AIRPORT DEVELOPMENT PLAN

Bloomfield Municipal Airport
Bloomfield, Iowa

AIRPORT DEVELOPMENT PLAN

FOR

BLOOMFIELD MUNICIPAL AIRPORT

Prepared For

BLOOMFIELD MUNICIPAL AIRPORT COMMISSION

Robert Pose, Chairman

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COMMUNITY AND AIRPORT BACKGROUND

A. Introduction

The objectives of the Airport Development Plan, ADP, are as follows:

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

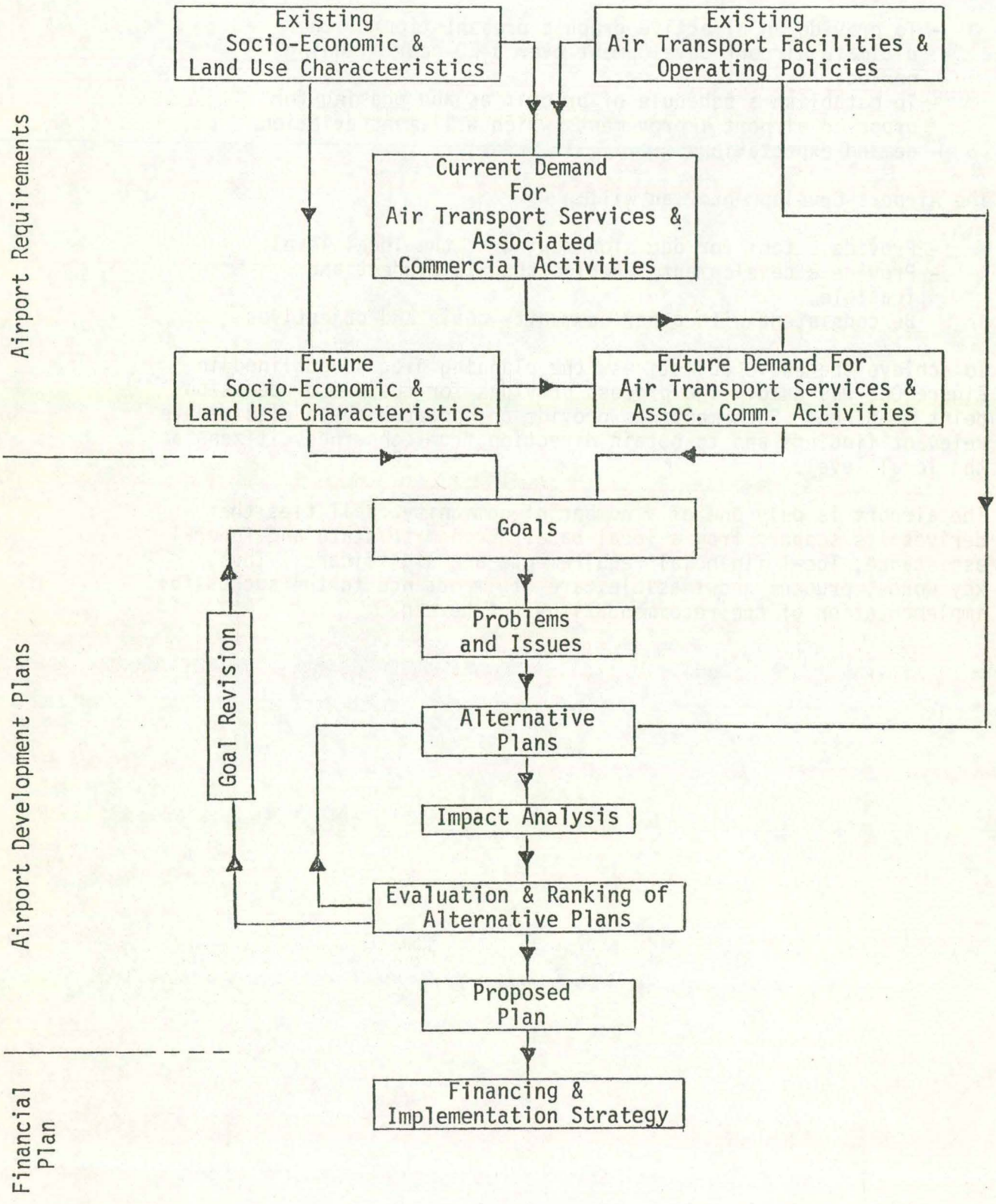
The Airport Development Plan will:

- Provide a tool for decision-making at the local level
- Provide a development scheulde that is prudent and feasible
- Be consistent with other community goals and objectives

To achieve the above objectives, the planning process outlined in Figure One was used. The process provides for the use of decision point meetings. Such meetings provide an opportunity to dissiminate relevant findings and to obtain direction from concerned citizens at the local level.

The airport is only one of a number of community facilities that derives its support from a local base. Even with state and federal assistance, local financial requirements are significant. Thus, key words, prudent and feasible, are of importance to the successful implementation of the recommendations set herein.

FIGURE 1: AIRPORT DEVELOPMENT PLANNING PROCESS



The following goals are recommended for adoption by the Bloomfield Airport Commission:

1. Encourage the public to participate in the airport development planning process to ensure that recommendations set forth enjoy wide spread community support.

2. Ensure that recommendations set forth are prudent and feasible.

3. Support efforts by the City of Bloomfield to attract industry that will ensure economic stability.

4. Encourage the development of industrial activity adjacent to the airport that is compatible with the operation of an airport.

5. Encourage the City and County to adopt land use policies in the vicinity of the Airport that will enhance development of the Airport and protect the community's investment.

6. Support efforts by the Iowa Department of Transportation to create a well-balanced system of airports throughout the state.

7. Encourage residents of Davis County to use the airport for purposes of business and pleasure.

8. Encourage the location of aviation oriented concerns on the airport that will provide quality services to local pilots and itinerant aircraft.

9. Support efforts by the Area IV Regional Planning Commission to create a stable regional economic base and transportation system.

10. Continue to monitor aviation activity throughout the twenty-year planning period to ensure that the facility is not "overbuilt."

B. Community Elements

Other Transportation Modes

The City of Bloomfield is served by U.S. Highway 63 and State Highway 2. U.S. Highway 63 provides access to Missouri some 16 miles to the south, and Ottumwa 20 miles to the north. State Highway 2 moves across southern Iowa in an east-west direction.

Rail service is provided by Norfolk and Western Railroad with one freight train per day. There is a possibility that the reailroad will seek abandonment of this line, leaving Bloomfield without rail service. The Rock Island maintains the rail service through the northern part of Davis County.

The City is served by commercial bus and two motor freight carriers. The nearest scheduled air carrier service is provided by Ozark Airlines at Ottumwa.

Utilities

Water is supplied to the community by the city from above ground storage facilities. The capacity of the water treatment plant is 1,000,100 gallons per day. Average consumption is 293,499 gallons per day. A water tower to serve the Airport Industrial Park is to be constructed in 1978 by the Rathbun Regional Water Association. The water storage facility will have a capacity of 300,000 gallons.

The sewage treatment plant has an average load of 250,000 gallons per day with an excess capacity of 100,000 gallons per day. Electricity is produced and distributed by the city. Natural gas is supplied by the Michigan-Wisconsin Pipeline Company.

Fire Protection

Smaller general aviation airports do not provide their own fire and crash rescue facilities and rely upon services provided by the community fire district.

Law Enforcement

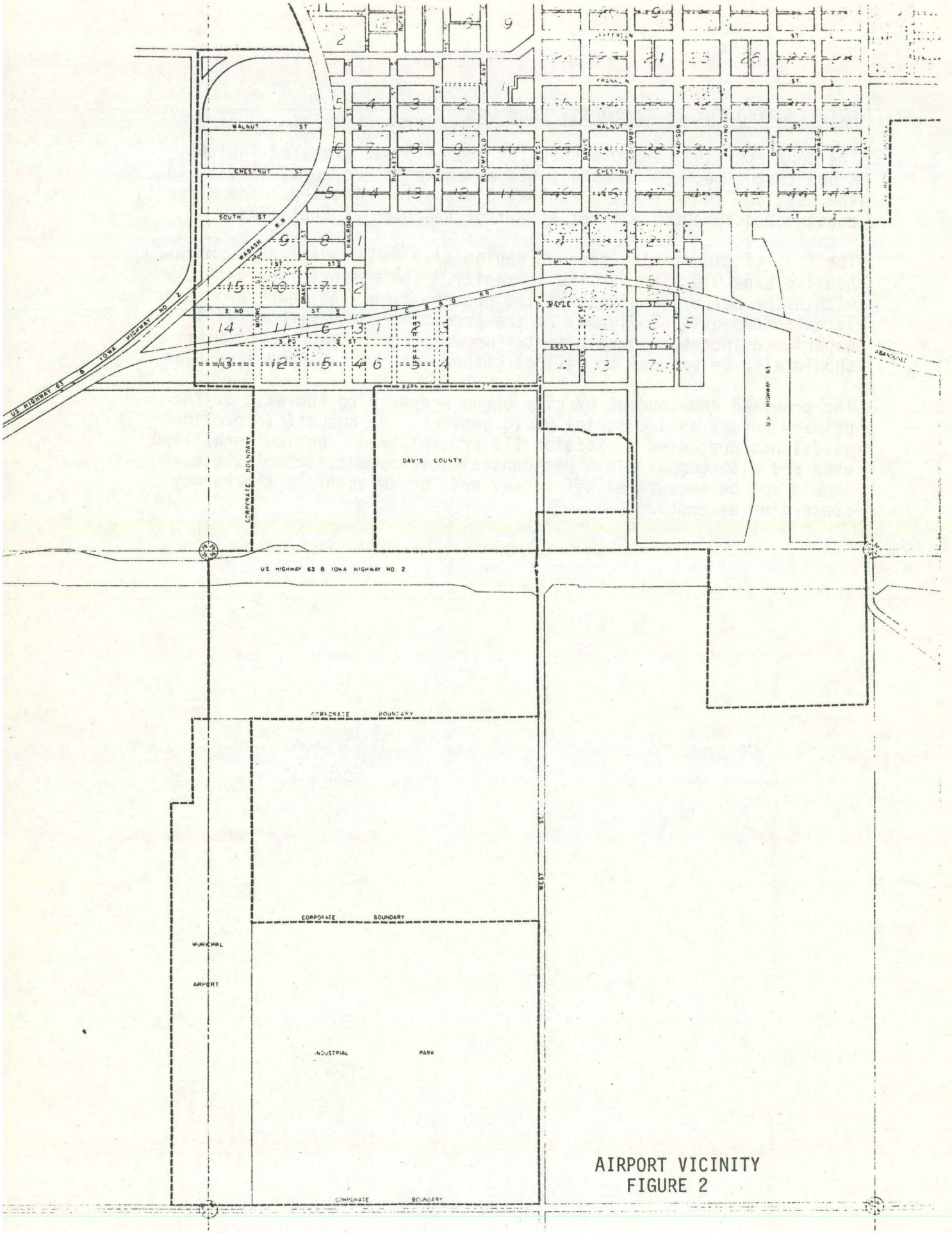
Security at the airport is provided by the City of Bloomfield.

Existing and Future Community Land Use

The Comprehensive Land Use Plan for the City was prepared in 1962. Since that time, the community has extended its corporate limits to the east and south. State Highway 2 was also relocated. The airport, constructed in 1966, was not a part of the plan at that time.

The City of Bloomfield, through Region XV, should update the Comprehensive Land Use Plan for the community. The airport lies entirely within the corporate limits at the present time. As sewer and water is extended south of Highway 2, the area around the airport will experience increased developmental pressures. The official zoning map should also be amended to reflect changes in the comprehensive plan.

The proposed development of city-owned property to the east of the primary runway as industrial would generally be compatible provided guidelines presented in Section III are followed. Agricultural land uses are also compatible. Residential development, schools, etc. should not be encouraged off runway ends or adjacent to the runway centerline extended.



AIRPORT VICINITY
FIGURE 2

C. Socioeconomic Characteristics

Socioeconomic characteristics and trends within the airport service area are a major determinant of future levels of aviation activity. Increased employment opportunities will foster not only population stability and growth, but use of air as a mode of transportation as well. The intent herein is not to examine socioeconomic characteristics in detail, but to summarize existing studies and relevant data.

As previously discussed, a major objective of the airport development plan, ADP, is to support local and regional development objectives. The ADP should be constructed around transportation goals and objectives that include, lend to, and support the concept of economic stability and diversification.

Area XV, consisting of ten counties, Appanoose, Davis, Jefferson, Keokuk, Lucas, Mahaska, Monroe, Van Buren, Wapello, and Wayne, has experienced economic stagnation and a population loss. " . . . the following quantitive analysis of recent trends seems to verify the fact that Area XV is caught in a cycle of progressive economic regression."[1] The "cycle of progressive economic regression" is complex in scope, but can be defined as one characterized by the following events:

1. Loss of employment opportunities in the regional coal mining industry. (Due to availability of oil and gas)

2. Loss of employment opportunities within the region's agricultural sector. (Due to increased mechanization and farm size)

3. Loss of employment opportunities in mining, construction, transportation, communication, utilities, and wholesale trade sectors. (Due in part to 1 and 2 above)

4. Growth in the service, manufacturing, and retail trade industries. (The increased employment opportunities in the above totaled 9,732 jobs from 1950-1970. Such increase was not near enough to offset the loss in opportunities, 17,885 jobs experienced in 2 and 3 above.)

5. Thus, between 1950 and 1970, the region experienced a population loss of 3.28 persons per job or employment opportunity.

   A. The out-migration was typically by those persons in their family formation years which further contributed to population decline.

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[1] Area XV Regional Planning Commission, Areawide Overall Economic Development Plan, Ottumwa, Iowa, 1975 Page 1-4.

B. In the same period, the region became more urbanized with growth concentrated in the larger communities.

6. The result of continual population decline further contributed to a decline of expenditures in other areas as well as shrinkage in the tax base.

The Area XV Regional Planning Commission has set forth economic development goals and objectives which are intended to stabilize the region's economic base. The Area XV Economic Development Goals are as follows:

Goal I: Ensure all communities selected as having industrial growth potential are equipped with adequate public work facilities and industrial parks.

Goal II: To examine potential benefits occuring to Area XV as a result of regional energy resource utilization.

Goal III: Provide technical assistance to existing community industrial promotion efforts and to implement a strategy for a region-wide industrial promotion program.

Goal IV: To provide special studies evaluating problems and opportunities of selected economic sectors, and to analyze demographic trends impacting on the stability of the regional economy.

Goal V: To provide technical assistance where possible to smaller area businesses facing special organizational or financial problems.

The spatial pattern of goal implementation is centered upon the concept of a multi-nucleated region with Ottumwa serving as the focal point of the region. For the region to be self-supporting, the Regional Planning Commission indicates that the total population must approach 200,000-250,000. Until the population reaches this level, the communities must rely upon federal and state assistance to sustain themselves.

The airport and ultimate development of the airport will provide short- and long-term direct and secondary benefits in helping Bloomfield, Davis County and the Region achieve its goals. Thus, it is important to integrate the airport into an industrial park concept at Bloomfield where land has been purchased for that purpose adjacent to the airport. Short term benefits are found in the number of construction jobs made available, while the inducement of industry desiring a location with runway access and utilities to locate in Bloomfield is a secondary short and/or long-term benefit.

To achieve the threshold population and to stabilize the economic base of the Region and Davis County, the Regional Planning Commission established the following targets:

TABLE 1

POPULATION AND JOB TARGETS FOR YEAR 2000

	Zero Growth		Threshold Growth	
	Population	Jobs	Population	Jobs
Davis County	8,200	3,594	10,000	4,343
Region Total	153,875	65,082	195,000	81,879

Source: Area XV Regional Planning Commission, Areawide Overall Economic Development Plant, Ottumwa, Iowa 1975, pages 2-4

In 1970, there were 2,968 persons employed in Davis County. To achieve zero growth, 608 new employment opportunities would be needed by 2000, while 1,357 would be required to achieve full growth. This represents a total increase from 1970 to 2000 of 20.4% and 45.4% respectively or an average annual increase of 0.7% and 1.5%.

From 1970 to 1973, Davis County experienced an average annual increase in employment opportunities of 1.1 percent. Thus the County has surpassed the zero growth target but is falling short of the full growth target by 0.4 percent per year.

Growth within existing manufacturing industries in Davis County are expected to total 131 from 1974 through 1980. The Bloomfield Foundary grew from 45 to 95 between 1972 and 1977. A new industry employing 12 persons is expected to begin operation in 1978. These basic employment jobs in turn are expected to generate 89 non-basic job opportunities or a total of 220 from 1974 to 1980. An additional trend found is an estimated increase in non-basic employment beyond the historic ratio of basic to non-basic employment of some 94 jobs. In summary, Davis County is expected to experience a total increase of 404 employment opportunities between 1970 and 1980. Should this trend continue, Davis County will come close to meeting its full growth target, falling short by 44 jobs.

Historical population trends in Davis County and communities within the county are shown in the following tables.

TABLE 2

DAVIS COUNTY POPULATION TRENDS, 1900-1970

Year	Bloomfield	Drakesville	Floris	Pulaski	Total County
1900	2,105	238	---	302	15,620
1910	2,028	249	---	382	13.315
1920	2,064	261	252	419	12,574
1930	2,226	190	209	376	11,150
1940	2,732	252	247	400	11,136
1950	2,688	222	215	381	9,959
1960	2,771	197	187	299	9,199
1970	2,718	163	145	255	

Source: Area XV ReCog, Areawide Overall Economic Development Plan, 1975

TABLE 3

DAVIS COUNTY POPULATION TRENDS, 1970-1975

	1970 Census	July 1, 1973 (Revised)	July 1, 1975 Estimated	Change 1970 Number	Change 1975 Percent
Bloomfield	2,718	2,687	2,631	-87	-3.2
Drakesville	163	147	138	-25	-15.2
Floris	145	138	134	-11	-7.6
Pulaski	255	320	328	+73	+28.6
Total County	8,207	8,376	8,572	+365	+4.4

Source: U.S. Department of Commerce, Series Page 25, No.263, Current Population Departments, Population Estimates and Projections

Davis County has been able to reverse its historic population loss. In 1900, there were 15,620 persons residing in the county. By 1970, the U.S. Census reported 8,207 persons in the county. Between 1970 and 1975, the County experienced a population increase of 365 persons or 4.4 percent. This can be attributed, in part, to the increase in employment opportunities.

Bloomfield has continued to experience a population loss. From 1970 to 1975, the community experienced a loss of 87 persons or 3.2 percent from the 1970 population of 2,718.

The full growth target population of Davis County is 10,000. In 1970, 33 percent of the total county population resided in Bloomfield. The community is expected to continue to function as the focal point for Davis County. Assuming that the community captures 33 percent of the target population, some 3,300 plus persons could reside in the community by 2000. Reference may be made to Figure 3 .

Employment trends for the airport service area are summarized in Table 4. Such trends provide some insight into the probable stability of aviation.

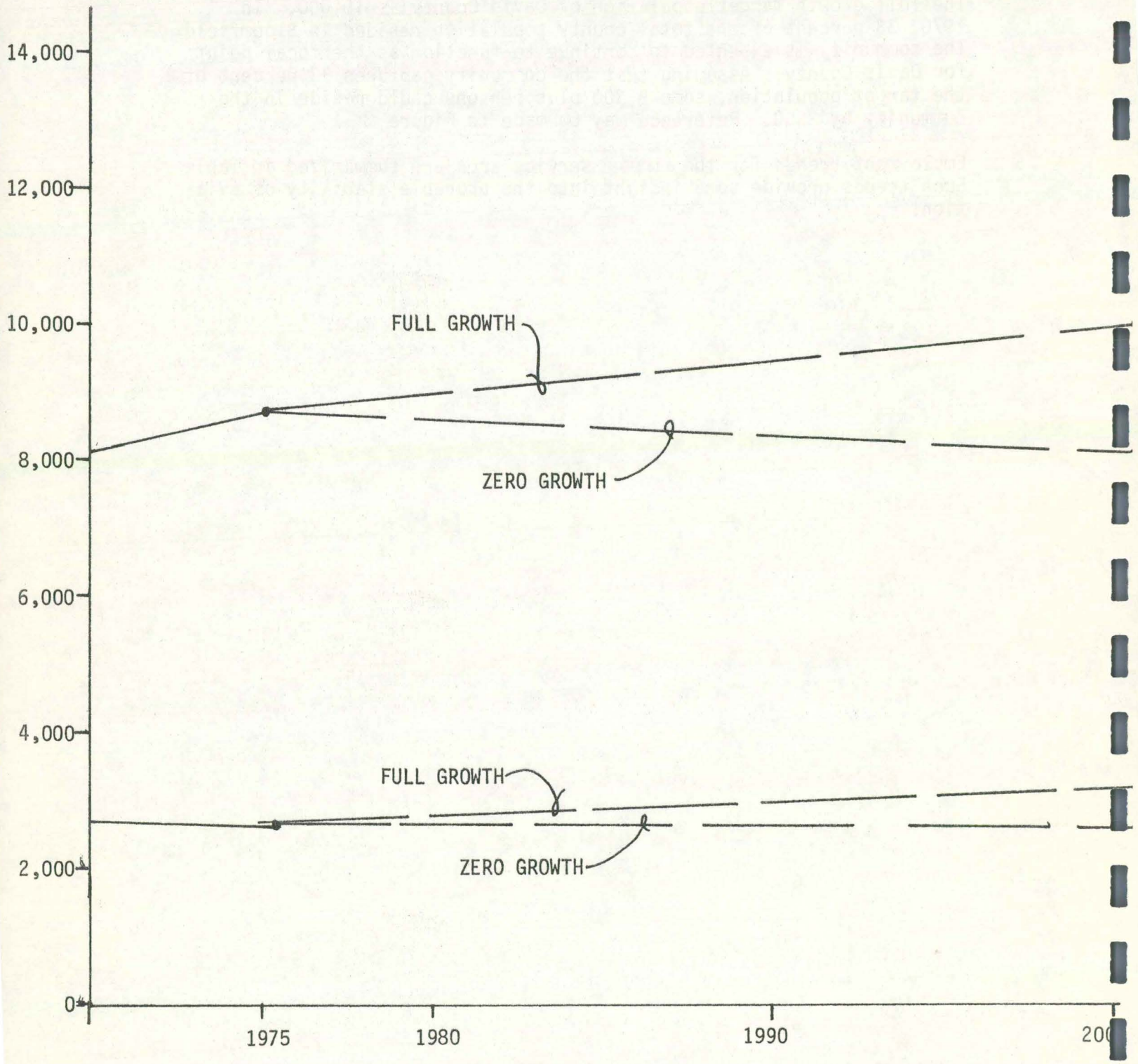


Figure 3 -- Population Change, 1970-2000
Davis County and City of Bloomfield

TABLE 4

PROJECTED EMPLOYMENT BY ECONOMIC SECTOR
1970-2000

Davis County

EMPLOYMENT CATEGORY	Year 1970	1980	2000	% Change 1970-2000
Agriculture	870	709	640	- 26%
Construction	40	110	125	+212%
Manufacturing	160	301	789	+393%
Transportation	60	80	86	+ 43%
Wholesale	40	62	65	+ 62%
Retail	350	442	503	+ 44%
Finance	50	60	71	+ 42%
Services	260	343	417	+ 60%
Government	680	720	719	+ 6%
Self-Employed	620	687	700	+ 13%
TOTAL	3,130	3,514	4,115	+ 31%

Source: Area XV Regional Planning Commission, Areawide Overall Economic Development Plan, 1975, Pages 2-17, 2-18, 2-20

The ENO Foundation grouped industry by travel tendency as follows:

High Travel	Mining, Manufacturing, Government and Business Services
Medium Travel	Construction, Wholesale and Retail Trade, Professional Services, Finance, Insurance and Real Estate
Low Travel	Agriculture, Forestry, Transportation, Communication, Utilities, Repair Services, Recreation, Amusement and Printing

Source: ENO Foundation, Air Travel Forecasting, Saugatuck, Conn., 1957, p.24

As noted, the greatest growth is expected in manufacturing employment. Growth in this sector is in turn followed by employment increases in the construction industry, business services, and wholesale trade. Both manufacturing and business services have high travel tendencies while construction and wholesale trade are characterized by medium travel tendencies. The agricultural sector, having low travel tendencies, is the only employment group expected to experience a decrease in employment. In summary, the greatest increase in employment is expected to be in those sectors having high and medium travel tendencies.

D. Area Airports

The Bloomfield Municipal Airport is the only airport within Davis County. The facility, which lies near the center of the County, is located halfway between facilities at Centerville and Keosaugua. The service area of the Bloomfield Municipal Airport approximates Davis County. Davis County also lies within the airport service area of Ottumwa as the nearest certificated air carrier airport.

