Freedom	1,877	1,910	1,916
Fairfield	414	484	637
Nevada	188	284	332
Fern Valley	340	473	611
Ellington	263	345	460
West Bend	1,236	1,235	1,379
Communities:			
Emmetsburg	4,621	4,150	3,887
Cylinder	119	133	161
Rodman	86	104	144
West Bend	924	853	893

(Table 1.12 continued on next page)

TABLE 1.12 AIRPORT SERVICE AREA POPULATION CONTINUED

	Year 1980	Year 1970	Year 1960
POCAHONTAS COUNTY	758	870	1,235
Townships:			
Powhatan	389	429	633
Des Moines	234	312	420
Communities:			
Plover	135	129	182
WRIGHT COUNTY	235	338	430
Townships:			
Boone	235	338	430
TOTAL AIRPORT SERVICE AREA	44,148	43,661	47,928

SOURCE: U.S. Census of Population, 1980

In 1980, some 44,148 persons resided within the service area compared to 43,661 in 1970, and 47,928 in 1960. Algona, with a 1980 population of 6,289 persons, contained 14.2% of the service area population. The service area population is expected to slightly decline between the years 1980 and 2010. The City of Algona is expected to increase its share of the service area population by the year 2010, with 17.2% of the service area population residing in Algona at that time.

TABLE 1.13 ALGONA AIRPORT SERVICE AREA POPULATION, 1980-2010

Year	Population	Year	Population
1980	44,148	2000	42,290
1985	43,060	2005	42,310
1990	42,560	2010	42,330
1995	42,250		

LOCAL USE:

Airports are both for those people who fly and those people who do not fly. An AOPA Report entitled "The Value of Airports" reported on the benefits found at Austin, Minnesota from operation of the general aviation airport facility.

> "In Austin, where the general aviation airport is located, a 35% reduction in business by nonresidents would occur if the airport were not available for their use."

Austin is a rural community located in southeastern Minnesota. A second illustration is the impact and benefits to agriculture from aerial application of pesticides and herbicides. The delivery of machine parts from the warehouse to the implement dealer may also save a local crop should time be critical.

General aviation airports are more often associated with business and industry where 90% of the general aviation aircraft are sold for business purposes. An FAA survey of five (5) general aviation airports found that:

1. Local opinion considered the airport a contribution of the local economy.

2. There were increases in the rate of growth following airport development.

3. New industries stated the presence of the airport had been an important factor in locational choice.

4. Old industries were retained partly because of the airport.

5. Economic growth including airports compensated for the trend toward loss of rural employment.

6. Rapid air access improves industrial equipment maintenance capability for manufacturing companies.

7. Connections to the national airport systems are important.

8. The airport can be a nucleus for industrial concentration and promotes cohesive land use in the airport area.

Several businesses currently use airport facilities for transportation of both passengers and cargo. Following is a short paragraph which shows how some businesses in the Alogna airport service area currently use air transport and transportation facilities. This information was collected in a mail and telephone survey of area businesses.

Benschoter's Pet Kingdom currently uses the Mason City airport for receiving cargo shipments every two weeks from Minneapolis or Chicago. The cargo can only come into airports with commuter service; if there is no commuter service available through the airlines the Pet Kingdom will use bus service for deliveries.

Druggists Mutual Insurance Company, the home office for several lines of property, casualty, and life insurance services, currently uses air transport for several activities, which include incoming clients, employees who make business trips to several states throughout the U.S., and air express mail. The majority of clients and employees who fly use commercial airlines which fly out of Des Moines, Minneapolis, Mason City, or Ft. Dodge. Only one client currently uses a private aircraft, and this client can currently land at the Algona airport. The majority of the Air

Express mail which the company receives comes through the Ft. Dodge airport.

George A. Hormel, a food products company, and AFECO, an equipment manufacturer, both have the same parent company of George A. Hormel of Austin, Minnesota. Neither company owns their own aircraft, but the parent company uses one Beech King Aire which flies into the Algona airport about four times per year. The parent company also owns two Westwind jets which currently cannot land at the Algona airport due to lack of runway length. Both companies do have clients which fly into the Algona airport on approximately a monthly basis, but the largest aircraft used is a Beech King Aire which currently lands at the Algona airport.

Home Federal Savings & Loan Association currently has clients flying into the Algona airport on a monthly basis; the largest aircraft used by these clients is typically a small twin engine aircraft, which has no difficulty landing at the Algona facilities. Home Federal employees will also occasionally use small aircraft for business trips to the city of Des Moines.

The Iowa Army National Guard currently has its regional battery headquarters located in the city of Ft. Dodge. The Guard would like to relocate to the Algona airport which would provide them with a more centrally located headquarters for the region. Currently the Guard makes monthly trips to the Alogna airport using mainly King and Queen Aire planes; however, the Guard has recently purchased a 16 passenger C-12 Cargo plane which cannot land at the Alogna facility due to lack of runway length.

The Iowa State Bank in Algona currently makes use of the Alogna airport on a monthly basis with the airport both serving incoming clients and Iowa State Bank personnel flying out. All clients flying in and employees flying out of the airport currently use single engine aircraft.

The Iowa State University Kossuth County Extension Service currently uses the Algona airport on approximately a monthly basis. The current aircraft used is either single engine or twin engine propeller aircraft. The future aircraft used will depend upon the aircraft owned by Iowa State University.

Kossuth Insulators, an insulating and asbestos abatement company, currently uses the air transportation from the Algona airport on the average one to two times a week. The company does work in the majority of the surrounding states and uses the aircraft to provide transportation to inspect buildings for clients and/or provide clients with cost estimate for insulation or asbestos abatement. The company normally leases an aircraft form the Algona airport when needed.

Kossuth Mutual Insurance Association has investment counselors from Cedar Rapids visit the firm about five times a year via transport to the Algona airport. The employees of Kossuth Mutual will infrequently charter an aircraft from the Algona airport for business trips.

Pioneer Hi-Bred International, Incorporated, currently has representatives form the parent company visiting the Algona plant an average of eight times a year. These representatives typically fly into the Algona airport using a small twin turbo-prop aircraft.

Snap-On Tools Corporation currently has several clients who use air transportation to Mason City, Ft. Dodge, or Des Moines on commercial flights. Snap-On does have clients use the Algona airport on approximately a monthly basis. Snap-On Executives will occasionally use air transportation for business trips, but the main method of air transport is through commercial flights. Currently an employee of Snap-On is in the process of obtaining a pilots license, and once the license is obtained chartering of aircraft out of the Algona airport may take place.

Universal Manufacturing Company uses single engine aircraft out of the Algona airport approximately ten times per year for business trips. Occasionally a supplier may use general aviation into the Algona airport. The biggest supplier to Universal Manufacturing is Ford Motor Company; representatives from Ford typically use commercial air transportation to Des Moines on visits to Algona.

The final Algona area business surveyed that uses the Algona airport is Wilson Funeral Homes. The airport is used several times a year on an as needed basis for the transfer of incoming and outgoing bodies for funeral services.

Evident herein is the fact that general aviation is an important part of the daily operation of some employers and of secondary importance to others. Nearly all at one time or another have used general aviation or commercial air carriers to transport people and freight.

Section Two provides an estimate of aviation demand potential within the Algona airport service area.

II. FORECAST OF AVIATION DEMAND

FORECAST OF AVIATION DEMAND

INTRODUCTION

BACKGROUND

The forecast of aviation demand provides a basis by which to estimate short and long range numbers of based aircraft and operational activity within the Algona airport service area. 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 (fixed based 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 as follows:

- 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 at 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 aircraft in the U.S.. By 1980 this number reached 208,600 and is projected to approach 540,000 by the year 2010.

The number of registered pilots nationwide increased from 720,028 in 1970 to 899,700 in 1980. By the year 2010, around 1.5 million persons are expected to be registered pilots.

TABLE 2.1 NATIONAL TRENDS, REGISTERED AIRCRAFT AND PILOTS: 1970-2010

	Year				
	1970	1980	1990	2000	2010
Registered Aircraft	131,700	210,300	240,000	295,000	343,000
Registered Pilots	720,028	899,700	1,155,800	1,331,300	1,500,000

SOURCE: IDOT 1985 Aviation System Plan (1970-1990)
CGA (2000-2010)

Total annual operations are also expected to increase from 134,000,000 operations in 1980 to 400,000,000 by the year 2010. General aviation aircraft are expected to experience an average annual increase of 2.4 percent through the year 2010.

STATEWIDE TRENDS:

The Iowa Department of Transportation anticipates future growth in the number of registered aircraft and pilots within the state.

TABLE 2.2 REGISTERED AIRCRAFT - STATE OF IOWA: 1970-2010

Year	Number	Year	Number
1970	2,565	2000	3,800
1980	3,500	2010	4,400
1990	3,200		

SOURCE: Statistical Profile of Iowa 1987-1988 (1970-1980)
IDOT 1985 Aviation System Plan (1990-2000)
CGA (2010)

TABLE 2.3 REGISTERED PILOTS - STATE OF IOWA: 1970-2010

Year	Number	Per 10,000 Population
1970	12,432	44
1980	12,101	42
1990	10,450	35
2000	12,000	40
2010	13,500	45

SOURCE: IDOT 1985 Aviation System Plan (1970-2000)
CGA (2010)

REGIONAL TRENDS:

Table 2.4 shows the current and projected number of registered aircraft in the eight county area around Algona. These numbers are expected to follow the same trend as shown in Table 2.2, with aircraft numbers decreasing slightly between 1988 and 1990, then steadily increasing in numbers through the year 2010.

TABLE 2.4 REGIONAL TRENDS IN REGISTERED AIRCRAFT 1988-2010

County	Number of Registered Aircraft 1988	1990	2000	2010
Emmet	9	9	11	12
Hancock	20	20	23	27
Humboldt	17	17	20	23
Kossuth	26	26	30	35
Palo Alto	14	14	16	19
Pocahontas	19	19	22	26
Winnebago	25	25	29	34
Wright	19	19	22	26
Total	149	149	173	202

SOURCE: IDOT (1988)
CGA (1990-2010)

Population totals for the eight counties should remain relatively stable from 1990 through 2010, but the number of aircraft within the eight county region is expected to increase throughout the same period. Table 2.5 summarizes the ratio of aircraft to county population in 1990 and 2010.

TABLE 2.5 RATIO OF AIRCRAFT TO POPULATION, EIGHT COUNTIES, 1990 & 2010

County	Population 1990	Population 2010	Number of Aircraft 1990	Number of Aircraft 2010	Number of Aircraft per 10,000 Population 1990	Number of Aircraft per 10,000 Population 2010
Emmet	13,300	13,500	9	12	6.8	8.9
Hancock	13,600	13,800	20	27	14.7	19.6
Humboldt	11,800	11,500	17	23	14.4	20.0
Kossuth	21,400	21,700	26	35	12.1	16.1
Palo Alto	12,200	12,100	14	19	11.4	15.7
Pocahontas	10,700	10,400	19	26	17.8	25.0
Winnebago	11,800	11,200	25	34	21.2	30.4
Wright	15,800	15,800	19	26	12.0	16.5
Total	110,600	110,000	149	202	13.5	18.4

SOURCE: CGA

ALGONA AIRPORT SERVICE AREA TRENDS:

The Algona airport service area includes all of Kossuth County, and portions of Emmet, Hancock, Humboldt, Palo Alto, Pocahontas, and Wright Counties. In addition to the City of Algona, other communities served include Emmetsburg, West Bend, and Bancroft, as well as several other smaller communities. Within the service area there are forty three (43) registered aircraft.

Table 2.4 shows that the number of registered aircraft within Kossuth County is expected to increase from 26 in 1988 to 35 in the year 2010. This increase is based upon an overall increase in the state of Iowa of the number of airplanes per 10,000 population.

Because of the data base and the small numbers dealt with, a decision made locally could drastically alter any estimates made herein. 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, normally 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 aircraft is not always directly related to the residence of the owner. The choice may be affected by such factors as hanger 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

Of the 43 aircraft within the Algona service area, fourteen (14) are currently based at the Algona airport. Table 2.6 lists the aircraft within the Algona service area, as well as their current base airport. As seen in Table 2.7, the number of aircraft based at the Algona airport is estimated to increase to 19 by the year 2010, assuming no improvements in airport services or physical conditions of the airport.

It should be noted that the Emmetsburg airport can service all traffic for Palo Alto County up to Basic Utility Type II. Provisions will be made in estimating total future aviation activity at the Algona airport for traffic Basic Utility Type II coming from Palo Alto County.

TABLE 2.6 REGISTERED AND BASED AIRCRAFT, ALGONA AIRPORT SERVICE AREA

Owner	Mail Address	Base Airport	Aircraft Type
Kadera, D.E.	Corwith	Eagle Grove	Piper 2806
Smidt, D.R.	Swea City	Northwood	Stits SA 3A
Tepner, S.A.	Bode	Algona	Beech M35
Reutzel, C.L.	Burt	Algona	Cessna 177B
O'Leary, P.J. (3)	Algona	Algona	Cessna 182F
	Algona	Algona	Cessna 182A
	Algona	Algona	N.A.
O'Leary, D.C.	Algona	Algona	Cessna 152
Bartholomew, M.R.	Algona	Algona	Piper 28R-180
Linde Implement Co. Inc.	Swea City	Algona	Mooney M20J
Crop Survey Inc.	Algona	Algona	Piper PA28-181
Sheraire Corp.	Algona	Algona	N.A.
Nielson, H.E. Jr.	LuVerne	Algona	Cessna 172
Algona Aviation Inc.	Algona	Algona	Cessna 152 11
Guy, J.	Swea City	Algona	Piper PA36
Riedel, R.C. & Schenck, J.L.	Algona	Algona	Cessna 172
Hofstad, G.B.	Emmetsburg	Emmetsburg	Beech D35
Leuer, J.	Emmetsburg	Emmetsburg	Cessna 172
Kragt, J.B.	Emmetsburg	Emmetsburg	Beech V35A
Dick's Office Equipment	West Bend	Emmetsburg	N.A.
Gjerde Flying Service Inc.	Emmetsburg	Emmetsburg	Piper PA32RT-300
Ken's Construction Services	Emmetsburg	Emmetsburg	Cessna 172
Jamison, J.M.	Emmetsburg	Emmetsburg	Beech B35
Palo Alto Flyers	Emmetsburg	Emmetsburg	Cessna 172N 11
Johannsen, D.L.	Emmetsburg	Emmetsburg	Evans Volksplane
Gjerde, A.D.	Emmetsburg	Emmetsburg	A.P.D.C. A98
Emmetsburg Aero Club Inc.	Emmetsburg	Emmetsburg	Cessna 177
Fogary Flying Service Inc.	West Bend	Emmetsburg	Piper 1102
Nixon, D.E.	Emmetsburg	Field Strip	Piper PA28-140
Christensen, F.M.	West Bend	Field Strip	Cessna 172
Kohlhaas Spraying Inc.	Livermore	Field Strip	N.A.
Kramer, I.C.	Bancroft	Field Strip	Cessna 150
McClintock, J.E. & Joseph, D.	Fenton	Field Strip	Piper PA28-235
Larson, R.W.	Lakota	Field Strip	Piper PA28-235
Vucetik, M.	Ackley	Field Strip	Cessna A188B
Bonnstetter, L.	West Bend	Field Strip	Cessna 182
Voss, K.	LuVerne	Field Strip	Cessna 172M
Meyer, D.	Whittemore	Field Strip	Cessna 188BA
Two Ten Enterprises Ltd.	Lone Rock	Field Strip	Cessna T210M 11
Steier Ag Aviation Inc.(3)	Whittemore	Field Strip	Beech E33A
	Whittemore	Field Strip	Piper PA25-235
	Whittemore	Field Strip	Cessna A188B
Bauer, E.	Bancroft	Field Strip	Piper PA18

43 Total Registered Aircraft

SOURCE: IDOT - 1/88

TABLE 2.7 BASED AIRCRAFT, ALGONA AIRPORT, 1988-2010

Year	Based Aircraft	Year	Based Aircraft
1988	14	2000	17
1990	15	2005	18
1995	16	2010	19

SOURCE: CGA

The future mix of based aircraft is expected to consist, for the most part, of single and light twin engine aircraft having a gross landing or takeoff weight of 6,000 pounds or less. The exceptions to this are two Westwind jets used by George A. Hormel Company which currently cannot land at the Algona airport due to lack of runway length. Heavier twin engine planes are also owned by both the Iowa National Guard and George A. Hormel Company (Beech King Air E90) which can land at the Algona airport as long as they are not carrying a full load.

The design aircraft for future considerations at the Algona airport should be one that can safely accommodate all aircraft operations desired by the community in order to accommodate transportation and economic development goals. The Westwind jets, and the Beech King Air would then be the design aircraft. Characteristics of each aircraft are shown in Table 2.8.

TABLE 2.8 DESIGN AIRCRAFT CHARACTERISTICS

	Westwind	Beech King Air
Gross Take off Weight (Max.)	23,650 lbs.	9,650 lbs.
Wingspan	44.8 ft.	50.3 ft.
Approach Speed	129 knots	100 knots

SOURCE: FAA

AIRCRAFT OPERATIONS

ANNUAL, ITINERANT, AND LOCAL OPERATIONS:

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

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

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

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

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

An itinerant aircraft operation is one that operates outside of 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 of correlation has typically been found between aircraft operations and service area population, based aircraft, and registered pilots.

Table 2.3, found earlier summarizes the historic and future number of registered pilots in the state of Iowa from 1970 through the year 2010.

The ratios found in Table 2.3 were used to estimate the number of airmen in the Algona airport service area. Deviation from the statewide average will vary from airport service area to airport service area 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 statewide average. Table 2.9 shows the estimated number of airmen in the Algona airport service area from the year 1970 through the year 2010; in estimating registered pilots for the Algona service area, only 20 percent of the population resulting from Palo Alto County was considered as served by the Algona airport.

TABLE 2.9 REGISTERED PILOTS - ALGONA AIRPORT SERVICE AREA, 1970-2010

Year	Registered Pilots	Year	Registered Pilots
1970	138	2000	122
1980	132	2010	136
1990	107		

SOURCE: CGA

Total annual aircraft operations were computed utilizing the following equation:

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

The same variables were used to estimate itinerant operations:

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

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 variation respectively. The estimated total general aviation operations at the Algona airport is shown in Table 2.10.

TABLE 2.10 GENERAL AVIATION OPERATIONS, ALGONA AIRPORT 1990-2010

Year	Annual Operations	Annual Itinerant Operations	Annual Local Operations
1990	16,590	6,370	10,220
2000	18,900	7,400	11,500
2010	21,100	8,500	12,600

SOURCE: CGA

Total operations are expected to increase 27.2% through the year 2010 to a total of 24,900 operations per year. That increase comes from a 33.4% increase in itinerant operations, and a 23.3% increase in local operations.

An airport activity count made by the IDOT during the years 1985 through 1987 indicated approximately 8,300 annual operations at the Algona airport. This count when applied to the number arrived at through application of the models shows the models to arrive at total operations which double the numbers tabulated by the IDOT.

Considering variations in airport activity as previously discussed, the General Aviation Operations shown in Table 2.10 should be considered as a maximum possible number of operations and a number of operations at 50% of Table 2.10 should be considered as a minimum possible number of operations expected at the Algona airport facility.

For purposes of estimating air passengers and freight, an average of the minimum and maximum estimated operations will be used.

