HARLAN IOWA
HARLAN MUNICIPAL AIRPORT
Airport Development Plan

PDS

Harlan Municipal Airport

Airport Development Plan

Prepared For

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INTRODUCTION

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

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

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

It should be noted that the airport planning process is a continual effort. As such, the City is encouraged to update the plan on a periodic basis.

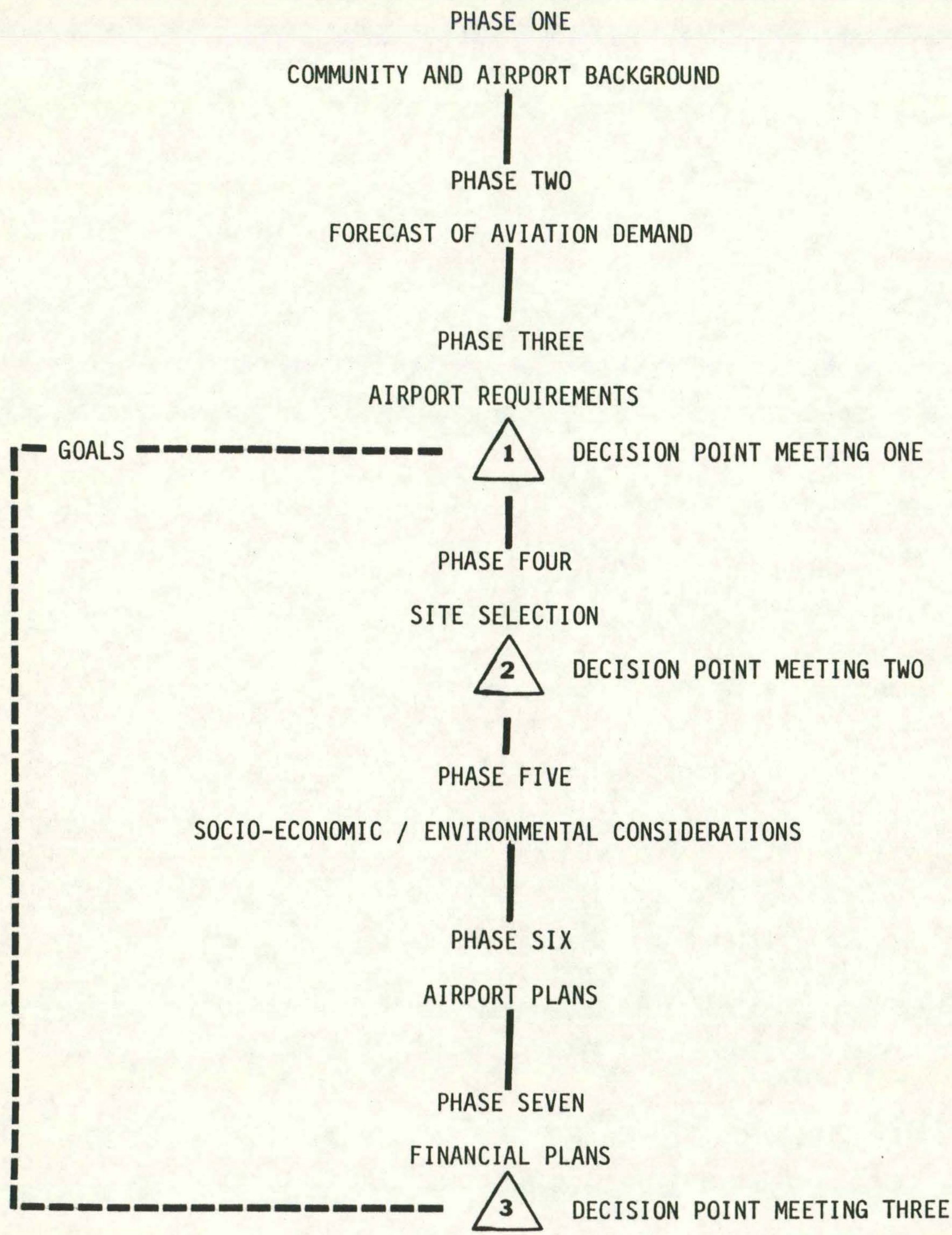


Figure 1: Airport Planning Process

The airport should be a functional part of the community's infrastructure so as to ensure a high degree of compatibility.

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

BACKGROUND

SERVICE AREA

The City of Harland is located in Shelby County Iowa approximately 50 miles northeast of Omaha Nebraska. The community of 5000 persons is an agricultural service center.

The Harlan Municipal Airport is located four miles south of the City. Reference may be made to Figure 2. The airport service area includes all of Shelby County and the northern most part of Pottawattamie County. Population change within Shelby County is projected to experience a very modest increase from 15043 persons in 1980 to 15,606 persons by the year 2000.

In addition to the airport, the City is accessible via U.S. Highway 71 and Interstate Highway 80. At present there is no highway bus service or rail service to the community. The City is served by several motor freight carriers.