Area airports summarized herein are as follows: Keosaugua, Ottumwa, Centerville, Albia, and Fairfield. The role of these airport facilities within the Iowa State Airport System Plan are summarized below.

AIRPORT SYSTEM AIRPORTS (ASI)	SYSTEM CANDIDATE AIRPORTS
Ottumwa, Air Carrier	Keosaugua
Centerville, General Utility	
Fairfield, General Utility	
Albia, Basic Utility	
Bloomfield, Basic Utility	

The 1978 SASP evaluated a number of alternative procedures by which to identify airports for inclusion into the state system. The alternative selected was based upon an analysis involving eight criteria for which penalty points were assigned to determine the entry factor. The eight criteria were as follows:

- Existing and forecast of based aircraft
- Existing and forecast of total annual operations
- Existing and forecast of community population
- County population growth trend, 1950-1970
- County employment growth trend, 1950-1970
- Community interest (Master Plan or Development Plan at least in application phase)
- Distance to nearest alternative system airport
- Primary runway (Paved or Turf)

$$ASI = D(1 + Cp + CE = \geq Pi + I + R + \geq Ai + \geq Oi)$$

Where:

D = Distance to nearest alternative system airport
Cp = One point if county population growth is positive (1950-1970)
Ce = One point if county employment growth is positive (1950-1970)
P = One point for each of the planning periods (i=1977, 1982, 1987 1997) in which the airport community's projected population is more than 3,000
I = Five points if the community has applied for assistance in airport master planning or airport development planning

R = Five points if the airport's primary runway is hard-surfaced

A = One point for every 10 based aircraft projected for each of the planning periods (i = 1977, 1982, 1987, 1997)

O = One point for every 10,000 annual operations projected at the airport for each of the planning periods (i = 1977, 1982, 1987, 1997)

The state system of 80 airports is composed of those airports having an ASI index of 300 or more.

	Air Carrier
Ottumwa	432 Points
Centerville	775 Points
Fairfield	459 Points
Albia	390 Points
Bloomfield	24 Points
Keosaugua	

The role of each airport within the system is further refined by type of airport facility to include:

Air Carrier (AC)	General Utility (GU)
Basic Transport (BT)	Basic Utility (BU)

Ottumwa is a representative air carrier airport. A basic transport airport in southern Iowa is Keokuk. Centerville and Fairfield are classified as utility airports while Bloomfield and Albia are basic utility airports.

Airport	Runways Length	Width	Surface	Light System	NAVAIDS
Keosaugua 6-24	2,600	100	Turf	LIRL	
Bloomfield 18-36	2,800	50	Paved	MIRL	NDB
Albia 18-36	2,500	50	Paved	LIRL	Beacon
Fairfield 17-35	3,200	60	Paved	LIRL	Beacon
Centerville 15-33 17-35	3,100 2,400	50 30	Paved Paved	MIRL	Beacon
Ottumwa 13-31 4-22	6,500 5,179	150 200	Paved Paved	HIRL MIRL	ILS,ALS NPI,Beacon

LIRL Low Intensity Runway Lights
MIRL Medium Intensity Runway Lights
HIRL High Intensity Runway Lights
NAVAIDS Navigational Aids
ILS Instrument Landing System
ALS Approach Light System
NPI Non-Precision Instruement Approach

E. Existing Site

The Bloomfield Municipal Airport is located approximately two miles south of the city at an elevation of 850 feet above sea level. The latitude of the facility is 40° 44' 00" N. The longitude is 92°25'30"W. The normal mean maximum temperature is 89° F.

Airport facilities consist of a single primary runway 18/36. The runway is 2,800 feet in length and 50 feet in width. The surface composition is concrete. The single wheel gross weight strength is 28,000 pounds. The runway has an effective gradient of .28 percent and is lighted with a medium intensity light system. Runway end identifier lights, REILS, are located on both runway ends.

The airport does not have a beacon light. A lighted wind tee is located adjacent to the apron area. A non-directional radio beacon, NDB, was commissioned by the Federal Aviation Administration, FAA, in 1977. The unicom is currently operated from 8 a.m. to 5 p.m. The nearest flight service station, FSS, is Ottumwa.

Three conventional hangar facilities are located on the airport in addition to a mobile home which serves as office space for Bloomfield Air Service. Of the three structures, two are available for public use while the newer structure has been leased to a local individual. The capacity of the two hangar structures is subject to the stacking procedures and size of aircraft. For planning purposes, it is assumed that the maximum desirable capacity is six and four respectively. The hangars are maintained by the City and appear to be in fair condition. As with any conventional hangar at a location where the F.B.O. does not move aircraft in out of the structure for the owner, there is some lack of efficiency in the utilization of space.

The conventional hangar, to include the improved surface apron area, was leased to a local individual in 1970 for a period of 20 years. The city constructed the hangar and apron on the basis that the leasee would rent the facilities for a sum sufficient to retire the annual principal and interest due on the revenue bonds.

The improved surface apron provides access to a conventional hangar, stub taxiway, and serves as a refueling area. Thus, the use of the apron for storage is limited to two aircraft tiedowns. The apron consists of 2,100 s.y. of concrete surface.

Reference may be made to FAA Form 5010, Figure 4, concerning the present airport layout.

The last airport federal aid project completed in Bloomfield was in 1966 at the time the airport was constructed. The project consisted of the following work elements:

- land acquisition, 32 acres
- clear zone easements
- construction of a 50' x 2,800' concrete runway
- construction of a loop turn around on RW End 18, 30' width
- grading and drainage
- construction of stub taxiway 20'x 250'

Total estimated cost: $188,025
Federal aid contribution: $ 85,426

The State of Iowa has provided the following grants in aid to Bloomfield from 1961 through 1978.

Date	State-Aid - Bloomfield	Amount
10-10-60	Land purchase	$ 3,783.00
5-9-61	Flying Farmers R/W Lighting Kit	480.59
10-2-61	Additional Grading North End of R/W	155.00
10-8-62	Hard Surfaced Ramp & Installed Tie-Downs	400.00
4-19-65	Land Purchase North End of R/W	625.00
4-19-66	Hard Surface R/W Construction	4,747.00
5-9-66	Airport Lighting	360.95
2-28-67	Purchase of Wind Tee	170.10
8-15-67	Cable for Lighting	569.52
11-14-78	Fencing & Seal Coat on Ramp	1,760.00
10-20-69	Paved Ramp	5,500.00
4-19-76	REILS	1,966.15
	Total ------	$20,517.31

Most recently, the state has participated in the Airport Development Plan and the NDB system.

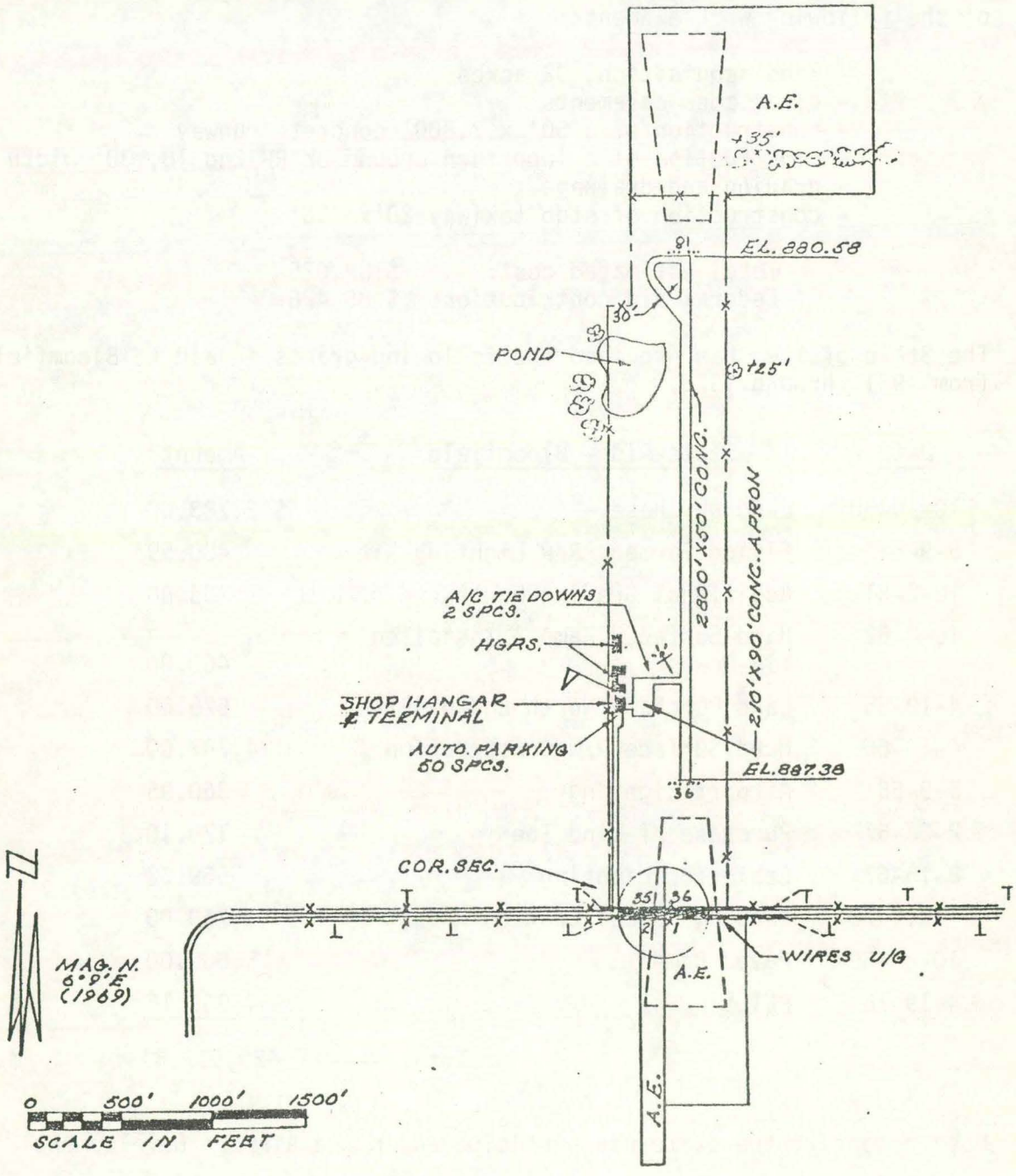


FIGURE: 4 Bloomfield Municipal Airport

Source: FAA Form 5010

SECTION II

FORECAST OF AVIATION DEMAND

A. Introduction

The airport is expected to play a significant roll in the development of the Region, Davis County, and the City of Bloomfield. As discussed in Section I, the airport will provide an opportunity for the community to promote the concept of an airport industrial park While the facility may not have a direct impact, the induced secondary impacts are expected to provide both short and long term benefits to the entire region.

The forecast of aviation demand is based not only upon historical aviation events, but the increasing propensity and need to travel. While the need to travel can be satisfied in a number of ways and by various modes, travel by air for business and pleasure is increasing. In terms of the former, it is a matter of economics for business interests to use air to transport its sales, management and marketing personnel from corporate to branch plants. The decision to travel or transport an item from one point to another is based upon a number of factors to include those listed below:

- Distance
- Accessibility
- Time in terms of length of stay, travel time
- Cost per unit of travel
- Reasons for making the trip
- Number of persons
- Type and value of cargo
- Regulations
- Economic trends
- Availability of other modes of transportation
- Aviation interests as may be fostered through school programs and Civil Air Patrol

The potential for development of aviation also is influenced by the airport facility as well as maintenance and management of the facility. This section estimates future numbers of based aircraft, aircraft operations, and air passengers anticipated over a twenty-year period at the Bloomfield Municipal Airport.

National trends from 1965 to 1974 for miles flown and hours flown by type of flying are shown in Tables 5 and 6 . While such trends may not be entirely applicable to Davis County, they may provide some insight into the increasing number of miles flown for business, commercial, and personal reasons within the nation from 1965 to 1974.

TABLE 5

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

Actual Use
(Thousands of miles)

Year	Estimated Total Miles Flown	Business		Commercial		Instructional		Personal		Other	
		Miles	Percent	Miles	Percent	Miles	Percent	Miles	Percent	Miles	Percent
1965[1]	2,562,380	1,204,321	47	461,228	18	258,733	14	512,476	20	25,622	1
1966[1]	3,336,138	1,536,158	46	515,730	16	646,169	19	605,912	18	32,169	1
1967[1]	3,429,964	1,431,372	42	568,502	16	713,242	21	690,595	20	36,253	1
1968[2]	3,700,864	1,406,328	38	666,156	18	814,190	22	777,181	21	37,009	1
1969[2]	3,926,461	1,425,923	36	722,916	19	910,290	23	829,043	21	38,289	1
1970[3]r/	3,207,127	1,134,279	35	554,683	17	686,152	22	753,434	24	78,579	2
1971[3]r/	3,143,181	1,128,951	36	506,598	16	651,091	21	794,713	25	61,900	2
1972[3]r/	3,317,068	1,143,841	34	580,861	18	691,513	21	833,855	25	66,998	2
1973[3]	3,728,534	1,343,723	36	688,402	18	777,868	21	825,099	22	93,442	3
1974[3]	4,042,700	1,433,276	35	789,695	20	815,543	20	919,587	23	84,599	2

Source: FAA

r/ Revised

[1]Estimated from FAA Form 2350

[2]Estimated from FAA Form 8320-3

[3]Estimated from AC Form 8050-73

Note: 1. Business includes business and executive

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

3. Instructional includes training and rental

TABLE 6

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

Actual Use
(Thousands of hours)

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

Source: FAA

[1]Estimated from FAA Form 2350

[2]Estimated from FAA Form 8320-3

[3]Estimated from AC Form 8050-73

Note: 1. Business includes business and executive

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

3. Instructional includes training and rental

B. Based Aircraft

Regional Based Aircraft Trends

The estimate of future numbers of based aircraft for Bloomfield is based upon historic regional trends within an 18 county area in south-central and eastern Iowa. This approach removes much of the annual variation caused at a specific airport because of actions or decisions by one or two individuals. The estimates are also based upon conclusions drawn from the 1976 SASP.

> "The number of aircraft based at an airport is not directly related to the area of residence of the owner. The choice of a site for basing an aircraft may be affected by factors such as: hangar rental and maintenance-fee structure, availability of navigational aids, runway length and condition."
>
> (1976 SASP,Page 59)

Experience also indicates that service provided by an F.B.O. and/or air taxi operator would attract aircraft from other area communities. However, those airports which now enjoy numbers of based aircraft owned by persons from outside the community or airport service area may, in the future, loose their historical dominance.

> ". . . the development of a quality system throughout the state would remove much of the attractiveness differentials between airports by 1995, thus causing the number of aircraft based in a county to be more clearly equal to the number of registered aircraft in the county."
>
> (1976 SASP, Page 61)

An 18 county area was used to create a base upon which to make future estimates. A step down procedure, from a regional level to the county and community level, was used to estimate future numbers of aircraft likely to be based at Bloomfield. The 18 county area included the following counties: Clarke, Decatur, Lucas, Wayne, Warren, Madison, Union, Ringgold, Jefferson, Van Buren, Adams, Adiar, Marion, Monroe, Appanoose, Davis, Wappello, and Mahaska.

Table 7 shows historical numbers of regional aircraft from 1965 to 1975. As noted in the table, there is considerable annual variation. In 1965 there were 203 general aviation aircraft registered in the region. This number increased to 333 by 1972 and declined the following year to 296. In 1975, there were 308 aircraft registered in the region.

TABLE 7

TOTAL ACTIVE AIRCRAFT, 1965-1975
SELECTED SOUTHERN IOWA COUNTIES

YEAR	CLARKE	DECATUR	LUCAS	WAYNE	WARREN	MADISON	UNION	RINGGOLD	JEFFERSON	VAN BUREN
1975	8	3	18	4	32	12	19	2	21	5
1974	12	2	16	3	24	15	21	2	15	7
1973	8	2	14	4	15	10	20	0	21	4
1972	16	1	14	6	10	11	19	0	20	2
1971	17	1	12	3	7	12	18	0	18	2
1970	17	1	15	2	9	6	13	0	25	2
1969	13	3	11	6	18	9	14	5	19	3
1968	8	2	12	8	20	5	12	3	9	4
1967	9	5	24	8	23	2	8	2	6	5
1966	9	4	21	5	20	0	12	2	9	2
1965	6	5	18	6	21	0	14	1	9	2

YEAR	MARION	MONROE	APPANOOSE	DAVIS	WAPPELLO	MAHASKA	ADAMS	ADAIR	TOTAL
1975	50	16	15	6	39	34	9	15	308
1974	45	16	18	10	45	29	8	14	302
1973	51	17	16	8	39	36	10	21	296
1972	48	17	14	13	68	37	11	26	333
1971	39	14	19	5	41	30	10	10	258
1970	43	11	22	6	37	34	8	22	273
1969	35	19	21	10	31	29	11	9	266
1968	38	14	16	11	30	28	10	12	242
1967	26	10	17	11	33	31	14	9	243
1966	25	8	18	11	30	21	15	9	221
1965	26	9	12	9	22	21	16	9	203

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

The historical growth and annual variation was compared against a historic trend line fitted by a non-linear equation. The equation is as follows: $Yc = a + bx + cx^2$. Where y = number of aircraft, x = assigned value, and a, b, and c are constants. Reference may be made to the table below and Figure 5.

TABLE 8

REGIONAL G-A REGISTERED AIRCRAFT DEVIATION
1965-1975

Year	Actual	2nd Degree Equation Trend Line	Deviation
1975	308	311	- 3
1974	302	306	- 4
1973	296	301	- 5
1972	533	294	+39
1971	258	285	-27
1970	273	275	- 2
1969	266	263	+ 3
1968	242	251	- 9
1967	243	236	+ 7
1966	221	221	0
1965	203	203	0

Deviation from the regional trend line is within 10 aircraft except for the years 1971 and 1972. The actual occurance below the trend, more often than above, is due to the 1972 data. The projection of this historic trend line into the future produces a downward trend after 1979 and thus is of little value in estimating future registered aircraft over the twenty year period. It does, however, provide some insight into the past for the 18 southern Iowa counties. The historic trend line and trend line value were obtained from solving the following three equations:

Calculated Values:

$x^2 = 110$

$x^4 = 1,958$

$y = 2,945$

$xy = 1,182$

$x^2y = 28,818$

Constants:

a

b

c

y = Number of Registered Aircraft
x = Assigned Value
n = Number of Years

Solving for a,b, and c:

(I) $y = Na + c\Sigma x^2$
$c = -.72$

(II) $\Sigma x^2y = a\ x^2 - c\Sigma x^4$
$a = 275$

(III) $\Sigma xy = b\Sigma x^2$
$b = 10.745$

Equation for trend line: $yc = a + bx + cx^2$

where year calculated:

$1975 = 215 + 10.74(5) - .72(25) = 311$

$1965 = 275 + 10.74(-5) - .72(25) = 203$

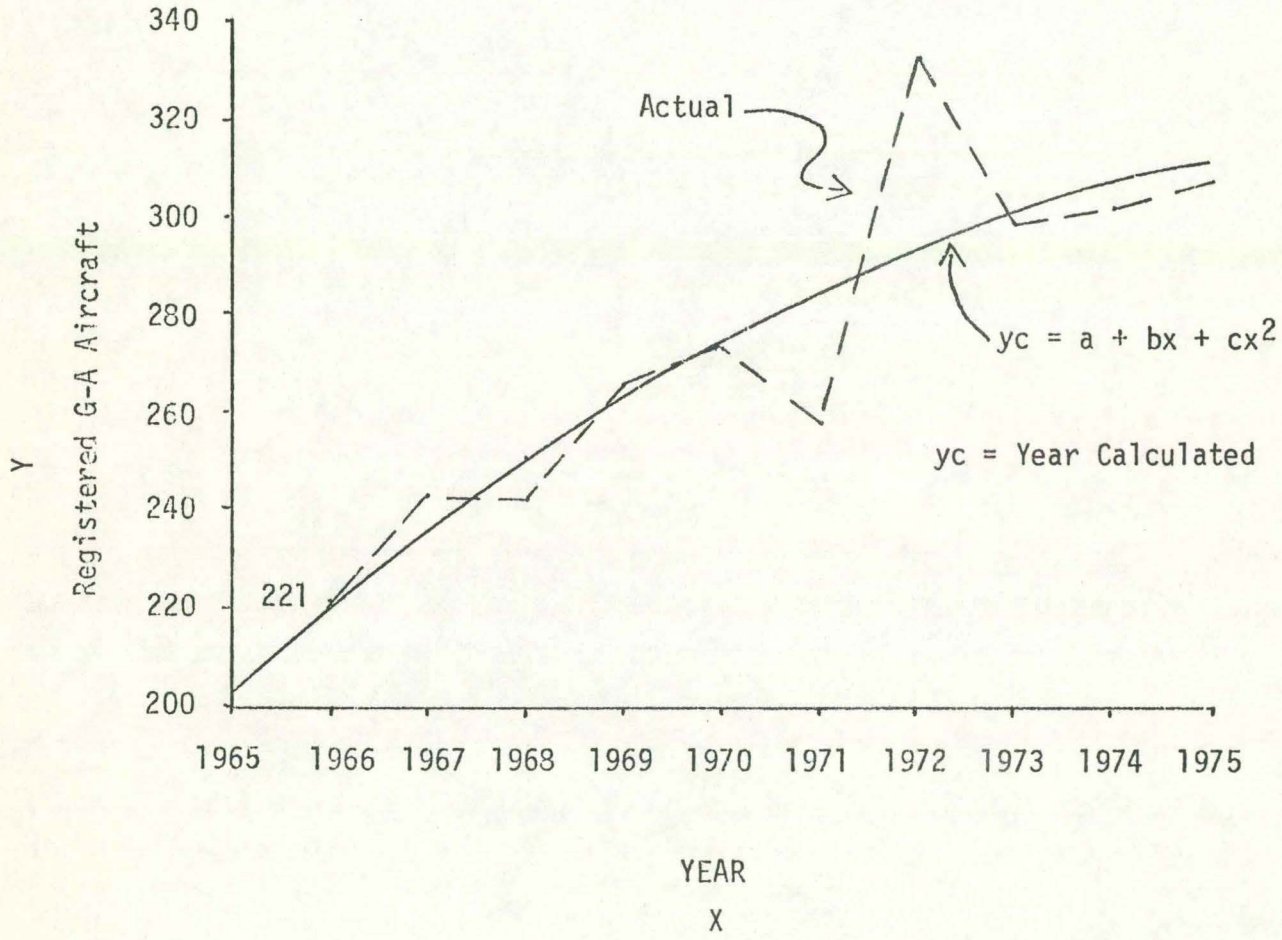
and so forth

FIGURE 5

REGISTERED G-A AIRCRAFT, 18 COUNTIES

1965-1975

2nd Degree Curve



A simple straight line equation, $Yc = a + bx$, was also used to fit a trend line to the historical regional data. Constants a and b were obtained by solving the following equations:

(I) $\Sigma y = Na$
(II) $\Sigma xy = b\ x^2$
Where $\Sigma y = 2.945$ $\quad a = 267.72$
$\Sigma x^2 = 110$ $\quad b = 10.74$
$\Sigma xy = 1,182$

Equation for trend line: $yc = a + bx$
Where year calculated: $1975 = 267.72 + 10.74(5) = 321$
$1965 = 267.72 + 10.74(-5) = 214$

and so forth as shown below:

Year	Actual	yc = a+ bx Straight Line
1975	308	321
1974	302	311
1973	296	300
1972	333	289
1971	358	278
1970	273	268
1969	266	257
1968	242	246
1967	243	236
1966	221	225
1965	203	214

The future estimate of registered aircraft in the 18 county area was obtained by calculating values for Yc - a + b x
This produced a high estimate. The low estimate was based upon the average annual increase from the value produced by the equation $Yc = a + bx + cx^2$ for the period 1971 to 1975. The middle trend line was obtained by determining the difference between the high and low values. Reference may be made below concerning the future estimate of regional based aircraft.