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 2.11 AIR PASSENGERS, 1990-2010

Year	Air Passengers
1990	7,170
2000	8,330
2010	9,560

SOURCE: CGA

AIR FREIGHT:

The tonnage of air freight was estimated at 8 pounds per enplaned passenger.

TABLE 2.12 AIR FREIGHT, 1990-2010

Year	Air Freight
1990	28.7 tons
2000	33.3 tons
2010	38.2 tons

SOURCE: CGA

COMMUTER AIR CARRIER/TAXI SERVICE:

Certified air service resides in very few communities in the State of Iowa, and commuter air service is not expected to expand to the basic transport category of airports which do not currently have commuter service. The air taxi would therefore seem to be the most appropriate carrier of air passengers and cargo for Algona.

AIRPLANE DESIGN GROUP

AIRPORT SCOPE:

As previously noted, the majority of aircraft operations will be made by single and light twin engine aircraft that would generally have an approach speed of less than 91 knots and a wingspan of less than 49 feet. If the airport were to be improved to accommodate Westwind jets as well as the Beech King Air, differing design criteria would have to be used.

The following airport design criteria is used to determine the scope of airport development required to satisfy aviation demand.

1. Aircraft Approach Categories:

   A. Category A Aircraft: Speeds less than 91 knots.
   B. Category B Aircraft: Speeds of 91 knots or more but less than 121 knots.
   C. Category C Aircraft: Speeds of 121 knots or more but less than 141 knots.

2. Aircraft Design Group:

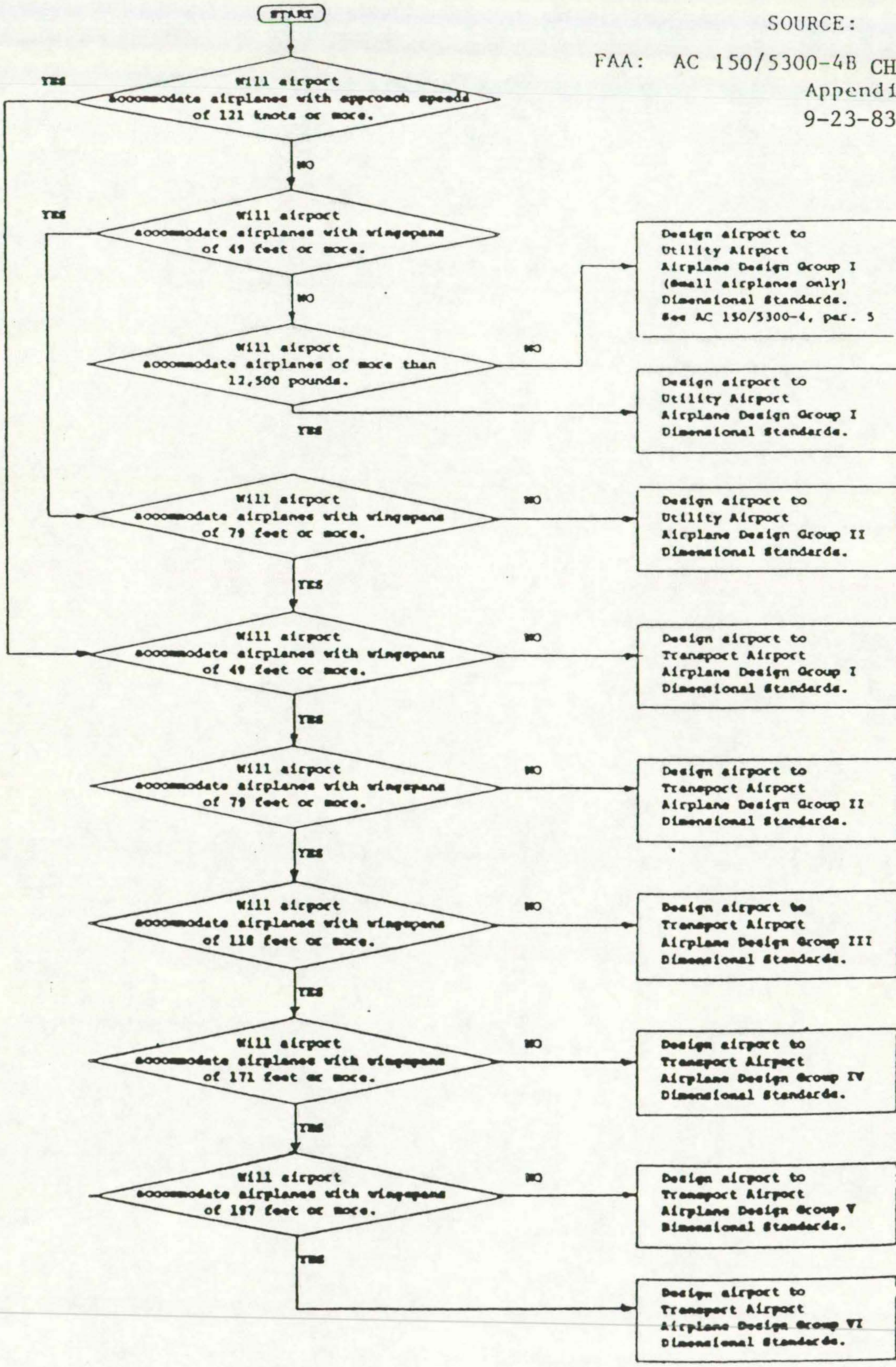
   A. Airplane Design Group I: Wingspan up to but not including 49 feet.
   B. Airplane Design Group II: Wingspan up to but not including 79 feet.

The two design aircraft both fit in different approach categories and design groups. The Westwind jets are Category C Aircraft and Airplane Design Group I. The Beech King Air E90 are Category B Aircraft and Airplane Design Group II. Based upon the design aircraft and the forecast of aviation activity, the Algona airport facility should be developed to meet Airplane Design Group II, transport airport standards. Reference may be made to Figure 2.1, "Airplane Design Group Concept."

FIGURE 2-1 AIRPLANE DESIGN GROUP CONCEPT

SOURCE:

FAA: AC 150/5300-4B CHG 7
Appendix 1
9-23-83



III. FACILITY REQUIREMENTS

INTRODUCTION

This portion of the study describes those facility and equipment requirements needed to accommodate the aviation demand forecasted in the previous portion of the study. It is intended that this information be presented in a form that can be readily used in analyzing and determining the ability of the existing Algona Airport site to accommodate anticipated future needs.

The following specific items of development and requirements are addressed:

- Runway and Taxiway - Length, width, clearances, visibility, orientation and grades.
- Terminal Area - Apron, hangars, administration building, and auto parking.
- Obstructions - Navigable airspace.
- Drainage.
- Paving - Rigid pavement and flexible pavement.
- Marking, lighting and visual aids.
- Navigational aids.

Information contained herein is drawn primarily from applicable FAA Advisory Circulars. As indicated in the Forecast of Aviation Demand section on this study, development should be planned to Transport standards for Approach Category C, Aircraft Design Group II.

RUNWAY AND TAXIWAY

LENGTH:

Runway length requirements are a function of the aircraft type using the facility and certain conditions at the airport, including 1) temperature, 2) surface wind, 3) runway gradient, 4) pavement condition, and 5) altitude of the airport. The following paragraphs describe these factors and their effect on the runway length at the Algona Airport.

- Temperature. The higher the temperature, the longer the runway length requirements. This is due to the fact that higher temperatures reflect lower air densities. Therefore, increased airspeed is required to obtain or maintain proper lift. These faster speeds require longer runway lengths for acceleration and deceleration. This study assumes a mean daily maximum temperature during the hottest month of the year to be 83 degrees Fahrenheit.

- Surface Wind. The greater the headwind the shorter the runway length requirements and conversely, tailwinds require longer runway lengths. The following table approximates the effect of wind:

ACTUAL WIND (KNOTS)	% INCREASE OR DECREASE OF LENGTH WITH NO WIND
+ 5	- 3
+ 10	- 5
- 5	+ 7

  SOURCE: Planning and Design of Airports, Robert Horonjeff.

  For the purpose of this study, a no wind situation will be assumed. This is a worst case situation since if there is any wind, a landing direction can be selected where there is at least some headwind component.

- Runway Gradient. Runway gradient, or slope of the runway, requires additional runway length for takeoff on an uphill gradient as opposed to a level or downhill gradient. Therefore, the runway length determined in this section will need to be increased to account for the gradient. It is assumed the gradient of the runway will be 0.26% based on the existing runway at the Algona Airport.

- Pavement Condition. When landing operations govern the length of the runway, additional runway length may be required for wet conditions. However, runway gradient and wet runway effects are not cumulative and, when both conditions apply, the larger of the increases is used to determine the recommended runway length.

- Altitude of the Airport. The higher the altitude of the airport, the longer the runway length requirements. Higher altitudes reflect lower air densities. Therefore, higher operating speeds are required to maintain sufficient lift. In general, an additional 7% of runway length is required for each additional 1000 feet of altitude. For the purpose of this study, an altitude of 1214 feet above mean sea level is assumed for the airport.

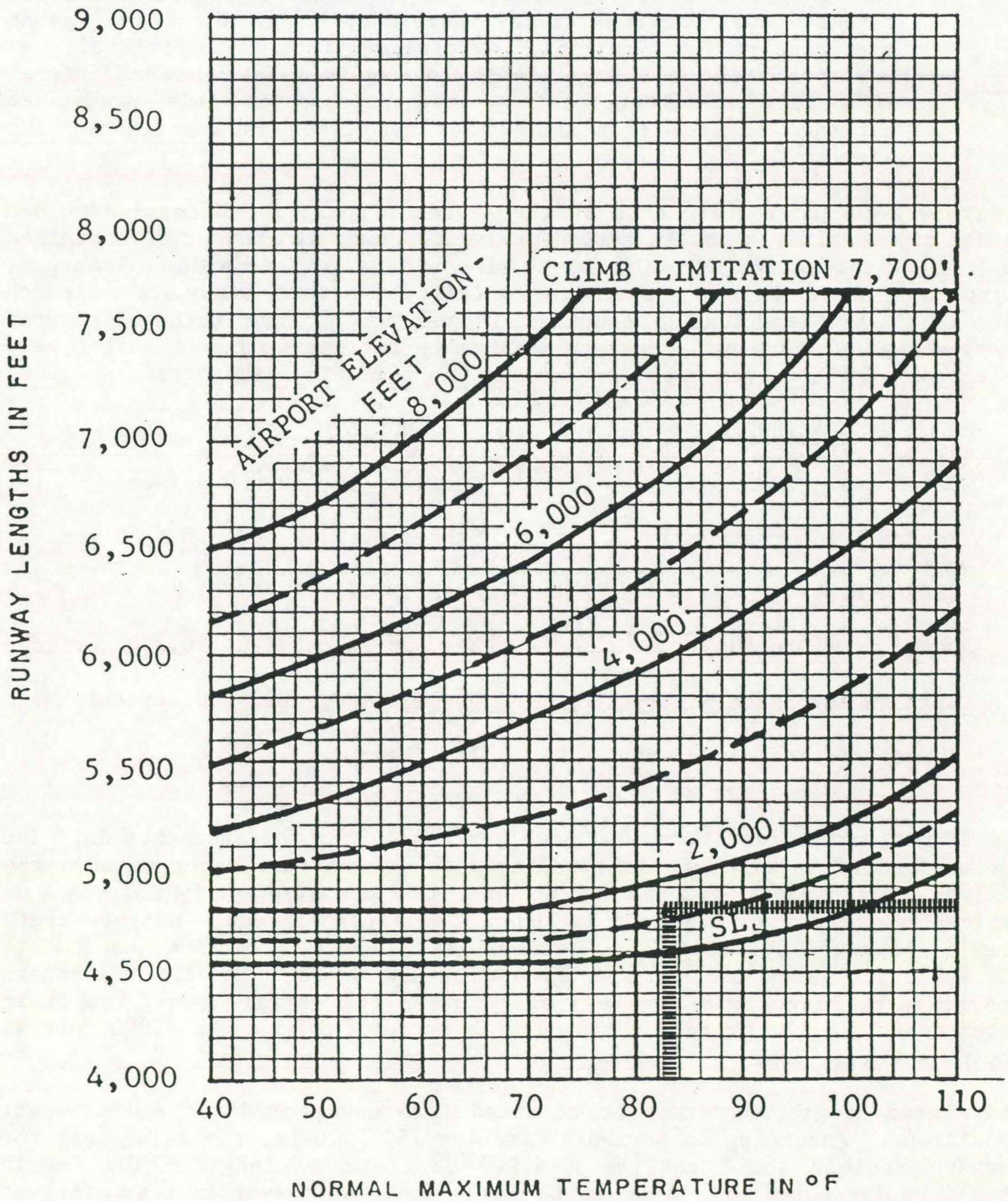
The runway length requirements at the Algona Airport are determined based on the above criteria and in accordance with runway length curves contained in FAA Advisory Circular 150/5300-12 Airport Design Standards - Transport Airports. Based on the forecasts contained in this study, the length curves for airplanes which comprise 75 percent of the turbojet-powered airplanes of 60,000 pounds or less maximum certificated takeoff weight were selected. These curves will accommodate the following aircraft:

MANUFACTURER	MODEL
Gates Learjet Corporation	Learjet (20, 30, 50 series)
Rockwell International	Sabreliner (40, 60, 75 & 80 series)
Cessna Aircraft	Citation (I, II, III)
Dassault - Bregeut	Fan Jet Falcon (10, 20, 50 series)
British Aerospace Aircraft Group	HS-125 (400, 600, 700 series)
Israel Aircraft Industries	1124 Westwind

The length curves for 60% useful load were used in this determination. The useful load of an aircraft is considered to be the difference between the maximum certificated takeoff weight and the operating weight empty. A typical operating weight empty includes the airplane's empty weight, crew, crew's baggage and supplies, removable passenger service equipment, removable emergency equipment, engine oil, and unusable fuel. Passengers and baggage, cargo, and usable fuel comprise the useful load. The basic requirement for the primary runway length is determined to be 4,800 feet as shown in Figure 3.1.

This basic length must then be adjusted for runway gradient and pavement conditions. According to Advisory Circular 150/5300-12, the adjustment for runway gradient would require a 4,900 foot runway length. The length should be increased by 15% or up to 5,500 feet, whichever is less, for wet runway conditions. Therefore, the recommended runway length is 5,500 feet.

A cross wind runway is recommended to accommodate aircraft operations when the wind conditions are such that the aircraft cannot safely use the primary runway. It is assumed the demand for the cross wind runway will be from lighter propeller driven aircraft in the basic utility classification. The normal runway length for basic utility aircraft is 4,000 feet. The cross wind runway can be shortened to 80% of its required length. This is



75% FLEET @ 60% USEFUL LOAD

RUNWAY LENGTH CURVES

FIGURE 3.1

based on a wind situation where the primary runway cannot be used. There should be sufficient headwind on the cross wind runway justifying a shorter length. Therefore, it is recommended here that the cross wind runway length be in the range of 3,200 feet to 4,000 feet.

Width and Clearances:

The airport's dimensional requirements are based on the standards of the FAA as described in Advisory Circular 150/5300-12 for Airplane Design Group II. These dimensional standards are as follows:

Runway Width	100 feet
Runway Shoulder Width	10 feet
Runway Safety Area Width	500 feet
Taxiway Width	35 feet
Taxiway Safety Area Width	79 feet
Separation Distance	
Runway Centerline to Parallel Taxiway Centerline	400 feet
Runway Centerline to Aircraft Parking Area	500 feet
Runway Centerline to Property/ Building Restriction Line	500 feet
Taxiway Centerline to Fixed or Movable Object and to Property Line	64 feet

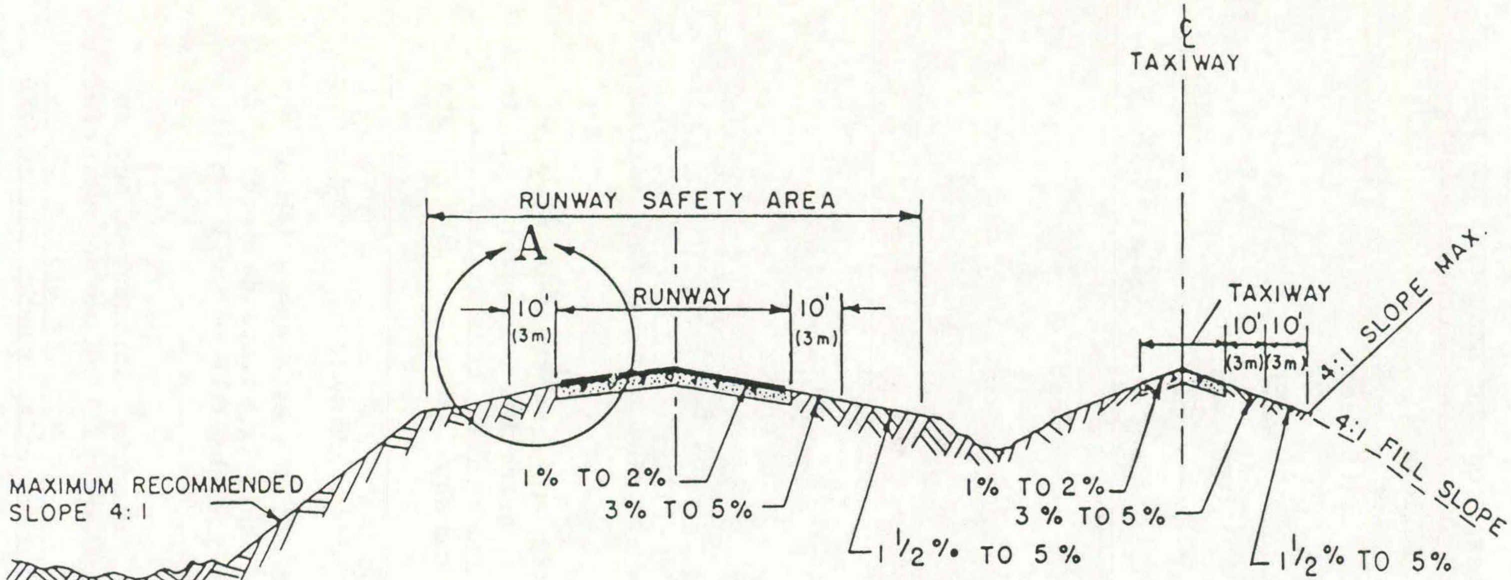
Figure 3.2 depicts a typical cross section of the runway and taxiway configuration.

The forecast of aviation demand does not justify the construction of a full parallel taxiway system based on capacity criteria. However, it is recommended that it be planned for anyway and can be constructed should activity exceed expectations or safety reasons should justify its development.

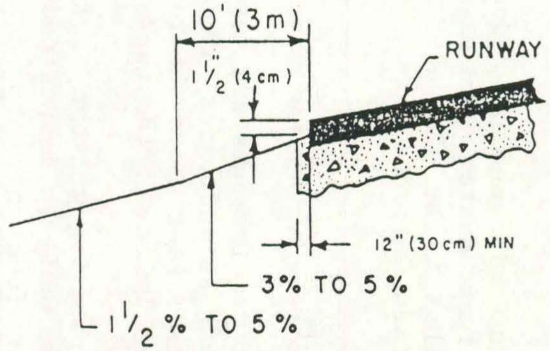
Line-Of-Sight:

Line-of-sight requirements are very important for the safe operation of the airport. Along an individual runway, grades shall be maintained such that any two points 5 feet above the runway centerline shall be mutually visible for the entire length of the runway.