There are seventeen manufacturing plants supporting some 460 manufacturing jobs. Major manufactures are noted as follows:

Harlan Manufacturing:	Fertilizer Equipment
Western Iowa Pork:	Pork Carcasses
Charter Data Services:	Data Processing
Variety Distributors:	Wholesale Distributors

On October 9, 1943, the City Council was petitioned to call a special election for the voting of bonds to finance the purchase of a site for the

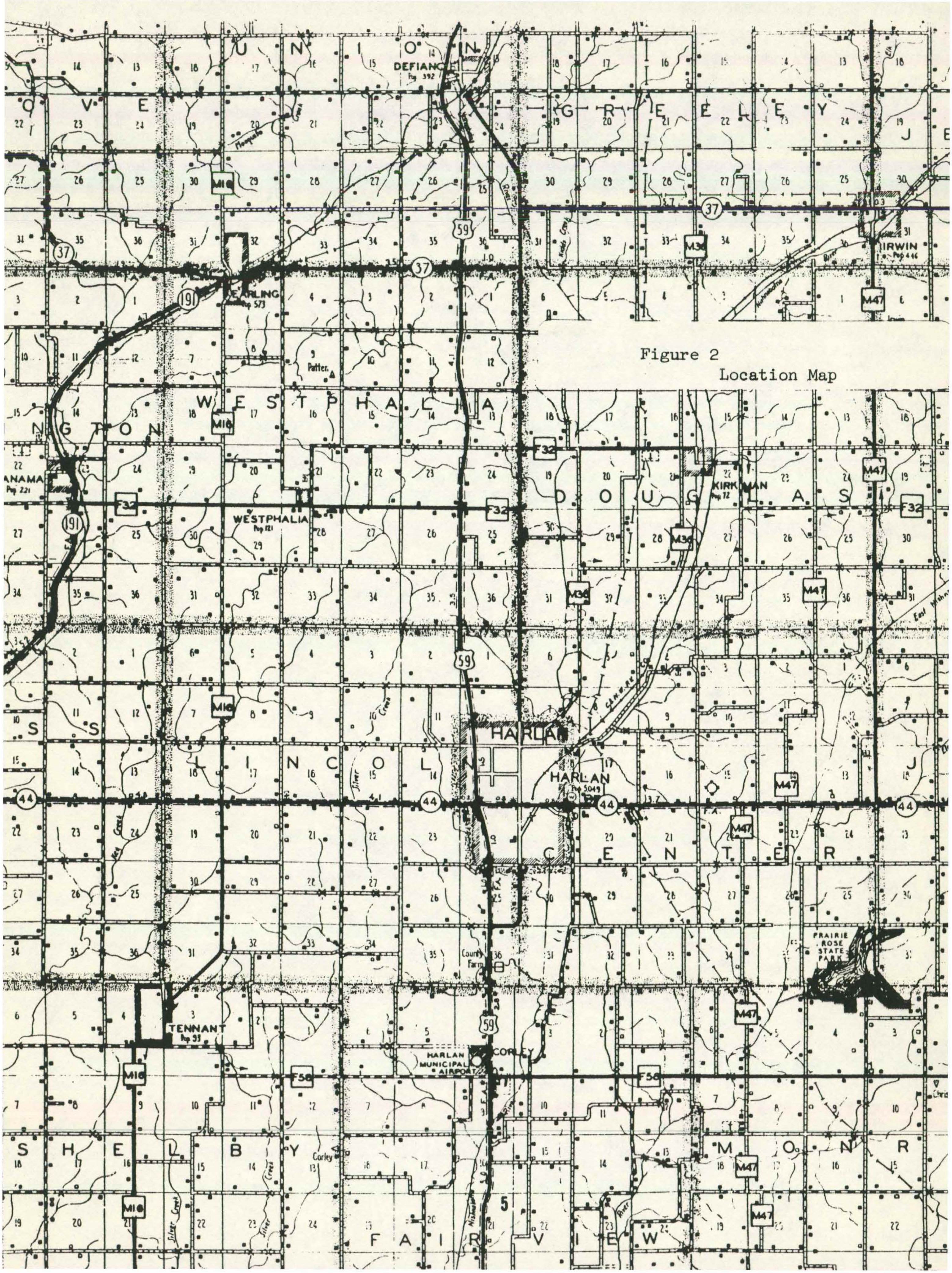


Figure 2

Location Map

construction of a municipal airport. Action was taken by the City Council to hold a special election for the purpose of voting a bond issue of $25000 for the acquisition of an airport site. 829 votes were cast on January 21, 1944. 757 were for the bond issue and 62 were against.

The Harlan Municipal Airport Commission was created in 1944. In the same year, a parcel of property was purchased from C.N. Christensen for $20,000. The initial runway was a turf facility 2700 feet in length.

In 1968, the City obtained a grant from the FAA and issued general obligation bonds to finance the construction of the present hard surface runway. The Airport Commission along with the City Council has continued to improve the airport through the construction of hangar facilities and other support facilities.

The primary runway is 3400' in length and 60' in width. A medium intensity runway light system is in operation. A turf crosswind runway is also maintained. Eight hangar structures and a residential unit is maintained on the airport. A summary of existing airport facilities is as follows:

Airport Elevation: 1217' ASL

Airport Location Point:

Latitude	41° 35' 15" N
Longitude	95° 20' 15" W

Airport Acreage: 131 acres (approx.)

Runway 15/33

Length	3400'
Width	60'

Lighting Medium Intensity Runway Lights

Surface Asphalt

Airport Landing and Navigational Aids

Non-Directional Radio Beacon

Beacon

Lighted Wind Tee

Runway 3/21

Length	1600'
Width	100'
Surface	Turf

The eight hangar structures have a storage capacity for 29 aircraft. Seven of the eight structures are owned by the City. A terminal office and FBO shop are also maintained in Hangar Number Two.

A more detailed discussion of the airport facilities may be found in Section Three "Facility Requirements".

AREA AIRPORTS:

Certificated air carrier service is available at Eppley Field-Omaha, Nebraska. Public airports are also located at Atlantic, Council Bluffs, Denison, Audubon, Manning and Woodbine. Reference may be made to Figure 3.