Registered G-A Aircraft, 18 Counties
1976-1997

Year	Low	Middle	High
1976	319	326	332
1977	326	335	343
1978	334	344	354
1979	341	353	364
1980	349	362	375
1981	356	371	386
1982	364	381	397
1987	401	426	450
1996	476	517	558

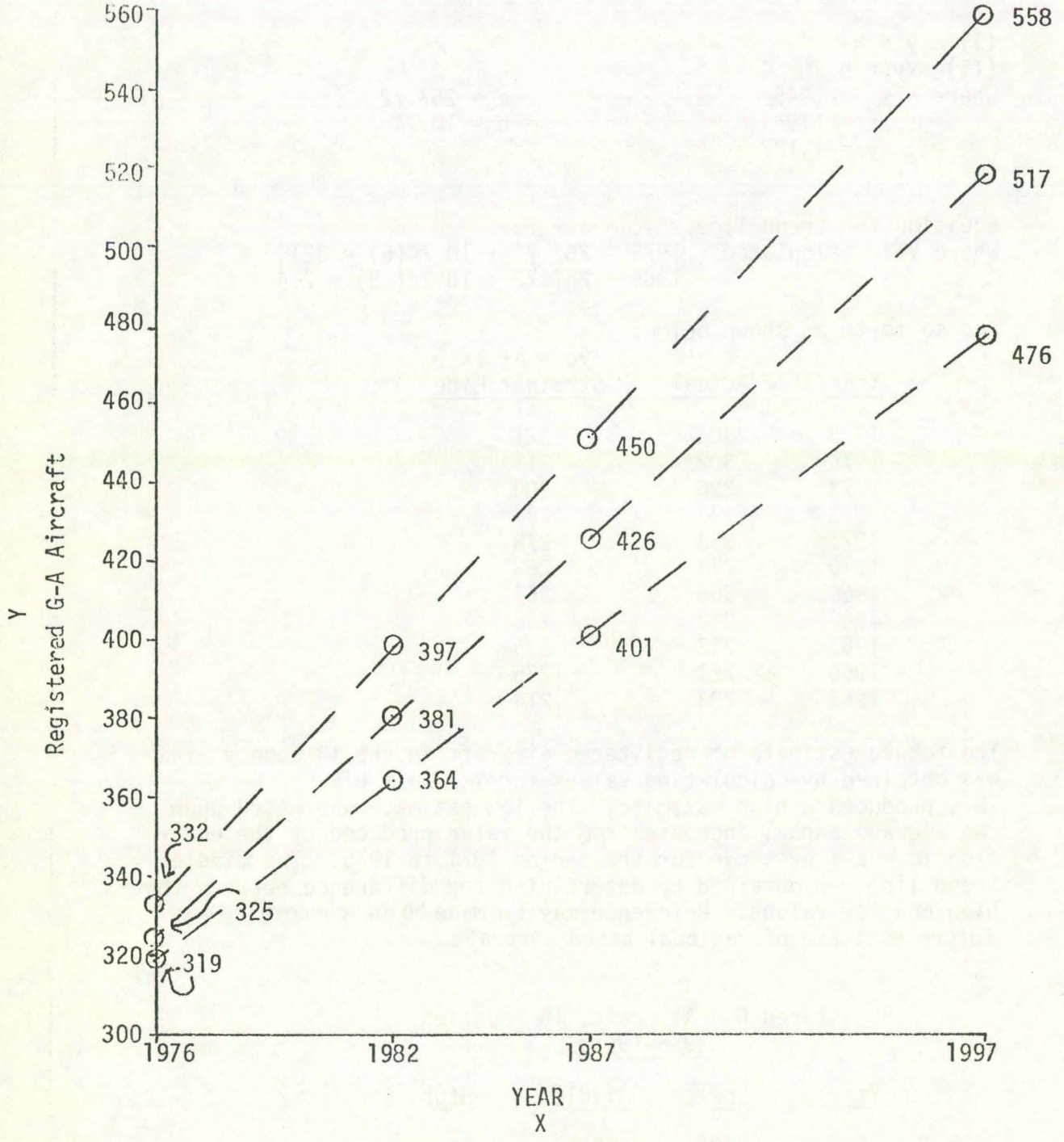


FIGURE 6

REGISTERED G-A AIRCRAFT, 18 COUNTIES

1976-1997

Marion, Wappello, Mahaska, and Warren Counties dominate the region. Ringgold and Decatur Counties contribute the least amount of aircraft. The remaining counties fall somewhere in between with Wayne and Van Buren at the lower end and Monroe, Union, and Jefferson at the upper end. The significance of the historical trend can be summarized as follows:

- There appears to be an upward trend in the number of registered general aviation aircraft.
- The upward trend is sporatic with significant increases and decreases rather than a constant rate of increase.
- There is considerable annual variation by county.
- Between 1965 and 1975 there was a 51.7% increase in the number of registered aircraft.
- The increase represents an average annual increase over the 11 year period of 4.7 percent.

Assuming that the number of aircraft registered in the County will equal the number based within the county, the next step is to identify future potential registered aircraft in Davis County from the regional estimate. Future numbers of aircraft in the region are expected to follow the middle trend line with a continual annual variation. The variation, however, is expected to fall between the high and low estimates as shown in Figure 5 and Table 9.

Davis County Based Aircraft Trends

The step down procedure assumes that the county's historical share of the regions total will remain constant throughout the twenty-year planning period. Reference to the following table shows the county's historical share of the regional total.

Table 9

DAVIS COUNTY'S SHARE OF THE

REGIONAL TOTAL G-A AIRCRAFT

Year	18-County Region	Davis County Number	Davis County % of Region
1975	308	6	1.95
1974	302	10	3.31
1973	296	8	2.70
1972	333	13	3.90
1971	258	5	1.94
1970	273	6	2.19
1969	266	10	2.57
1968	242	11	4.55
1967	243	11	4.53
1966	221	11	4.98
1965	203	9	4.43

11 Year Average : 3.37

Average of 4 Lowest Years : 2.16

Average of 4 Highest Years: 4.62

The average 11 year share of the county's total was 3.37 percent. The county captured the highest percentage of the 18-county regional total in 1966 with 4.98 percent while realizing only 1.94 percent in 1971. As noted, the actual number of aircraft registered varied considerably from 1965 to 1975.

A middle trend line was obtained from the 11 year average. The low and high estimates were obtained from an average of the four lowest and four highest years. Thus, Davis County is expected to capture 3.37 percent of the region's total projected aircraft. Annual County variation, as with the region, is expected to fall between 2.16 percent and 4.62 percent of the regional total through 1997.

TABLE 10

REGISTERED G-A AIRCRAFT

Davis County

1977-1997

Year	Low	Middle	High
1977	7	11	15
1978	7	11	16
1979	7	12	16
1980	7	12	17
1981	8	12	17
1982	8	13	18
1987	8	13	18
1997	9	14	21
	(2.16%)	(3.37%)	(4.62%)

At present, and in the immediate future, the actual number of aircraft registered in the county is expected to range between the low and middle estimate as shown in the above table. Should Region XV achieve its economic development and growth objectives, the high trend line would not be unrealistic. For planning purposes, the middle trend line will be used throughout the twenty-year planning period.

Current registered aircraft types to include model, weight, and owner in Davis County for 1977 are shown in the table below.

TABLE 11

Aircraft Type, Gross Weight, Year and Owner, 1977
Davis County

Type and Model	Weight	Year	Owner's Name
Cessna 150 D	1,600	1964	Clear Sky, Inc.
Cessna 150 L	1,600	1974	Bloomfield Air Service
Cessna 172 E	2,300	1964	Hooper Enterprises, Inc.
Cessna 172 G	2,300	1966	Davis County Savings Bank
Piper PA-22-135	---	1953	Bemis, Robert H.
Cessna	2,950	1966	White, Luetta M.

Source: Aviation Data Service, December 15, 1977
FAA AC 150/5325-5B

Of the six aircraft registered in Davis County, all had a gross weight under 8,000 pounds. Two of the six were 2-place and under. All are single engine piston powered aircraft. Five of the six owners had a Bloomfield mailing address. One owner listed Floris as a mailing address.

Bloomfield Municipal Airport

Reference to FAA for 5010 provides an indication of the number of aircraft actually based at a facility on a given date by year.

Year	Based	Registered	
1972	9	13	-4
1971	8	5	+3
1970	10	6	+4
1969	8	10	-2
1968	8	11	-3
1967	12	11	-1

With the exception of 1970 and 1971, the number of registered aircraft exceeded the number of based aircraft at Bloomfield. This suggests that county aircraft owners chose to base their aircraft at private strips or an area airport.

As previously stated, the number of based aircraft in the county is expected to equal the number registered. Whether this potential is achieved depends a great deal upon the management and services offered at the facility. Reference to Table 12 summarizes future numbers of aircraft expected to be based at the Bloomfield Municipal Airport.

TABLE 12

Based G-A Aircraft, 1978-1997
Bloomfield Municipal Airport

Year		Low	Middle	High
1978	a	6	10	14
1979	a	6	11	14
1980	b	6	11	16
1981	b	8	11	16
1982	b	8	12	17
1987	c	8	13	18
1997	c	9	14	21

a. 90% of County Total Registered Aircraft
b. 95% of County Total Registered Aircraft
c. 100% of County Total Registered Aircraft

The actual number of based aircraft is expected to follow the middle trend line with annual variation falling between the low and middle lines. Throughout the twenty-year planning period, the based aircraft mix is expected to consist entirely of D+E aircraft or aircraft with a gross weight under 8,000 pounds. Should an air taxi operator locate on the field, there could be a diversification of based aircraft type to include light twins under 8,000 pounds. No turbo prop aircraft are expected to be based at the facility although there is a possibility of continued turbo prop operations by itinerant aircraft. D+E aircraft and the other general aviation aircraft are defined as follows:

Class D+E: Light twins and single engine aircraft having a gross weight under 8,000 pounds.

(Aero Commander, Cessna 310, Cessna 210, Piper Cherokee, Piper Commanche, Beech 35, etc.)

Class C: Heavy twins and small executive jets with a gross weight in excess of 8,000 pounds.

(Jet Commander, Beech 18, Beech B80, Gulfstream I & II Beech King Air, MU-2, Twin Otter, etc.)

Class B: Small turbojet aircraft with a gross weight exceeding 25,000 pounds, Piston and Turbo prop aircraft with a gross weight in excess of 36,000 pounds.

Class A: Heavy four-engine turbo jets.

C. Aviation Operations and Operations Mix

While the total number of based aircraft and associated mix is of importance in determining facility needs, total annual operations must also be considered. In many smaller communities, the design aircraft or representative aircraft is often based at another facility. An example of this is the many corporated or business aircraft based in metropolitan areas which use small community airports where branch operational activities are located. Since there is no historical daily accounting of operational activity, the estimate must be based upon survey data at tower and non-tower airports.

The methodology used herein to estimate future operational activity is derived from the 1976 SASP. The state used a data base of 15 activity counts at non-tower airports and five tower airports to arrive at an estimate for various airports within the state system of airports. These activity counts were found to correlate well with based aircraft and county airmen resulting in the following model:

$$\log(\text{annual total operations}) = 2.614 + 0.501 \log(\text{based aircraft} \times \text{county airmen})$$

The result of this effort produced the following estimates:

Year	Aircraft	Total Annual Ops.	Annual Operations/Based Aircraft
1975	13	8,000	615
1980	13	8,000	615
1985	12	7,800	650
1995	12	7,800	650

Source: 1976 SASP

An operation is defined as a takeoff (departure) or landing (arrival). Thus a "touch and go" would consist of two operations.

Assuming that the ratio of aircraft operations to based aircraft remained constant, the following total annual operations could be expected.

TABLE 13

TOTAL ANNUAL G-A AIRCRAFT OPERATIONS

Year	Low	Middle	High
1978	3,690	6,150	8,610
1982	4,900	7,380	10,455
1987	5,200	8,450	11,700
1997	5,850	9,100	13,650

The total annual operations at Bloomfield is expected to fall within the low and middle trend lines with 3,690 to 6,190 total annual operations estimated for 1978. The actual number of operations is subject to not only aircraft and airmen, but also the level of aviation interest and activity generated locally.

Where, at a typical general aviation airport, approximately two-thirds of the total operations are local in character, the ratio of operations to based aircraft could be enhanced through an active student pilot program. Of the total local operations, a large percentage is often composed of "touch and go" operations or operations by students and those involved in proficiency flying. Should such interests be generated, the number of annual operations will tend to be closer to the high trend line.

Local operations consist of those aircraft which operate within sight of a tower or within the local traffic pattern; and they are known to be departing for or arriving from flight in local practice areas located within a 20 mile radius of the field. Itinerant operations, the balance of the total annual operations, compose the remaining arrivals and departures. Future annual itinerant operations are summarized in Table 14.

TABLE 14

Total Annual Itinerant Operations, 1978-1997

Year	Low	Middle	High
1978	1,290	2,150	3,010
1982	1,720	2,580	3,655
1987	1,800	2,925	4,050
1997	2,025	3,150	4,725

As with total annual operations, annual itinerant operations are expected to fall between the low and middle trend lines. Should an active air taxi operator locate on the field or the community attract branch plants which utilize air as a mode of transportation, the middle to high trend line would be probable. The realization of potential aviation operations in summary depends upon:

- Number of aircraft based at facility
- Number of airmen residing in airport service area
- Services offered by an F.B.O.
- Air taxi services
- Corporate or business aircraft
- Interest in aviation which encourages continued proficiency in aviation training

Peak Day and Peak Hour Operations

From the survey data compiled within the 1976 SASP, it was possible to determine the approximate peak day and peak hour operations expected at Bloomfield over the twenty-year planning period.

Peak Hour/Annual: .002125
Peak Day/Annual : .004900

TABLE 15

Peak Hour and Peak Day Operations, 1978-1997

Peak Hour

Year	Low	Middle	High
1978	8	13	18
1982	10	16	22
1987	11	18	25
1997	12	19	29

Peak Day

Year	Low	Middle	High
1978	18	30	42
1982	24	36	51
1987	25	41	57
1997	29	45	67

As with total annual operations, peak hour and peak day operations will be greatly influenced by "touch and go" operations. Peak hour and day operations are expected to fall between the low and middle trend line established in the above tables.

Aircraft Operations Mix

Aviation operations at Bloomfield are expected to be conducted entirely by aircraft with a gross landing and/or takeoff weight under 12,000 pounds. Of those, nearly 95 to 100 percent are expected to be by aircraft with a gross weight under 8,000 pounds. Although there may be times when larger aircraft use the field, operations by Class C aircraft would not justify expansion of the facilities to accommodate aircraft with a gross weight in excess of 12,500 pounds.

- All based aircraft are expected to have a gross weight of less than 12,500 pounds over the twenty year planning period.

- Based aircraft with a gross weight in excess of 8,000 pounds, but less than 12,500 pounds may in the long range future be based at the facility.
- Air taxi aircraft that may be based at the facility are not expected to exceed 8,000 pounds.
- Itinerant aircraft exceeding 8,000 pounds are expected to make only a small contribution to total annual operations.
- 95 to 98 percent of all total operations are expected to be made by D+E aircraft.
- The design aircraft selected upon which to assess ultimate airport needs, is the Britten-Norman Trislander.

TABLE 16

Aircraft Operational Mix, 1978-1997

Year	Total Annual Operations[1]	Class D+E		Class C[2]	
		%	No.	%	No.
1978	6,150	99	6,089	1.0	61
1982	7,380	98.5	7,270	1.5	110
1987	8,450	98.5	8,324	1.5	126
1997	9,100	98.0	8,918	2.0	182

[1] Middle trend line

[2] At present time, there are no Trislanders based at Bloomfield. Should such aircraft be based at the facility, the total Class "C" operations could increase significantly.

Over the twenty year planning period, no operation capacity problems are anticipated. Reference FAA AC 150/5060-1A and AC 150/5060-3A reveals the following:

Single Runway, Aircraft Mix 1:

PANCAP: 215,000 ops/year
PHOCAP: IFR - 53 ops/hour
VFR - 99 ops/hour

Intersecting Runway, Aircraft Mix 1

PANCAP 220,000 ops/year
PHOCAP IFR - 61 ops/hour
VFR - 99 ops/hour

Aircraft Mix 1 90% Class D+E Aircraft
10% Class C Aircraft

(PANCAP: Practical Annual Capacity)
(PHOCAP: Practical Hourly Capacity)

D. Airmen and Air Passengers

Airmen

Of the 30 airmen registered in Davis County as of September 15, 1977, 21 listed Bloomfield as their mailing address. The remaining airmen listed an Orient (3), Drakesville (3), Pulaski (2), or Eddyville (1) mailing dress. With the exception of four airmen with commercial ratings and two students, the remaining had a private rating.

The Bloomfield Airport Commission is encouraged to maintain an active list of area pilots and to keep such pilots informed of airport events. Reference may be made to Table 17 concerning the most recent listing of area pilots. Future numbers of registered pilots in Davis County are expected to total 30 in 1978, 31 in 1982, 32 in 1987, and 34 in 1997.

Air Passengers

The 1976 SASP assumed that the total annual passengers would equal 1.5 times the number of itinerant aircraft operations. As previously discussed, itinerant operations are expected to range between the low and middle estimates. Thus, total annual passenger emplanements and deplanements estimated at Bloomfield are as follows:

Year	Low [1]	High [2]
1978	1,936	3,225
1982	2,580	3,870
1987	2,700	4,388
1997	3,038	4,725

[1] Low Estimate x 1.5

[2] Middle Estimate x 1.5

TABLE 17

Airmen Proficiency, Davis County, 1977

Name	City	Proficiency Rating
Dixon, J.C.	Bloomfield	Commercial
Morton, W.S	Bloomfield	Commercial, Instrument Rating
Porter, T.J.	Bloomfield	Commercial, Flight Instructor
Seals, P.N.	Bloomfield	Commercial, Instrument Rating Flight Instructor
Cary, C.C.	Bloomfield	Private
Gravett, D.D.	Bloomfield	Private
Heckenbach, T.L.	Orient	Private
Herbert, G.D.	Bloomfield	Private
Hering, V.K.	Bloomfield	Private
Hockersmith, R.C.	Bloomfield	Private
Hooper, T.D.	Bloomfield	Private
Larsen, D.J.	Orient	Private
Logan, M.D.	Bloomfield	Private
Milburn, C.L.	Bloomfield	Private
Offill, G.D.	Bloomfield	Private
Sturdy, J.W.	Orient	Private
Treharne, D.W	Bloomfield	Private
White, L.D.	Bloomfield	Private
White, L.M.	Bloomfield	Private
Bemis, R.J.	Bloomfield	Private
Boatman, W.C.	Bloomfield	Private
Eakins, C.P.	Bloomfield	Private
Pirtle, D.R.	Bloomfield	Private
Horn, D.R.	Drakesville	Commercial, Instrument Rating Flight Instructor
Schwieger, D.R.	Bloomfield	Private
Campbell, T.P.	Pulaski	Private
Cofer, H.A.	Drakesville	Private
McCracken, L.W.	Eddyville	Private
Gibson, K.E.	Drakesville	Private
Griner, C.E.	Pulaski	Private

Source: Aviation Data Service; September 15, 1977

E. Summary

Based upon the forecast of aviation demand, a basic utility Stage II airport is expected to meet aviation demand levels over the twenty year planning period.

Planning Period	Airport Concept
Phase I - 1978-1982	Basic Utility, Stage II
Phase II - 1983-1987	Basic Utility, Stage II
Phase III - 1988-1997	Basic Utility, Stage II

The basic utility, Stage II airport will serve 95% of all general aviation aircraft with a gross weight less than 12,500 pounds. Justification for a higher service level, general utility, is found when there are 500 or more annual itinerant aircraft operations by aircraft with a gross weight between 8,000* and 12,500 pounds. This would indicate substantial usage by Class C aircraft.

*NOTE:

A recent change in FAA AC 150/5300-4B uses 6,000 pounds rather than 8,000 pounds as the basis for evaluating airport service level.

SECTION III

AIRPORT REQUIREMENTS

A. Introduction

Section III, Airport Requirements, identifies anticipated facility improvement needs over the twenty year planning period from 1977 through 1997. The recommended improvements are based upon the forecast of aviation demand expectations and existing facilities. While certain of these facilities may be desirable financial constraints may prohibit implementation within the planning period identified herein.

Phase I	1978-1982
Phase II	1983-1987
Phase III	1988-1997

The Airport Commission is urged to monitor the aviation activity throughout the twenty-year planning period. This will insure that the facility will be neither "under-built" nor "over-built." It is expected that, as community needs and aspirations change through time, specific airport facility improvements will move from one phase to another.

The planning process should provide for continual updating of the airport development plan. The updating may be accomplished on an annual basis by the Airport Commission. The plan will provide for a long-range capital need by Phase, while the annual updating will provide for specific budget requests.

B. Runways and Taxiways

Runway Length

The required runway length at an air carrier or larger airport is often based upon the critical aircraft using the facility. At smaller general aviation airports, it is difficult to isolate one single aircraft upon which to determine runway length. The approach utilized herein is to use runway length curves developed by the Federal Aviation Administration, FAA, for general aviation airports.

Reference to FAA AC 150/5300-4B indicates that the runway length curves were based upon Airplane Flight Manuals for aircraft of a certain group. The runway length curves assume the following conditions:

- Zero headwind component
- Maximum weight for takeoff and landing
- Optimum flap setting for shortest runway length
- Takeoff and landing distances were increased by 10% for the group's most demanding aircraft to account for relative humidity and runway gradient.
- The temperature and field elevation were left as variables. The normal maximum temperature used for Bloomfield was 89°F. The field elevation used was 850'±.

From the runway length curves, the minimum runway length recommended for the Primary Runway, 18/36, is 3,400 feet. This length is based upon the assumption that a basic utility, Stage II airport will serve the aviation needs over the twenty year planning period. This does not suggest that all general aviation aircraft can be served on all critical days. There will be times when environmental conditions will require the aircraft operator to schedule the aircraft to more favorable conditions or lessen the load. The basic utility airport is expected to serve 95% of the G-A aircraft with a gross weight of less than 12,500 pounds.

Basic Utility, Stage I	2,800 feet	
*Basic Utility, Stage II	3,300+feet	Min. Recommended
General Utility	3,900 feet	

The 1976 SASP recommends an ultimate runway length of 3,400 feet. The runway length curves in addition to the SASP recommendations would suggest that until there is substantial activity by aircraft with a gross weight between 8,000 and 12,500 pounds, a 3,400' runway is adequate.

The crosswind runway should have a length no less than 80 percent of the primary runway length. The 1976 SASP recommends an ultimate crosswind runway length of 3,400 feet. The minimum runway length should be no less than 2,720 feet. Reference may be made to Figure 7. Landing and take-off requirements are shown in Figure 8.