Between intersecting runways, grade changes, terrain, structures and any other objects shall be maintained such that there will be an unobstructed line of sight from any point 5 feet above the runway centerline to any point 5 feet above the centerline of the intersecting runway within the



LOCATION OF DITCH, SWALE OR HEADWALL DEPENDS ON SITE CONDITION BUT IN NO CASE WITHIN LIMITS OF RUNWAY SAFETY AREA.



DETAIL A

TRANSVERSE SLOPES SHOULD BE ADEQUATE TO PREVENT THE ACCUMULATION OF WATER ON THE SURFACE.
SLOPES SHOULD FALL WITHIN THE RANGES SHOWN ABOVE.
THE RECOMMENDED $1\frac{1}{2}$" (4 cm) PAVEMENT EDGE DROP IS INTENDED TO BE USED BETWEEN PAVED AND UNPAVED SURFACES.
IT IS DESIRABLE TO MAINTAIN A 5% SLOPE FOR THE FIRST 10' (3m) OF UNPAVED SURFACE IMMEDIATELY ADJACENT TO THE PAVED SURFACE.

TYPICAL CROSS SECTION

FIGURE 3.2

runway visibility zone. The runway visibility zone is graphically depicted in Figure 3.3.

Obstacle Free Zone:

The Obstacle Free Zone (OFZ) is an area of imaginary surfaces which should not be penetrated by obstructions or hazards of any sort. An obstruction or hazard is any above ground object, including parked aircraft. Frangibly-mounted NAVAID'S are the exception since they must be located near the runway because of their function. The OFZ for the the Algona Airport is defined as follows:

> Runway OFZ. The runway OFZ is the volume of space above a surface longitudinally centered on the runway. The elevation of any point on the surface is the same as the elevation of the nearest point on the runway centerline. The runway OFZ extends 200 feet beyond each end of the runway and its width is 250 feet for nonprecision instrument and visual runways serving or expected to serve small airplanes with approach speeds of 50 knots or more and no large airplanes.

Runway Location and Orientation:

Runway location and orientation are important from a safety, environmental, efficiency and economic point of view. The following paragraphs discuss the considerations to be made in runway location and orientation while Phase IV (Site Evaluation) will address the ability of the existing airport site to satisfy these considerations.

Wind coverage is of paramount importance in orienting a runway. Runway orientation should be such that the airport can be utilized 95% of the time without excessive cross wind components. For aircraft in Aircraft Approach Category C, the recommended limiting crosswind is 13 knots (15 miles per hour). For general utility operations, the recommended limiting crosswind is 10.5 knots (12 miles per hour).

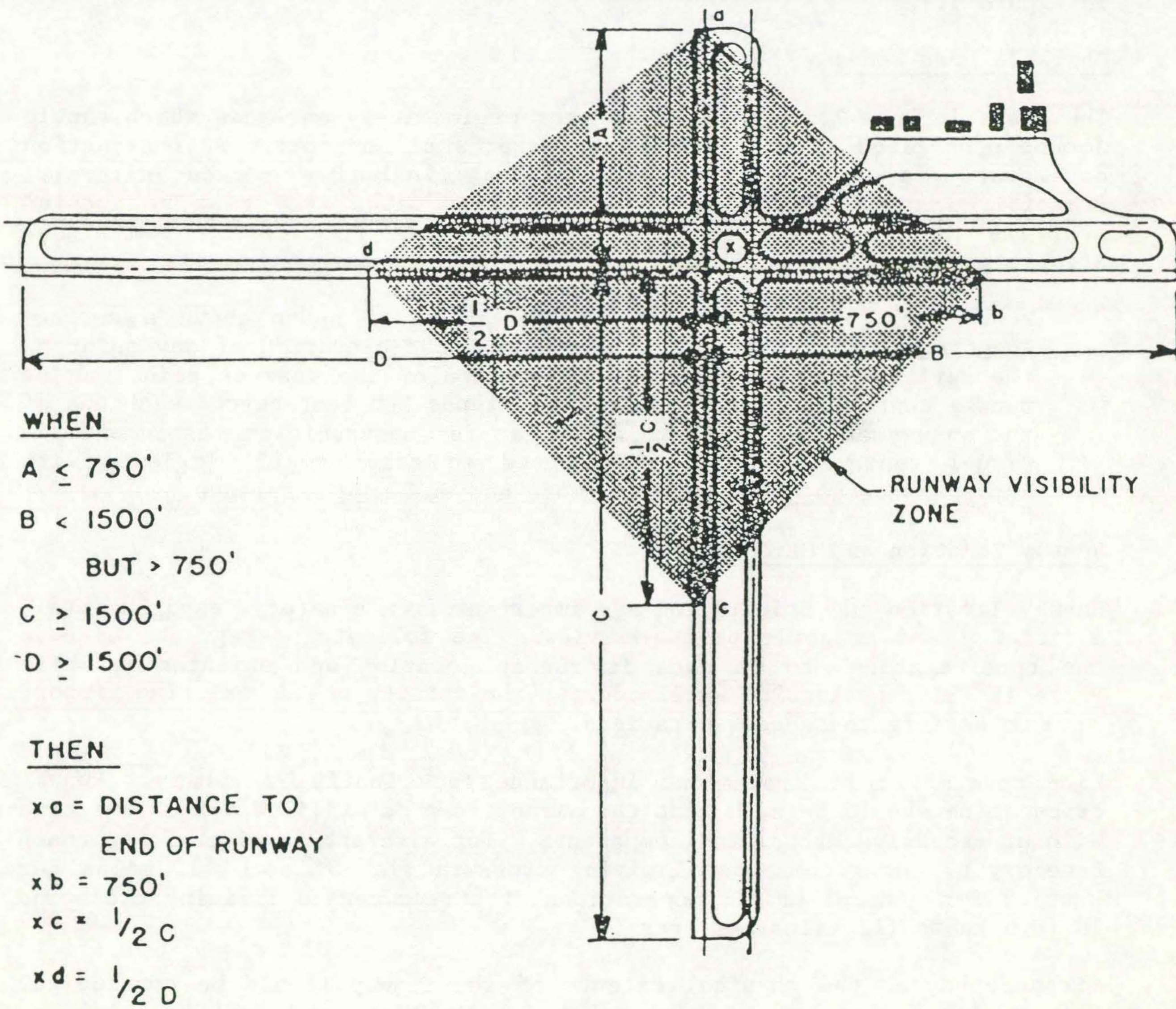
Airspace beyond the physical extents of the runway should be considered. This includes clear zones, approaches, obstructions and traffic patterns. Clear zones and obstruction standards are discussed elsewhere in this section of the study.

Environmental factors are also an important consideration. Although a detailed environmental analysis is not a part of this study, a cursory evaluation should be made of the runway's orientation impact on air and water quality, land use and noise factors.

Topography plays an important role in selecting the orientation of the runway. Considerations must be made on the effect of the grading on surface and subsurface drainage, soil types to be encountered along with the total cost of construction.

Clear Zones:

It is required that the airport owner have an "adequate property interest" in the clear zone area. "Adequate property interest" in order of



RUNWAY VISIBILITY ZONE

FIGURE 3.3

preference may be in the form of fee ownership; a clear zone easement restricting the existence of any growths, structures or objects except normal crops; or an avigation easement restricting the height of obstructions. The dimensions and location of the clear zone are depicted in Figure 3.4.

Surface Gradient:

In addition to the sight distance requirements listed above, the runway's longitudinal grade shall not exceed those limitations depicted in Figure 3.5.

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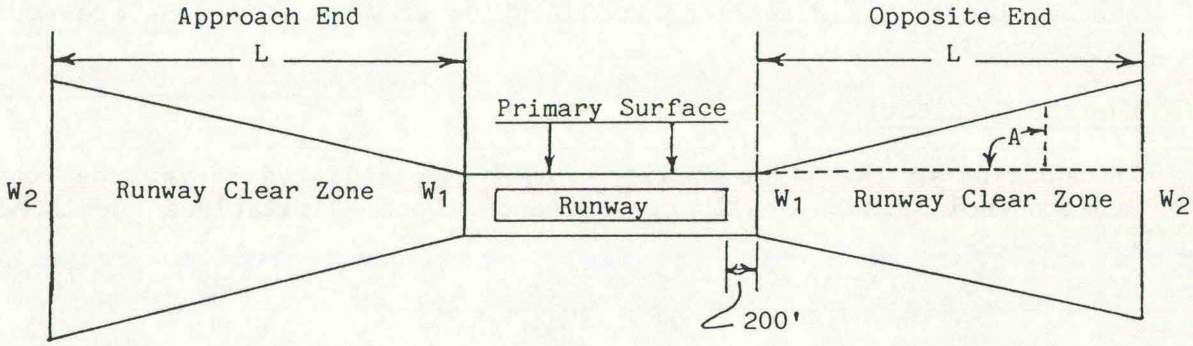


Facilities Expected To Serve	Set No.	Runway End: Approach End	Runway End: Opposite End	Dimensions: Length L (feet)	Inner Width W_1 (feet)	Outer Width W_2 (feet)	Runway Clear Zones (acres)	Flare Ratio A (rise/run)
Only Small Airplanes	1	V		1,000	250	450	8.035	.1:1
			V	1,000	250	450	8.035	.1:1
	2	V		1,000	500	650	13.200	.075:1
			NP	1,000	500	800	14.922	.15:1
	3	NP		1,000	500	800	14.922	.15:1
			NP	1,000	500	800	14.922	.15:1
Large Airplanes	4	V		1,000	500	700	13.770	.1:1
			V	1,000	500	700	13.770	.1:1
	5	V		1,000	500	700	13.770	.1:1
			NP 3/4 +	1,700	500	1,010	29.465	.15:1
	6	V		1,000	1,000	1,100	24.105	.05:1
			NP 3/4	1,700	1,000	1,510	48.978	.15:1
	7	V		1,000	1,000	1,100	24.105	.05:1
			P	2,500	1,000	1,750	78.914	.15:1
	8	NP 3/4 +		1,700	500	1,010	29.465	.15:1
			NP 3/4 +	1,700	500	1,010	29.465	.15:1
	9	NP 3/4 +		1,700	1,000	1,425	47.320	.125:1
			NP 3/4	1,700	1,000	1,510	48.978	.15:1
	10	NP 3/4 +		1,700	1,000	1,425	47.320	.125:1
			P	2,500	1,000	1,750	78.914	.15:1
	11	NP 3/4		1,700	1,000	1,510	48.978	.15:1
			NP 3/4	1,700	1,000	1,510	48.978	.15:1
	12	NP 3/4		1,700	1,000	1,510	48.978	.15:1
			P	2,500	1,000	1,750	78.914	.15:1
	13	P		2,500	1,000	1,750	78.914	.15:1
			P	2,500	1,000	1,750	78.914	.15:1

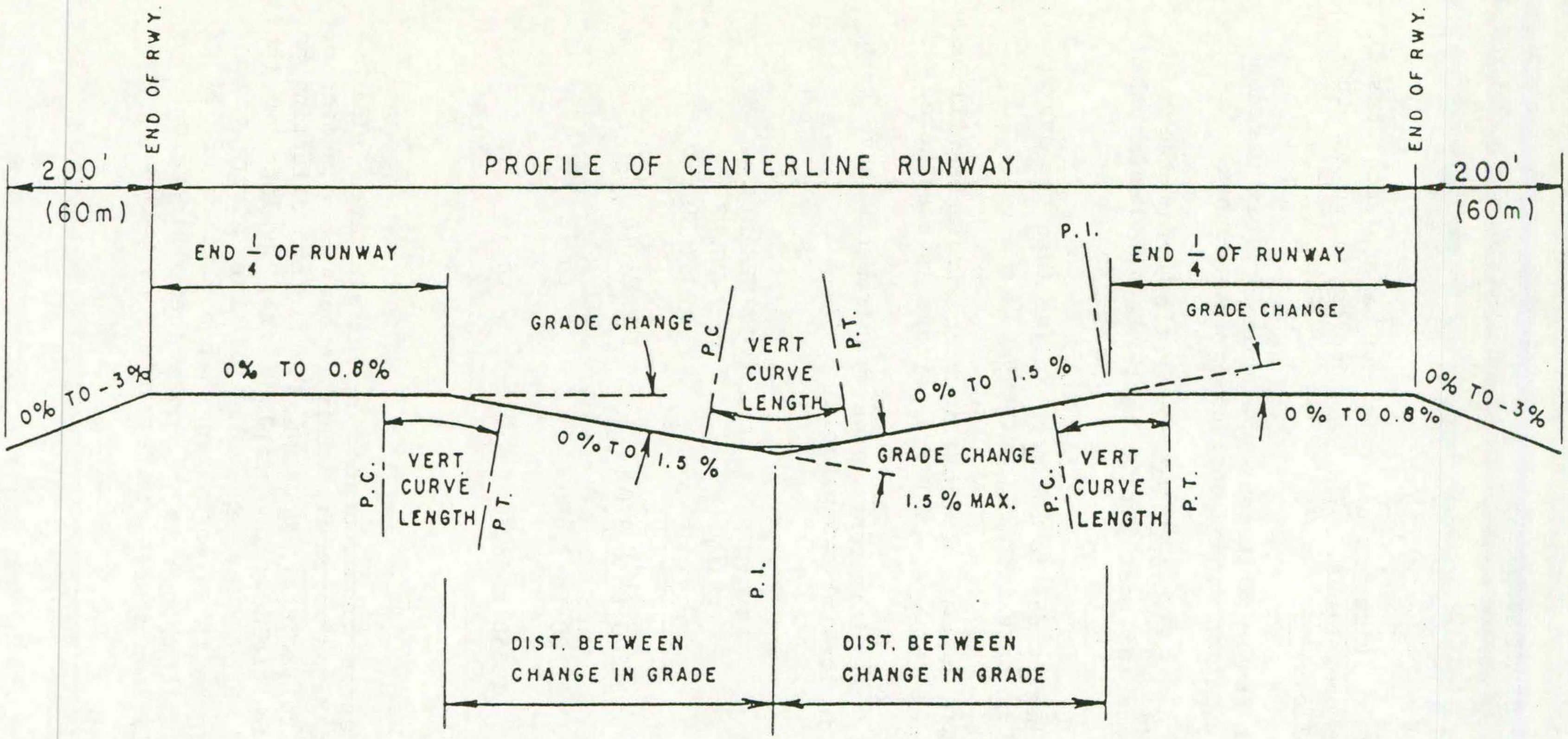
V = Visual approach
NP = Nonprecision approach
P = Precision instrument approach

NP 3/4 + = Visibility minimums more than 3/4-statute mile
NP 3/4 = Visibility minimums as low as 3/4-statute mile

*

RUNWAY CLEAR ZONE DIMENSIONS

FIGURE 3.4



MINIMUM DISTANCE BETWEEN CHANGE IN GRADE = 1000' (300m) x SUM OF GRADE CHANGES (IN PERCENT).

MINIMUM LENGTH OF VERTICAL CURVES = 1000' (300m) x GRADE CHANGE (IN PERCENT).

LONGITUDINAL GRADE LIMITATIONS

FIGURE 3.5

TERMINAL AREA

Itinerant Apron:

The area required for parking of itinerant aircraft can be projected based on the forecasted itinerant operations. The methodology used in this projection is described as follows:

a. Calculate the total annual itinerant operations. This was done in the forecast of aviation demand portion of this report.

b. Calculate the average daily itinerant operations for the most active month. Assume the most active month is 10% busier than the average month.

c. Assume the busy itinerant day is 10% more active than the average day. This is based on data from FAA surveys.

d. Assume that a certain portion of the itinerant airplanes will be on the apron during the busy day. Fifty percent is used here.

Based on the above analysis, the itinerant apron requirements have been calculated and are presented in the following table.

YEAR	ANNUAL ITINERANT OPERATIONS	ITINERANT TIE-DOWNS REQUIRED
1990	3,200 to 6,370	5 to 10
2000	3,700 to 7,400	6 to 12
2010	4,250 to 8,500	7 to 14

Based Aircraft Apron:

In addition to itinerant apron requirements, a certain area will be required for the tie-down of based aircraft. This depends on a number of variables and is difficult to project. Some of the factors affecting an aircraft owner's decision to tie-down an airplane are: quality of the available hangars; cost of hangar space; value of the aircraft; and personal preference. For Algona it is estimated that a maximum of 15% of the based aircraft owners will choose to tie-down their aircraft. The calculated based aircraft tie-down spaces are determined as follows.

YEAR	BASED AIRCRAFT	BASED AIRCRAFT TIE-DOWNS REQUIRED
1988	14	2
1990	15	2
1995	16	2
2000	17	2
2005	18	3
2010	19	3

Apron Requirements:

Total apron area requirements should provide adequate space for:

a. Tie-Down of Based Aircraft
b. Tie-Down of Itinerant Aircraft
c. Temporary Parking of Transient Aircraft
d. Short Term Loading and Unloading
e. Fixed Base Operator Functions
f. Fueling

With proper planning, the apron area will accommodate the maximum number of aircraft while maintaining ease of ingress and egress. The apron area should also be planned with a certain amount of flexibility and expandability. Figure 3.6 depicts a typical layout of the space requirement of an apron while Figure 3.7 depicts tie-down configurations.

Hangars:

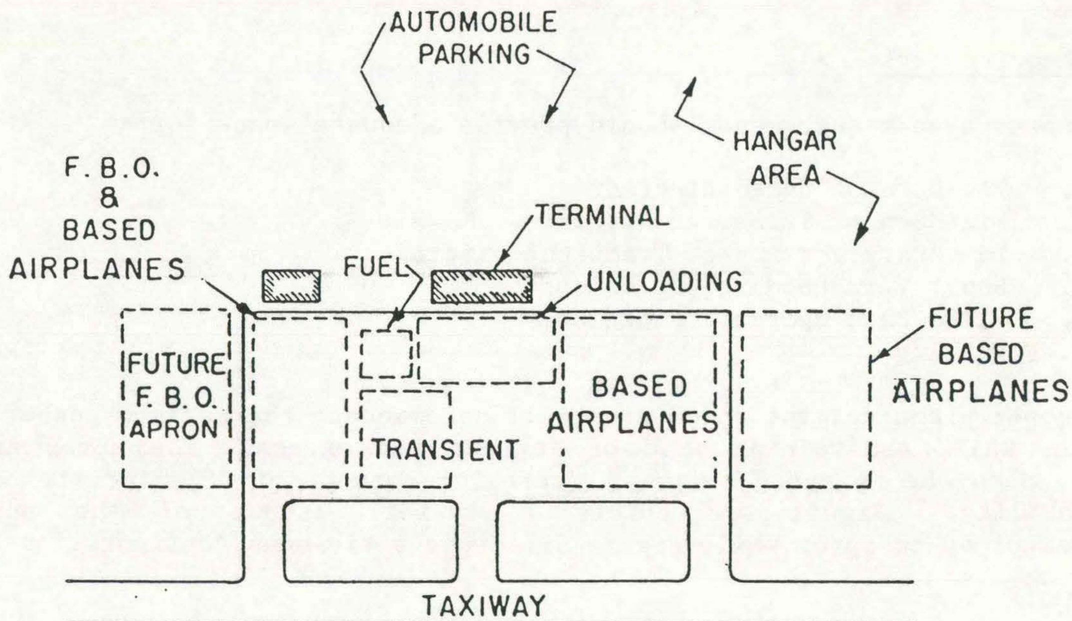
Hangar space requirements are in two forms - T-hangars and conventional hangars. The majority of aircraft owners will prefer to store their aircraft in T-hangars. This is the most economical form of aircraft storage for individual owners. Some aircraft owners, more specifically corporate aircraft owners, may prefer to hangar their aircraft in an individual conventional hangar. Lastly, conventional hangar space should be provided for fixed base operator facilities.