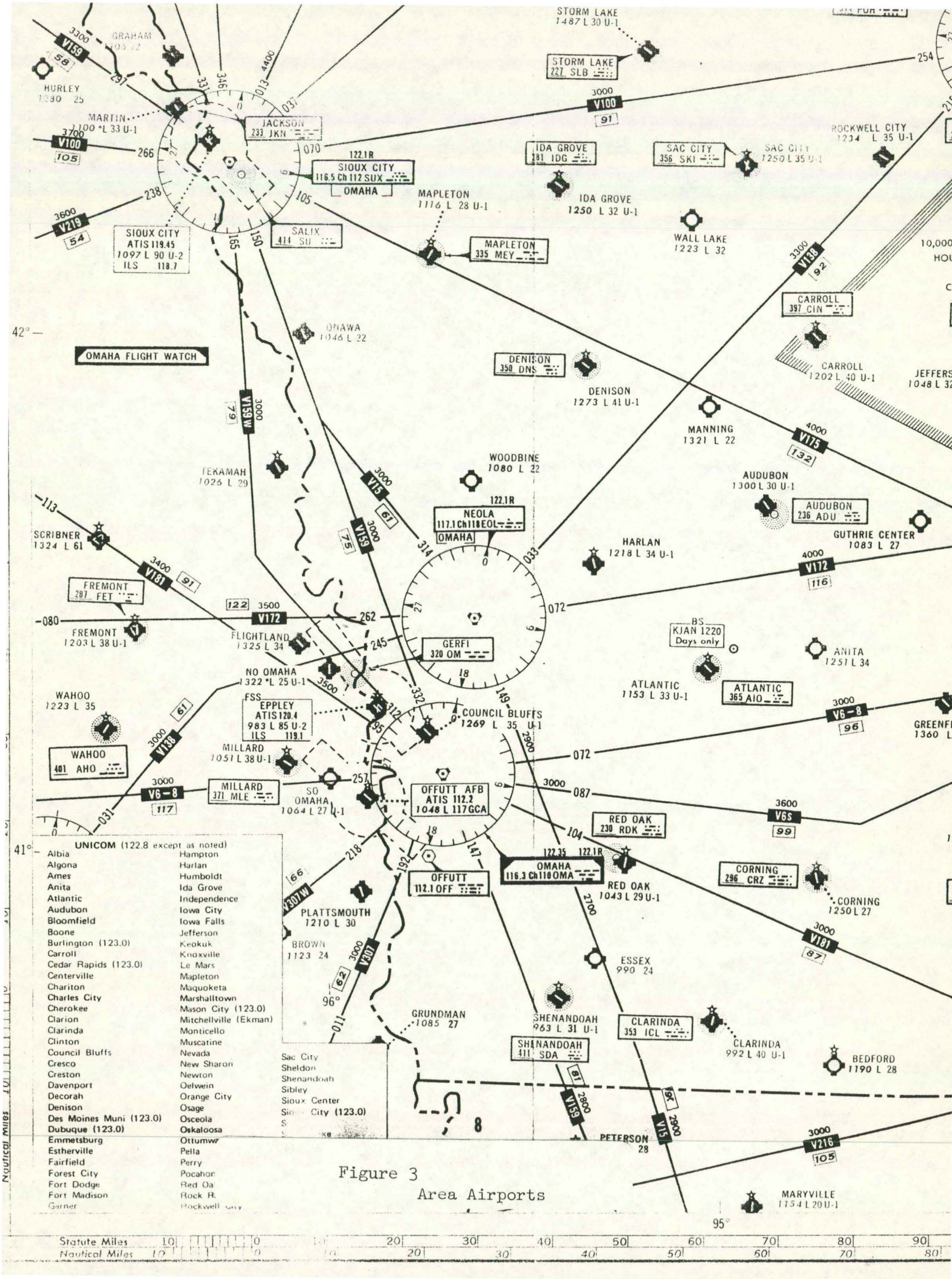


Figure 3

Area Airports

II. FORECAST OF AVIATION DEMAND

FORECAST OF AVIATION DEMAND

INTRODUCTION

Section Two, Forecast of Aviation Demand, provides a basis by which to identify short and long term facility and operational needs for the Harlan Municipal Airport. The forecast provides only what may be termed a trend line. Such a trend line for numbers of based aircraft, air - craft operations, passengers and cargo is subject to events beyond local control. Along a given trend line, actual occurrences will be above and below as demonstrated from a review of historic data.

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

Recently, the State of Iowa experienced a decrease in the number of registered aircraft. This decrease is attributed to the nationwide economic outlook and suggests an ever increasing use of aircraft for business over pleasure flying.

The forecast presented herein is based upon regional historic data supplemented by projections developed by the Iowa Department of Transportation. The annual number of registered aircraft is used as the primary data base for estimating future numbers of registered and based aircraft.

It should also be noted that aircraft are not necessarily based within the County where registered.

> "The choice of a site for basing as aircraft is not always directly related to the residence of the owner. The choice may be affected by such factors as hangar rental and maintenance free structures, availability of navigational aids, runway length and condition, etc."
>
> Source: 1978 SASP, p. 38

The above explains some of the annual variations of general aviation aircraft registered or based at one airport or another. Those air - ports which now enjoy numbers of based aircraft owned by persons from outside the community or airport service area, may in the future lose their historic dominance.

> "Ideally, as airport development improves the quality of airports throughout the state, the attractiveness of the airports will become more similar causing the number of aircraft based in a county to more nearly equal the number registered in the county."
>
> Source: 1978 SASP, p. 39

BASED AIRCRAFT

NATIONAL AND STATE TRENDS

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

TABLE 1 : REGISTERED AIRCRAFT, 1960-1997, U.S.A. and State of Iowa

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

(a) FAA Estimate
(b) DOT Projection (1978 SASP, p.38)

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

Table 2 summarizes historical and future numbers of active general aviation aircraft.