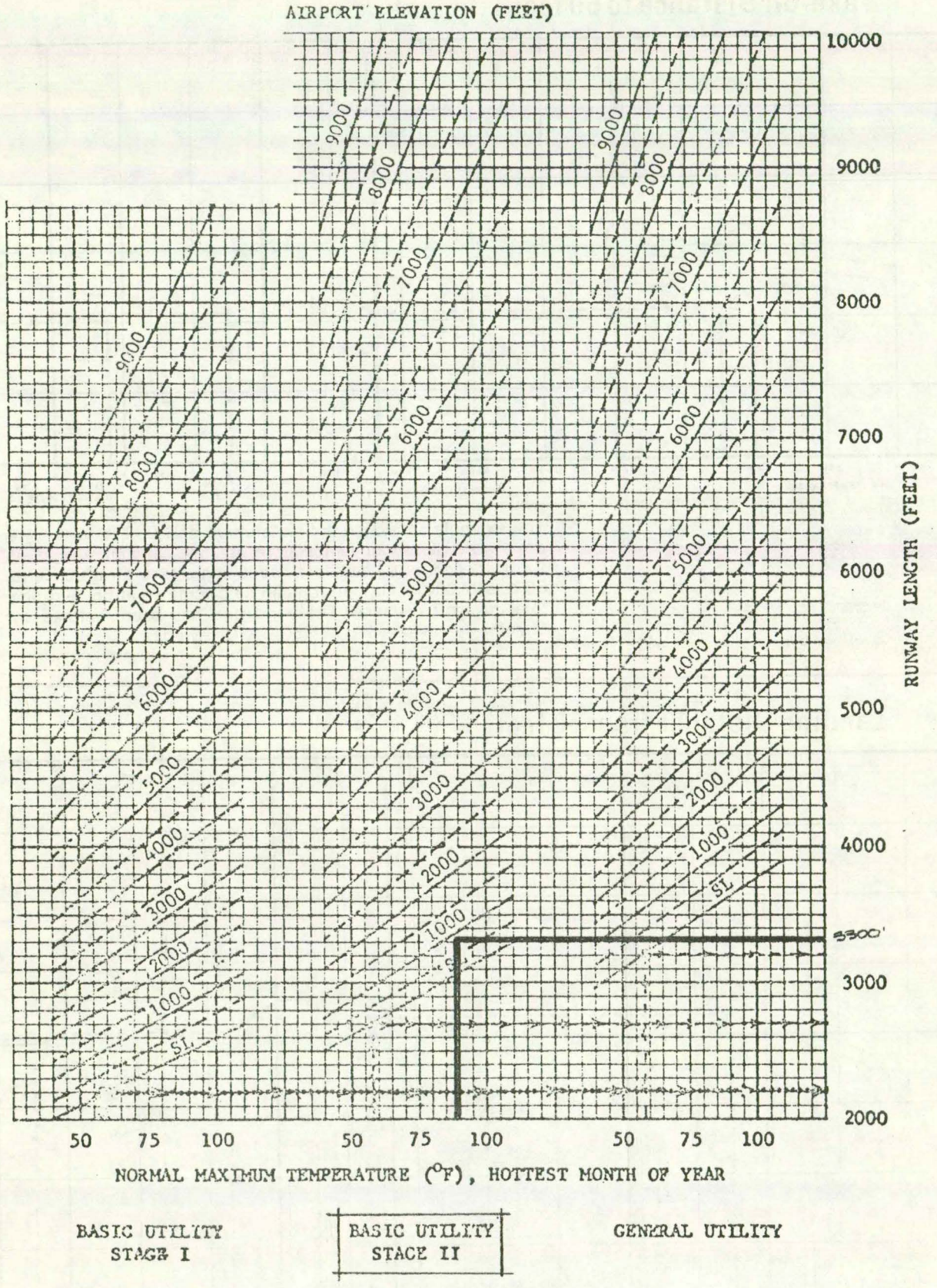
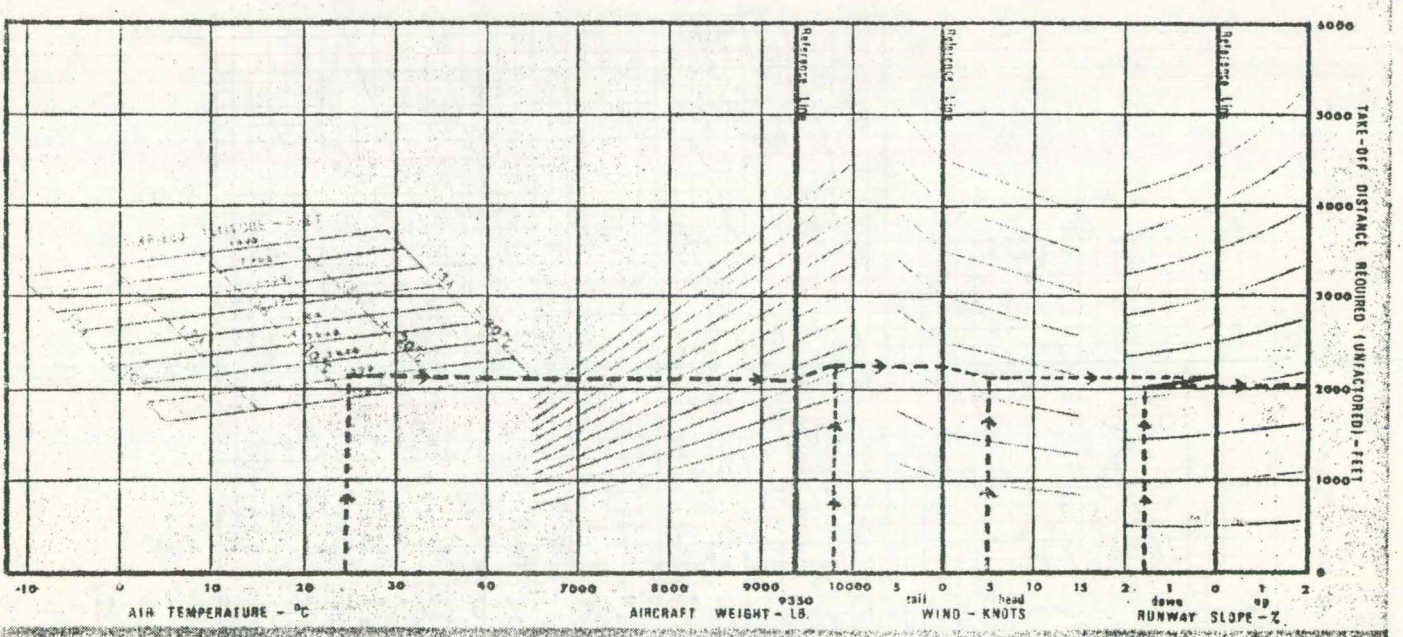


FIGURE: 7 Runway Length Curves

Source: AC 150-5300-4B

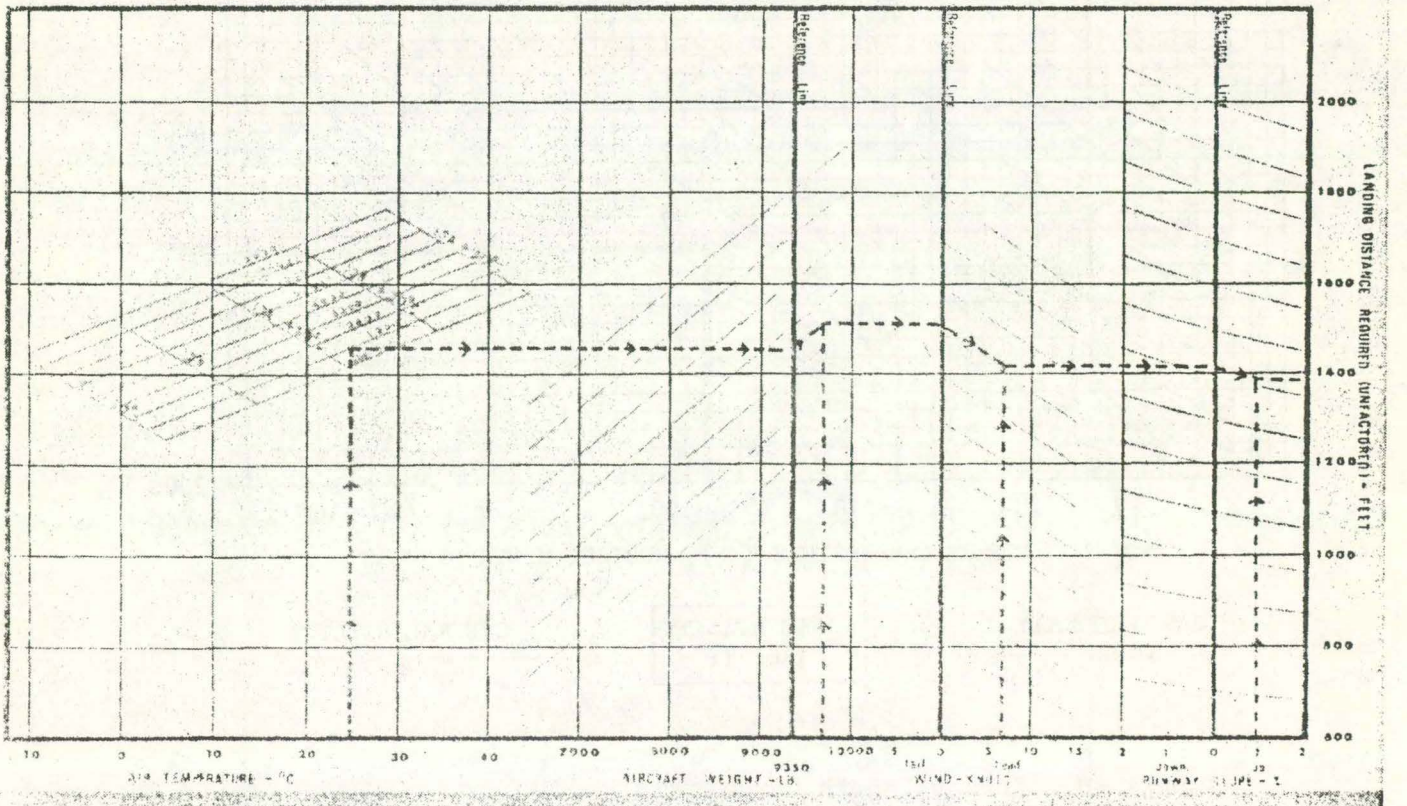
FIGURE: 8 Take-off and Landing Requirements of Britten Norman Trislander

Take-off Distance to 50 feet



The example shows an airfield altitude of 1,000 ft. with 1½% downward slope, air temperature at 25°C, aircraft weight of 9,800 lb., and 5 kt. headwind, producing a take-off distance to 50 ft. of 2,050 ft. Ground run can be calculated at 66 % of the total take-off distance. The wind grid has been factored by 50% for headwinds and by 150% for tailwinds.

Landing Distance from 50 feet



The example shows an airfield altitude of 1,000 ft. with 1% upward slope, air temperature at 25°C, aircraft weight at 9,700 lb., and 7 kt. headwind, producing a landing distance from 50 ft. of 1,385 ft. Ground run can be calculated at 50% of landing distance. The wind grid has been factored by 50% for headwinds and by 150% for tailwinds.

The minimum runway width for both runways should be no less than 60 feet. The existing runway, RW 18/36, is currently 50 feet in width. Within the twenty-year period, the width should be increased by 10 feet.

TABLE 18

Runway Length and Width

1978-1997

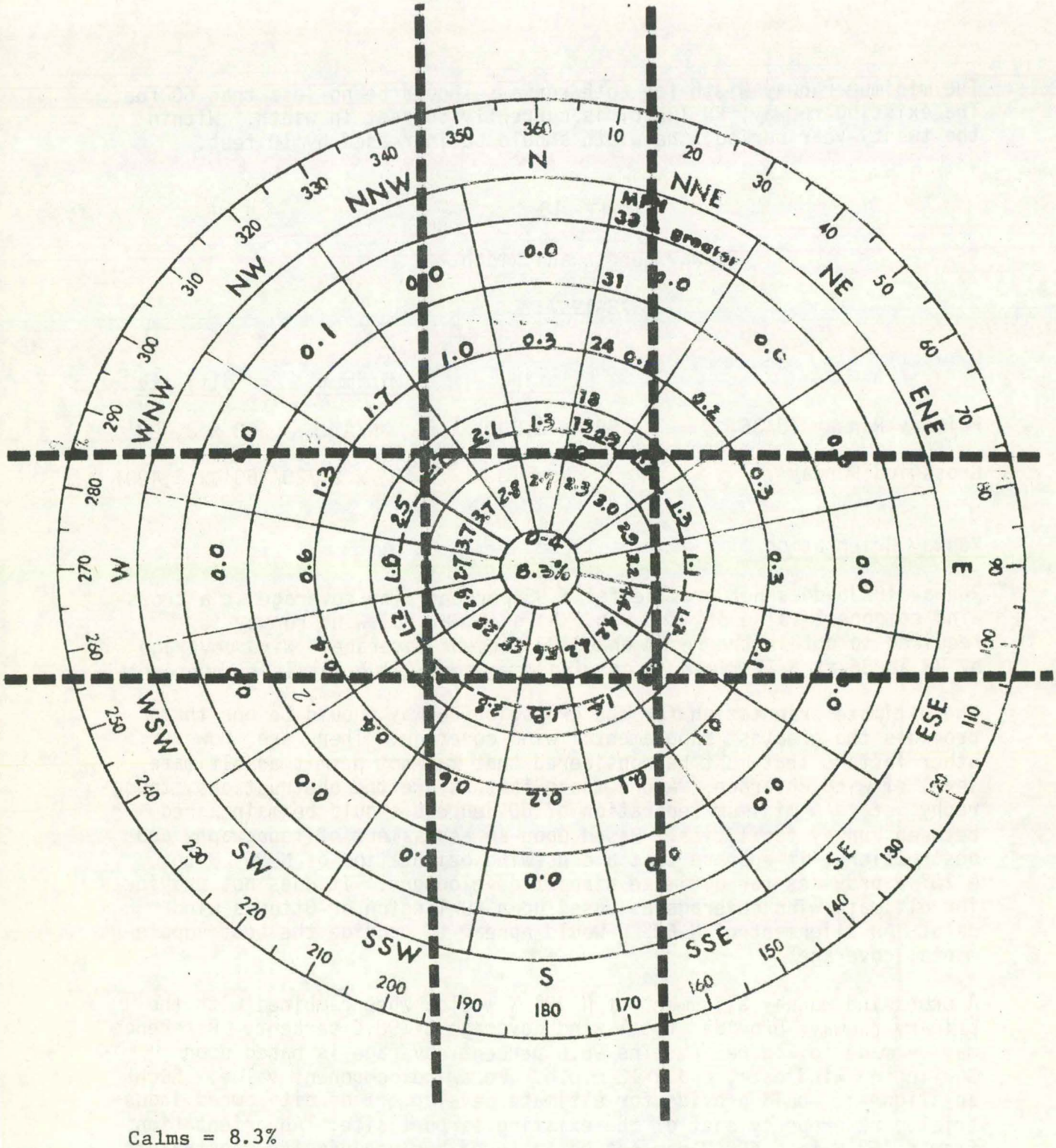
	Existing	Minimum	Ultimate
Primary Runway 18/36	50' x 2,800'	N/A	60 x 3,400'
Crosswind Runway	None	60' x 2,720'	60' x 3,400'

Runway Orientation

Runway 18/36 does not provide for a 95 percent wind coverage at a crosswind component value of 12 m.p.h. As such, a crosswind runway is required to obtain the recommended 95 percent coverage. Wind coverage by RW 18/36 at a 12 m.p.h. crosswind component value totals 85.1 percent.

The ultimate orientation for the crosswind runway should be one that provides the greatest supplemental wind coverage. There are, however, other factors that must be considered that may not permit an ultimate level of wind coverage. Among these factors are the obstructions, topography, etc. A minimum separation of 60 degrees should be maintained between runway facilities. Based upon an assessment of topography and obstructions, it appears that a crosswind orientation of N 90° W to N 70° W provides for ultimate airport development. It does not provide for ultimate wind coverage as based upon Burlington or Ottumwa wind data. An alignment of N 60° W would appear to provide the best supplemental coverage.

A crosswind runway alignment of N 90° W would, when combined with the primary runway, provide total wind coverage of 96.6 percent. Reference may be made to Figure 9. The 96.6 percent coverage is based upon Burlington wind data, and a 12 m.p.h. crosswind component value. Such an alignment would provide for ultimate development of city owned industrial park property east of the existing airport site. An orientation from N 75° W to N 60° W can not be achieved because of site constraints and area obstructions.



Calms = 8.3%
Ceiling and visibility group:
Greater than 1000 ft and/or 3 miles = 94.6%
Less than 1000 ft and/or 3 miles = 5.4%

Exhibit K. Burlington wind rose (mph), record of period 1956-1963.

Figure 9

Taxiway

Based upon the forecast of aviation activity, a taxiway system is not justified because of capacity problems. A taxiway system does provide for a degree of safety. The IDOT finds justification for a partial parallel taxiway at one runway end when total annual operations are between 30,000 and 50,000.

Taxiways are defined as parallel, full, and partial or stub. The latter is a taxiway connecting the runway to an apron area. The existing airport supports a stub taxiway from RW 18/36 to the apron. The taxiway is 30 feet in width.

A stub taxiway is recommended from the crosswind runway to the apron. Should intensive industrial development take place in the vicinity of the airport, it is recommended that a partial parallel system be constructed on runway ends 36 and 27. Justification for such construction is found only if such industry is aviation oriented and needs access to the runway. This would provide for aircraft movement along the runways to the terminal area or runway. The minimum taxiway width recommended for a basic utility airport is 30 feet.

Hangar access taxiways generally are constructed to a 20 foot width. Such taxiways provide access from the apron area to the individual hangar units where T-hangars are in use.

Pavement Design Considerations

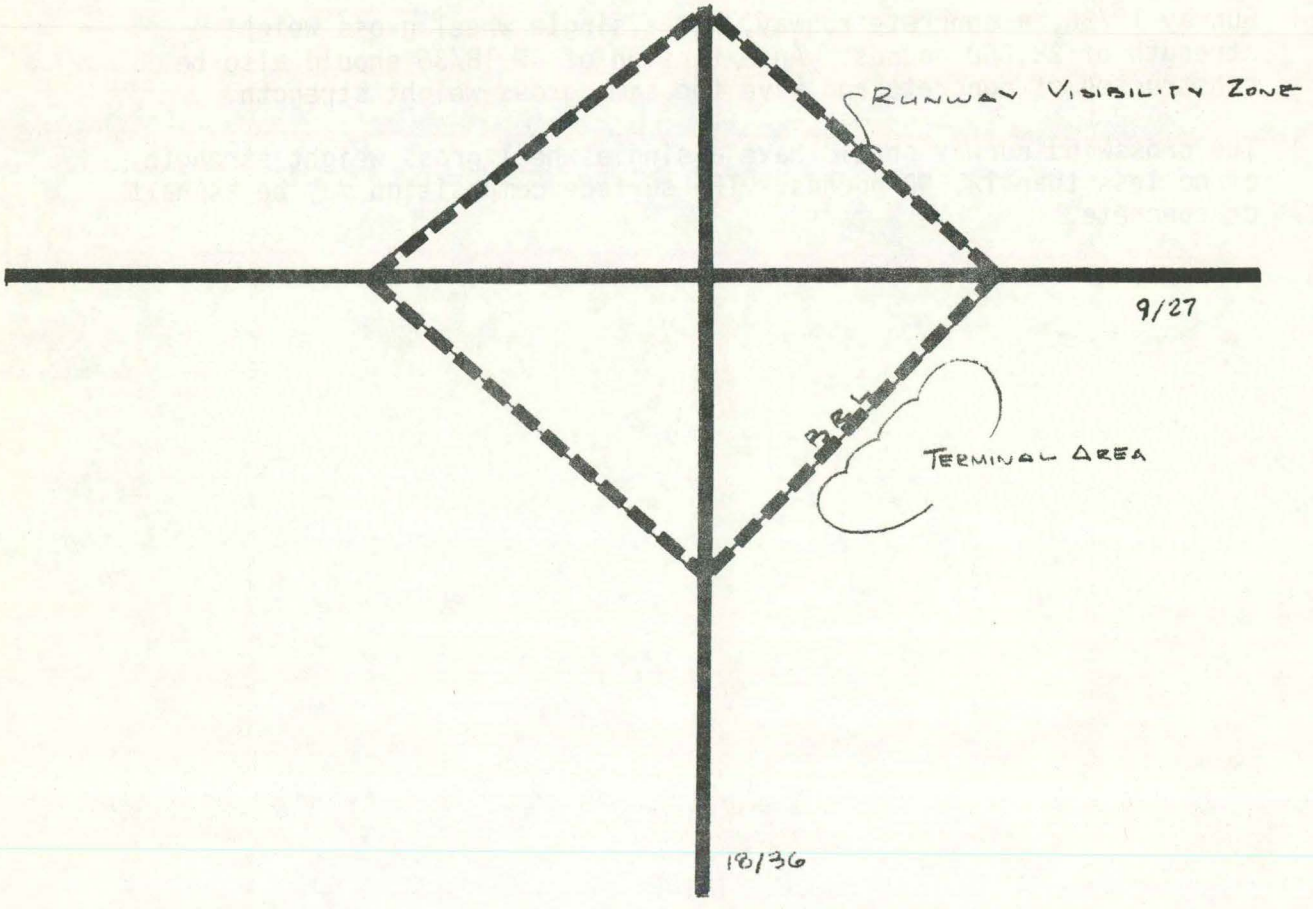
Runway 18/36, a concrete runway, has a single wheel gross weight strength of 28,000 pounds. An extension of RW 18/36 should also be constructed of concrete and have the same gross weight strength.

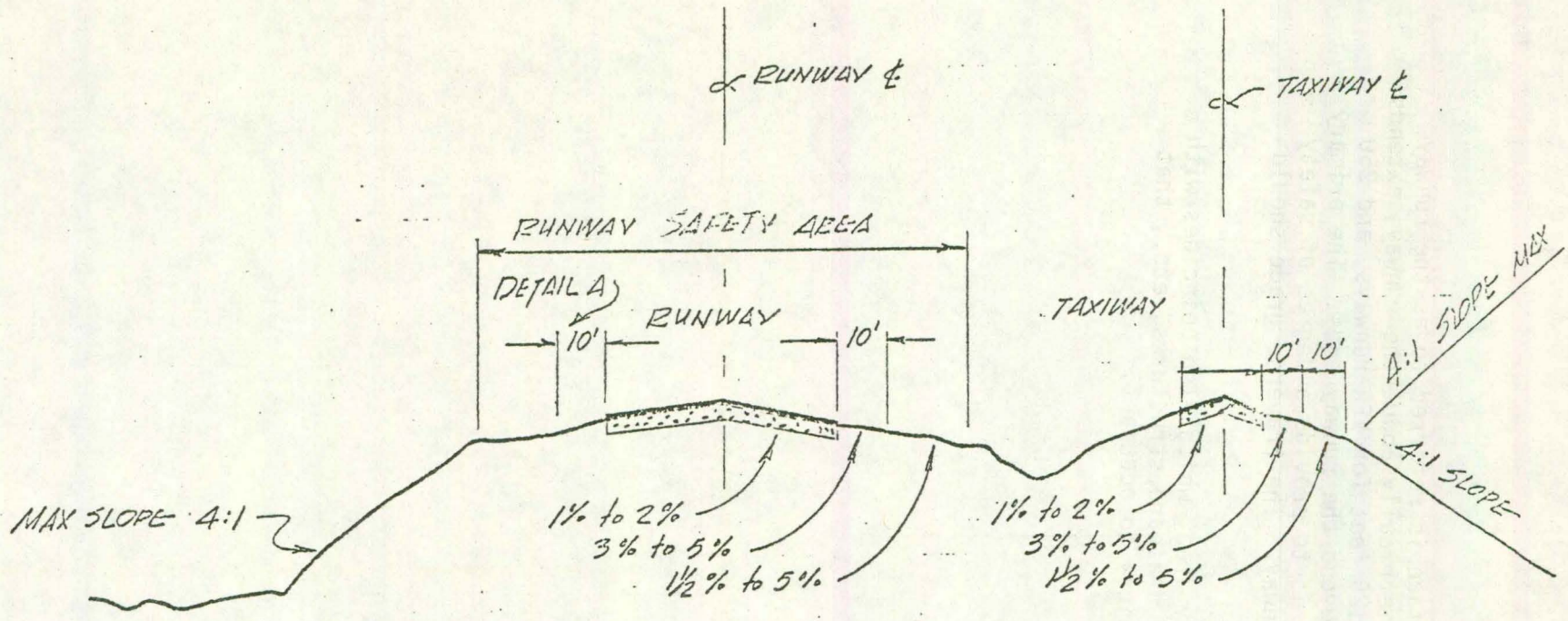
The crosswind runway should have a single wheel gross weight strength of no less than 12,500 pounds. The surface composition may be asphalt or concrete.

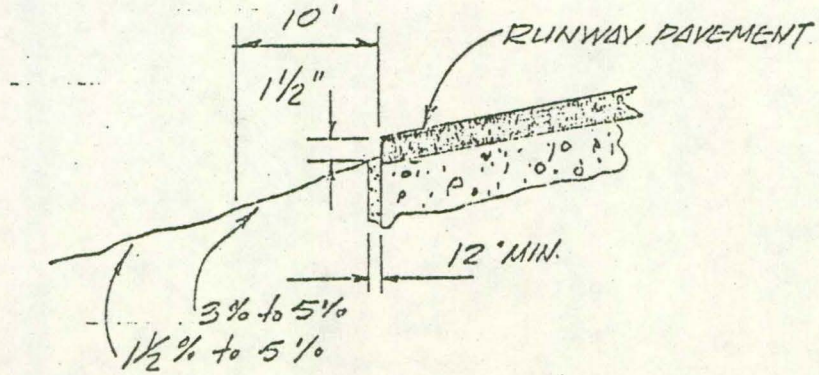
Runway grade changes should be such that there will be an unobstructed line of sight any point five feet above the runway centerline for the entire length of the runway. Maximum grade changes should not exceed two percent where vertical curves are required. The length of the vertical curve should not be less than 300 feet for each percent grade change. No vertical curves are required when the grade change is less than 0.4%.

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

The layout of the runways and other airport components must be such that a runway visibility zone can be provided. This zone is an area formed by imaginary lines connecting the visibility point of each runway. This requirement is of importance when assessing alternative runway alignments for the crosswind runway or expansion of the terminal area. The objective is to insure that the runway grades, terrain, structures, and other permanent objects do not obstruct a line-of-sight from any point five feet above one runway centerline to any point five feet above an intersecting runway centerline, both points being within the visibility zone.