The criteria for the number of hangar spaces that should be planned for is as follows:

a. T-hangar space should be provided for the number of based aircraft at the airport (use projected numbers for planning purposes). In addition, provide three to four spaces for itinerant aircraft which may need a space and as an attraction to new based aircraft.

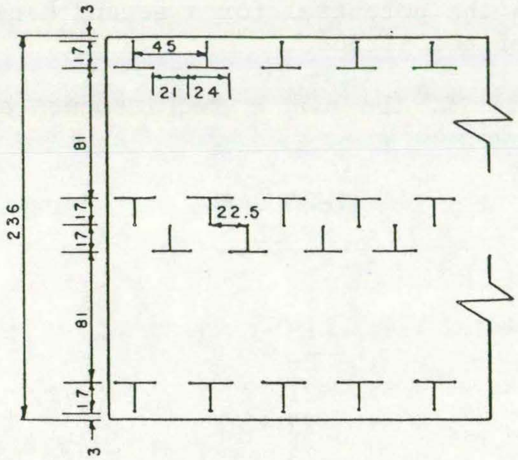
b. The number of conventional hangar spaces to be allowed for is difficult to estimate. It is highly dependent on the personal preferences of the local users. In general, two to three corporate hangars are adequate for the 20-year development of transport category airport.

c. Conventional hangar space should also be provided for the fixed based operator facilities. Initially, one such hangar will be

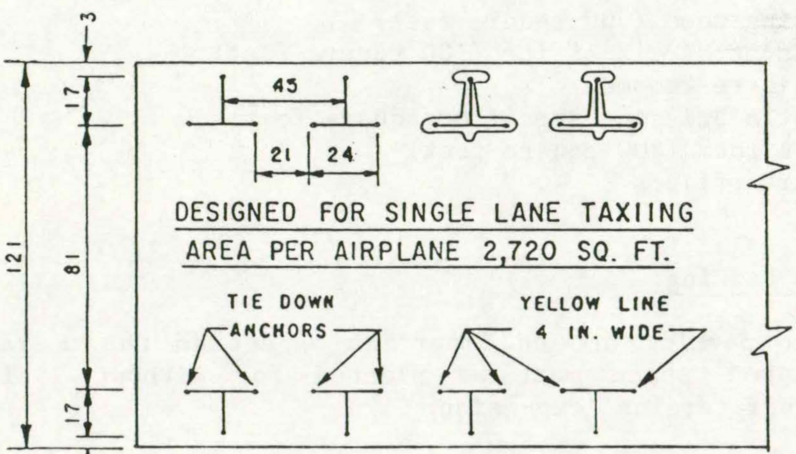


APRON LAYOUT

FIGURE 3.6



TYPICAL LAYOUT FOR
GENERAL UTILITY AIRPORT



TYPICAL LAYOUT FOR
BASIC UTILITY AIRPORT

TIEDOWN LAYOUTS

FIGURE 3.7

adequate with the potential for a second hangar in the long range development of the airport.

Based on the above criteria, the hangar requirements at the Algona Airport are determined as follows.

YEAR	T-HANGAR SPACE	CONVENTIONAL HANGAR SPACE
1988	18	1
1990	19	1
1995	20	2
2000	21	2
2005	22	2
2010	23	3

Typical configurations of T-hangars and taxiways are depicted in Figure 3.8.

Administration Building:

An administration building provides accommodations for the general public along with those responsible for administration of the airport. At a minimum the building should provide room for the following facilities.

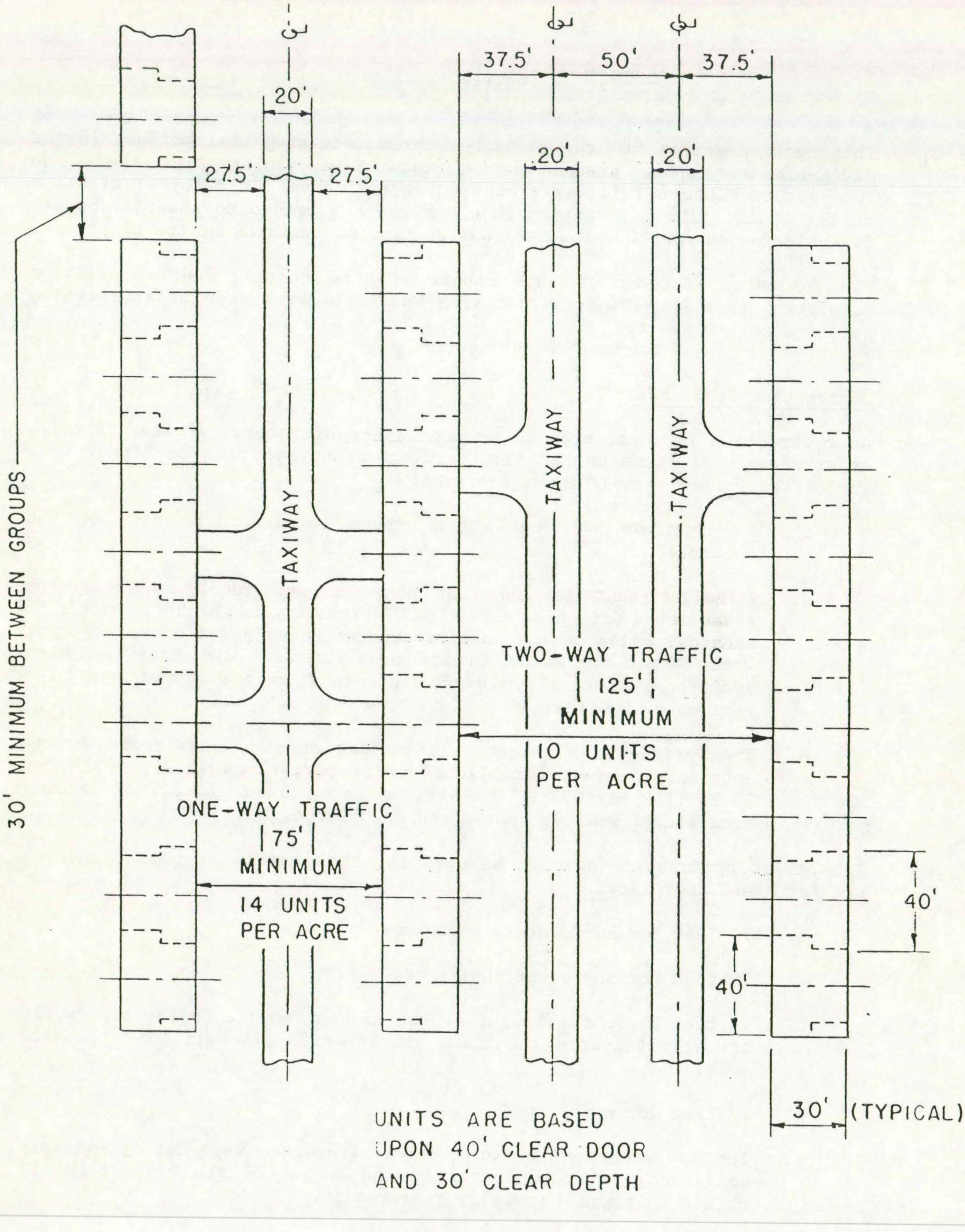
a. Waiting room (500 square feet)
b. Administrator's office (180 square feet)
c. Public restrooms
d. Pilot's briefing area (180 square feet)
e. Class room (200 square feet)
f. Future offices

Roads and Auto Parking:

Roads and auto parking are an important aspect in the operation of the airport. Adequate space must be planned for without limiting future building or other terminal expansion.

Parking spaces are required to accommodate pilots, passengers, visitors and employees. As a general rule, hard surfaced parking spaces equal to the number of based aircraft should be provided. This would require 14 spaces at the present time expanding to 19 in the year 2010. Special events such as air shows and fly-ins may require significant amounts of parking. Although it is not practical to provide hard surface space for these infrequent events, available turf areas should be kept in mind in the layout of the terminal area.

The entrance road should be hard surfaced and 22 feet wide with adequate shoulders and drainage provisions. In addition an access drive to the ramp area for service vehicles should be provided. However, it is recommended that a gate be provided to control unauthorized access.



T-HANGAR LAYOUT

FIGURE 3.8

OBSTRUCTIONS

This section sets forth the standards for determining obstructions in the navigable air space around the airport. This information should be incorporated into a tall structure zoning ordinance for future protection of air space. The information should also be provided to the FAA for use in analyzing notices of proposed construction in the area of the airport.

The following sections of this report will be quoting Federal Aviation Regulation Part 77 - Objects Affecting Navigable Air Space as it pertains to the Algona Airport.

Obstruction Standards:

An obstruction is considered to be any object of natural growth, terrain, or structures of permanent or temporary construction if it is higher than any of the following heights or surfaces:

a. A height of 500 feet above ground level at the site of the object.

b. A height that is 200 feet above ground level or above the established airport elevation, whichever is higher, within 3 nautical miles of the established reference point of an airport. That height increases in the proportion of 100 feet for each additional nautical mile of distance from the airport up to a maximum of 500 feet.

c. The surface of a takeoff and landing area of an airport or any imaginary surface established under paragraphs 77.25, 77.28, or 77.29 (FAR Part 77). However, no part of the takeoff or landing area itself will be considered an obstruction.

The height of traverse ways to be used for the passage of mobile objects are increased as follows:

a. 17 feet for an Interstate highway.

b. 15 feet for any other public roadway.

c. 10 feet above the height of the highest mobile object that would normally traverse the road, whichever is greater, for a private road.

d. 23 feet for a railroad.

e. For a waterway or any other traverse way not previously mentioned, an amount equal to the height of the highest mobile object that would normally traverse it.

The following paragraphs describe the imaginary surfaces as they would apply to the Algona Airport. Refer to Figure 3.9 for a graphic depiction of these surfaces.

Horizontal Surface - A horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs of 10,000 feet radii from the center of each end of the primary surface of each runway and connecting the adjacent arcs by lines tangent to those arcs.

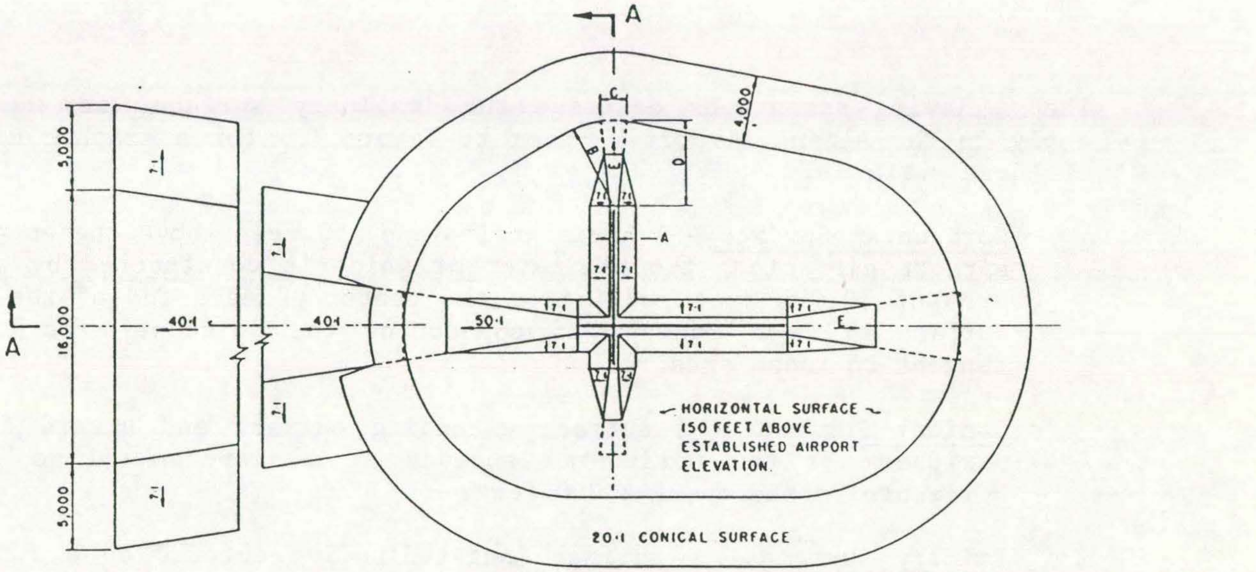
Conical Surface - A surface extending outward and upward from the periphery of the horizontal surface at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

Primary Surface - A surface longitudinally centered on a runway and extending beyond the end of that runway. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline. The width of a primary surface is 500 for nonprecision instrument runways having visibility minimums greater than three-fourths statute mile and 1,000 feet for a nonprecision instrument runway having a nonprecision instrument approach with visibility minimums as low as three-fourths of a statute mile.

Approach Surface - A surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of each runway based upon the type of approach available or planned for that runway end. The inner edge of the approach surface is the same width as the primary surface and it expands uniformly to a width of 1,250 feet for that end of a utility runway with only visual approaches; and 1,500 feet for that end of a runway other than a utility runway with only visual approaches; 2,000 feet for that end of a utility runway with a nonprecision instrument approach; 3,500 feet for that end of a nonprecision instrument runway other than utility, having visibility minimums greater than three-fourths of a statute mile; 4,000 feet for that end of a nonprecision instrument runway, other than utility, having a nonprecision instrument approach with visibility minimums as low as three-fourths statute mile; and 16,000 feet for precision instrument runways. The approach surface extends for a horizontal distance of: 5,000 feet at a slope of 20 to 1 for all utility and visual runways; 10,000 feet at a slope of 34 to 1 for all nonprecision instrument runways other than utility; and 10,000 feet at a slope of 50 to 1 with an additional 40,000 feet at a slope of 40 to 1 for all precision instrument runways.

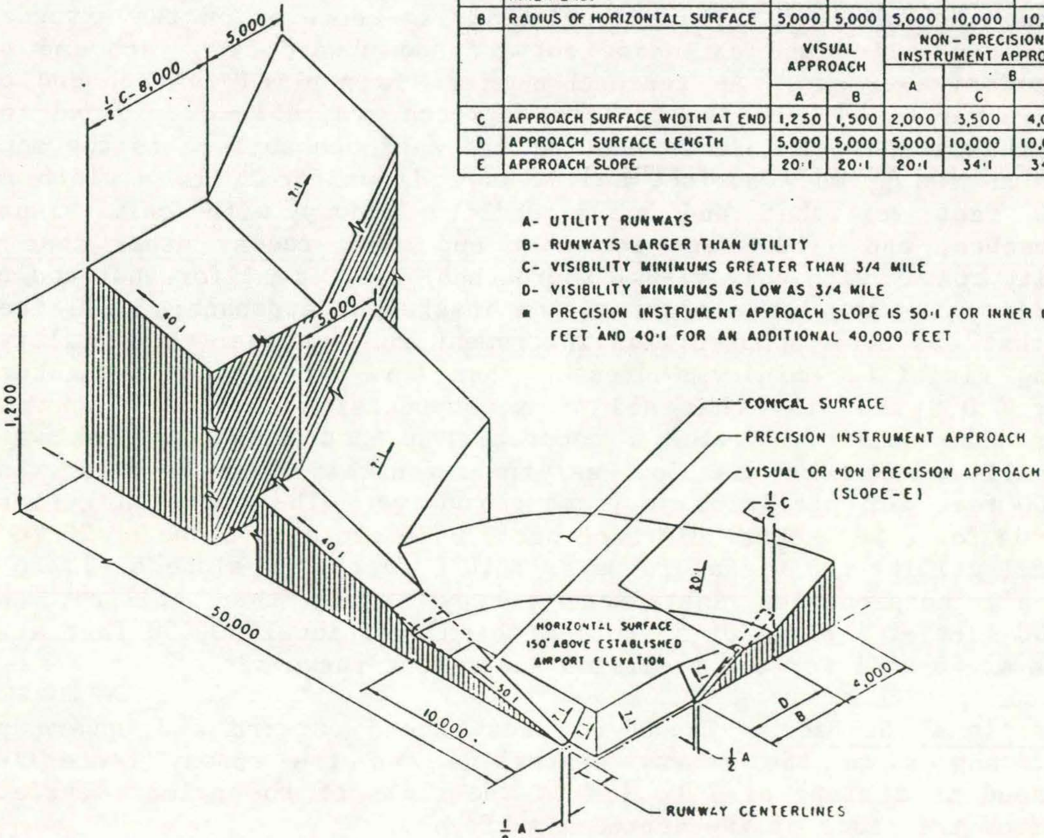
Transitional Surface - These surfaces extend outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the sides of the primary surface and from the sides of the approach surfaces.

The type of surface to be used shall be for the most precise approach existing or planned for that runway end.



DIM	ITEM	DIMENSIONAL STANDARDS (FEET)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		A	B	A	B		
					C	D	
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END.	250	500	500	500	1,000	1,000
B	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	10,000	10,000	10,000
		VISUAL APPROACH		NON-PRECISION INSTRUMENT APPROACH			PRECISION INSTRUMENT APPROACH
		A	B	A	B		
					C	D	
C	APPROACH SURFACE WIDTH AT END	1,250	1,500	2,000	3,500	4,000	16,000
D	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000	*
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 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET



ISOMETRIC VIEW OF SECTION A-A

IMAGINARY SURFACES

FIGURE 3.9

DRAINAGE

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

Typical pavement cross sections are shown in Figure 3.2. It is recommended here that runway and taxiway cross slopes be designed at 1 1/2%. There should be a pavement edge drop of 1 1/2 inches to the shoulder to allow for turf build-up. The shoulder immediately adjacent to paved areas should be sloped at 5% for the first 10 feet from the pavement edge to assure positive surface runoff. Beyond 10 feet, turf areas should be sloped 2%.

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

Subsurface drainage systems are desirable where water may rise to within 1 foot of the pavement section or where there are capillary susceptible soils. Water in the subgrade contributes directly to frost boil and heaving action. Also, saturated subgrades exhibit a greatly reduced load bearing capacity. For these reasons, it is recommended that pavement subdrains be provided at most sites in the state of Iowa.

PAVING

Airport pavement is intended to provide a smooth and safe all-weather surface free from particles and other debris that may be picked up by propeller wash. The pavement should be of sufficient thickness and strength to accommodate the anticipated loads without undue pavement distress. Pavement for the Algona Airport should be designed to accommodate basic transport aircraft with a maximum gross weight of 30,000 pounds and a single wheel gear.

The various pavement courses are shown graphically in Figure 3.10 and described as follows.