TABLE 2 : U.S ACTIVE GENERAL AVIATION AIRCRAFT BY TYPE, 1975-1992

		Fixed Wing (In thousands)			
		Piston		Turbo	
Year As Of January 1	Total	Single Engine	Multi-Engine	Prop	Jet
1975	161.0	131.5	19.7	2.1	1.6
1976	168.0	136.6	20.3	2.5	1.7
1977	178.0	144.8	21.3	2.5	1.9
1978	184.3	149.3	21.5	2.9	2.3
1979	198.8	160.7	23.2	3.1	2.5
1980*	208.0	167.1	24.5	3.4	3.0
1981*	218.7	175.8	25.0	3.8	3.2
1985*	254.5	202.1	28.8	5.3	4.3
1990*	298.1	234.0	33.5	6.8	5.7

* Estimate

Source: GAMA General Aviation Statistical Data, 1980 Edition
The long range forecasts are projections by the Federal Aviation Administration (FAA)

Single engine fixed wing piston powered aircraft made up 80% of the total active G-A fleet in 1980. By 1990, this percent of total is expected to decrease slightly to 78.5%. However, the total number of units will increase from 167,100 in 1980 to an estimated 234,000 by 1990.

Multi-engine piston aircraft are expected to increase by absolute numbers while making up a smaller percentage of the total fleet. Turbo-prop and Turbo-jet aircraft are expected to increase in absolute numbers while making up a larger share of the total fleet

The number of hours flown are estimated to increase through 1990. In 1975, 31,900,000 hours were flown by general aviation aircraft while in 1979, 41,100,000 hours were flown. By 1990, 60,900,000 hours are expected to be flown.

The average hours flown by all aircraft in 1974 was 195. This average decreased in 1975 and 1976 to 191 while increasing to 194 and 198 in 1977 and 1978 respectively. An increasing number of the hours flown are for business. In 1980, it was reported by the General Aviation Manufactures Association that 90% of the industry sales were for business purposes.

REGIONAL TRENDS

Registered historical numbers of general aviation aircraft for a nine county region are summarized in the following table. The total number of aircraft has remained somewhat stable over the ten year period (1971-1981) with the exception of 1980 where there was a significant increase followed by a significant decrease in 1981.

The significant decrease can be explained in part by the IDOT efforts to identify those registered aircraft which are inactive and should be excluded.

TABLE 3 : REGISTERED GENERAL AVIATION AIRCRAFT, NINE COUNTIES, 1971-1981

Year	Adair	Audubon	Cass	Carroll	Crawford	Monona	Pottawattamie	Shelby
1981	22	10	30	27	11	28	56	32
1980	26	10	35	28	23	57	66	37
1979	13	4	25	21	16	32	44	32
1978	12	4	23	21	17	32	44	28
1977	12	2	22	14	17	35	44	24
1976	18	12	21	20	29	39	62	28
1975	15	6	23	18	21	34	57	25
1974	14	5	30	21	21	34	57	24
1973	21	8	33	16	16	38	54	26
1972	26	8	33	13	20	35	64	31
1971	10	4	33	21	17	30	52	23

Source: IDOT 1977-1981
FAA 1971-1976

As would be expected, Pottawattamie County historically recored the largest number of registered aircraft followed by Shelby, Cass and Monona Counties. The Airport Master Plan Report for the Council Bluffs Municipal Airport projected the following future numbers of registered aircraft for Pottawattamie County: 1985 = 83; 1990 = 94 and the year 2000 = 117 registered aircraft. (P.III-12 Airport Master Plan, Council Bluffs)

SHELBY COUNTY TRENDS

As noted in Table 4 Shelby County has experienced a certain amount of annual variation in the numbers of registered aircraft for the years from 1965 through 1981. From a low of 14 registered aircraft in 1965, the number of registered aircraft increased to a high of 37 in 1980.

TABLE 4 : ANNUAL VARIATION, REGISTERED AIRCRAFT, SHELBY COUNTY, 1965-1980

Year	Actual	Trend Line	Deviation
1981	32	34.4	-2.4
1980	37	33.0	+4.0
1979	32	31.7	-0.3
1978	28	30.4	-2.4
1977	24	29.2	-5.2
1976	28	28.1	+0.1
1975	25	27.1	-2.1
1974	24	26.1	-2.1
1973	26	25.3	-1.3
1972	31	24.5	+6.5
1971	23	23.8	+0.8
1970	20	23.2	-3.2
1969	23	22.7	+1.7
1968	21	22.2	-1.2
1967	29	21.8	+7.2
1966	22	21.5	+0.5
1965	14	21.3	-7.3

In order to examine the historic data, a trend line as fitted by a non-linear equation, $yc=a + bx + cx^2$ where y = aircraft: a,b,c are constants and x is an assigned value.

(I) $\Sigma y = Na + c\Sigma x^2$ $a=25.29$

(II) $\Sigma xy = b\Sigma x^2$ $b=0.82$

(III) $\Sigma x^2 y = a\Sigma x^2 + c\Sigma x^4$ $c=0.04$

The registered aircraft for each year (1965-1981) is presented in the preceeding table under the column entitled trend line. As noted, the actual number of registered aircraft deviates above and below the trend line. Reference may be made to Figure 4 .

Reasons for the deviation are unknown, but, as previously discussed, such can for the most part be explained in terms of local decisions to buy and sell aircraft from one year to the next.

The trend line also reveals an upward trend in aircraft registrations. Over the 17 year period, calculated values experienced an increase from 21.3 aircraft (1965) to 34.4 (1981) for an average annual increase of 0.77 aircraft per year.

Registered aircraft as of September 9, 1981 for Shelby County are summarized in Table 5 .