DETAIL A

TYPICAL CROSS SECTION

FIG. 10

SOURCE: AC 150-5300-4B

A graded area beyond the runway surface is referred to as the runway safety area. The area, located symmetrically about the runway, extends outward from the runway centerline 125 feet for VFR runways, and 250 feet for IFR runways and 200 feet beyond the runway ends. The primary function of the runway safety area is to provide a degree of safety should and aircraft veer off the runway. The traverse grade should not exceed five percent.

The minimum width of a runway safety area, which also coincides with the landing area, should be void of drainage, structures, etc., that could cause damage to arcraft or injury to occupant.

Holding Apron

Where a full or partial parallel taxiway is not recommended, an aircraft turnaround is recommended at each runway end. Runway end 18 has a circular turnaround consisting of a 30 foot wide concrete pavement width. A turnaround on RW End 18 should be constructed as part of the extension.

A square turnaround is recommended rather than a circular turnaround for runway ends 36, 9, and 27. Should a partial taxiway be constructed in conjunction with the industrial park, a turnaround would not be required on runway end 36 and 27. A typical rectangular turnaround is depicted below:

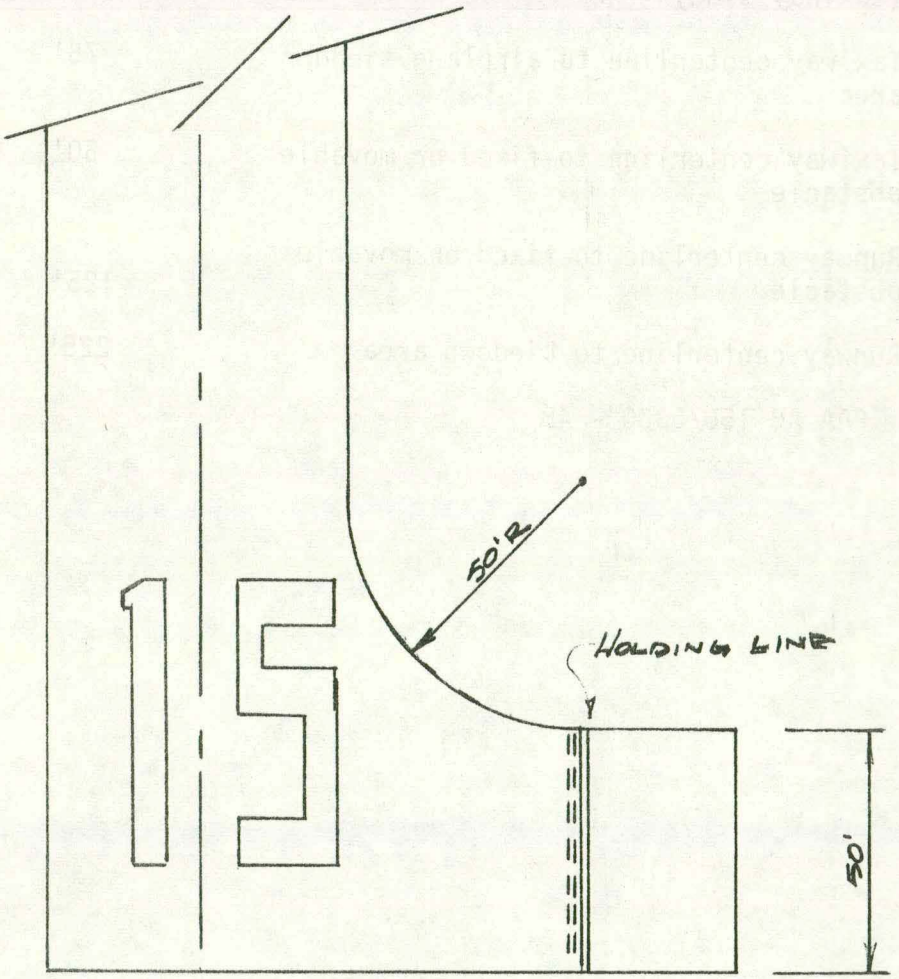


FIGURE 11 Rectangular Turnaround

Source: AC 150-5300-4B

Lateral Widths and Clearances

Following is criteria for se ration of airport facilities. As previously discussed, the use of maximum standards will provide for ease of upgrading the facility in future years. While the airport is designated as an initial basic utility airport, general utility requirements related to lateral widths and clearances will be used for planning purposes.

	Minimum	Desirable
- Runway to taxiway centerline	150'	200'
- Runway centerline to building restriction line (BRL) and property line (non-taxiway side)	200'	250'
- Runway centerline to building restriction line (taxiway side)	250'	300'
- Runway centerline to property line (taxiway side)	250'	350'
- Taxiway centerline to airplane tiedown area	75'	Design
- Taxiway centerline to fixed or movable obstacle	50'	Design
- Runway centerline to fixed or movable obstacle	125'	125'
- Runway centerline to tiedown area	225'	275'

Source: FAA AC 150/5300 - 4B

Pavement Markings

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

- Centerline Markings

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

- Designation Markings

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

- Threshold Markings

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

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

C. Landing and Navigational Aids

Runway and Taxiway Lighting

Runway 18/36 is presently lighted with a medium-intensity system. The present system will have to be relocated when the primary runway width is increased. As such a medium intensity runway light system (MIRL) is recommended on both the primary and crosswind runways within the twenty-year planning period.

A MIRL system should be installed on the crosswind runway at time of runway construction.

Runway lights are used to outline the edges of the runway during periods of darkness or low visibility. Each runway edge light fixture emits an aviation white light defining the lateral limits of the runway. The edge light fixture should be located not more than ten feet from the defined runway edge and spaced 200 feet on center. The runway light stake should be no less than 40 inches high due to snow, snow removal, and grass cutting. The lights, located on both sides of the runway, should be directly across from each other and perpendicular to the runway centerline. Special requirements exist at runway intersections. Two groups of threshold lights, the second part of a runway light system, are located symmetrically about the runway centerline. The threshold lights emit an 180^{o} aviation red light inward and 180^{o} green light outward. Threshold lights should be located no closer than two feet and no more than ten feet from the runway threshold. Threshold lights are found in two groups, with each group having no less than three fixtures for VFR runways and four fixtures for IFR runways.

Taxiway edge lights are recommended for implementation within the twenty-year planning period. Taxiway lights are of a low priority. Reflectors may be used as an interim substitute until the lights could be installled.

Lighting Summary:	Ultimate	Minimum
Primary Runway	MIRL	MIRL
Crosswind Runay	MIRL	LIRL

The IDOT recommends a MIRL system for general utility airports and LIRL system for basic utility airports.

Visual Approach Slope Indicator, VASI

The 1976 SASP recommends that a VASI-2 system be installed at general aviation airports when total annual operations exceed 10,000. A VASI-2 system, based upon the forecasts, would not be justified within the twenty-year planning period unless the high forecast was achieved. If the high trend line was achieved, the VASI-2 system would not be justified until 1982. However, the high trend line is not anticipated and as such a VASI-2 system is not recommended for the Bloomfield Municipal Airport.

Should the Airport Commission elect to install a VASI system, it is recommended that it be installed on RW 18/36. The system should be located to the left side of the runway approach and 50 feet out from the pavement edge. The downwind bar should, ideally, be located 500 feet$^{+}_{-}$ from the threshold. The upwind bar should be located 700 feet$^{+}_{-}$ from the downwind bar. The VASI system enables the pilot to determine if his approach is high, on glide slope, or low, from the two-color light beam emitted.

Runway End Identifier Lights, REIL

The primary function of runway end identifier lights is to assist the pilot with runway identification where the runway is difficult to distinguish because of other light sources. A REIL system is currently in operation on RW 18/36. The REIL's on each runway end will need to be relocated at the time RW 18/36 is extended. Should a VASI-2 system be installed on RW 18/36, the REIL system would need to be relocated so as to insure compatibility with the VASI system. In this situation the REIL's would be located 75 feet from the pavement edge and in line with the threshold lights. If alone, the REIL should be located 40 feet from the pavement edge and in line with the threshold lights.

Segmented Circle, Wind Indicator, and Beacon

The existing wind indicator should be located so as to be visible from both the primary and crosswind runways. The wind indicator should also be placed inside a segmented circle. Reference may be made to FAA AC 150/5340-5 concerning layout of the segmented circle. The primary purpose of the segmented circle is to help the pilot locate the wind indicator and airport as well as to convey traffic patterns.

A rotating beacon light is also recommended for installation. The beacon light should be installed in the vicinity of the terminal area. The beacon emits two light beams 180 degrees apart (white and green). The primary function of the beacon light is to assist the pilot in locating the airport.

Non-Directional Radio Beacon

A non-directional radio beacon is currently in operation at the Bloomfield Municipal Airport, (Southern Avionics SS-250-B).

D. Terminal Area

Apron

The existing concrete apron consists of an area 90 feet x 210 feet or 2,100 square yards. The apron provides space for two aircraft tiedowns, refueling, and access to the new conventional hangar. Access to the apron from RW 18/36 is provided by a stub taxiway.

The apron area, at minimum, should provide area for improved surface tiedowns for based and itinerant aircraft and queuing space for aircraft movement. Based and itinerant aircraft tiedown needs are presented in the table below.

TABLE 19

TIEDOWN NEEDS

1978-1997

PLANNING PERIOD		ITINERANT	BASED	TOTAL
I	1978-1982	4	1	5
II	1983-1987	5	1	6
III	1988-1997	5	1	6
	TOTAL	5	1	6

Itinerant tiedown needs are based upon the following methodology:

Planning Period	Annual Operations[1]	Avg/Day	10% increase for busy day	50% on ground at any one time
I	2,580	7	8	4
II	2,925	8	9	5
III	3,150	9	10	5

1 - Middle Trend Line

It is assumed that most aircraft owners will choose to hangar their aircraft. There may be an individual who will choose to tie his aircraft down rather than rent hangar space if such space is available.

Since itinerant tiedown needs are expected to be closer to the low trend line, the use of these tiedowns by based aircraft would not appear to create a problem. Thus, one based aircraft tiedown supplemented by available itinerant tiedowns appear adequate over the twenty-year planning period.

At present, there are two improved surface tiedowns. It is recommended that the apron area be increased to accommodate four additional tiedown spaces. The FAA AC 150/5300-4B recommends 360 square yards per itinerant tiedown and 300 square yards of apron per based aircraft tiedown.

3 Itinerant Tiedowns:	360 s.y. x 3 =	1,080 s.y.
1 Based Tiedown :	300 s.y. x 1 =	300 s.y.
TOTAL APRON AREA NEEDED ----------		1,380 s.y.

The itinerant tiedowns should be readily accessible to the fixed base operator (F.B.O.) facilities and terminal building.

Hangars

The number of aircraft expected to be based at the facility is summarized below by planning period. It is assummed that 90 to 100 percent of these aircraft will be in hangars. The based aircraft mix is expected to consist of D+E aircraft.

Planning Period		Low	Middle	High
I	1978-1982	6-8	10-12	14-17
II	1983-1987	8	13	18
III	1988-1997	9	14	21

The two conventional hangars have a total capacity for ten aircraft, provided an ultimate mix and stacking of aircraft is achieved. The most salient problem with the existing hangars is the need to move one or more aircraft to move an aircraft in or out. This problem is further complicated when individual owners move the aircraft rather than an F.B.O.

A second problem at the airport is the lack of security after 5:00 p.m. All facilities should be secured which requires the distribution of keys to individual aircraft owners and operators. The present system does not appear to encourage aircraft ownership.

While the two conventional hangars appear to meet low and middle forecast needs, it is recommended that a six unit nested tee be constructed in Phase I. The existing hangars could be used for storage of aircraft seldom used or for large aircraft such as the Britten-Norman Islander. The hangars could also be used to store airport or city owned maintenance equipment. Typical aircraft dimensions are presented herein. Typical dimensions for the Britten-Norman Trislander are shown in Figure 12.

A nested tee hangar with a clear door of 40 feet and a clear depth of 30 feet is expected to accommodate those aircraft based at Bloomfield.

The City of Bloomfield constructed a conventional hangar in 1970. This hangar is subject to a 20-year lease agreement. Such an agreement, while it appears in the best interest of the city at present time, precludes the use of this structure as an F.B.O. and/or air taxi facility. An additional conventional hangar is not needed unless the Airport Commission succeeds in attracting an F.B.O. With the present situation, there appears to be four alternatives available.

1. Maintain the current lease until the Airport Commission can negotiate an agreement with a qualified F.B.O./Air Taxi operator interested in relocating to Bloomfield-Construct or provide alternative facilities on the air port for the leasee.

2. Construct a new conventional hangar, 60' x 80' for use as an F.B.O. facility.

3. Rehabilitate one of the existing wood conventional hangars for use as the F.B.O. facility and terminal building. Construct the new nested tee hangar in 1978-1982. The northern most hangar is 45' x 90' (4,050 S.F.). The middle hangar is rectangular and is not suitable for an F.B.O. facility.

4. Construct a separate terminal building to include office space.

The airport should also provide a terminal building facility. At small G-A airports this facility is typically included within the F.B.O. facility. Approximately 680 square feet of area should be allocated for activities to include pilot briefing, public waiting, and public services. This area should be accessible to the public and remain open 24 hours.

Since a terminal building is needed, it would appear that the current leasee of the conventional hangar could occupy space in a newly constructed terminal building.

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

Single Engine, High Wing Tailwheel

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

Single Engine, Low Wing Tricycle Gear

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

Single Engine, High Wing Tricycle Gear

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

Twin Engine, High Wing Tricycle Gear

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

Twin Engine Tricycle Gear (Low Wing)

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

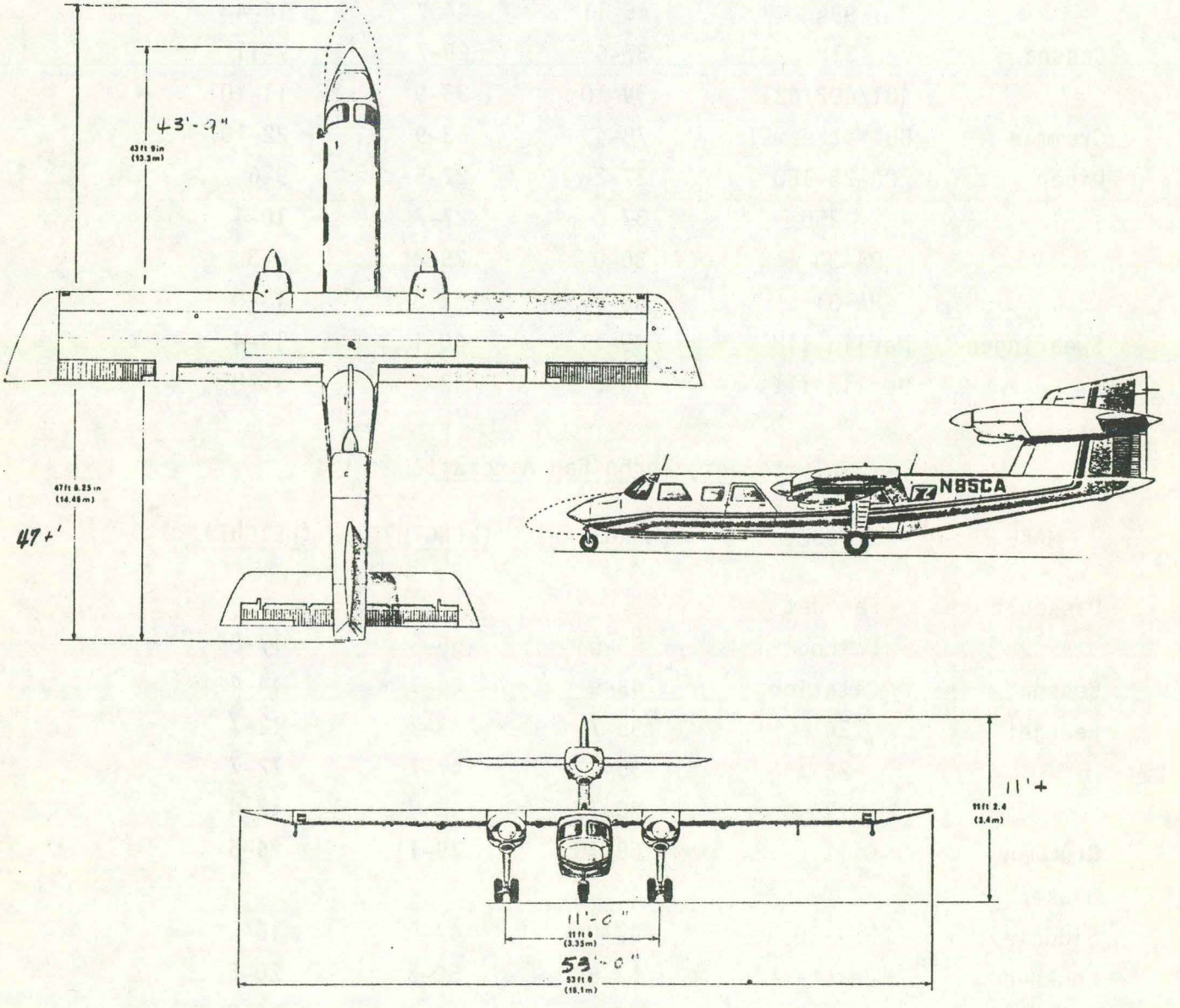
Twin Engine Tricycle Gear (Low Wing)
Cont.

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

Turbo Jet, Turbo Fan Aircraft

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

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



BRITTEN-NORMAN TRISLANDER
TYPICAL DIMENSIONS

FIGURE: 12

Vehicle Parking and Access Road

Vehicle parking at the facility is not adequate. The location of parking requires an aircraft owner to cross the leased apron area in order to reach the middle and northern most hangars.

Vehicle access and parking should be provided to the west of the existing structures. This would involve land acquisition.

The granular surfaced access road is well maintained and adequate until such time paving may be implemented.

The IDOT recommends a minimum of six vehicle spaces at the terminal building and one additional space for each based aircraft. A minimum of 18 spaces should be provided in Phase I with an additional two spaces added in Phase III. A total of 20 parking spaces appears adequate to meet parking needs over the twenty-year planning period.

TABLE 20

Vehicle Parking Needs

1978-1997

Planning Period	Terminal Area	Hangar Area	Total
I	6	12	18
II	6	13	19
III	6	14	20
TOTAL	6	14	20

Additional parking spaces will be requested by each airport business based upon employees and clients.

Airport Manager's Residence

When feasible, the City is encouraged to construct a residence for the airport manager. In most cases, the F.B.O. is the designated manager. This arrangement allows the F.B.O. to provide 24-hour service on the airport. It also provides the terminal area with 24-hour security.

The location of the structure should be such that convenient access is provided to the terminal building and itinerant apron. The location should also enable the F.B.O./Manager to be aware of incoming and outgoing vehicle traffic.

E. FAR Part 77

Obstruction Standards

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

Standards for Determining Obstructions

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

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

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

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

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

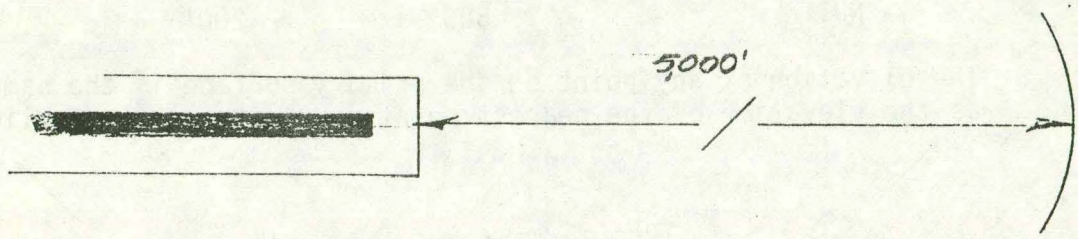
- Interstate Highway	17 feet
- Public Roadway	15 feet
- Private Road	10 feet or height of the highest mobile object
- Railroad	23 feet

Imaginary Surfaces

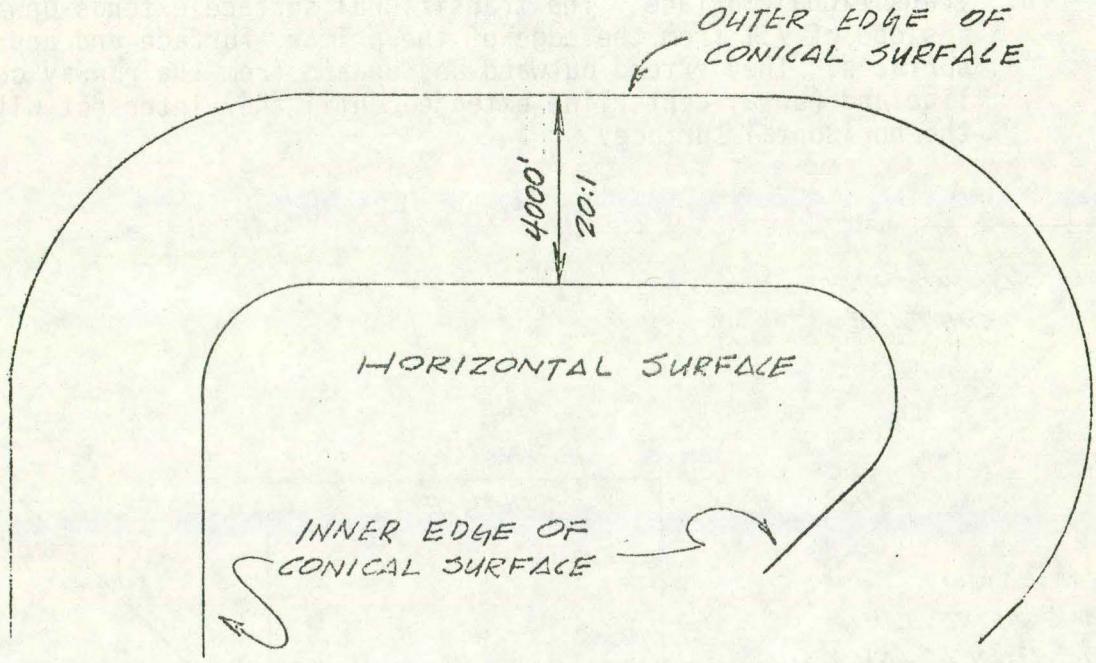
1. Imaginary surfaces establish areas where any object penetrating that surface would be considered an obstruction to air navigation. The imaginary surface establishes an imaginary line that separates ground activities from aircraft activities. In order to select the applicable imaginary surface, the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

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

- Visual Radius of 5,000 feet
- NPI Radius of 10,000 feet (runway larger than utility)
- NPI Radius of 5,000 feet (utility runway)



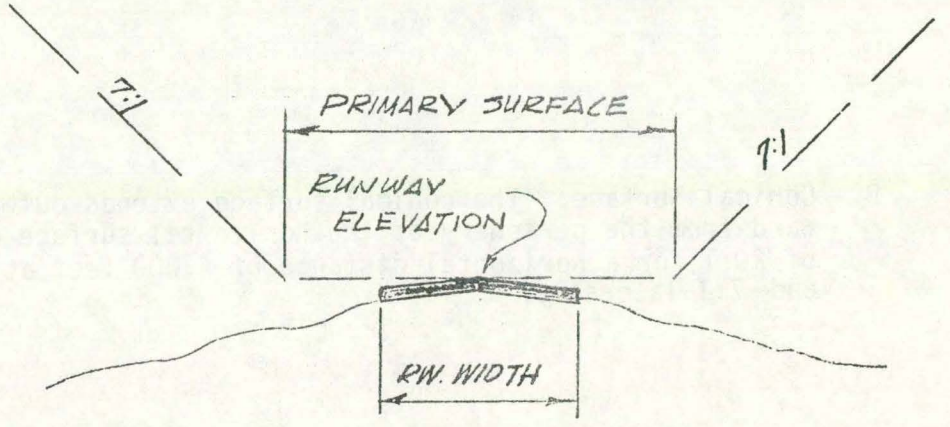
B. Conical Surface: The conical surface extends outward and upward from the periphery of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet at the ends and 7:1 laterally.