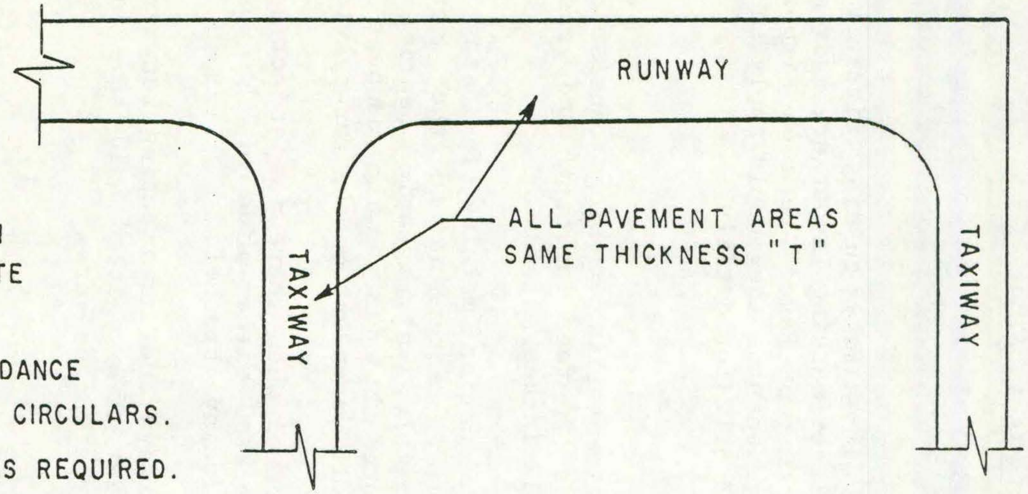
> Surface Course - includes Portland cement concrete, bituminous concrete, aggregate bituminous mixtures, or bituminous surface treatments.
>
> Base Course - consists of a variety of different materials which generally fall into two main classes, treated and untreated. The untreated bases consist of stone, gravel, lime rock, sand-clay, or a variety of other materials. The treated bases normally consist of a crushed or uncrushed aggregate that has been mixed with cement or bitumen.
>
> Subbase Course - consists of a granular material or a stabilized soil.

Rigid Pavement:

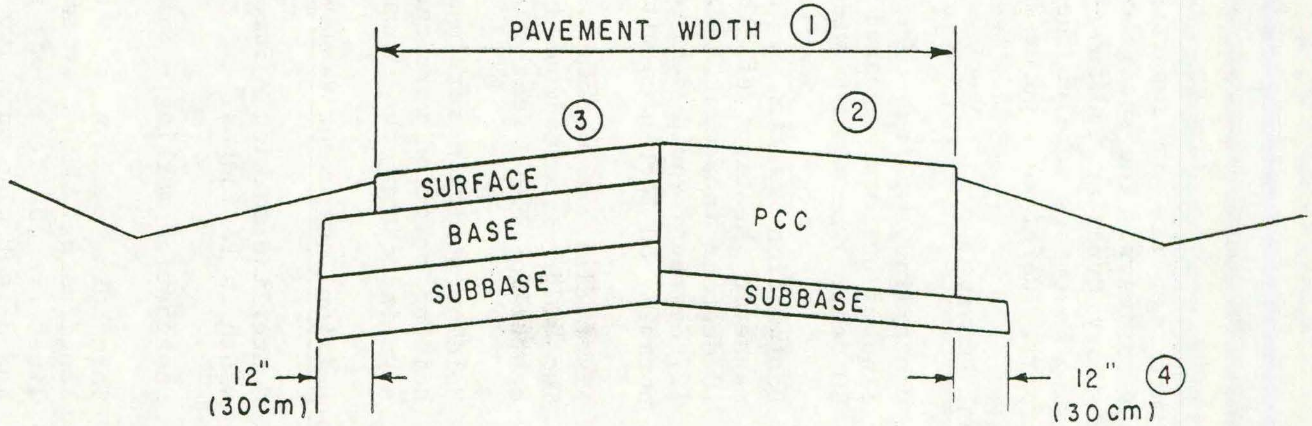
A rigid pavement section for the Algona Airport would consist of a 6 inch thick Portland Cement Concrete surface course. The necessity of a base course, probably of crushed stone, is dependent on the bearing capacity of the soil encountered. A poor grade of soil will require a minimum 4 inch thick subbase course.

Flexible Pavement:

There are many combinations of flexible surface, base and subbase that could be required for the Algona Airport. Design parameters are outlined in FAA Advisory Circular 150/5320-6C. Of critical importance in the flexible pavement design process is the bearing capacity of the existing soil.



1. RUNWAY AND TAXIWAY WIDTHS IN ACCORDANCE WITH APPROPRIATE ADVISORY CIRCULARS
2. TRANSVERSE SLOPES IN ACCORDANCE WITH APPROPRIATE ADVISORY CIRCULARS.
3. SURFACING, BASE, PCC, ETC., AS REQUIRED.
4. MINIMUM 12" (30 cm) TYPICAL [UP TO 30" (76 cm) ALLOWABLE FOR SLIP-FORMED PCC]



TYPICAL PAVEMENT SECTIONS

FIGURE 3.10

MARKING, LIGHTING AND VISUAL AIDS

Marking:

Pavement markings are an important aid in safely guiding aircraft on runways and taxiways. The specific details of marking layout are addressed in FAA Advisory Circular 150/5340-1E Marking of Paved Areas on Airports. The following describes some of the requirements as they would apply to the Algona Airport. Refer to Figures 3.11 and 3.12 for details.

Visual Runway

a. Centerline marking - The runway centerline markings consist of a line of uniformly spaced stripes 120 feet in length and gaps of 80 feet. The minimum width is 12 inches.

b. Designation marking - The designation marking indicates the magnetic bearing of the runway centerline to the nearest 10 degree increment. For example, a magnetic bearing of 127 degrees would be represented by "13". The numbers are normally 60 feet high with a width dependent on the runway width.

c. Fixed distance marking - Required when there is jet activity. Two solid longitudinal bars located either side of the runway centerline 1,000 feet from the runway threshold.

d. Holding position markings (taxiways and intersecting runways) - holding position markings consist of a painted hold line and a sign indicating the runway designation numbers.

Nonprecision Instrument Runway:

a. Centerline marking - Same as for visual runway except the minimum width is 18 inches.

b. Designation marking - Same as for visual runway.

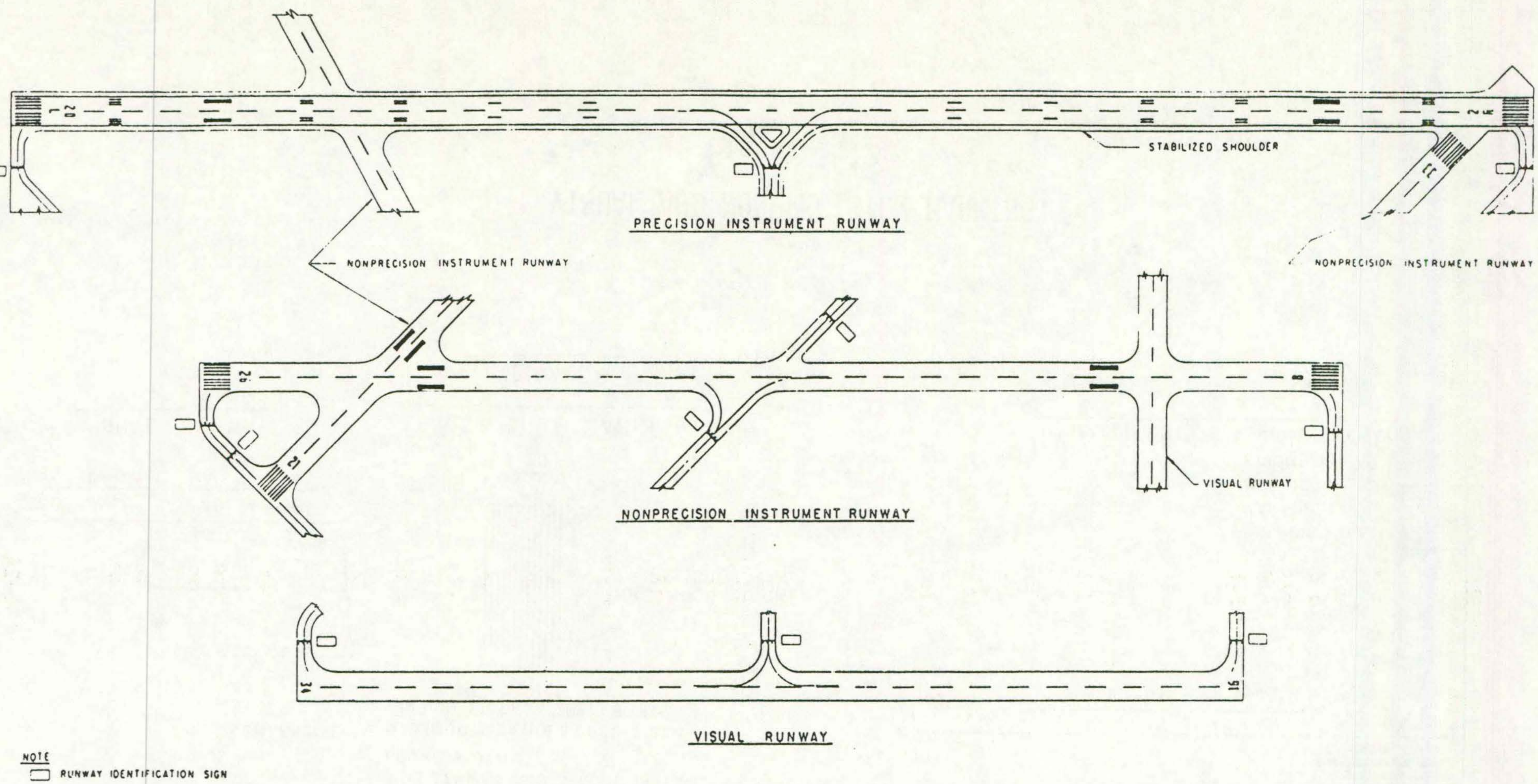
c. Threshold marking - threshold marking consists of eight longitudinal lines symmetric about the runway centerline. The lines are 150 feet long and 6 feet wide on a 75 foot wide runway and 8 feet wide on a 100 foot wide runway.

d. Fixed distance marking - Same as for visual runway.

e. Holding position marking (taxiways and intersecting runways) - Same as for visual runway.

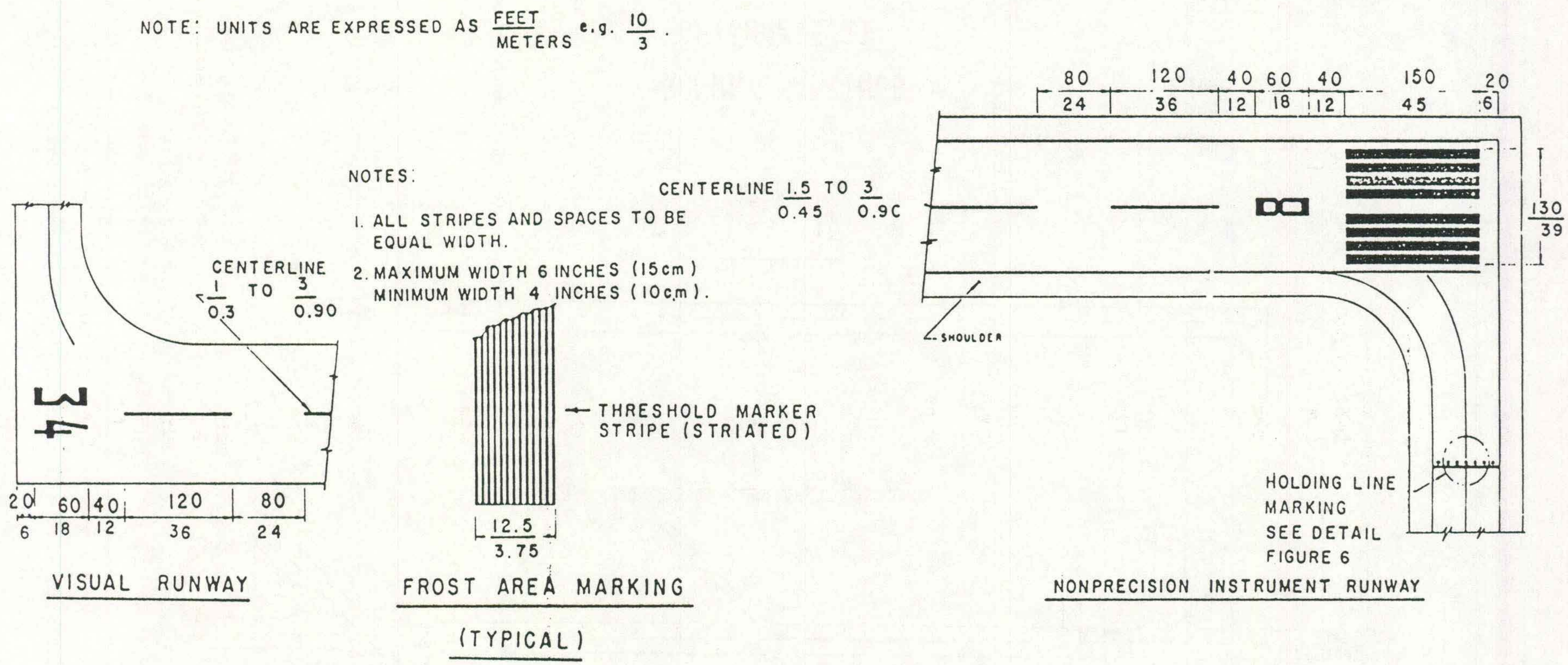
The color of marking used on runways is white, while that used on taxiways and for marking deceptive, closed or hazardous areas is yellow.

Nonprecision marking will be required at the Algona Airport on the primary runway. It is anticipated that the crosswind runway will require visual



RUNWAY MARKINGS

FIGURE 3.11



VISUAL AND NONPRECISION MARKING

FIGURE 3.12

marking until approach procedures are established. At that time, nonprecision instrument runway marking should be incorporated.

Lighting:

Airport lighting allows nighttime operations and enhances an airport's serviceability and safety. A lighting system consists of runway and taxiway lights, rotating beacon and a lighted wind indicator.

Runway lights include edge and threshold lights. It is recommended that the primary runway and cross wind runway employ medium intensity runway lights (M.I.R.L.). Edge lights are located 10 feet from the edge of the runway pavement with a uniform spacing not exceeding 200 feet. The edge lights have clear lenses except for instrument runway where the last 2,000 feet of runway away from the approach end have amber lenses.

Threshold lights have split red and green lenses. The red half faces the runway and the green half faces away from the runway. Although the standard arrangement is to install six threshold lights on a visual runway and eight threshold lights on an instrument runway, it is recommended here that eight lights be installed in either case. Thus, if an instrument approach should be developed for a previously visual runway, it would not be necessary to modify the lights. The threshold lights are installed in two groups of four and a 10 foot spacing with the outside light in line with the edge lights.

Blue taxiway lights are similar to runway lights as far as intensity and location are concerned. Specific details of runway and taxiway edge lighting systems can be found in FAA Advisory Circular 150/5340-24 Runway and Taxiway Edge Lighting System.

An airport rotating beacon has two rotating beams of light. One light is green and the other white.

The wind indicator or wind sock should be installed at the center of a segmented circle and lighted for enhanced visibility. The lighting should also illuminate any traffic pattern indicators associated with the installation. Specific information on wind indicators and rotating beacons can be obtained from FAA Advisory Circular 150/5340-21.

Airport Visual Aids:

A number of visual aids are available to assist a pilot in locating and navigating about an airport. Those recommended for the Algona Airport are described in the following paragraphs.

Runway End Identifier Lights (R.E.I.L.) consist of two flashing lights located at the runway threshold. The lights provide positive identification of the end of the runway and are of particular use in featureless terrain or confusing surrounding lights.

Visual Approach Slope Indicators (V.A.S.I.) provide visual guidance for landing approaches. The light units are normally located on the left side of the runway as viewed on approach. Each light unit emits a red and white beam of light which enables a pilot to determine whether the approach is being made above, on or below the recommended approach. A two-box V.A.S.I. system is recommended for the Algona Airport.

NAVIGATIONAL AIDS

A Nondirectional Beacon (NDB) is recommended for the Algona Airport. The NDB radiates a signal which can be used by pilots to provide electronic directional guidance to the airport. A symmetrical T-antenna is recommended. This consists of two 65 foot poles spaced at approximately 350 feet with two wires strung between them. The NDB should be located on airport property but at least 100 feet away from any metal buildings, power lines or metal fences. The ground should be smooth, level and well drained. The location should take into account the obstruction standards described in this report.

When instrument operations justify, a terminal very high frequency onmirange (TVOR) should be installed. The TVOR provides azimuth information to the pilot. The TVOR should be near the runway intersection but at least 500 feet from a runway centerline and 250 feet from a taxiway centerline. The signal can be distorted or reflected by fences, structures, power lines or trees. The following clearances should be maintained:

> Structures - No structures within 750 feet. Beyond that metal buildings should be cleared by a vertical angle of 1.2 degrees and other buildings by 2.5 degrees.
>
> Fences - Metal fences should be at least 500 feet away.
>
> Power and Telephone Lines - Overhead power and telephone lines should have a clearance of at least 1,200 feet.
>
> Trees - Trees within 1,000 feet of the antenna should be removed. Beyond 1,000 feet, trees should be cleared by a vertical angle of 2 degrees.

The ground surface around a TVOR should be relatively flat and free from ravines, ditches, rocks or embankments. The ground may slope gently away from the TVOR but not toward it.

IV. SITE EVALUATION

INTRODUCTION

This phase of the study will identify and discuss alternatives for development of the required facilities detailed in the previous portions of this study. The alternatives will be confined to utilization or expansion of the existing Algona Airport site. Due to the substantial investment in the existing airport facilities it is not considered feasible or prudent to consider any alternate sites.

Detailed environmental analysis is not required by the Iowa Department of Transportation. If Federal Aviation Administration Funds are contemplated, an environmental assessment will be required for the following catagories of airport development projects:

1. Airport location.

2. New runway.

3. Major runway extension. A major runway extension is a runway extension which upgrades an existing runway to permit usage by a noisier aircraft (such as extending a runway from a utility length to a basic transport length).

4. Runway strengthening which would permit use by a noisier aircraft than that for which the pavement was previously designed. Noisier aircraft are aircraft over 12,500 pounds which are at least 3 decibels louder that aircraft currently using a runway as measured at one or more of the measuring points used to determine compliance with Federal Aviation Regulations, Part 36.

5. Major new construction or expansion of passenger handling or parking facilities with Federal funding.

6. Land acquisition associated with all of the above items plus any land acquisition which causes relocation of residential or business activities or involves land convered under section 4(f) of the Department of Transportation Act of 1966, as amended.

7. Establishment or relocation of an instrument landing system, an approach lighting system, or runway end identification lights.

8. An airport development action which involves any of the following:

    a. Use of section 4(f) land.

    b. Effect of property included in or eligible for inclusion in the National Register of Historic Places or other property of state or local historical, architectural, archaeological, or cultural significance.

    c. Wetlands or floodplains.

    d. Endangered or threatened species.

The major improvements being considered are as follows:

1. Development of a 5,500' x 100' primary runway.

2. Development of a cross wind runway.

3. Terminal area improvements.

An Airport Layout Plan was prepared for Algona by Clapsaddle-Garber Associates in 1970. Amendments to the the FAA Advisory Circulars, changes in dimensional requirements and the passage of time have necessitated this updated study. However, the conclusions and plans developed in that previous study will be used as the basis or starting point for this analysis.