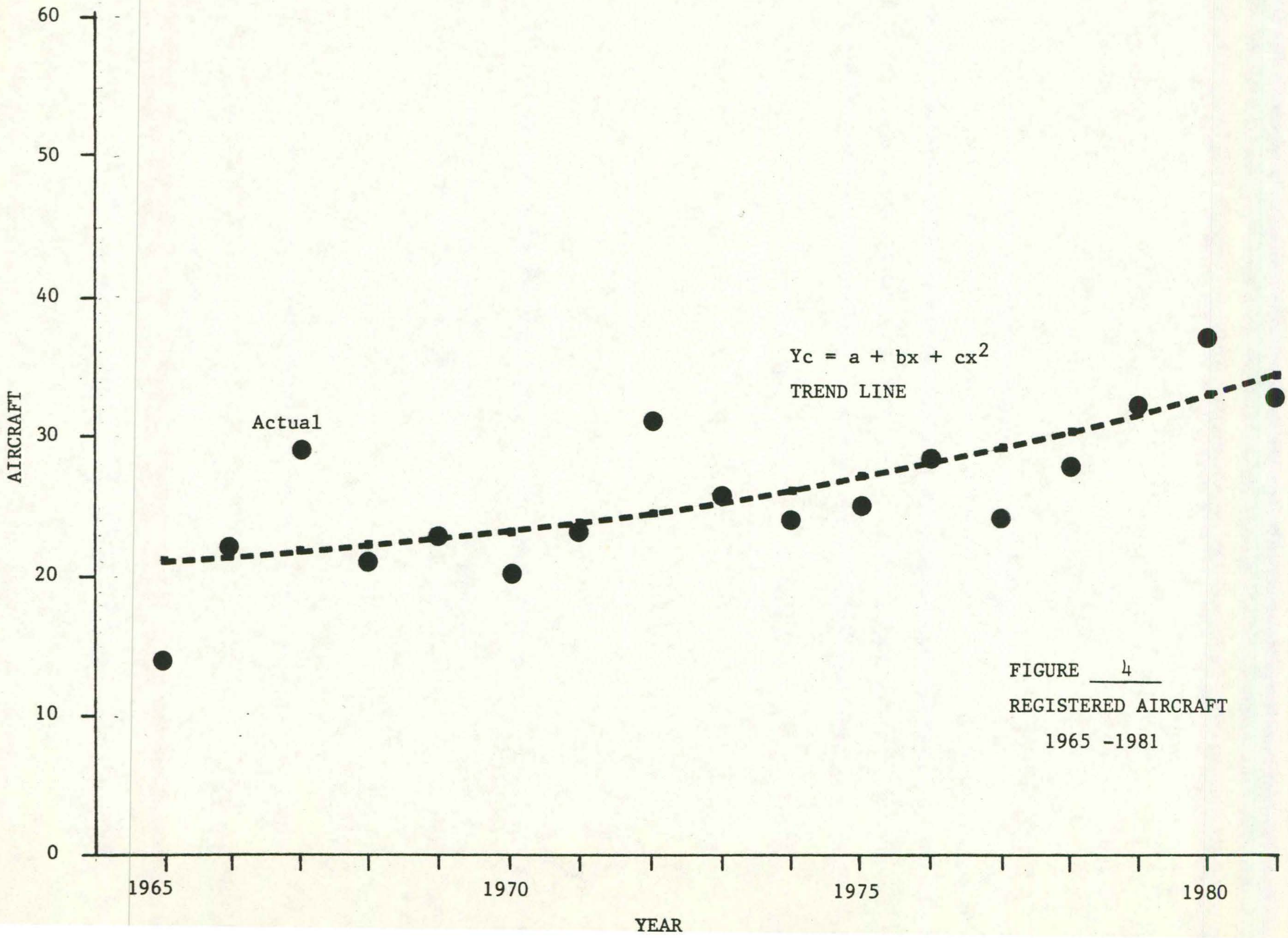


FIGURE 4
REGISTERED AIRCRAFT
1965 -1981

TABLE 5 : REGISTERED AIRCRAFT, SHELBY COUNTY, 9/9/81

Owner	Address	Aircraft Model
Grote, Leroy	Earling	Cessna 242
Paulsen, Robert	Harlan	Antique 0112
Bailey, Glen	Elkhorn	Cessna 172
Pash, Olin	Harlan	Pitts-J1C
Western Engineering	Harlan	Smith Aero 600A
SAPP	Harlan	Cessna 182
Scott, Paul	Harlan	Piper J3
Anderson, Charles	Elkhorn	PA 32-300
Jensen,M & Heilesen,B	Harlan	PA 12
Hansen, Monte	Harlan	Piper J3
Burmeister, Richard	Harlan	Bellanca 17-30A
Kohl, Clyde	Harlan	Cessna 172
Donlin	Harlan	PA 23 250
Elmquist, Gerald	Elkhorn	Taylorcraft 0416
Leistad, Inc.	Elkhorn	PA 28 - 181
Harris, R.	Harlan	Stits PBoy JA 34
Pash, Olin	Harlan	PA 23-250
STS Bins	Defiance	Cessna 150
Tredway Impl.	Harlan	Cessna 182
Squealer Feeds	Harlan	PA 24 250
Musich, Gerald	Harlan	Piper J3
Western Engineering	Harlan	Beech V35B
Ahrenholtz, Clark	Definance	Cessna 150
Pauley, Paul	Harlan	Cessna 182
Hansen, Stephen	Kirkman	PA 18

TABLE 5 Cont.

Owner	Address	Aircraft Model
Scott, L & Harris R.	Harlan	PA 20
Goetz, Donald	Definance	Cessna 182
Jensen, Ronald	Harlan	Mooney 0212
Frazier, Orville	Harlan	Cessna 182
Scott, Larry	Harlan	Cessna 140
Skyline Flyers	Harlan	Cessna 182
Goetz, Donald	Harlan	Cessna 270

Source: IDOT, 9/9/81

Of the 32 aircraft registered in Shelby County,none have a gross landing and/or take off weight in excess of 6000 pounds. Two of the registered aircraft are twin engine piston aircraft while the remainder are single engine aircraft.