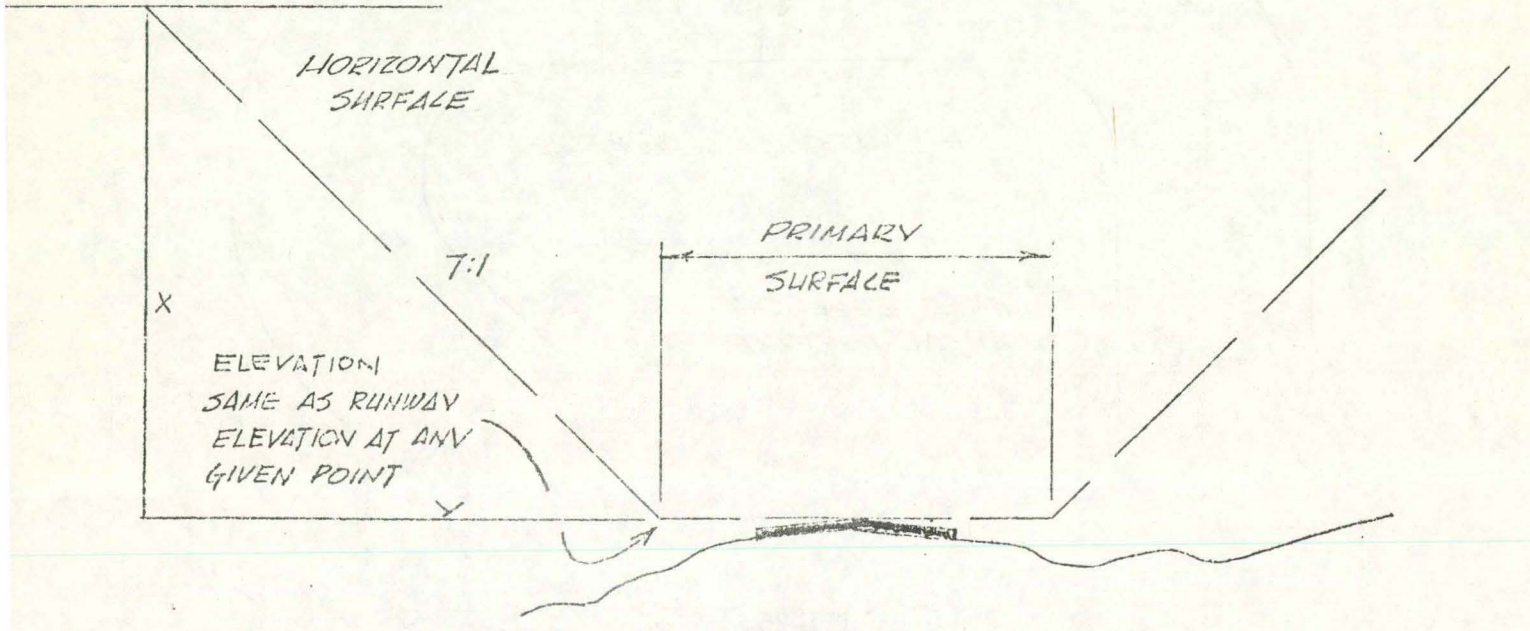
C. Primary Surface: The primary surface is longitudinally centered on the runway and extends 200 feet beyond the runway end in the case of a paved runway. The primary surface end coincides with the runway end in the case of a turf runway. The width of the primary surface varies with the approach.

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

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



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



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

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

Visual: 250' x 5,000 x 1,250'

NPI: 500' x 10,000 x 3,500' (Runway larger than utility with visability minimum as low as 3/4 of a mile)

NPI: 500' x 5,000 x 2,000' (Utility runways)

The approach slope also varies

Visual: 20:1

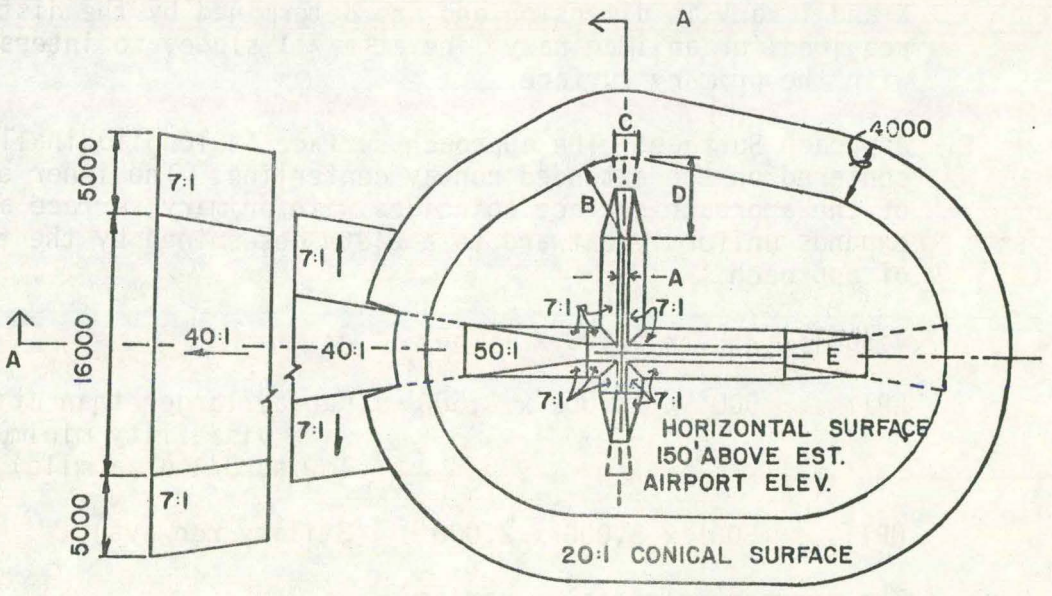
NPI: 34:1 (Larger than Utility)

NPI: 20:1 (Utility Runways)

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

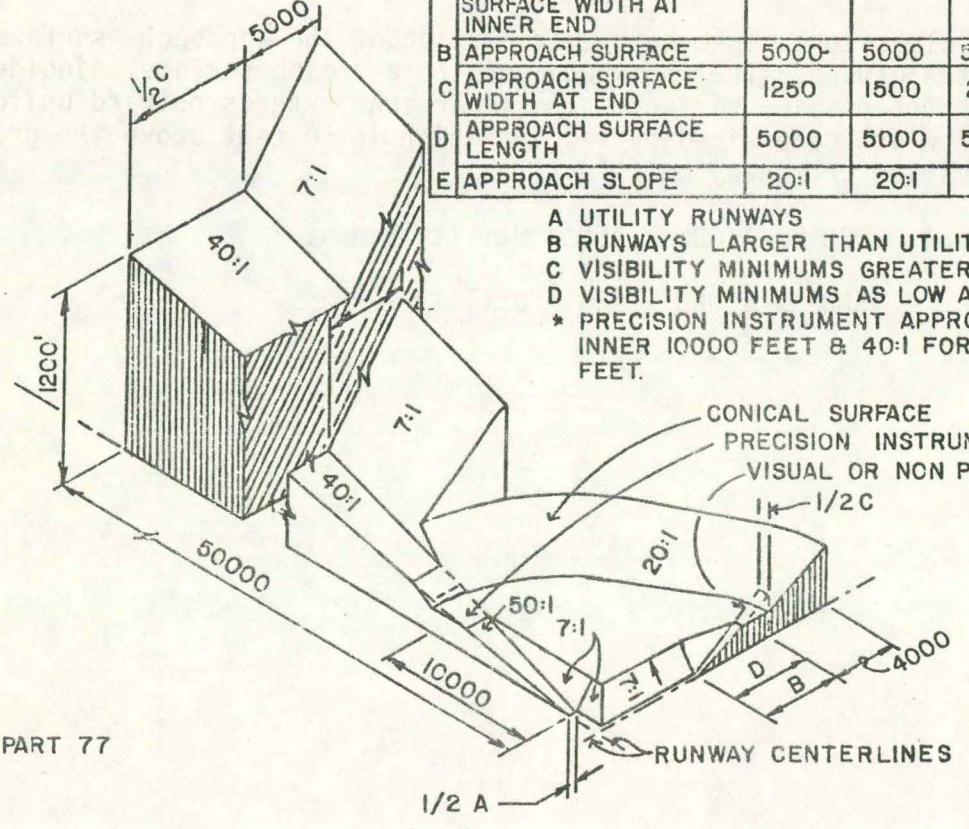
Visual: 250' x 1,000 x 450' Utility Runway

NPI: 500' x 1,000 x 800' Utility Runway



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

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



Source: FAR PART 77

AIRPORT IMAGINARY SURFACE

FIGURE 13

F. Land Use Guidelines

Land Use

Airport land use may be discussed in terms of the

- impact of adjacent land uses on the airport
- impact of the airport on adjacent land uses

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

Goals

- The airport and associated imaginary surfaces should be protected from encroachment of land uses that might impair operational capabilities of the facility.
- Having identified the ultimate level of airport development, care should be exercised through-out the planning period to insure that future expansion of the facility is not compromised.
- Adjacent airport environs should be protected against aircraft operations and noise.
- Establish or organize land uses on and off the airport that will complement each other.
- Encourage the development of an industrial park adjacent to the airport.

Land Use Compatibility

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

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

NATURAL CORRIDORS

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

OPENS SPACE AREAS

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

INDUSTRIAL AND TRANSPORTATION FACILITIES

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

AIRPORT AND AVIATION ORIENTED FACILITIES

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

COMMERCIAL FACILITIES

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

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

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

G. Summary

	PHASE ONE	PHASE TWO	PHASE THREE
RW Length and Width			
RW 18/36	60' x 3,400'	60' x 3,400'	60' x 3,400'
RE 9/27	---	---	60' x 2,720
RW Strength (Single Wheel)			
RW 18/36	28,000 lbs conc.	28,000 lbs conc.	28,000 lbs conc.
RW 9/27	---	---	12,500 lbs Asphalt/Concrete
Taxiway			
RW 18/36	Stub	Stub	Stub
RW 9/27	---	---	Stub
RW Pvmt. Markings			
RW 18/36	NPI	NPI	NPI
RW 9/27	---	---	Visual
RW Lighting			
RW 18/36	MIRL	MIRL	MIRL
RW 9/27	---	---	MIRL
REIL			
RW 18/36	Relocate REIL	REIL	REIL
RW 9/27	---	---	---
VASI-2 (SAVASI)			
RW 18/36	SAVASI	SAVASI	(VASI-2)
RW 9/27	---	---	SAVASI
Segmented Circle	Yes	Yes	Yes
Beacon	Yes	Yes	Yes
NDB	Exist.	Yes	Yes
Tiedowns	6	6	6
Hangars-Tee	6-Unit	-	6-Unit
Vehicle Parking	20	20	20
Airport Manager's Residence	---	Construct	Yes

SECTION IV

AIRPORT DEVELOPMENT ALTERNATIVES

SOCIOECONOMIC/ENVIRONMENTAL FEASIBILITY

A. Introduction

Upon identifying and summarizing anticipated airport facility needs over the twenty year period, some consideration needs to be given to the physical relationship of these facilities to each other. Also, an assessment of the impact of these proposed actions must be undertaken. Section IV of the study summarizes the above concerns.

Consideration of airport development concepts deals primarily with the location of the crosswind runway and terminal area development schemes. Assessment of socioeconomic/environmental impacts is limited to identifying possible areas of concern. The IDOT does not require the preparation of an Environmental Impact Assessment Report, EIAR, in conjunction with preparation of the Airport Development Plan. The Federal Aviation Administration, FAA,(when a Master Plan recommends a major airport action)does require the preperation of an EIAR. If federal funds are sought for implementation of a major airport action, the Airport Commission will most likely be required to undertake the preparation of a full blown EIAR.

B. Airport Development Alternatives

Two airport development alternatives were considered. For the most part, the alternatives involve only the crosswind runway alignment. The terminal area, terminal area access, and primary runway are fixed.

Each of the alternatives will influence ultimate off-airport land use patterns. In selection of one of the two alternatives, the following concerns were taken into account:

- Topography
- Land Ownership
- Vegetation
- Drainage
- Area Land Uses
- Industrial Park
- Proposed Rathbun Water Storage Facility
- Existing Airport Facilities
- Wind Coverage

Alternative One:

Alternative One proposes a 600 foot extension to the primary runway, RW 18/36. The proposed orientation of the crosswind runway is N 90° W. To maintain runway visibility zone requirements, the runway is located 250 feet north of the terminal area complex. Approximately 640 feet of the 2,720 foot minimum length lies on existing airport property. Approximately 1,100 feet would fall within the industrial park. The remainder, to the west of the airport, would lie on private property. The clear zone for each runway end and the runway itself does not have an impact upon any existing structures. Combined wind coverage at a 12 m.p.h. crosswind component value is 96.6 percent. Reference may be made to figure 14.

Alternative Two:

Alternative Two provides for a crosswind runway with an alignment of N 75° W. While an alignment of N 60° W would provide for ultimate wind coverage, such an alignment would conflict with the proposed Rathbun water storage facility and an existing set of farm buildings on the industrial park. Alternative alignments thus available for consideration are limited to those between N 75° W and N 90° W.

Approximately 650 feet of the proposed runway would lie on existing airport property while the balance would fall on industrial park land. Reference may be made to Figure 15.

The consultant recommended that Alternative One be recommended for implementation. While Alternative Two provided for slightly better wind coverage, Alternative One still provided for a combined wind coverage in excess of 95 percent. Alternative One had the distinct advantage of being more compatible with development of the industrial

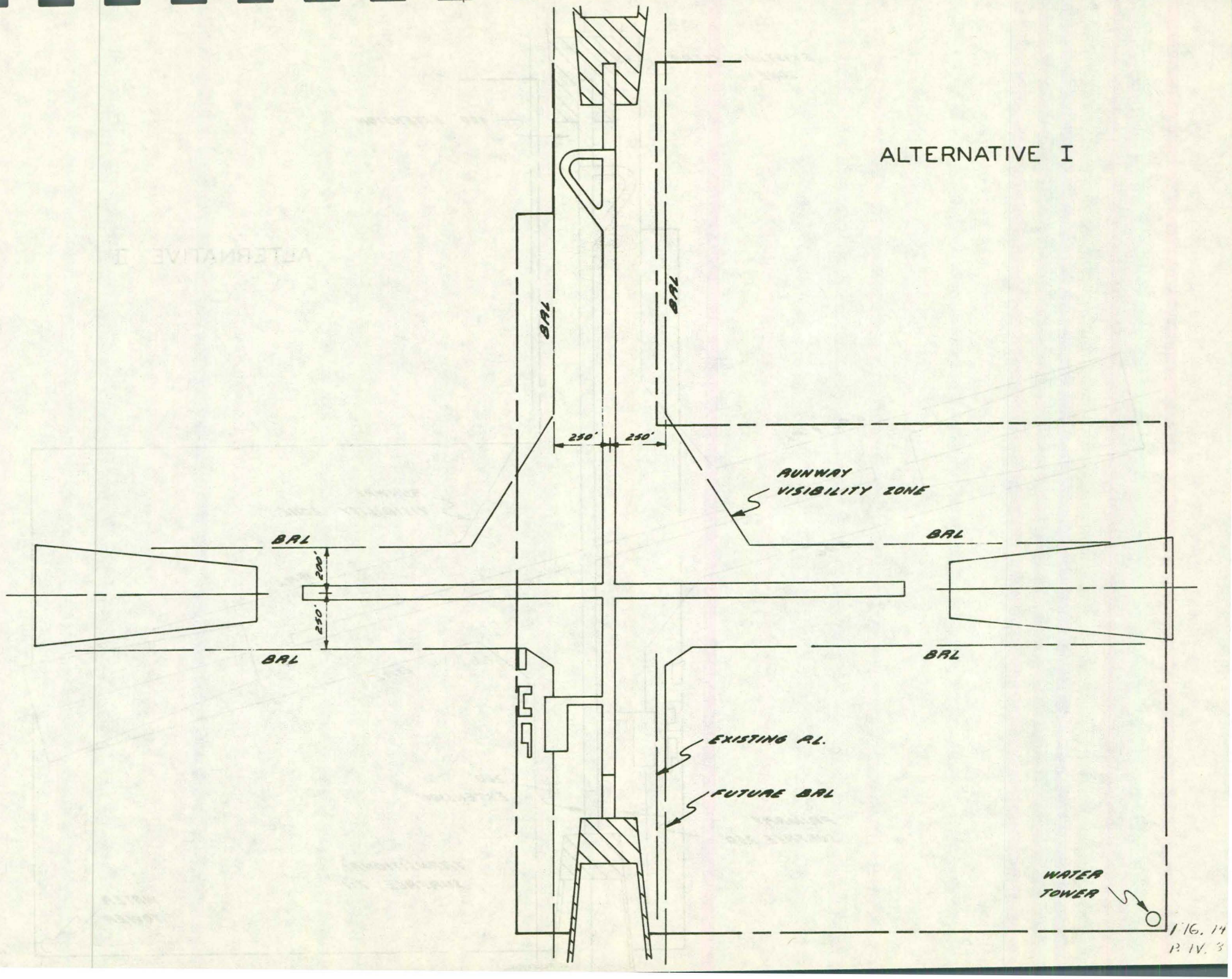

ALTERNATIVE I
BAL
BAL
250'
250'
RUNWAY
VISIBILITY ZONE
BAL
BAL
200'
250'
BAL
BAL
EXISTING RL.
FUTURE BAL
WATER
TOWER

FIG. 14
P. IV. 3

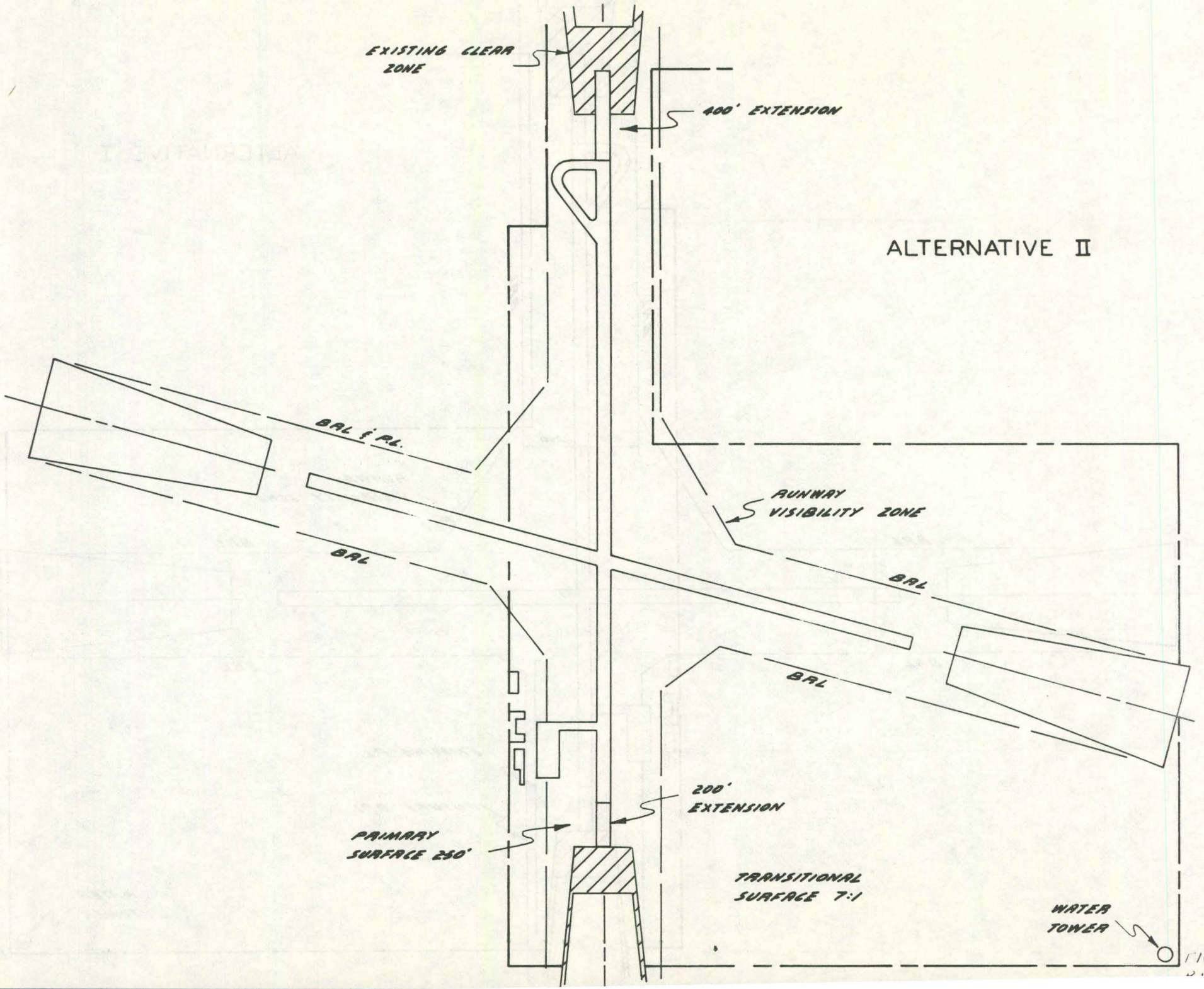

EXISTING CLEAR ZONE
400' EXTENSION
ALTERNATIVE II
BAL & R.L.
BAL
RUNWAY VISIBILITY ZONE
BAL
BAL
200' EXTENSION
PRIMARY SURFACE 250'
TRANSITIONAL SURFACE 7:1
WATER TOWER

FIG. 15

park. The clear zone in Alternative Two would preclude the development of some of the most suitable land while the clear zone in Alternative One allows more flexibility in use of existing farm buildings on the site and directs traffic away from the water tower. Both alternatives would involve the removal of trees and are considered the same when assessing their impact upon terminal area expansion, taxiway extension and drainage.

It is also evident that Alternative One lends itself more to ultimate development of runway access to potential industrial sites. In summary, Alternative One appeared most suitable for development while maximizing development opportunities and minimizing constraints.

The most salient problem at the airport is found in the terminal area where the terminal expansion is confined to a narrow strip of land between the property line and building restriction line. The only feasible solution is to acquire additional land to the west.

Alternative development schemes were presented. The ultimate scheme, presented in Section V, was a result from discussion of the initial two schemes. To accommodate future hangar construction in which the structures are located perpendicular to the primary runway, an additional 200 feet of land would be required.

Terminal Expansion - Land Acquisition
200' x 600' (min.) = 2.75 Acres±

Access - Land Acquisition
100' x 670' (opt.) = 1.54 Acres±

Terminal Building
Construct terminal building to include office space for lease.

Nested Tee Hangars
Construct one six-unit nested tee hangar

Remove Existing Conventional Hangar

Expand Apron Area

C. Socioeconomic/Environmental Feasibility

I. Consistency of the proposed actions in achieving community goals and objectives

II. Community Support for Airport

- A. Support at public meetings
- B. Past actions by City
- C. Recent growth in numbers of based aircraft
- D. Projected potential aviation activity

III. Assessment of the Proposed Actions

- A. An Environmental Impact Assessment Report, EIAR, is not required by the IDOT at the time the ADP is prepared
- B. Certain critical areas of concern should be examined if identified by local government as having a potentially significant impact

IV. Potential Areas of Concern

- A. Noise
  1. CNR, NEF, ASDS, Methodologies
  2. Residential, public meeting places, schools, etc.
- B. Land Use
  1. Consistent with comprehensive land use plan
  2. Land acquisition
  3. Avigation easements
  4. Airport Zoning Ordinance
  5. Secondary induced uses
- C. Vegetation, wildlife, and endangered species
  1. Intensive agriculture (Man-dominated)
  2. Similar habitat adjacent to airport
  3. No known endangered species on site
- D. Water Quality
  1. River basins, water bodies, wet lands
  2. Site drainage plans, Input from Areawide 208 Study
  3. Sedimentation
     - a. Wastes from fueling operations
     - b. Fuel and oil spills
     - c. Chemicals used in snow and ice removal
     - d. Detergents
     - e. Solid waste disposal
     - f. Sanitary wastewater

4. Mitigation measures
    a. Erosion and sediment control (retention ponds)
    b. Grease and oil traps
    c. Solid waste disposal in land fill
    d. On-site sanitary wastewater system (septic tank)
    e. Use of petroleum-absorbent materials
5. Short/Long-term

E. Water hydrology
1. Storm water management plan (retention)
2. Short/Long-term

F. Flood plain

G. Wetlands

H. Air Quality
1. Increase in aircraft emissions
2. Cordination/long-term

I. Direct Socioeconomic Impacts
1. No relocation of residential or business units
2. Economic Impact
    a. Direct (employment)
    b. F.B.O./Air Taxi (Taxes)
    c. Consistent with economic diversification
3. Utilities
    a. On-site
    b. Induced impact upon community facilities
4. Access Surface
    a. No surface improvements required

J. Induced secondary impacts
1. Spin-off jobs and service expansion
2. Increased employment
3. Increased tax base
4. Airport industrial park concept
5. Impact upon community utilities

K. Section 4(F) Lands

L. Historical and Archaeological

M. Light emissions

N. Prime and unique farm lands
1. Alternative runway alignments
2. Removal of land from production
3. Compatibility of agriculture with airport

From the areas of environmental concerns outlined on the preceding two pages, there appears to be no significant detrimental environmental impacts involved in the proposed actions. That is not to say that there will not be some alteration of the environment. As aircraft operations increase, there will be an increase in aircraft noise and emissions. Land will also be removed from agricultural production due to extension of the primary runway and construction of the crosswind runway.