PRIMARY RUNWAY

The findings in the previous phases of this study identified the need for the ultimate development of a 5,500' by 100' primary runway. Referring to figure 4.1, the existing physical features to be considered in evaluating the alternatives for development of this runway are as follows:

1. U.S. Highway 18 is an east-west highway located along the north side of the existing airport property. It is assumed that no realignment of the highway is feasible. In addition, the Part 77 surfaces described in the previous phase, must maintain a clearance of 15 feet over the highway.

2. A north-south county gravel road is located on the east side of the airport. This is a farm to market road and it is assumed that closure of the road is not feasible. However, the 1970 plan called for relocation of the road and it is assumed that is still a feasible alternative.

3. A north-south conty gravel road is located approximately one half mile west of the airport. This is also a farm to market road and it is assumed that closure of the road is not feasible. However, relocation or re-routing may be feasible.

4. A railroad is located approximately one quarter mile south of the existing airport and curves north easterly towards the City of Algona. It is assumed that relocation of the railroad is not practical. The Part 77 surfaces must maintain a clearance of 23 feet over the railroad.

5. A substantial investment has been made in the existing runway and terminal area facilities. Optimum use should be made of these facilities.

6. Various homes, farmsteads and an elevator facility have been developed in the vicinity of the airport. These features limit development alternatives. Acquisition of any of these features is possible, but it is recommended that this be considered a last resort consideration.

7. Topographic features such as the lay of the land and drainage patterns also have an effect on development alternatives. The major effect is the cost of the construction of an alternative.

<u>Extension of Existing Runway 12/30</u>: Runway 12/30 is the existing primary runway. It has a length of 3,960 feet and a width of 75 feet. The 1970 Airport Layout Plan calls for expansion of this runway to a 4,900 foot length and a width of 100 feet by extending to the southeast.

Runway End 12 is located within 800 feet of U.S. Highway 18. The existing visual approach clear zone provides a clearance of 15 feet over the highway at the most restrictive point. Therefore it is concluded that any further expansion of runway end 12 is not feasible.

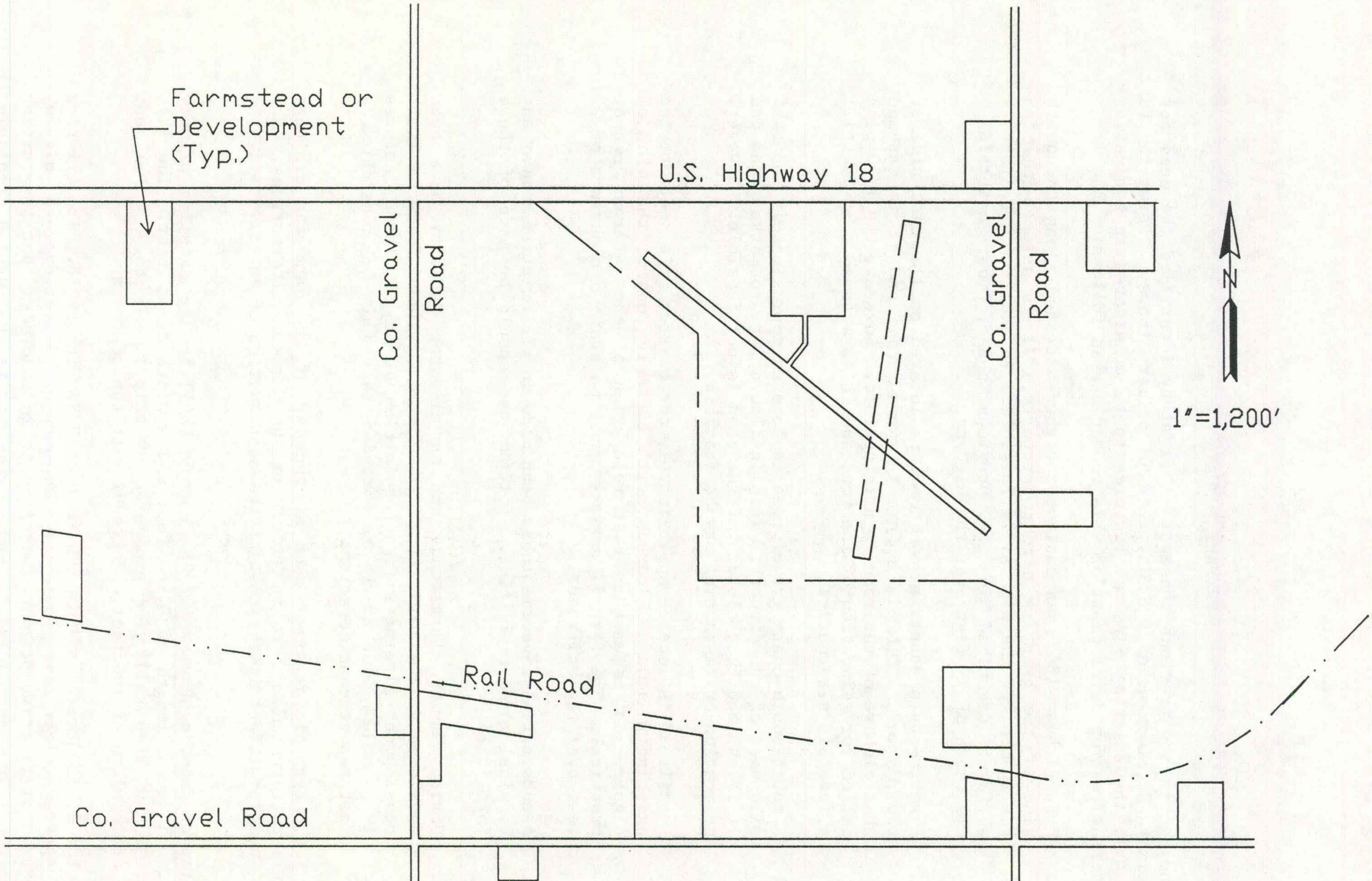


FIGURE 4.1

EXISTING AIRPORT LAYOUT

Runway End 30 is located within 300 feet of an existing county gravel road. In addition a residential acreage has been constructed on the east side of the gravel road 500 to 900 feet from the extended runway centerline. Extension of runway end 30 would require acquisiton of a portion of the acreage between the home and the existing county road and relocation of the county road around the north and east sides of the acreage. Refer to figure 4.2.

Expansion of the existing primary runway would involve a significant amount of earthwork. The safety area should be widened from 250 feet to 500 feet. Also, the terraine and elevation differance between runway end 30 and the county road would require fills in excess of 10 feet. However, these items can be remedied through normal construction procedures and would not create prohibitive construction or economic restrictions.

Develop North-South Runway: A north-south alignment such as the existing turf crosswind runway with a 18/36 orientation should be considered as an alternative. However, due to the constraints imposed by Highway 18 on the north and the railroad on the south, a maximum length of approximately 3,800 feet is possible. Therefore, this alternative is rejected as a possibility for the primary runway but could be considered for the cross wind runway.

Develop East-West Runway: Development of an east-west alignment with approximately a 9/27 orientation would be possible with respect to existing development in the area and the existing terrain as shown in figure 4.3. This orientation would require the relocation of the county gravel road around the west end of the runway. Existing runway 12/30 would serve as the cross wind runway.

The major drawback of this alternative is the lack of angular separation between the proposed runway 9/27 and the existing runway 12/30. FAA standards would require the two runways to provide a minimum of 95 percent wind coverage. An analysis of wind coverage indicates 88.0 percent coverage for the combined runways while runway 12/30 provides 82.1 percent coverage by it's self. The marginal gain in wind coverage for this alignment would not justify the cost for development.

The maximum angular separation possible while avoiding existing development and providing required clearances would be a 7/25 orientation. This would place the runway approaches directly over residances within approximately 2000 feet of each end of the runway. Wind coverage would be increased only slightly to 89.5 percent.

Recommendations: Based on the above discussion, expansion of existing runway 12/30 to the ultimate 5,500 foot length is the recommended alternative.

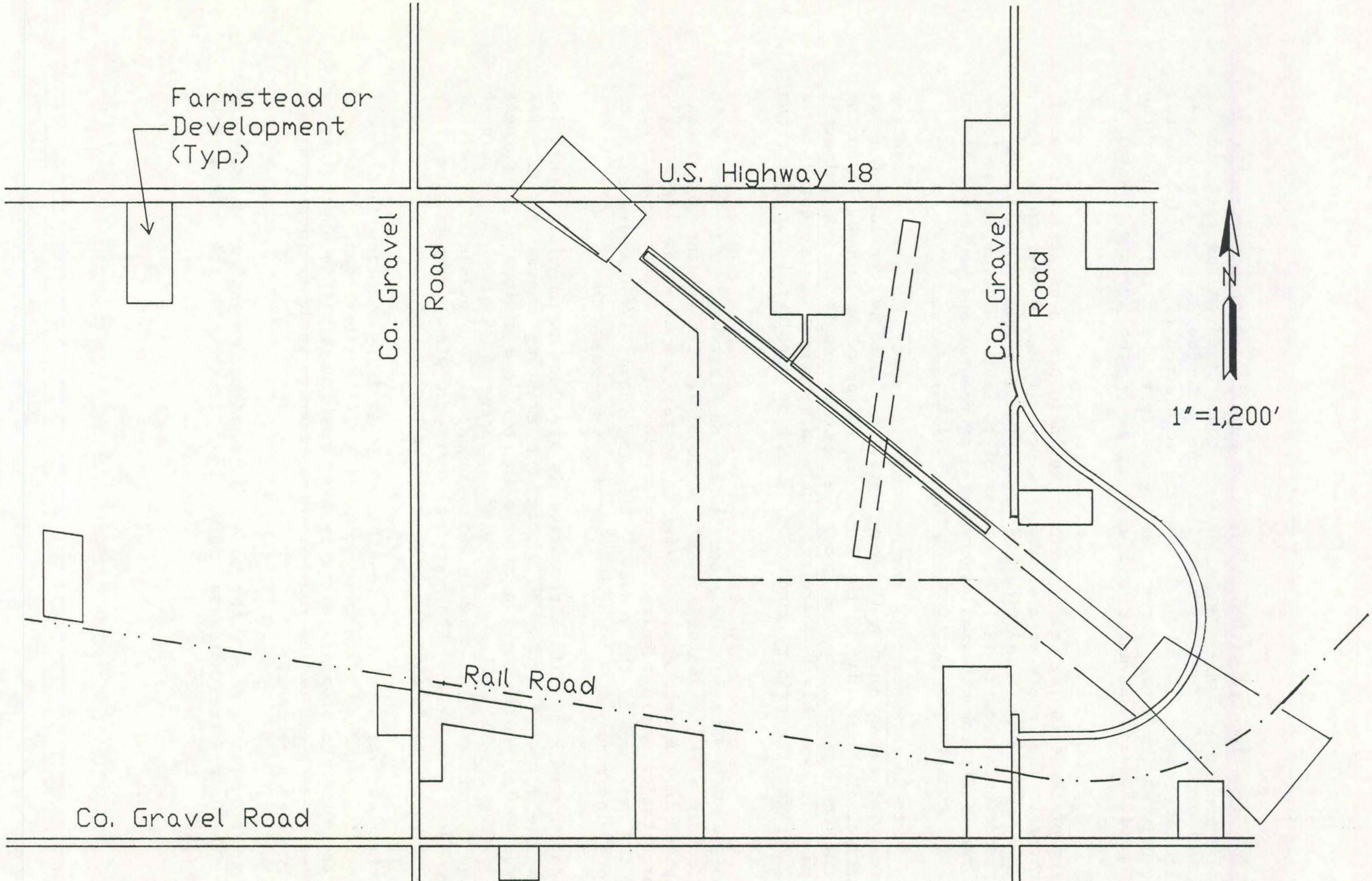


FIGURE 4.2
SOUTHEAST ALTERNATIVE

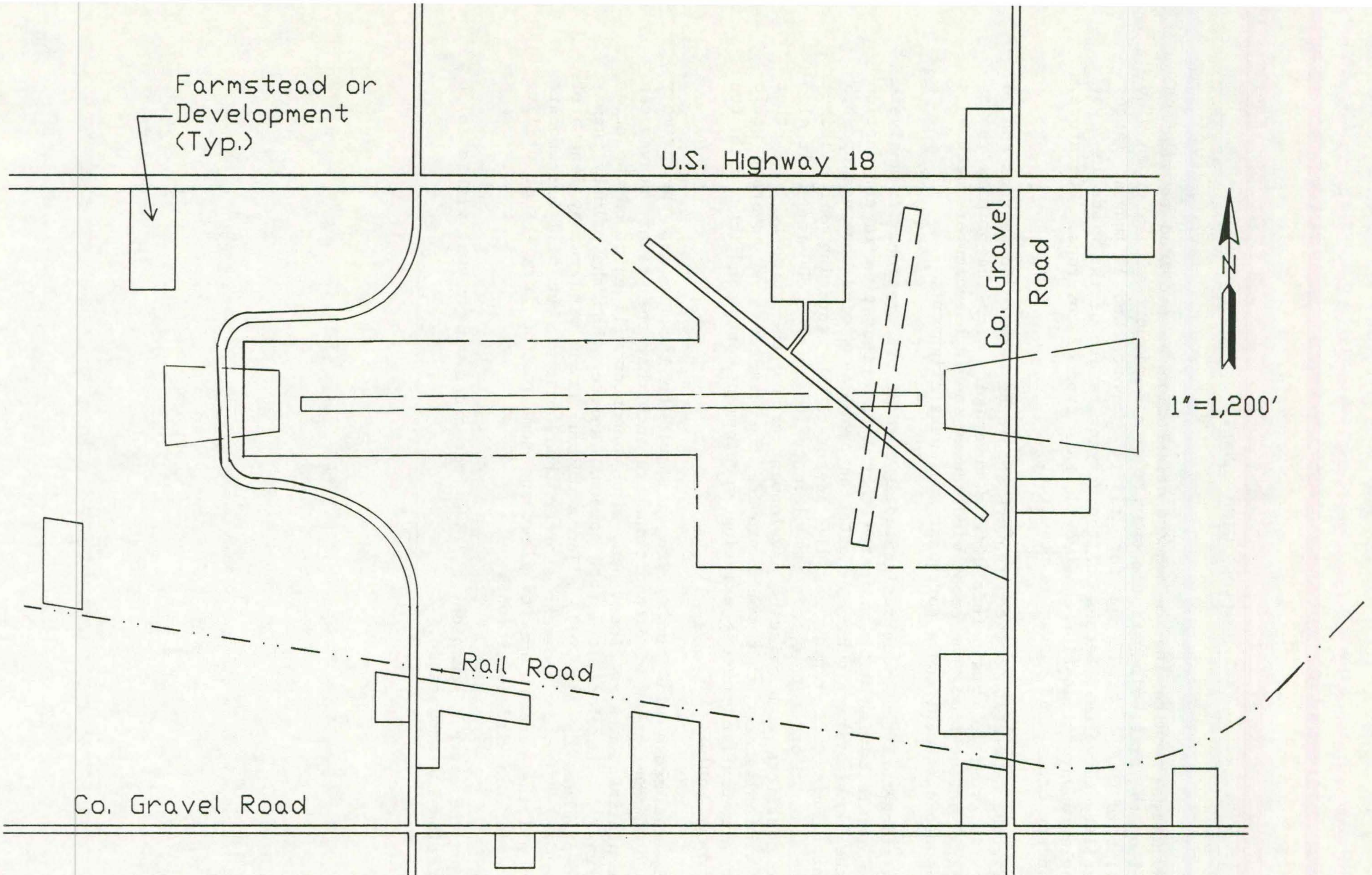


FIGURE 4.3
EAST-WEST ALTERNATIVE

CROSS WIND RUNWAY

FAA standards require that a runway orientation be provided so that 95 percent of the time, aircraft can operate at the airport with a cross wind component of less that 12 mph for utility airports and 15 mph at larger that utility airports. Because of the varying nature of the winds in Iowa, no single runway orientation can provide this type of coverage. Therefore, a secondary cross wind runway is required.

Ideally, the separation between runways should be between 60 degrees and 90 degrees in order to obtain this desired coverage. With the primary runway at a 12/30 orientation, the cross wind runway should be somewhere between a north-south alignment and a northeast-southwest alignment.

The existing turf runway is designated as a 18/36 orientation. An analysis of the availble wind data indicates that this orientation in conjunction with the 12/30 primary runway orientation provides a wind coverage of 95.3 percent. This turf runway has the advantage of requiring only minimal grading work in order to obtain its ultimate length of 3,800 feet. It also has no conflicts with existing development around the airport. Any other cross wind alignment that would provide the desired wind coverage would direct air traffic towards existing development and conflicts with the clear zones would exist.

Ideally the cross wind runway length should be the same as the primary runway. However, when wind conditions are such that the primary runway can not be utilized, a significant head wind component will exist on the cross wind runway. Therefore, a length somewhat shorter that the primary runway is acceptable. The site will allow a maximum cross wind runway length of 3,800 feet. This is somewhat shorter than optimum, but will accommodate almost all the general utility fleet and some of the larger that utility fleet under headwind conditions.

Based on the above discussion, a 3,800 foot cross wind runway with a 18/36 orientation is recommended.

TERMINAL AREA IMPROVEMENTS

No alternatives for terminal area development will be considered herein. Considerable effort and resources have been dedicated by the Algona Airport Commission in improving and providing an adequate terminal area. The result is a modern facility that is currently meeting the needs of the Algona flying public.

Forecasted activity will require expansion of some of the existing terminal area facilities. However, adequate room for expansion is available. Phase IV, Airport Layout Plan, will provide the details for the terminal area expansion needs.

SUMMARY

The following table is presented as a summary of the site evaluation phase of this study. It compares forecasted facility requirements with the airport's existing features. It also identifies if the existing site will accommodate the anticipated future improvements.