The mailing address for the 1981 registratants is summarized as follows:

Harlan	23 aircraft
Earling	1
Elkhorn	4
Defiance	3
Kirkman	1

As previously discussed, a number of aircraft registered in the County maybe based at airports located in adjacent counties. Likewise, aircraft registered elsewhere are based at the Harlan Municipal Airport. The latter aircraft are summarized below: (and on the next page)

Minden	1 aircraft

Avoca	1 aircraft
Neola	1
Hancock	1
Oakland	1

The airport service area coincides with Shelby County and, at present, extends into the northeast portion of Pottawattamie County.

The calculated trend line may also be extended into the future and would be a reasonable indicator of future aircraft registrations through 1990. Beyond 10 years, most estimates are questionable and should be reviewed. As such, an estimate of aircraft registration from 1990 to 2000 should be based upon actual data for the previous ten years (1980 - 1989).

For purposes of estimating the number of based aircraft, the assumption is made that based aircraft will approximate the number of registered aircraft.

Population change represents another measure of anticipated aircraft registration. The 1978 State Airport Systems Plan Update indicates that the average number of registered aircraft per 10000 population increased from a 1982 estimate of 11.37 to 14.3 aircraft per 10000 population in 1997. In 1981, Shelby County had 21.9 registered aircraft per 10000 population. This ratio of aircraft not only exceeds the state average but the national average as well. Table 6 summarizes future number of based aircraft expected at Harlan through the year 2000. The high estimate is based upon the calculated trend line (average annual increase, 1965-1981) while the low is based upon future population change.

TABLE 6 : BASED AIRCRAFT, HARLAN MUNICIPAL AIRPORT, 1980-2000

Year	High	Middle	Low
1980	34	33	32
1981	35	34	32
1982	36	34	32
1983	37	35	33
1984	38	36	33
1985	38	36	33
1990	42	37	34
1995	46	39	34
2000	51	41	34

1) High: Based upon $Yc = a + bx + cx^2$ trend line from 1965 to 1981 or an average annual increase of 0.77 aircraft.

2) Middle: Average of the high and low estimates.

3) Low: Based upon 1981 ratio of 21.93 aircraft per 10000 population and OPP population estimates for Shelby County.

For long range planning purposes the middle line was used. Actual numbers of based aircraft will vary, as in the past, above and below this estimate. Reference may be made to Figure 5 regarding a graphic presentation of future numbers of based aircraft.

The based aircraft mix is expected to consist of single engine and light twins (aircraft with a gross weight under 8,000 pounds). While there are no heavy twins (8,000 to 12,5000 pounds) based at the airport, there

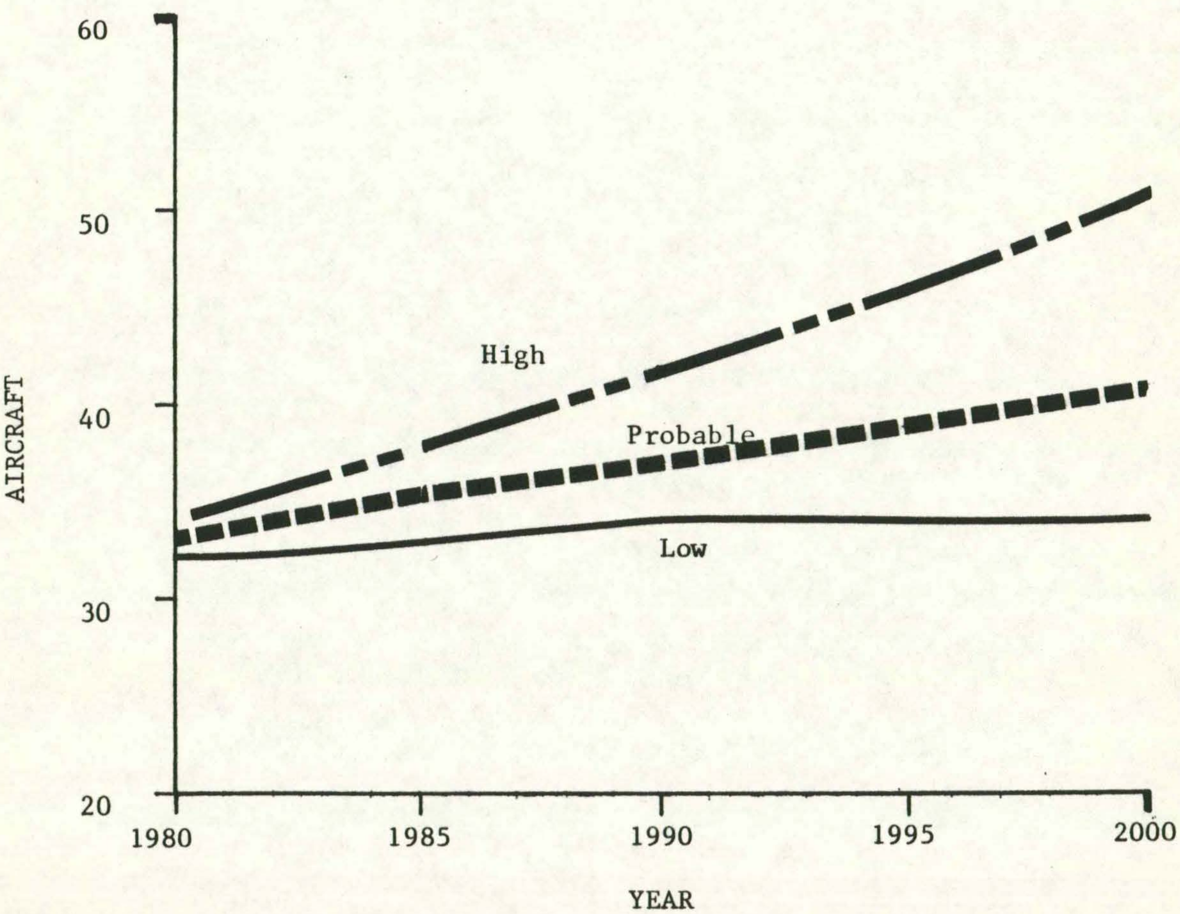


FIGURE 5 BASED AIRCRAFT

1980 - 2000

exists the possiblity that such aircraft could be based at the facility. Existing industry coupled with aggressive efforts by the community to attract new industry enhances the probability that one or more firms may acquire such aircraft.