Land adjacent to the airport is under intensive cultivation. However, a major area encompassed by the crosswind runway lies on agricultural land acquired for industrial development. The clear zone of the crosswind to the east is on land not suitable for development. There are no major bodies of water or rivers in the vicinity of the airport although significant drainage courses and a number of detention ponds exist. Sedimentation will be controlled through construction procedures and on-side drainage structures.

The proposed actions will not displace any persons or businesses. Secondary induced impacts are expected to be positive in scope by contributing to the tax base and bringing money into the community. The airport is one of the community facilities that will be a factor in the community's effort to attract industry. Such efforts are consistent with regional economic development objectives.

There are no Section 4(F) lands involved nor are there any known archaelogical and historical sites. Removal of prime farm land production will result from expansion of the airport facility.

While this section does not constitute an environmental assessment report, it does suggest that an awareness of environmental concerns has been considered to a very limited degree. No effort was made to identify unique species of wildlife or vegetation. Socioeconomic impacts are expected to be positive. Attendance at the three public meetings was small.

Should the community apply for federal assistance from the Federal Aviation Administration, the request for such assistance must comply with environmental requirements set forth by that agency. Reference may be made to FAA Order 5050-2B concerning proposed actions which require an environmental assessment.

SECTION V

AIRPORT SITE PLANS

A. Introduction

The airport site plans present a graphic summary of airport facility requirements anticipated over the twenty-year planning period. The drawings consist of the following exhibits:

Airport Layout Plan, ALP: (sheet 1) Figure 16
The ALP depicts existing and proposed airport facility components. The major proposed actions consist of an extension to the primary runway, construction of a crosswind runway, and expansion of the terminal area.

Airport Layout Plant Data Sheet: (sheet 2) Figure 17
The ALP Data Sheet presents the relevant runway and airport data, wind coverage and the geographical location of the airport with respect to area communities.

FAR PART 77: (sheet 3) Figure 18
Sheet 3 presents the imaginary surfaces criteria of Federal Aviation Regulation Part 77. This criteria is also the basis for the tall structures ordinance. The imaginary surfaces criteria is normally drawn on a 7 1/2 minute USGS Quad. However, this mapping is not available.

Clear Zone Plan and Profile Sheets: (sheet 4) Figure 19
Sheets 4 and 5 of the ALP package depict the plan view of the clear zone along with the approach slope for each runway end.

Terminal Area Plan: (sheet 5) Figure 20
The terminal area plan depicts at a larger scale anticipated needs within the "Built-up" portion of the airport.

AIRPORT DEVELOPMENT PLAN

BLOOMFIELD MUNICIPAL AIRPORT

BLOOMFIELD, IOWA

1978

OTTO & CULVER
a Professional Corporation
Engineers Architects Land Surveyors

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

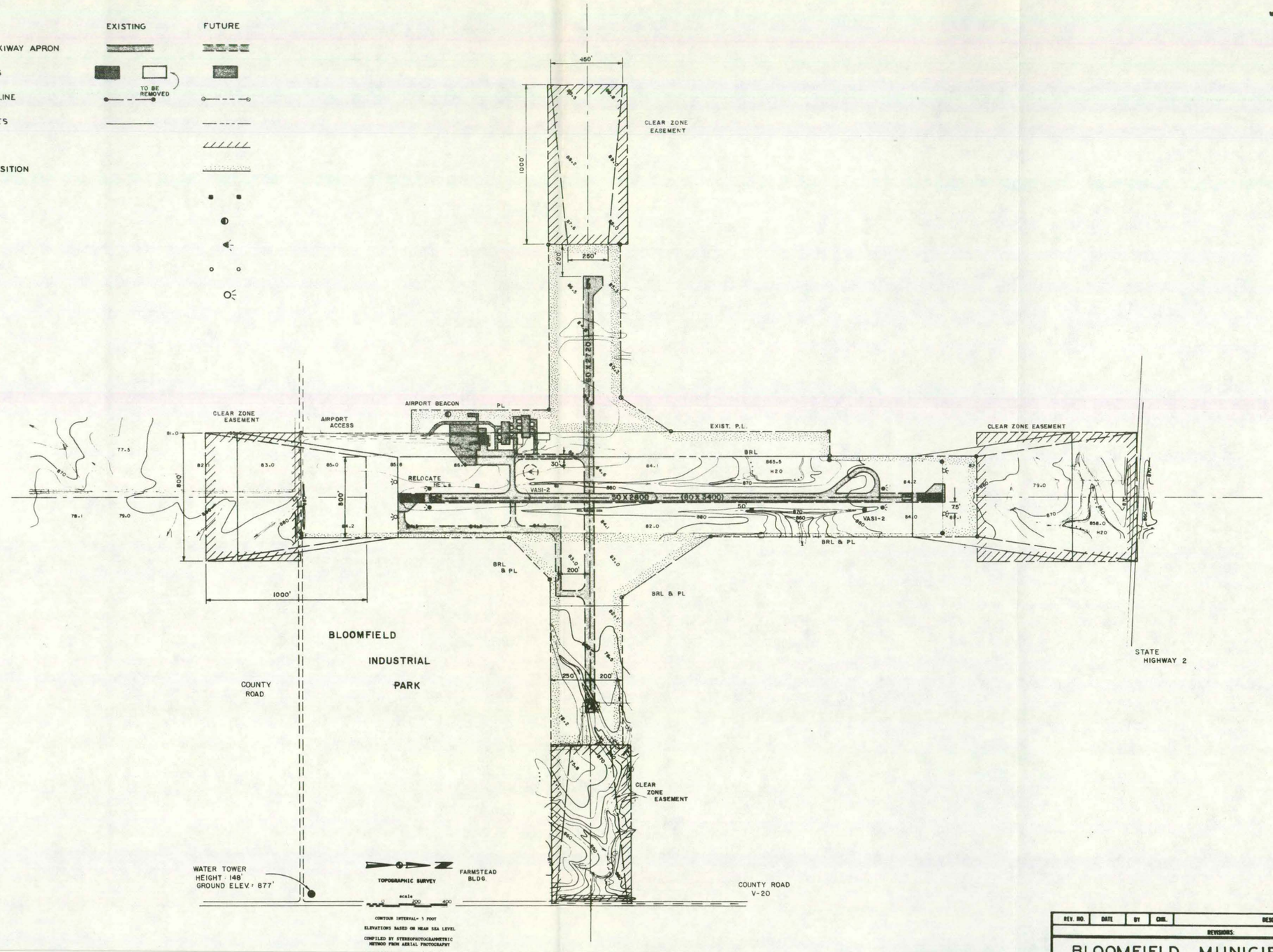
DATE

SCALE

0-770102-1

SHEET NO.

	EXISTING	FUTURE
RUNWAY TAXIWAY APRON		
STRUCTURES	TO BE REMOVED	
PROPERTY LINE		
CLEAR ZONE'S		
EASEMENTS		
LAND ACQUISITION		
VASI-2		
BEACON		
WIND SOCK		
NDB		
REIL		



REV. NO.	DATE	BY	CHK.	DESCRIPTION
				REVISIONS:

BLOOMFIELD MUNICIPAL AIRPORT
AIRPORT DEVELOPMENT PLAN

OTTO & CULVER
a Professional Corporation
Engineers Architects Land Surveyors

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

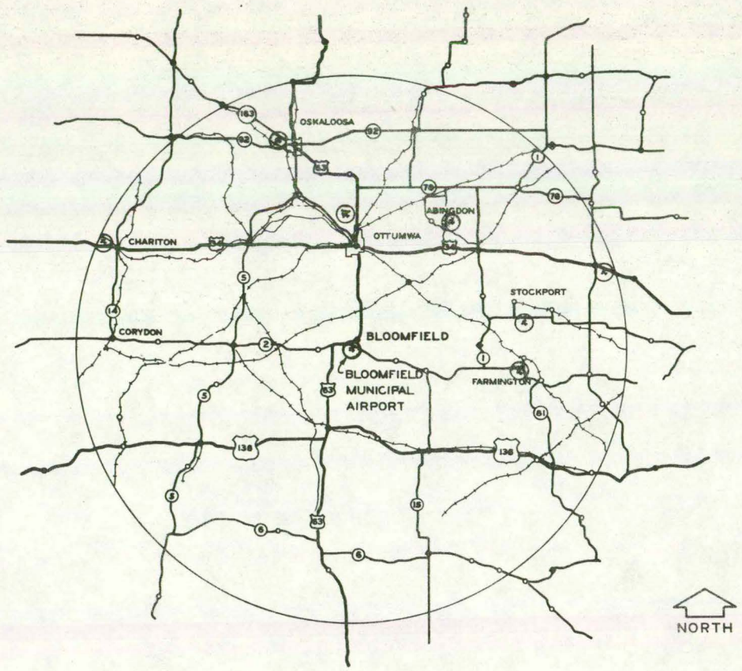
DATE

SCALE: AS SHOWN

AIRPORT LAYOUT PLAN

DWG NO: 0-770102-2

REV NO



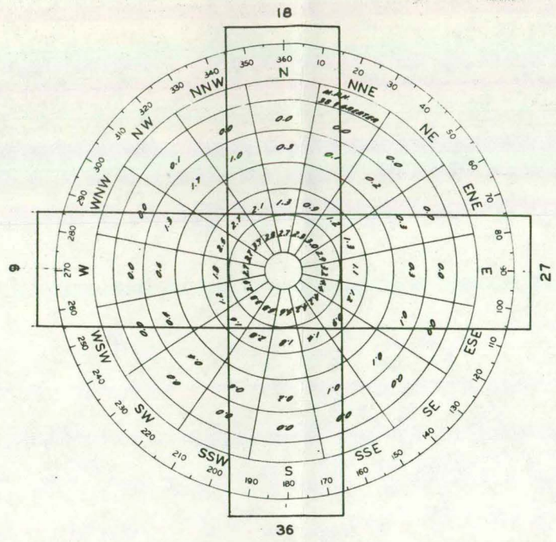
VICINITY MAP

SCALE: 1" = 13 MI.

0 6.5 13 26

AIRPORT

CALMS : 8.2 % 0-4 M.P.H.
CEILING AND VISIBILITY GROUP : GREATER THAN 1000 FT. AND / OR 3 MILES = 94.6 %
LESS THAN 1000 FT. AND / OR 3 MILES = 5.4 %
WIND COVERAGE : 12 M.P.H.
RUNWAY 18/36 85.1 %
RUNWAY 9/27
COMBINED 96.6 %



WIND ROSE

SOURCE: 1972 SOSP / BURLINGTON, IOWA 1936-1963

RUNWAY DATA	RUNWAY 18/36		RUNWAY 9/27			
	EXISTING	FUTURE	EXISTING	FUTURE		
EFFECTIVE RUNWAY GRADIENT	0.28%	0.28%	TO BE CONSTRUCTED	0.3%		
% WIND COVERAGE	85.1%	85.1%		84.8%		
INSTRUMENT RUNWAY	N.P.I.	N.P.I.		VISUAL		
APPROACH SURFACE	20:1	20:1		20:1		
RUNWAY LENGTH	2800 FT.	3400 FT.		2720 FT.		
RUNWAY WIDTH	50 FT.	60 FT.		60 FT.		
RUNWAY STRENGTH	28000 LBS. S.W.	28000 LBS. S.W.		12500 LBS. S.W.		
RUNWAY SAFETY AREA WIDTH	120	120		120 FT.		
RUNWAY LIGHTING	LIRL	MIRL		MIRL		
NAVIGATIONAL AIDS	REIL	REIL VASI-2		SAVASI		
RUNWAY MARKINGS	NON-STD	N.P.I.		VISUAL		
RUNWAY END ELEVATIONS	RW 36 886.5 RW 18 880.5	RW 36 886.5 (E) RW 18 881.5		RW 9 887' RW 27 878'		
RUNWAY SURFACE	CONC.	CONC.		CONC.		

AIRPORT DATA		
	EXISTING	FUTURE
AIRPORT ELEVATION	886.5 EST.	887'(E)
AIRPORT LOCATION POINT COORDINATES	LONG.	92° 25' 30" W
	LATITUDE	40° 44' 00" N
NORMAL MEAN MAX. TEMP.	89° F.	SAME
% WIND COVERAGE	85.1%	96.6 %
AIRPORT NAVIGATIONAL AIDS	N.D.B.	N.D.B.
AIRPORT ACREAGE	33	70±
FBO FACILITIES	YES	YES
AIRPORT LANDING AIDS	REIL	REIL, VASI-2
BEACON	NO	YES
SEGMENTED CIRCLE	NO	YES
LIGHTED WIND TEE	YES	YES
EASEMENTS	YES	YES

REV. NO.	DATE	BY	CHK.	DESCRIPTION
REVISIONS:				

BLOOMFIELD MUNICIPAL AIRPORT
AIRPORT DEVELOPMENT PLAN

OTTO & CULVER
a Professional Corporation
Engineers Architects Land Surveyors

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

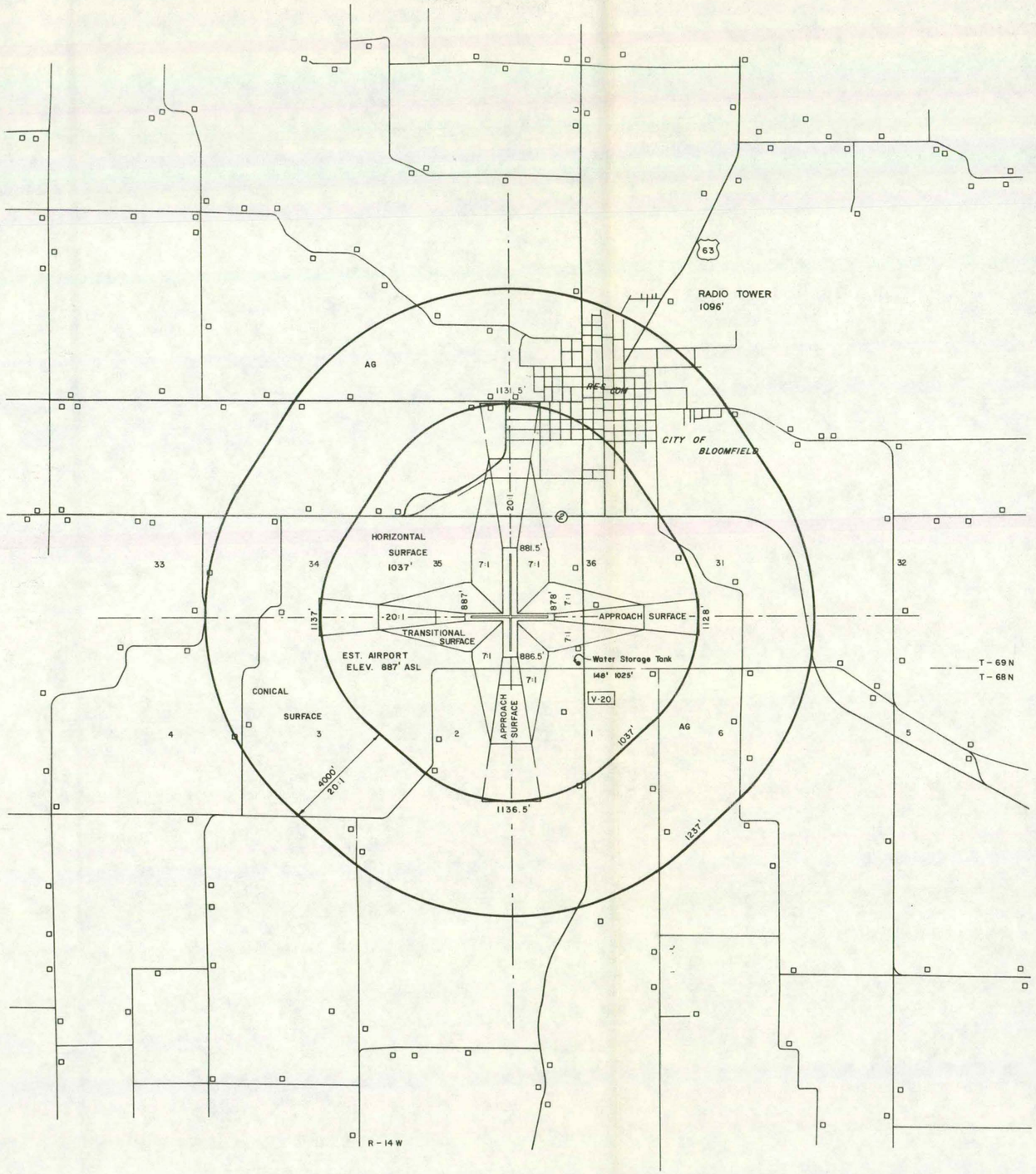
DATE

SCALE AS SHOWN

ALP DATA SHEET

DWG NO 0-770102-3

REV NO



NORTH

SCALE: 1" = 2000'

0 1000 2000 4000

REV. NO.	DATE	BY	CHK.	DESCRIPTION
				REVISIONS:

BLOOMFIELD MUNICIPAL AIRPORT
AIRPORT DEVELOPMENT PLAN

OTTO & CULVER
a Professional Corporation
Engineers Architects Land Surveyors

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

DATE:

SCALE: AS SHOWN

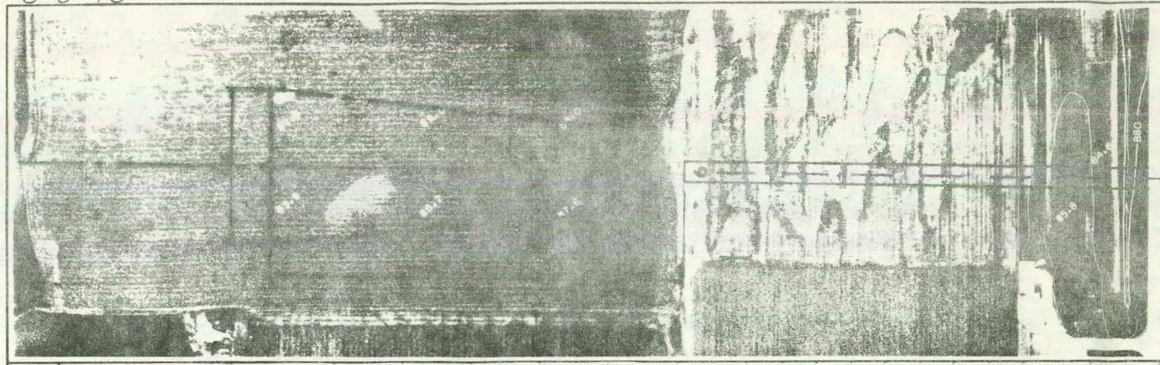
FAR PART 77

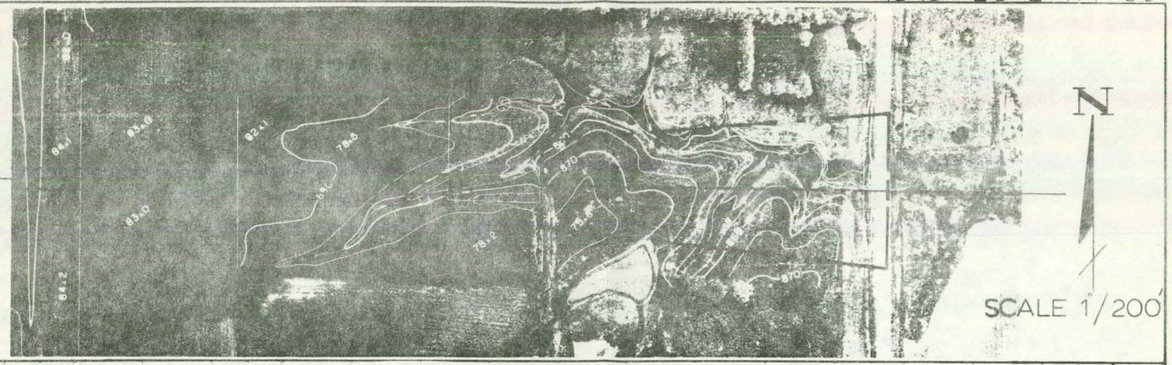
DWG. NO. 0-770102-4

REV. NO.

5 3 78

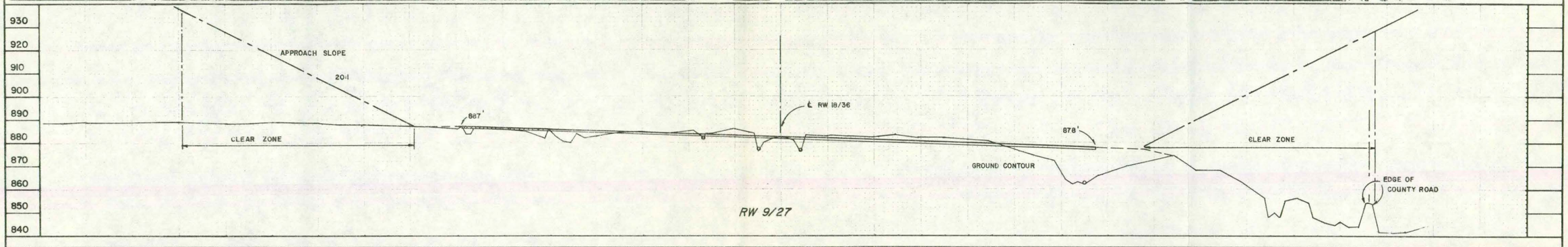
1343 26 2 114 90



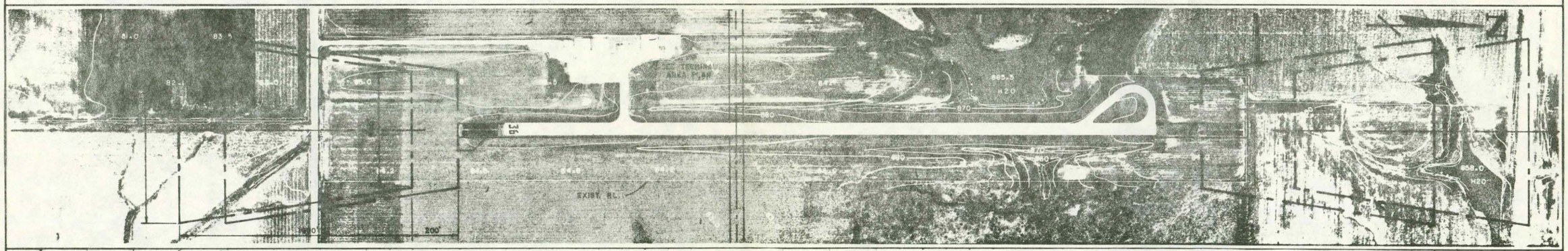


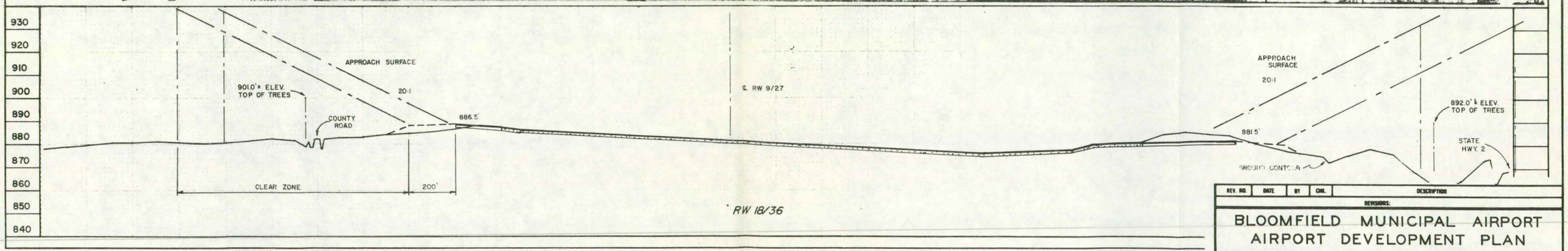
N

SCALE 1/200'



RW 9/27





RW 18/36

REV. NO.	DATE	BY	CHK.	DESCRIPTION
				REVISIONS:

BLOOMFIELD MUNICIPAL AIRPORT
AIRPORT DEVELOPMENT PLAN

OTTO & CULVER
a Professional Corporation
Engineers Architects Land Surveyors

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

DATE

SCALE

CLEAR ZONE PLAN & PROFILE

DWG NO
0-770102-5

REV NO

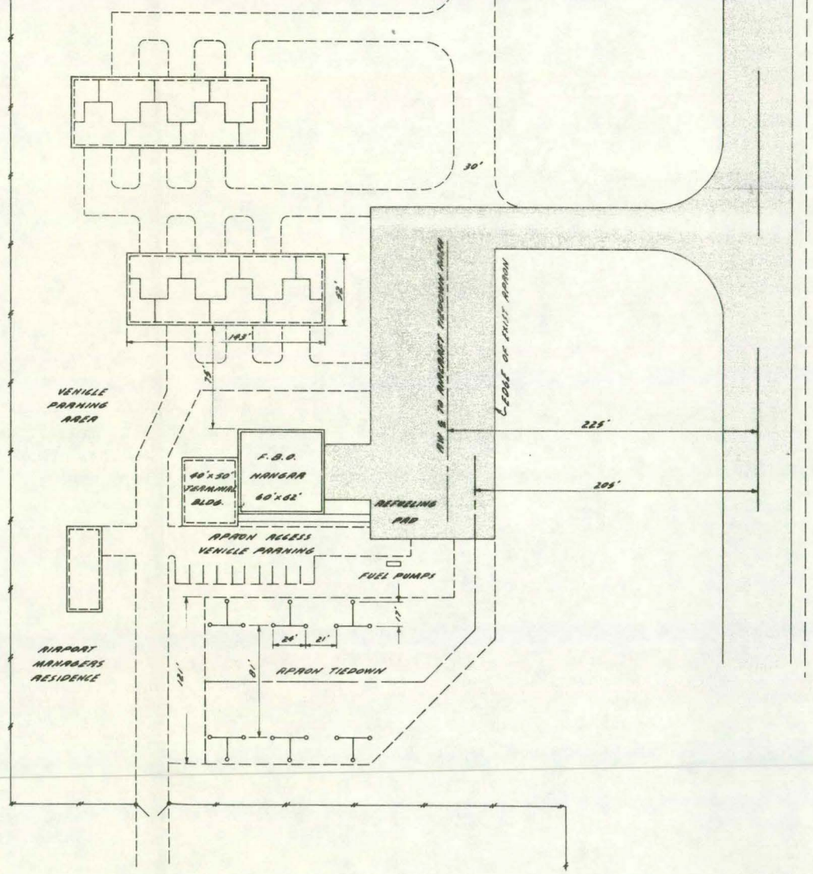
NORTH

SCALE : 1" = 50'

0 25 50 100

NOTES :

1. CONSTRUCTION OF 6 UNIT NESTED TEE HANGAR, 1978-1982
2. REMOVE EXISTING WOOD HANGAR STRUCTURE ADJACENT TO F.B.O. SHOP
3. REMOVE EXISTING NORTH WOOD HANGAR STRUCTURE, 1978-1997
4. CONSTRUCTION OF 6 UNIT NESTED TEE HANGAR, 1988-1997
5. CONSTRUCTION OF TERMINAL BUILDING, 1978-1982
6. CONSTRUCTION OF AIRPORT MANAGERS RESIDENCE, 1983-1987
7. EXPAND APRON AREA, 1983-1987
8. CONSTRAUCT TAXIWAY ACCESS TO HANGAR



REV. NO.	DATE	BY	CHK.	DESCRIPTION
				REVISIONS:

BLOOMFIELD MUNICIPAL AIRPORT
AIRPORT DEVELOPMENT PLAN

OTTO & CULVER
a Professional Corporation
Engineers Architects Land Surveyors

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

DATE:

SCALE: AS SHOWN

TERMINAL AREA PLAN

DWG. NO. 0-770102-6

REV. NO.