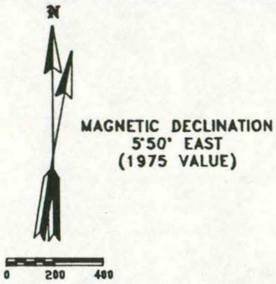
FEATURE	EXISTING	FORECASTED ULTIMATE	CAN BE ACCOMMODATED
Primary Runway Length	3,960'	5,500'	Yes
Cross Wind Runway Length	3,000'	3,800'	Yes
Primary Runway Width	75'	100'	Yes
Cross Wind Runway Width	165'Turf	75'	Yes
Primary Safety Area Width	250'	500'	Yes
Cross Wind Safety Area Width	165'	250'	Yes
Taxiway Width	40'	35'	Yes
Taxiway Safety Area		70'	Yes
Separation Distances			
Runway - Parallel Taxiway	- -	400'	Yes
Runway - Aircraft Parking	500'	500'	Yes
Runway - Property/BRL	400'	500'	Yes
Taxiway - Property/Object	- -	64'	Yes
Line of Sight	5'	5'	Yes
O.F.Z.		250'	Yes
Apron			
Based Aircraft Tie-Downs	12	14	Yes
Itinerant Tie-Downs	0	3	Yes
Hangars			
T-Hangar Spaces	20	23	Yes
F.B.O. Hangar	1	1	Yes
Private Corporate Hangars	0	2	Yes
Terminal			
Waiting Room	880 S.F.	500 S.F.	Yes
Administrator's Office	250 S.F.	180 S.F.	Yes
Restrooms	2	2	Yes
Pilot's Room	200 S.F.	180 S.F.	Yes
Class Room/Meeting Room	325 S.F.	200 S.F.	Yes
Future Offices	No	Yes	Yes

Entrance Road Width	22'	22'	Yes
Auto Parking Spaces	10	19	Yes
Pavement Strength	30,000 lbs.	30,000 lbs.	Yes
Fuel			
Auto Gas	5,000 gal.	5,000 gal.	Yes
100 Octane	5,000 gal.	10,000 gal.	Yes
Jet Fuel	0	10,000 gal.	Yes
Lighting, Marking & Navaids			
Marking	NPIR	NPIR	Yes
Radio Control	1 Step	3 Step	Yes
MIRL	Yes	Yes	Yes
MITL	Yes	Yes	Yes
REIL	Yes	Yes	Yes
VASI/PAPI	Yes	Yes	Yes
NDB	Yes	Yes	Yes
TVOR	No	Yes	Yes
Lighted Wind Cone	Yes	Yes	Yes
Rotating Beacon	Yes	Yes	Yes

V. AIRPORT LAYOUT PLAN

RUNWAY DATA

ITEM	RUNWAY 12 – 30 EXISTING	RUNWAY 12 – 30 ULTIMATE	RUNWAY 36 – 18 EXISTING	RUNWAY 36 – 18 ULTIMATE
EFFECTIVE GRADIENT, %	0.27	0.24	---	0.24
% WIND COVERAGE	82.1	SAME	81.0	SAME
SAFETY AREA	4360 x 150	5900 x 500	NONE	4200 x 150
PAVEMENT STRENGTH	---	60,000	---	12,500
APPROACH SLOPES	20:1	20:1 & 34:1	20:1	20:1
LIGHTING	MIRL	MIRL	NONE	MIRL
MARKING	NPIR	NPIR	NONE	BASIC
APPROACH AIDS	VASI & REIL	VASI & REIL	NONE	VASI
LENGTH	3960	5500	---	3800
WIDTH	75	100	---	75



AIRPORT DATA

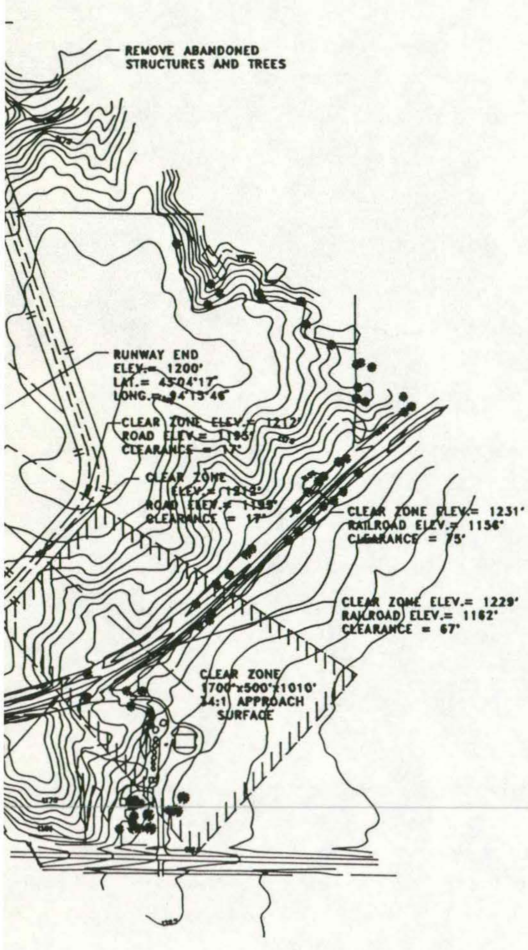
ITEM		EXISTING	ULTIMATE
AIRPORT ELEVATION		1214.0	SAME
NORMAL MAX. TEMP.		87° F	SAME
TAXIWAY MARKING		NONE	NONE
NAVIGATIONAL AIDS		NDB	NDB
AIRPORT COORDINATES	LAT.	--	43°04'36"
	LONG.	--	94°16'14"
AIRPLANE DESIGN GROUP		--	II

LEGEND

EXISTING	ULTIMATE	ITEM
NOT SHOWN	BRL	BUILDING RESTRICTION LINE
1210	NOT SHOWN	GROUND CONTOURS
------	------	AIRPORT PROPERTY LINE
●●● ●●●	○○○ ○○○	THRESHOLD LIGHTS
	---------	FACILITIES
●	○	RUNWAY LIGHTS
▬	[ ]	BUILDING CONSTRUCTION
--TL--o--	--TL--o--	TILE LINE & INTAKE
--P--	NOT SHOWN	POWER LINE
xxxxxxxxx	//////////	EASEMENTS
NOT SHOWN	-- LOS --	LINE OF SIGHT
℄	℄	AIRPORT PROPERTY LINE
	— — — —	CLEAR ZONE
—x—x—x—	—//—//—//—	AIRPORT FENCING
--T--	NOT SHOWN	TELEPHONE LINE
▲	△	RUNWAY END IDENIFICATION LIGHTS
▬	▭	VISUAL APPROACH SLOPE INDICATOR

ABBREVIATIONS

BRL	BUILDING RESTRICTION LINE
FBO	FIXED BASE OPERATOR
MIRL	MEDIUM INTENSITY RUNWAY LIGHTS
REIL	RUNWAY END IDENTIFIER LIGHTS
VASI	VISUAL APPROACH SLOPE INDICATOR
NDB	NON-DIRECTIONAL RADIO BEACON
ARP	AIRPORT REFERENCE POINT
LOS	LINE OF SIGHT
ILS	INSTRUMENT LANDING SYSTEM
VOR	VERY HIGH FREQUENCY OMNIRANGE
TVOR	TERMINAL VOR



REVISION	DATE

AIRPORT LAYOUT PLAN

ALGONA MUNICIPAL AIRPORT

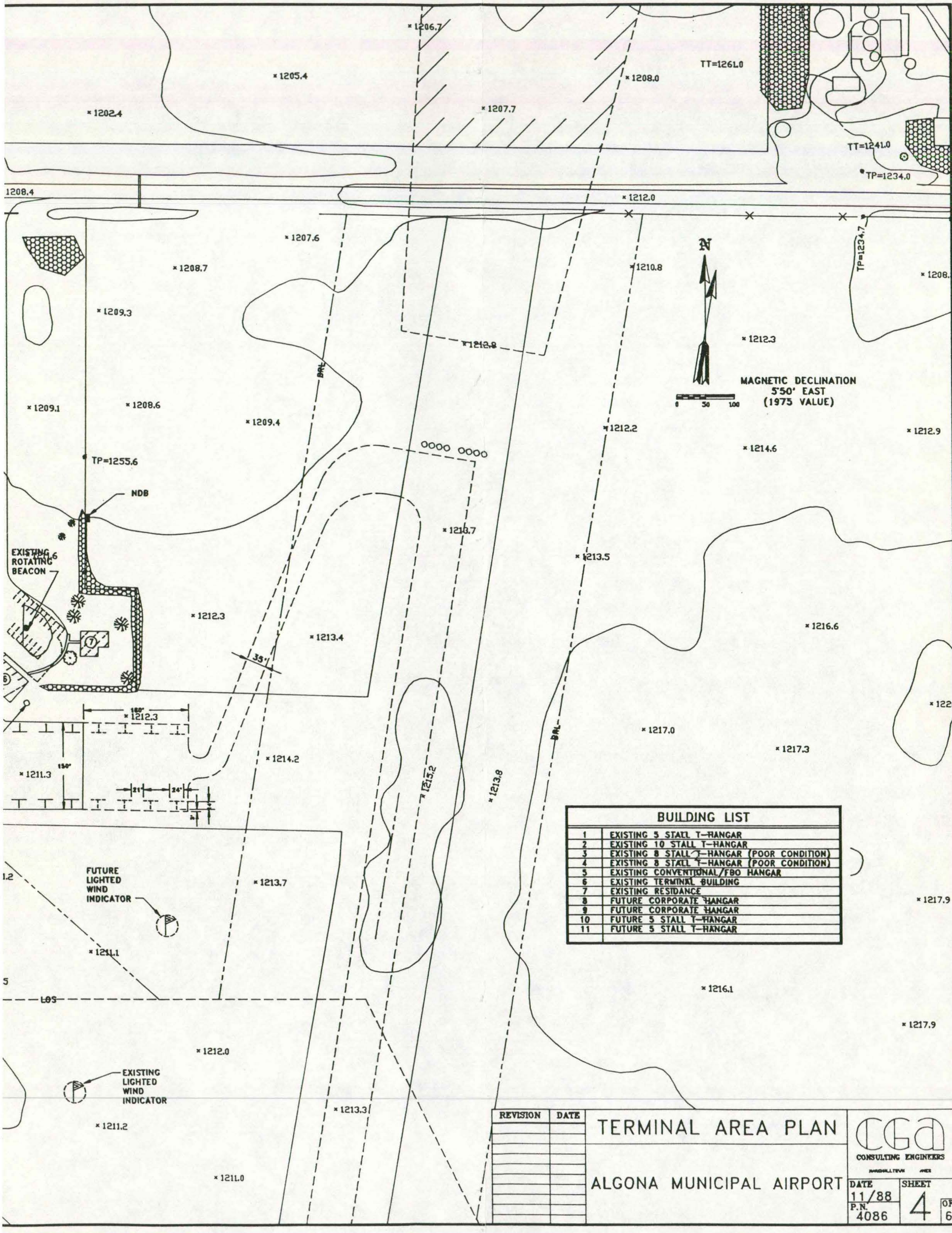
CGA CONSULTING ENGINEERS

MARSHALLTOWN AMES

DATE 11/88

SHEET 2 OF 6

P.N. 4086



BUILDING LIST

1	EXISTING 5 STALL T-HANGAR
2	EXISTING 10 STALL T-HANGAR
3	EXISTING 8 STALL T-HANGAR (POOR CONDITION)
4	EXISTING 8 STALL T-HANGAR (POOR CONDITION)
5	EXISTING CONVENTIONAL/FBO HANGAR
6	EXISTING TERMINAL BUILDING
7	EXISTING RESIDANCE
8	FUTURE CORPORATE HANGAR
9	FUTURE CORPORATE HANGAR
10	FUTURE 5 STALL T-HANGAR
11	FUTURE 5 STALL T-HANGAR

REVISION	DATE

TERMINAL AREA PLAN

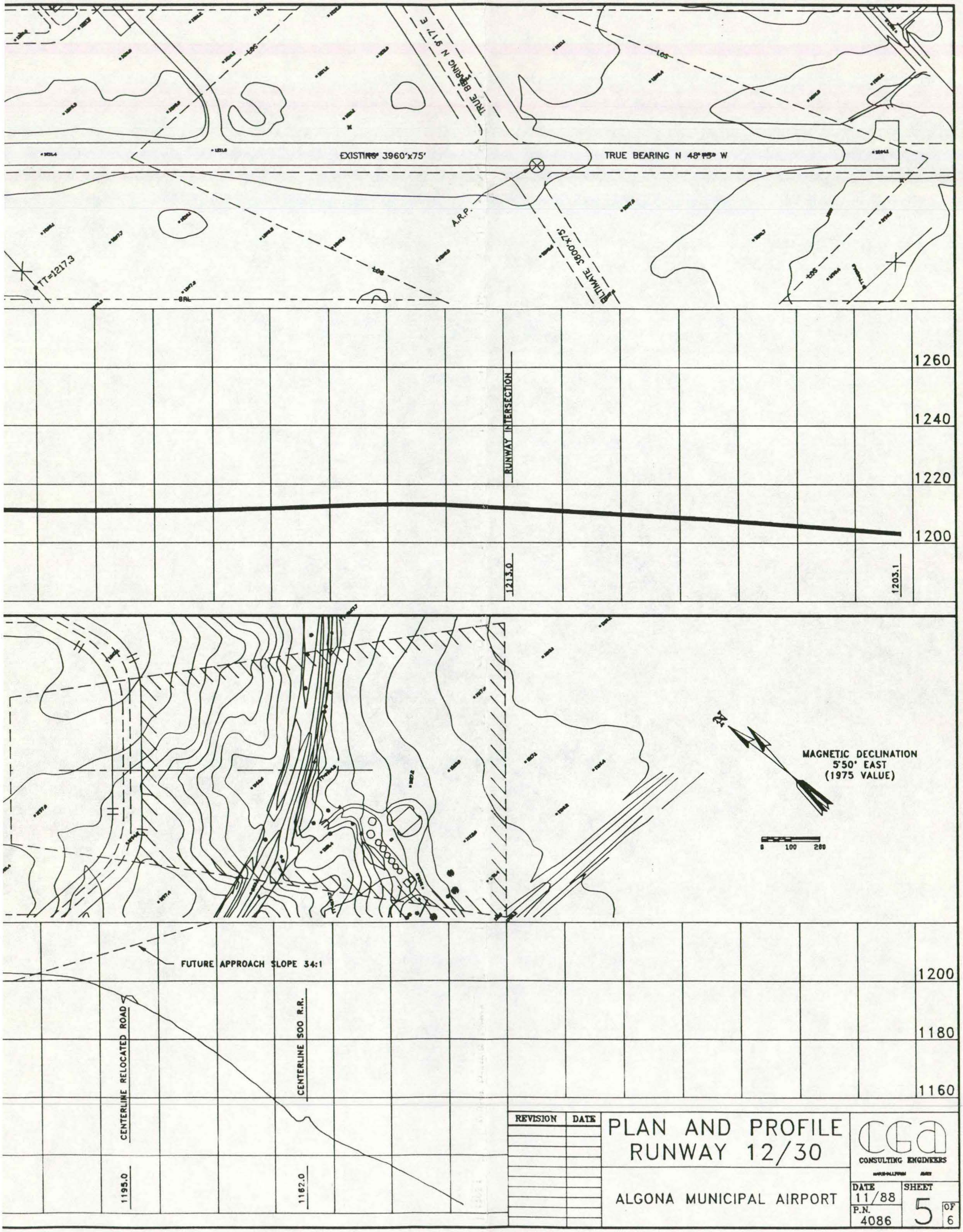
ALGONA MUNICIPAL AIRPORT

CGA CONSULTING ENGINEERS

DATE 11/88

P.N. 4086

SHEET 4 OF 6



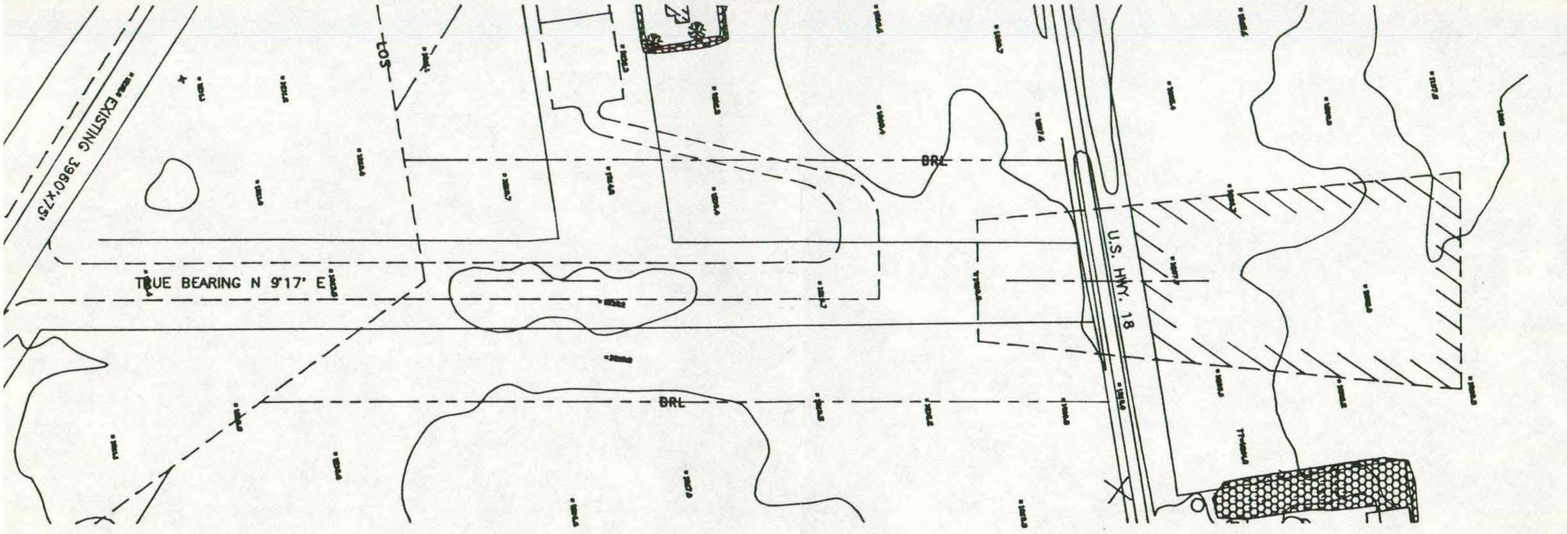
REVISION	DATE

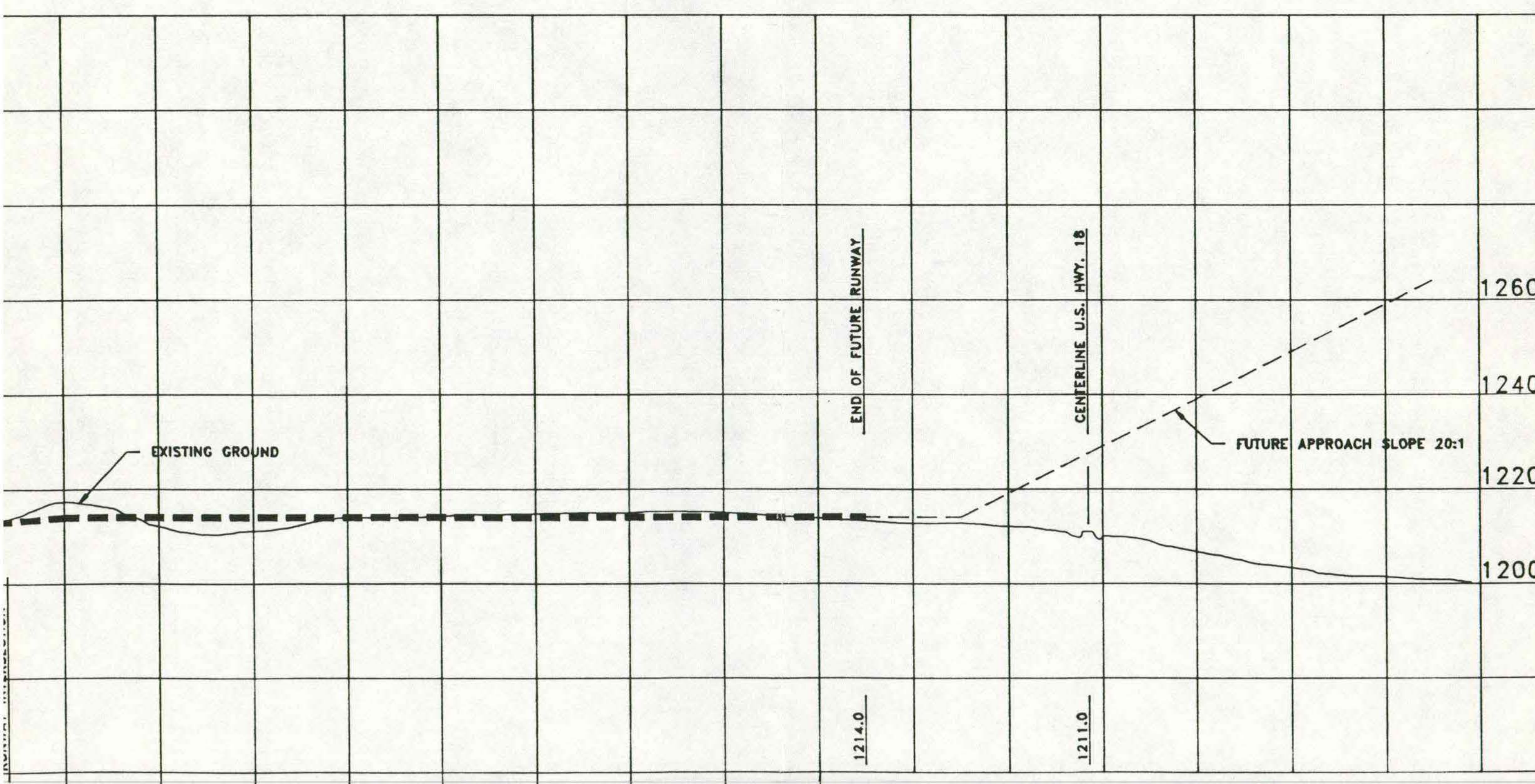
PLAN AND PROFILE
RUNWAY 12/30

ALGONA MUNICIPAL AIRPORT

CGA CONSULTING ENGINEERS

DATE 11/88
P.N. 4086
SHEET 5 OF 6





REVISION	DATE

PLAN AND PROFILE RUNWAY 18/36

ALGONA MUNICIPAL AIRPORT

CGA CONSULTING ENGINEERS

DATE 11/88

P.N. 4086

SHEET 6 OF 6

VI. DEVELOPMENT SCHEDULE AND FINANCIAL PLAN

PROPOSED IMPROVEMENTS

The improvements which will bring the airport to its ultimate development in the next 20 years are divided into three stages, for short, intermediate and long range periods. The stages can then be accomplished through phases, each designated as a project and usually lasting one construction season.