TABLE 7 : BASED AIRCRAFT MIX

	1980	1985	1990	2000
Class A	--	--	--	--
Class B	--	--	--	--
Class C	--	1	1	1
Class D & E	33	35	38	40

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

AVIATION OPERATIONS AND OPERATIONS MIX

ANNUAL, ITINERANT AND LOCAL OPERATIONS:

An aircraft operation is defined as the airbourne movement of aircraft in controlled and non-controlled airport terminal areas and about given enroute fixes or at other points where counts can be made. Each movement counts as one operation. A "touch and go", for example, counts as two (2) operations.

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

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

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

1. Total Annual Aircraft Operations
   - Total Annual Local
   - Total Annual Itinerant

2. Peak Day and Peak Hour Operations

Aircraft operations are a function of the following:

1. Based Aircraft
2. Airmen
3. Airport Facilities
4. Aircraft Maintenance Services
5. Airport Management
6. Airport Hinterland Socioeconomic Characteristics

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

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

The same variables were used to estimate itinerant operations:

$$\text{Log (Annual Itinerant Operations)} = 1.865 + 0.605 \log \text{(Based Aircraft x County Airmen)}$$

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

The following methodology was used to estimate the total annual number of aircraft operations for the Harlan Municipal Airport through the year 2000:

1. The model developed in the 1976 SASP (using airmen and aircraft as variables) was assumed a valid basis by which to estimate the number of operations by aircraft based at Harlan.
2. Seasonal variations are expected from increased pleasure flying, crop dusting and student activity during the summer months. Such variations may be accounted for from increased aviation fuel sales.
3. Recent economic trends are expected to alter the traditional relationship of itinerant and local operations where one-third of the total operations were typically itinerant. It would appear that the larger share of the total operations will be itinerant as student traffic and pleasure flying level off.

Reference may be made to the following table concerning an estimate of total annual aircraft operations.

TABLE 8 : TOTAL ANNUAL AIRCRAFT OPERATIONS, 1980 - 2000

Year	Annual Aircraft Operations
1980	22,712
1985	24,368
1990	25,342
1995	26,782
2000	28,223

TABLE 9: TOTAL ANNUAL ITINERANT & LOCAL OPERATIONS, 1980-2000

Year	Annual Itinerant	Annual Local
1980	9,309	13,409
1985	10,135	14,233
1990	10,626	14,716
1995	11,360	15,422
2000	12,102	16,121

The majority of aircraft operations are expected to be made by light twin and single engine aircraft. An increasing use of the airport is expected by heavy twin engine aircraft as business usage increases. For planning purposes, the assumption is made that a minimum of one Class C aircraft will be based at the facility within the twenty year planning period. In addition, a number of itinerant Class C aircraft use the airport from time to time. The anticipated operational mix of aircraft is summarized in the following table.

TABLE 10: OPERATIONAL MIX, 1980 -2000

Year	A	B	C	D + E
1980	-	-	818	21894
1985	-	-	877	23491
1990	-	-	912	24430
1995	-	-	964	25818
2000	-	-	1016	27207

PEAK HOUR OPERATIONS

Peak hour operation estimates were obtained from a least squares regression line developed by the Iowa Department of Transportation (p. 42, 1978 SASP) which explained the relationship between total annual and peak hour operations.

TABLE 11 : PEAK HOUR OPERATIONS, 1980 -2000

Year	Annual Operations		Peak Hour Operations
1980	22712	.0015(1)	34
1985	24368	.0014	34
1990	25342	.0014	35
2000	28223	.0013	37

1. From 1978 SASP (Peak Hour Divided by Total Annual Operations)

Peak hour operations data is used to assess airport capacity. Reference may be made to FAA AC 150/5060-3A. "Airport Capacity Criteria Used In Long-Range Planning" reveals the following generalities concerning airport capacity.

Runway Configuration:

1. Single Runway:
   a. Arrivals = Departures
   b. Aircraft Mix One
   c. Practical Hourly Capacity (PHOCAP)
      1) IFR: 53 Operations/hour
      2) VFR: 99 Operations/hour
   d. Practical Annual Capacity (PANCAP) 215,000 Operations Per Year

2. Intersecting Runways:

   a. Arrivals = Departures

   b. Aircraft Mix One

   c. Practical Hourly Capacity (PHOCAP)

      1) IFR: 61 Operations/hour

      2) VFR: 99 Operations/hour

   d. Practical Annual Capacity (PANCAP) 220,000 Operations per year

These capacity estimates are based upon the following:

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

With only a NDB, the IFR capacity is ten operations per hour rather than 61 with full instrumentation.

AIR PASSENGERS AND AIR FREIGHT

AIR PASSENGER:

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

TABLE 12 : AIR PASSENGERS, 1980 - 2000

Year	Passenger
1980	13,964
1985	15,203
1990	15,939
2000	18,153

AIR FREIGHT:

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

TABLE 13 : AIR CARGO, 1980 -2000

Year	Air Cargo (in tons)
1980	56
1985	61
1990	64
2000	73

Based upon the forecast of aviation demand, a general utility airport is espected to meet aviation demand expectations over the twenty year planning period.