SECTION VI

DEVELOPMENT SCHEDULE
COST ESTIMATES
AND
FINANCIAL PLAN

A. Introduction

Presented herein is a proposed schedule for development of the Bloomfield Municipal Airport, to include estimated costs and strategy for implementation. The development schedule and cost estimates are based upon a 5-year, 10-year, and 20-year program by phase.

Planning Phase	Years
Phase One	1977-1982
Phase Two	1983-1987
Phase Three	1988-1997

The Airport Commission should revise, on an annual basis, the proposed development schedule. This continual update is important because of changing aviation demand and availability of state and federal assistance.

B. Development Schedule

The development schedule is based upon the following considerations:

- Critical Need
- Usage
- Availability of state and federal assistance
- Local financial constraints

While need or demand would suggest immediate implementation, the resources for implementation may not be readily available. As such the facility component is proposed for implementation over a period of several years. Also, the development schedule may be revised to accommodate unforeseen increases or decreases in aviation demand or availability of financial assistance.

PHASE ONE: 1977-1982

A. Land Acquisition
   1. RW End 36
      a. Fee Title: 0.0 Acres
      b. Easement: 8.9 Acres
   2. RW End 18
      a. Fee Title: 4.99 Acres
      b. Easement: 18.4 Acres
   3. Terminal Area and Access
      a. Fee Title: 2.8 Acres

B. Runway Construction
   1. RW 18/36
      a. Increase width by 10 ft., 2,800 L.F., 3,111 S.Y.
   2. RW End 18
      a. 60' x 400'
   3. RW End 36
      a. 60' x 200'
   4. Turnaround, RW End 18
      a. 1,200 S.Y.

C. Runway Lighting
   1. RW 18/36
      a. (Relocate with widening of runway) MIRL, 2,800 L.F.
   2. RW End 18
      a. MIRL, 400 L.F.
   3. RW End 36
      a. MIRL, 200 L.F.

D. REIL
   1. RW 18/36
      a. Relocate

E. SAVASI
   1. RW 18/36
      a. Install

F. Beacon
   1. Install

G. Segmented Circle
   1. Install

H. Hangar
   1. Nested Tee
      a. 6-Unit, 7,436 S.F.

I. Taxiway
   1. To Hangar
      a. 1,151 S.Y.

J. Runway Markings
   1. RW 18/36
      a. N.P.I.

K. Perimeter Fence

PHASE TWO: 1983-1987

A. Apron/Taxiway
   1. Extend Apron
      a. 2,447 S.Y.
   2. Install Tiedowns
      a. 24

B. Airport Manager's Residence
   1. Construct
      a. 1,200 S.F.

C. Access Road/Vehicle Parking
   1. Access Road
      a. 1,333 S.Y. (including parking)
   2. Vehicle Parking

D. Security Fence
   1. 400 L.F.

E. Terminal Building
   1. 680 S.F.

PHASE THREE: 1988-1997

A. Land Acquisition
   1. RW 9/27
      a. Fee Title 29.30 Acre
      b. Easement 16.07 Acre

B. Runway Construction
   1. RW 9/27
      a. 60' x 2,720'

C. Runway Lighting
   1. RW 9/27
      a. MIRL, 2,720 L.F.

D. SAVASI
   1. RW 9/27
      a. Both ends, Relocate from RW 18/36

E. VASI-2
   1. RW 18/36
      a. Both Ends

F. Hangar
   1. Nested Tee
      a. 6-Unit, 7,346 S.F.

G. Taxiway
   1. To Hangar
      a. 915 S.Y.
   2. To RW 9/27
      a. 1,433 S.Y.

H. Fence
   1. Perimeter
      a. 8,640 L.F.

C. Development Costs

The development costs are presented by phase, unit, unit cost, quantity, and total cost. To this cost was added a twenty percent contingency to cover legal, engineering and administrative expenses. The total cost is presented in the last column.

The unit costs were taken from the 1978 Iowa State Airport Systems Plan and past Otto & Culver, P.C., airport construction projects. The quantities used are of a preliminary nature and are not based upon detailed engineering plans and specifications. All unit costs are 1977 dollar values.

Total costs do not account for anticipated levels of inflation. A more realistic Phase Two cost can be obtained by multiplying the total cost shown by 1.45. A multiplier of 2.10 will provide a more realistic Phase Three cost. This reasoning is based upon a cost increase of eight percent annually.

There may also be a cost variation because of improved technology and construction practices as well as final product selected. For example, hangar costs will vary considerably depending upon the final design; therefore, full partitions, bifold electrically operated doors, personnel doors, etc.

The purpose of the estimates is to provide the Airport Commission with a long-term capital improvement program and some indication of estimated costs.

PHASE ONE: 1977-1982

ITEM	UNIT	UNIT COST	QUANTITY	1977 DOLLAR COST	LEGAL, ADMIN. CONT., ENG.	TOTAL COST
A. Land Acquisition						
1. RW End 36						
a. Fee Title	Acre	1,500	---	---	---	---
b. Easements	Acre	750	8.9	6,675		
2. RW End 18						
a. Fee Title	Acre	1,500	4.99	7,485		
b. Easements	Acre	750	18.4	9,525		
3. Terminal Area and Access						
a. Fee Title	Acre	1,500	2.8	4,200		
SUBTOTAL				27,885	5,577	33,462
B. Runway Construction						
1. RW 18/36 3,111 S.Y.						
a. Grading	C.Y.	2.00	1,040	2,080		
b. Subgrade Prep.	S.Y.	1.00	3,111	3,111		
c. 6" P.C.C.	S.Y.	12.50	3,111	38,888		
2. RW End 18						
a. Grading	C.Y.	2.00	3,900	7,800		
b. Subgrade Prep.	S.Y.	1.00	2,667	2,667		
c. 6" P.C.C.	S.Y.	12.50	2,667	33,338		
3. RW End 36						
a. Grading	C.Y.	2.00	5,700	11,400		
b. Subgrade Prep.	S.Y.	1.00	1,333	1,333		
c. 6" P.C.C.	S.Y.	12.50	1,333	16,662		
4. Turnaround Both Ends						
a. Grading	C.Y.	2.00	400	800		
b. Subgrade Prep.	S.Y.	1.00	1,200	1,200		
c. 6" P.C.C.	S.Y.	12.50	1,200	15,000		
5. Subbased Course (1-4)	C.Y.	14.00	914	12,799		
SUBTOTAL				147,078	29,416	176,494

PHASE ONE CONTINUED

ITEM	UNIT	UNIT COST	QUANTITY	1977 DOLLAR COST	LEGAL, ADMIN. CONT., ENG.	TOTAL COST
C. Runway Lighting						
1. RW 18						
a. MIRL	L.F.	5.50	400	2,200		
2. RW End 18/36						
a. MIRL (Relocate)	L.F.	5.50	2,800	15,400		
3. RW End 36						
a. MIRL	L.F.	5.50	200	1,100		
SUBTOTAL				18,700	3,740	22,400
D. Runway End Identifier Lights						
1. RW 18/36						
a. Relocate REIL 2 Ends	L.S.	1,200	1	1,200	240	1,440
E. Abbreviated VASI						
1. RW 18/36						
a. Install, 2 Ends	L.S.	2,650	1	2,650	530	3,180
F. Beacon						
1. Install (High Estimate)	L.S.	14,000	1	14,000	2,800	16,800
G. Segmented Circle						
1. Construct	L.S.	2,000	1	2,000	400	2,400
H. Hangar						
1. Nested Tee, 52' x 143'						
a. 6-Unit	L.S.	42,000	1	42,000	8,400	50,400
I. Taxiway						
1. Grading	C.Y.	2.00	2,000	4,000		
2. Subgrade Prep	S.Y.	1.00	1,151	1,151		
3. 6" P.C.C.	S.Y.	12.50	1,151	18,888		
4. Subbase Course	C.Y.	14.00	126	1,764		
SUBTOTAL				25,803	5,161	30,964

PHASE ONE CONTINUED

ITEM	UNIT	UNIT COST	QUANTITY	1977 DOLLAR COST	LEGAL, ADMIN. CONT., ENG.	TOTAL COST
J. Runway Markings						
1. RW 18/36						
a. N.P.I.	L.F.	1.00	3,400	3,400	680	4,080
K. Perimeter Fence						
1. 2,400 L.F.	L.F.	1.00	2,400	2,400	480	2,880

PHASE TWO: 1983-1987

ITEM	UNIT	UNIT COST	QUANTITY	1977 DOLLAR COST	LEGAL, ADMIN. CONT., ENG.	TOTAL COST
A. Apron/Taxiway						
1. Extend Apron (2,447 S.Y.)	L.S.	34,634	1	34,634		
2. Install 24 Tiedowns	EACH	12.00	24	288		
SUBTOTAL				34,922	6,984	41,906
B. Airport Manager's Residence						
1. Construct						
a. 1,200 S.F.	S.F.	30.00	1,200	36,000	7,200	43,200
C. Access Road/Vehicle Parking						
1. Access Road, Granular						
a. 1,333 S.Y.	L.S.	6,887	1	6,887	1,377	8,264
D. Security Fence						
1. 400 L.F.	L.F.	6.00	400	2,400	480	2,880
E. Terminal Building						
1. Construct						
a. 680 S.F.	S.F.	35.00	680	23,800	4,760	28,560

PHASE THREE: 1988-1997

ITEM	UNIT	UNIT COST	QUANTITY	1977 DOLLAR COST	LEGAL, ADMIN. CONT., ENG.	TOTAL COST
A. Land Acquisition						
1. RW 9/27						
a. Fee Title	ACRE	1,500	29.3	43,950		
b. Easement	ACRE	750	16.07	12,058		
SUBTOTAL				56,003	11,201	67,204
B. Runway Construction						
1. RW 9/27						
a. Grading	C.Y.	2.00	19,800	39,600		
b. Subgrade Prep.	S.Y.	1.00	18,133	18,133		
c. 6" P.C.C.	S.Y.	12.50	18,133	226,663		
d. Subbase Course	C.Y.	14.00	1,995	27,925		
SUBTOTAL				312,321	62,464	374,785
C. Runway Lighting						
1. RW 9/27						
a. MIRL	L.F.	5.50	2,720	14,960	2,992	17,952
D. SAVASI						
1. RW 9/27						
a. Relocate from RW 18/36	L.S.	1,200	1	1,200	240	1,440
E. VASI-2						
1. RW 18/36						
a. Install	L.S.	20,000	1	20,000	4,000	24,000
F. Hangar						
1. Nested Tee, 52' x 143'						
a. 6-Unit	L.S.	42,000	1	42,000	8,400	50,400

PHASE THREE CONTINUED

ITEM	UNIT	UNIT COST	QUANTITY	1977 DOLLAR COST	LEGAL, ADMIN. CONT., ENG.	TOTAL COST
G. Taxiway						
1. To Hangar						
a. Grading	C.Y.	2.00	1,300	2,600		
b. Subgrade Prep.	S.Y.	1.00	915	915		
c. 6" P.C.C.	S.Y.	12.50	915	11,438		
2. To RW 9/27						
a. Grading	C.Y.	2.00	1,600	3,200		
b. Subgrade Prep.	S.Y.	1.00	1,433	1,433		
c. 6" P.C.C.	S.Y.	12.50	1,433	17,915		
3. Subbase (1-2)	C.Y.	14.00	778	10,892		
SUBTOTAL				48,393	9,679	58,072
H. Perimeter Fence	L.F.	1.00	8,640	8,640	1,728	10,368

DEVELOPMENT SCHEDULE COST SUMMARY

Table 21

Development Cost Summary

1978-1997

PHASE ONE:

1978-1982

TOTAL COST ---------- $ 344,500

PHASE TWO:

1983-1987

TOTAL COST ---------- $ 124,810

PHASE THREE

1988-1997

TOTAL COST ---------- $ 604,221

TOTAL DEVELOPMENT COST:

1977-1997 ---------- $1,073,531

D. Airport Revenue and Expenditures

Airport revenue is derived from two sources:

- Rental of crop land
- Rental of hangar space

Revenue from cropland, on a "share crop" basis, totaled some $1,500 in 1977. Hangar rental income at the present time totals $75 per month or $900 per year. This is based upon the rate of $15 per month per aircraft.

Revenue realized from the lease of land and conventional hangar to Bloomfield Air Service is the difference between the annual hangar department obligation (principal and interest) and the revenue generated by the rental of hangar stalls. Thus, all revenue realized from hangars goes to the retirement of the general obligation bond for the conventional hangar.

Revenue from the share crop is thus the only revenue readily available for annual O&M expenditures. This amount of $1,500 per year is subject to change.

Expenditures on the airport can be divided into two groups.

- Annual O&M costs
- Capital Improvement costs

Annual O&M costs are paid for out of the City's General Fund. Grass mowing, snow removal, etc., is accomplished by City crews. Airport insurance is covered by the City Policy. The hangars are not heated and as such there is no expenditure for fuel. Bloomfield Air Service provides its own source of heating.

The City Clerk estimated that expenditures for electrical power average $40 per month or $480 per year. In summary, airport revenue can be expected to do no more than meet annual O&M costs and retire the present hangar bond.

As such, future capital improvements will require issuance of general obligation bonds or transfer of funds from other city revenue sources.

E. State and Federal Assistance

The Department of Transportation and the Federal Aviation Administration provide financial assistance for a number of airport components under the Airport and Airway Development Act of 1970. The 1976 amendments to the act provide up to 90 percent of total cost on eligible items through September 30, 1978. This share then drops to 80 percent for F 1979 and 1980.

In general, eligible items include all airport requirements except those that specifically benefit the private sector. In other words hangar structures and taxiways 20 feet from the hangar are not eligible. Parking lots and internal road systems are not eligible. Terminal buildings are not eligible except at CAB certificated air carrier airports.

Airport components recommended from implementation over the twenty-year planning that are eligible are as follows:

- Land Acquisition
- Runway Construction
- Runway Lighting
- Access Road Improvements
- REIL, and VASI-2
- Taxiway Construction
- Apron Area Construction
- Seeding, Etc.
- Drainage (Runway and Apron)

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

Total assistance, available from FAA and State sources for general aviation airports, has historically not exceeded 1.2 million dollars annually. Competition for these funds is quite intense. The airport development plan will be a valuable tool in obtaining assistance from the above agencies.

Reference to Table 22 provides a summary of historic state and federal aid by fiscal year to the Bloomfield Municipal Airport.

Table 22

ANNUAL FEDERAL AND STATE AID
TO BLOOMFIELD MUNICIPAL AIRPORT

Fiscal Year	Amount Federal	State
1963	--	--
1966	$85,426.00	$ 625.00
1967	--	5,087.20
1968	--	2,690.47
1970	--	5,500.00
1975	--	3,943.30
1977	--	3,000.00
TOTAL	$85,426.00	$26,134.15

Source: 1978 SASP

The table below summarizes anticipated federal and state assistance that may be available for Iowa through 1983.

Table 23

SUMMARY OF STATE AND FEDERAL ASSISTANCE
GENERAL AVIATION

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

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

The state also maintains a safety contingency reserve of $25,000 annually.

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

F. Strategy for Implementation

PHASE ONE: 1977-1982

A. Runway 18/36 (Increase width, extend 600 feet, MIRL, Land SAVASI, relocate REIL, Markings, Fence) 1979-1980

1. Total Cost: $243,936
2. Amortization of Cost
    a. Federal Assistance (80%): $195,149
    b. Local (20%): $41,647
        1. From General Obiligation Bond: $48,787

B. Beacon (Segmented Circle) 1980-1981

1. Total Cost: $19,200
2. Amortization of Cost
    a. State Assistance (70%): $13,440
    b. Local (30%): $5,760
        1. From general Obligation Bond: $5,760

C. Hangar (Taxiway) 1981-1982

1. Total Cost: $81,364
2. Amortization of Cost
    a. State Assistance (70%): $12,214 (Part Taxiway)
    b. Local (30% - 100%): $69,150
        1. From General Obligation Bond: $18,750
        2. From private sector: $50,400

PHASE TWO: 1983-1987

A. Apron/Taxiway 1983-1984

1. Total Cost: $44,786
2. Amortization of Cost
    a. State Assistance (70%): $31,350.20
    b. Local (30%): $13,435.80
        1. From General Obligation Bond: $13,435.80

B. Airport Access Road: 1983-1984

1. Total Cost: $8,264
2. Amortization of Cost
    a. State Assistance (70%): $5,784.80
    b. Local (30%): $2,479.20
        1. From City Revenues: $2,479.20

C. Airport Manager's Residence: 1985-1986 (low priority)

1. Total Cost: $43,200
2. Amortization of Cost:
    a. Local (100%)
        1. From General Obligation Bond: $43,200

D. Terminal Building 1986-1987

1. Total Cost: $28,560
    a. Local (100%)
        1. From General Obligation Bond: $23,560

PHASE THREE: 1988-1997

A. Land Acquisition (perimeter fence) 1988-1989

1. Total Cost: $77,572
2. Amortization of Cost
    a. Federal Assistance (80%): $62,058
    b. Local Assistance (20%): $15,514
        1. From General Obligation Bond: $15,514

B. Runway Construction: 9/27 (Lighting, SAVASI, VASI-2, Taxiway) 1996-1997

1. Total Cost: $476,249
2. Amortization of Cost
    a. Federal Assistance (80%): $380,999
    b. Local (20%): $95,250

C. Hangar 1996-1997

1. Total Cost: $50,400
2. Amortization of Cost
    a. Local (100%): $50,400
        1. From Private Sector: $50,400

G. Funding Source Summary

I. Phase One 1978-1982

Item	Federal	State	Local-G.O.	Private
A	$195,149	---	$48,787	---
B	---	$13,440	$ 5,760	---
C	---	$12,214	$18,751	$50,400
TOTAL	$195,149	$25,654	$73,298	$50,400

II. Phase Two 1983-1987

Item	Federal	State	Local-G.O.	Private
A	---	$13,350	$13,436	---
B	---	$ 5,785	$ 2,479	---
C	---	---	$43,200	---
D	---	---	$28,560	---
TOTAL	---	$37,135	$87,675	---

III. Phase Three 1988-1997

Item	Federal	State	Local-G.O.	Private
A	$ 62,058	---	$ 15,514	---
B	$380,999	---	$ 95,250	---
C	---	---	---	$50,400
TOTAL	$443,057	---	$110,764	$50,400

IV. Total 1978-1997

Phase I, II, and III

	Federal	State	Local-G.O.	Private
TOTAL	$638,206	$62,789	$271,737	$100,800

For purposes of assessing the feasibility of implementing the proposed actions over the twenty-year planning period, the preceding summary of costs by funding source was prepared. The item referenced represents a development package as presented in the strategy for implementation on the preceding pages.

It should be noted that the grant-in-aid sought is allocated to either the state or federal program. This does not suggest that the source of funding for Item A in Phase One may be sought from the State rather than the federal government as so indicated. In fact, it is reasonable to seek a grant-in-aid from both sources. The purpose herein is to present one strategy for implementation. Each program and strategy must be evaluated at the time of implementation in order to determine the available funding source.

As noted, the total obligations by source is $638,206 in federal assistance, $62,789 in state assistance and $271,737 required in local match. The private sector will be encouraged to construct the two tee hangars for which an estimated cost of $100,800 was established.

It would appear reasonable to assume that the state will participate, when able, where federal funds are in question. For example, the following strategy might be used for Item A, of Phase One, RW 18/36.

Land Acquisition ---------- State
Runway Extensions --------- State
Runway Width & Lighting --- Federal

The Airport Commission should select its consultant and refine the project at least 12 to 18 months prior to anticipated construction. This would allow the funding agency needed time to review the proposed actions and determine eligibility for funding. Prior to consultant selection, the Airport Commission should contact the Iowa Department of Transportation concering procedures.

The feasibility of the proposed actions is contingent upon the Airport Commission's ability to obtain federal and state grants-in-aid.

Phase Three costs may be reduced to elimination of the crosswind paving. An alternative to the actions proposed herein is to go with a turf crosswind runway and a stake mounted low intensity light system.

In any event, the process of implementation will require the constant attention of the Airport Commission. The decision whether or not to proceed with implementation should be made only after determination of the need.

APPENDIX

DEFINITIONS AND ABBREVIATIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

LIST OF ABBREVIATIONS

ATC - Air Traffic Control

ATCT - Airport Traffic Control Tower

CAB - Civil Aeronautics Board

DME - Distance Measuring Equipment

DOT - Department of Transportation

DWG - Dual Wheel Gear

DTWG - Dual Tandem Wheel Gear

FAA - Federal Aviation Administration

FAR - Federal Aviation Regulations

FAS - Flight Advisory Service

FBO - Fixed Base Operator

FSS - Flight Service Station

HIRL - High Intensity Runway Lights

IFR - Instrument Flight Rules

ILS - Instrument Landing System

MEA - Minimum En Route IFR Altitude

MIRL - Medium Intensity Runway Lights

MSL - Mean Sea Level

NASA - National Aeronautics and Space Administration

NAVAID - Navigational Aid or Air Navigational Facility

NOTAMS - Notice to Airmen

NTS - Not to Standard or Scale

REIL - Runway End Identifier Lights

STOL - Short Takeoff and Landing

SWG - Single Wheel Gear

TACAN - Tactical Air Navigation

TVOR - Terminal Very High Frequency Omnidirectional Radio Range

UNICOM - Air to Ground Radio Communication Facilities