Stage One (1 to 5 Years): The projects planned for Stage One accomplishment include relocation of the existing rotating beacon and the lighted wind indicator to locations that will be compatible with planned future improvements. It is also planned to upgrade the lighting system radio control from the existing two-step system to a standard three-step arrangement. It is anticipated that as the number of based aircraft increase, it will be necessary to demolish one of the old deteriorated T-Hangars and replace it with a larger and more functional 6 Stall T-Hangar. Lastly, it is planned to expand the automobile parking lot and pave the entrance road during stage two.

Stage Two (6 to 10 Years): The major development items anticipated during Stage Two include the initial phases of the cross wind runway improvements, a connecting taxiway to runway end 12 and certain terminal area improvements.

The first phase in the cross wind runway improvements involves the acquisition of land in fee and easement. The second phase would be grading the safety area required for the ultimate cross wind runway. The graded safety area would function as a turf runway until such time that the runway is paved in Stage Three.

A connecting taxiway to runway end 12 is planned for the stage two time period. This taxiway would increase the capacity of the primary runway and enhance safety by reducing the amount of time the primary runway is used for taxiing.

Terminal area improvements include demolition of the second deteriorated hangar and replacement with a more functional 6 stall T-Hangar. Also, as demand justifies it is anticipated that jet fuel facilities will be necessary to accommodate the turboprop and jet aircraft using the airport.

Stage Three (11 to 20 Years): Stage Three projects primarily involve improvements to accommodate larger aircraft and to increase operational efficiency and capacity. These improvements include a ramp expansion, completion of the cross wind runway and expansion of the primary runway. These improvements may or may not be constructed. They should be developed as the need dictates.

The ramp expansion project will create an additional eight tie-down spaces. This project, or a portion thereof, should be accomplished as terminal activity and ramp congestion increase.

Completion of the cross wind runway involves paving and lighting projects. It is also planned to develop a connecting taxiway to runway end 18 to facilitate access to the cross wind runway.

Expansion of the primary runway to transport standards will involve multi-phased improvements. The first phase is acquisition of the necessary land in fee and easement. The following phases include grading, paving and lighting of the ultimate runway.

STAGE DEVELOPMENT COSTS

Based on the above described improvements, costs have been estimated for the stage development of the airport. The unit costs used represent an average for current 1988 pricing. Actual project costs may vary depending on several parameters such as construction conditions, specification requirements and time of construction. Future costs can be estimated by comparing Engineering News Record construction cost indexes and applying those to the costs included herein. The ENR Construction Cost Index Value for December, 1988 is 4567.90.

Following are the estimated costs for the stage development.

STAGE I DEVELOPMENT (1 TO 5 YEARS)

ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
	RELOCATE ROTATING BEACON AND WIND INDICATOR				
1.	Relocate Beacon		L.S.		$ 5,000.00
2.	Relocate Wind Indicator		L.S.		$ 1,500.00
3.	Contingencies		10%		$ 650.00
4.	Engineering, Legal & Admin.		25%		$ 1,850.00
					$ 9,000.00
	UPGRADE RADIO CONTROL				
1.	3-Step Radio Control	1	Each	$ 2,500.00	$ 2,500.00
2.	Miscellaneous Wiring		L.S.		$ 2,500.00
3.	Contingencies		10%		$ 500.00
4.	Engineering, Legal & Admin.		25%		$ 1,500.00
					$ 7,000.00
	HANGAR DEVELOPMENT				
1.	Demolition of Old Hangar		L.S.		$ 2,500.00
2.	Site Preparation		L.S.		$ 3,000.00
3.	6 Stall T-Hangar	6	Stall	$18,000.00	$108,000.00
4.	Taxiway Paving	750	S.Y.	$ 25.00	$ 18,750.00
5.	Contingencies		10%		$ 13,225.00
6.	Engineering, Legal & Admin.		25%		$ 36,525.00
					$182,000.00

STAGE I DEVELOPMENT (1 TO 5 YEARS) CONTINUED

ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
	EXPAND PARKING LOT AND PAVE ENTRANCE ROAD				
1.	Subgrade Preparation	3,300	S.Y.	$ 0.50	$ 1,650.00
2.	5" P.C.C. Paving	3,300	S.Y.	$ 15.00	$ 49,500.00
3.	Shouldering		L.S.		$ 2,500.00
4.	Seeding & Fertilizing	1	Acre	$ 750.00	$ 750.00
5.	Contingencies		10%		$ 5,440.00
6.	Engineering, Legal & Admin.		25%		$ 15,160.00
					$ 75,000.00

STAGE II DEVELOPMENT (6 TO 10 YEARS)

ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
	LAND ACQUISITION FOR CROSS WIND RUNWAY				
1.	Land in Fee	17	Acre	$ 1,800.00	$ 30,600.00
2.	Land in Easement	11	Acre	$ 500.00	$ 5,500.00
3.	Appraisals & Review Appraisals		L.S.		$ 2,500.00
4.	Land Survey & Descriptions		L.S.		$ 1,000.00
5.	Negotiations		L.S.		$ 1,000.00
6.	Legal, Recording & Admin.		L.S.		$ 1,500.00
7.	Fencing	3,350	L.F.	$ 2.00	$ 6,700.00
8.	Contingencies		10%		$ 5,200.00
					$ 54,000.00
	GRADING TO EXTEND TURF CROSS WIND RUNWAY				
1.	Excavation & Grading	15,000	C.Y.	$ 2.50	$ 37,500.00
2.	Drainage Structures	350	L.F.	$ 25.00	$ 8,750.00
3.	Seeding & Fertilizing	9	Acre	$ 750.00	$ 6,750.00
4.	Contingencies		10%		$ 5,300.00
5.	Engineering, Legal & Admin.		25%		$ 14,700.00
					$ 73,000.00
	HANGAR DEVELOPMENT				
1.	Demolition of Old Hangar		L.S.		$ 2,500.00
2.	Site Preparation		L.S.		$ 3,000.00
3.	6 Stall T-Hangar	6	Stall	$18,000.00	$108,000.00
4.	Taxiway Paving	750	S.Y.	$ 25.00	$ 18,750.00
5.	Contingencies		10%		$ 13,225.00
6.	Engineering, Legal & Admin.		25%		$ 36,525.00
					$182,000.00
	CONNECTING TAXIWAY TO RUNWAY END 12				
1.	Excavation & Grading	8,000	C.Y.	$ 2.50	$ 20,000.00
2.	Drainage Structures	200	L.F.	$ 25.00	$ 5,000.00
3.	Subgrade Preparation	7,400	S.Y.	$ 0.35	$ 2,590.00
4.	4" Granular Base	1,600	Tons	$ 10.00	$ 16,000.00
5.	6" P.C.C. Paving	6,600	S.Y.	$ 18.00	$118,800.00
6.	Shouldering		L.S.		$ 3,000.00
7.	Seeding & Fertilizing	4	Acres	$ 750.00	$ 3,000.00
8.	Marking	1,000	S.F.	$ 0.50	$ 50.00
9.	Subdrains w/Porous Backfill	3,600	L.F.	$ 6.00	$ 21,600.00
10.	Contingencies		10%		$ 19,049.00
11.	Engineering, Legal & Admin.		25%		$ 52,461.00
					$262,000.00

STAGE II DEVELOPMENT (6 TO 10 YEARS) CONTINUED

ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
	JET FUEL FACILITIES				
1.	8,000 Gallon Buried Tank		L.S.		$ 16,000.00
2.	Dispenser & Pump		L.S.		$ 5,000.00
3.	Miscellaneous & Contingencies		10%		$ 2,100.00
4.	Engineering, Legal & Admin.		25%		$ 5,900.00
					$ 29,000.00

STAGE III DEVELOPMENT (11 TO 20 YEARS)

ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
	RAMP EXPANSION				
1.	Excavation & Grading	1,000	C.Y.	$ 2.50	$ 2,500.00
2.	Subgrade Preparation	3,200	S.Y.	$ 0.35	$ 1,120.00
3.	4" Granular Base	660	Ton	$ 10.00	$ 6,600.00
4.	6" P.C.C. Paving	3,000	S.Y.	$ 18.00	$ 54,000.00
5.	Shouldering		L.S.		$ 1,500.00
6.	Seeding & Fertilizing	1	Acre	$ 750.00	$ 750.00
7.	Tie-Down Anchors	24	Each	$ 125.00	$ 3,000.00
8.	Marking	250	S.F.	$ 0.50	$ 125.00
9.	Contingencies		10%		$ 6,959.50
10.	Engineering, Legal & Admin.		25%		$ 19,445.50
					$ 96,000.00
	PAVING OF CROSS WIND RUNWAY				
1.	Subgrade Preparation	35,200	S.Y.	$ 0.35	$ 12,320.00
2.	4" Granular Base	7,400	Ton	$ 10.00	$ 74,000.00
3.	6" P.C.C. Paving	33,500	S.Y.	$ 18.00	$603,000.00
4.	Shouldering		L.S.		$ 3,000.00
5.	Seeding & Fertilizing	5	Acre	$ 750.00	$ 3,750.00
6.	Marking	20,000	S.F.	$ 0.35	$ 7,000.00
7.	Subdrains w/Porous Backfill	8,000	L.F.	$ 6.00	$ 48,000.00
8.	Contingencies		10%		$ 75,107.00
9.	Engineering, Legal & Admin.		25%		$206,823.00
					$1,033,000.00
	LIGHTING OF CROSS WIND RUNWAY				
1.	Basic M.I.R.L. System		L.S.		$ 40,000.00
2.	V.A.S.I.	2	Sets	$ 7,500.00	$ 15,000.00
3.	R.E.I.L.'s	2	Sets	$ 5,000.00	$ 10,000.00
4.	Miscellaneous & Contingencies		10%		$ 6,500.00
5.	Engineering, Legal & Admin.		25%		$ 18,000.00
					$ 89,500.00
	LAND ACQUISITION FOR PRIMARY RUNWAY EXPANSION				
1.	Fee Land for Runway Extension	55	Acre	$ 1,800.00	$ 99,000.00
2.	Fee Land for Road Relocation	11	Acre	$ 1,800.00	$ 19,800.00
3.	Land in Easement	26	Acre	$ 500.00	$ 13,000.00
4.	Appraisals & Review Appraisals		L.S.		$ 10,000.00
5.	Land Survey & Descriptions		L.S.		$ 7,000.00
6.	Negotiations		L.S.		$ 5,000.00
7.	Legal, Recording & Admin.		L.S.		$ 3,000.00
8.	Fencing	15,500	L.F.	$ 2.00	$ 31,000.00
9.	Contingencies		10%		$ 19,200.00
					$207,000.00

STAGE III DEVELOPMENT (11 TO 20 YEARS) CONTINUED

ITEM NO.	DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
	GRADING FOR PRIMARY RUNWAY EXPANSION				
1.	Runway Excavation & Grading	60,000	C.Y.	$ 1.50	$ 90,000.00
2.	Road Excavation & Grading	28,000	C.Y.	$ 1.50	$ 42,000.00
3.	Road Surfacing	3,700	Ton	$ 10.00	$ 37,000.00
4.	Drainage Structures		L.S.		$ 12,000.00
5.	Seeding & Fertilizing	50	Acre	$ 750.00	$ 37,500.00
6.	Contingencies		10%		$ 21,850.00
7.	Engineering, Legal & Admin.		25%		$ 60,650.00
					$301,000.00
	PAVING OF PRIMARY RUNWAY EXPANSION				
1.	Excavation for Widening	3,100	C.Y.	$ 3.00	$ 9,300.00
2.	Subgrade Preparation	18,000	S.Y.	$ 0.35	$ 6,300.00
3.	4" Granular Base	6,400	Ton	$ 10.00	$ 64,000.00
4.	6" P.C.C. Paving	29,000	S.Y.	$ 18.00	$522,000.00
5.	Shouldering		L.S.		$ 5,000.00
6.	Seeding & Fertilizing	5	Acre	$ 750.00	$ 3,750.00
7.	Marking	40,000	S.F.	$ 0.35	$ 14,000.00
8.	Subdrains w/Porous Backfill	4,000	L.F.	$ 6.00	$ 24,000.00
9.	Contingencies		10%		$ 64,835.00
10.	Engineering, Legal & Admin.		25%		$178,815.00
					$892,000.00
	LIGHTING OF PRIMARY RUNWAY EXPANSION				
1.	Basic M.I.R.L. System		L.S.		$ 90,000.00
2.	V.A.S.I.	2	Sets	$ 9,000.00	$ 18,000.00
3.	R.E.I.L.'s	2	Sets	$ 8,000.00	$ 16,000.00
4.	Miscellaneous & Contingencies		10%		$ 12,400.00
5.	Engineering, Legal & Admin.		25%		$ 34,600.00
					$171,000.00
	CONNECTING TAXIWAY TO RUNWAY END 18				
1.	Excavation & Grading	4,000	C.Y.	$ 2.50	$ 10,000.00
2.	Drainage Structures	100	L.F.	$ 25.00	$ 2,500.00
3.	Subgrade Preparation	3,100	S.Y.	$ 0.35	$ 1,085.00
4.	4" Granular Base	700	Ton	$ 10.00	$ 7,000.00
5.	6" P.C.C. Paving	2,800	S.Y.	$ 18.00	$ 50,400.00
6.	Shouldering		L.S.		$ 1,500.00
7.	Seeding & Fertilizing	2	Acre	$ 750.00	$ 1,500.00
8.	Marking	500	S.F.	$ 0.50	$ 250.00
9.	Subdrains w/Porous Backfill	1,800	L.F.	$ 6.00	$ 10,800.00
10.	Contingencies		10%		$ 8,503.50
11.	Engineering, Legal & Admin.		25%		$ 23,461.50
					$117,000.00

FINANCING

There are a number of sources of finances available to the Algona Airport Commission for airport improvement projects. The Commission should thoroughly investigate alternative sources in planning individual projects.

Government Grants: The Iowa Department of Transportation currently participates in eligible airport improvement projects through grants of 70% of the project cost with the remaining 30% to come from local sources. The D.O.T. anticipates they will have approximately $1.5 million available per year for improvement projects. In general, eligible projects include any improvements serving public aviation. Projects not eligible for participation include hangars, aprons within 20 feet of a hangar, parking lots and driveways. Since demand for D.O.T. money far exceeds the available funds, projects are funded in the following order or priority: safety projects, preservation of existing facilities and construction of new facilities. The D.O.T. also maintains a reserve for airport facilities and equipment on a 50-50 matching basis. The facilities and equipment program has approximately $60,000 available annually.

The Federal Aviation Administration participates in similar general aviation airport improvement projects as the D.O.T. The current legislation provides for participation in projects at the rate of 90% of allowable project costs. The amount of money available for general aviation improvements is variable from year to year depending on the appropriation bill and the amount of discretionary funds. Current funding levels for general aviation airports is approximately $2.5 million per year.

Other grants are sometimes available through other state and federal agencies. Such grants for airport improvements are not very common, however, their possibility should not be overlooked.

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

Private financing may also be available through donations. Some communities have had successful industrial fund drives soliciting private funds to help defray the local share of government participation grants.

Revenue Bonds: Revenue bond financing can be used for some airport improvements such as hangars. The advantage of revenue bonds is that it provides a method of financing necessary improvements without a direct burden to the taxpayer.

General Obligation Bonds: General obligation bonds have historically been the most common method of financing the local share of government participation grants. The bonds are backed by the taxing power of the municipality. However, the amount a municipality can bond is limited and airport improvement costs must be budgeted along with all other essential public works.

Airport Generated Revenues: The airport itself generates some revenues through F.B.O. and operator fees, hangar rentals and income from airport farmland. These revenues, however, must first pay for normal operating and maintenance costs of the airport.

Implementation: Development of the proposed improvements will probably involve many of the above sources of funding. The following table presents one possible scenario for financing of the proposed development.

PROJECT	TOTAL COST	FEDERAL SHARE AT 90%	DOT SHARE AT 70%	DOT SHARE AT 50%	LOCAL SHARE
STAGE I IMPROVEMENTS					
Relocate Beacon & Wind Cone	$ 9,000			$4,500	$ 4,500
Upgrade Radio Control	7,000			3,500	3,500
Hangar Development	182,000				182,000
Parking Lot & Entrance Road	75,000				75,000
PHASE I TOTAL	$ 273,000	$ 0	$ 0	$8,000	$265,000
STAGE II IMPROVEMENTS					
Land for Cross Wind	$ 54,000		$ 37,800		$ 16,200
Grading for Cross Wind	73,000		51,100		21,900
Hangar Development	182,000				182,000
Taxiway to Runway End 12	262,000		183,400		78,600
Jet Fuel Facilities	29,000				29,000
PHASE II TOTAL	$ 600,000	$ 0	$272,300	$ 0	$327,700
STAGE III DEVELOPMENT					
Ramp Expansion	$ 96,000		$ 67,200		$ 28,800
Paving of Cross Wind	1,033,000	$ 929,700			103,300
Lighting of Cross Wind	89,500	80,550			8,950
Land for Primary Runway	207,000	186,300			20,700
Grading for Primary Runway	301,000	270,900			30,100
Paving for Primary Runway	892,000	802,800			89,200
Lighting for Primary Runway	171,000	153,900			17,100
Taxiway to Runway End 18	117,000		81,900		35,100
PHASE III TOTAL	$2,906,500	$2,424,150	$149,100	$ 0	$333,250
PHASE I, II, & III TOTAL	$3,779,500	$2,424,150	$421,400	$8,000	$925,950