PHASE ONE	1980-1984	General Utility
PHASE TWO	1985-1989	General Utility
PHASE THREE	1990-2000	General Utility

Justification for a Basic Transport (BT) level of development does not appear to exist.

III. FACILITY REQUIREMENTS

FACILITY REQUIREMENTS

INTRODUCTION

Section Three outlines those facilities required to meet and satisfy anticipated aviation activity through the year 2000. Facility requirements outlined herein are based upon Federal Aviation Administration (FAA) and IDOT standards. It should be noted that the Iowa Department of Transportation has taken exception to conformance with FAA standards in some cases. The most salient of these relate to the crosswind runway.

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

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

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

As noted in Section II, the Airport should ultimately be developed to General Utility Standards. Section Three examines the existing level of service provided by each air and landside component.

RUNWAYS AND TAXIWAYS

RUNWAY ALIGNMENT

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

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

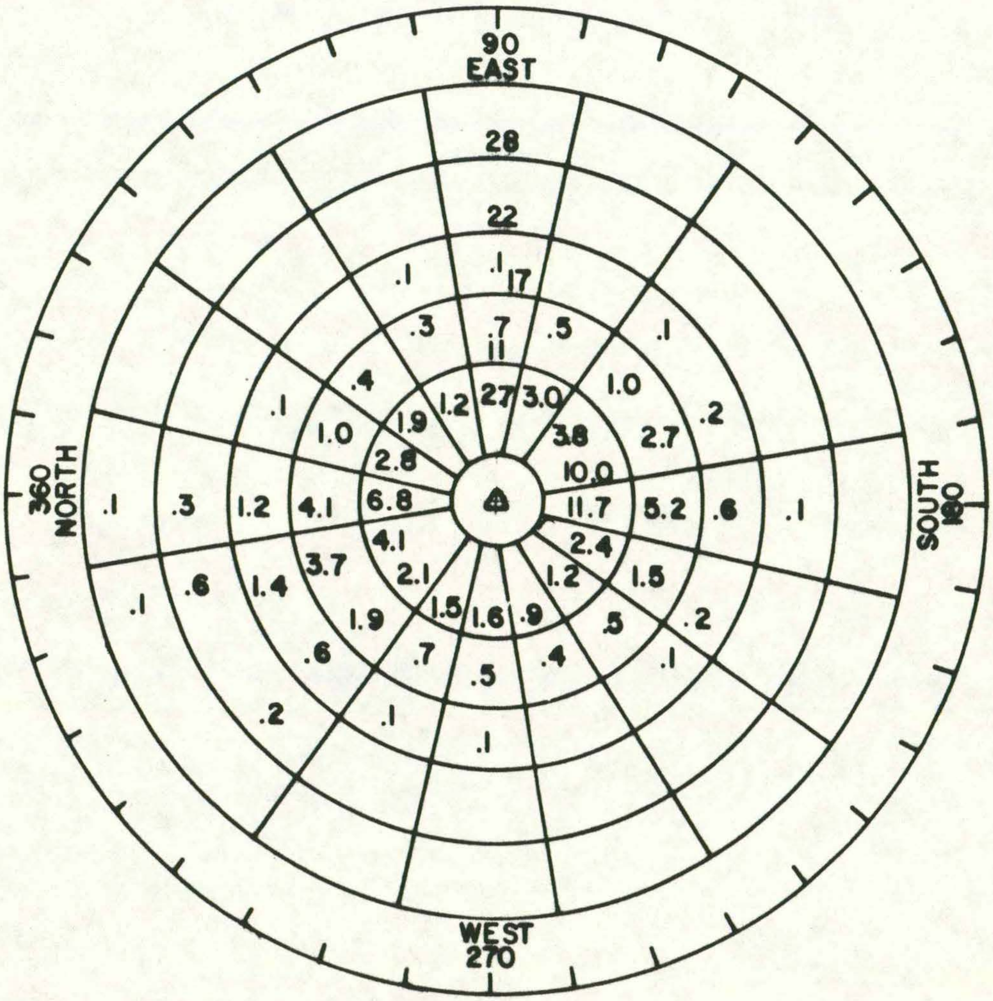
Since there is no wind data available for the Harlan Municipal Airport, wind data tabulated at Eppley Airfield in Omaha, Nebraska was used for determing wind coverage by the existing runway alignments. Reference may be made to Figure 6 regarding the percentage of wind by knots and direction.

The orientation for the existing runway facilities is as follows:

Primary Runway	RW 15/33	N 25° W (true)
Crosswind Runway	RW 3/21	N 40° E (true)

Based upon Eppley Airfield data and a 10.5 knot crosswind component value, the primary runway provides a 94.9% ± coverage. It should be noted that local topographic conditions may alter local wind characteristics somewhat.

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



IN KNOTS - %

Figure 6

CALMS (0-3) KNOTS
11.5%

ALL WEATHER WIND ROSE
Source : NOAA
Station : Eppley Airfield
Omaha, Nebraska
Observations Period :
Jan. 1965 - Dec. 1974

RUNWAY LENGTH AND WIDTH

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

Runway length requirements were obtained from FAA AC 150/5300-4B, CHG. 2, page 14 referenced herein as Figure 7 . The runway length curves are based upon performance information from aircraft flight manuals and assumes the following:

- Zero headwind component
- maximum certified takeoff and landing weights
- Optimum Flap setting for the shortest runway length
- Relative humidity and runway gradient were accounted for by increasing the takeoff or landing distance of the groups most demanding aircraft by 10 percent.

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

Given the following:

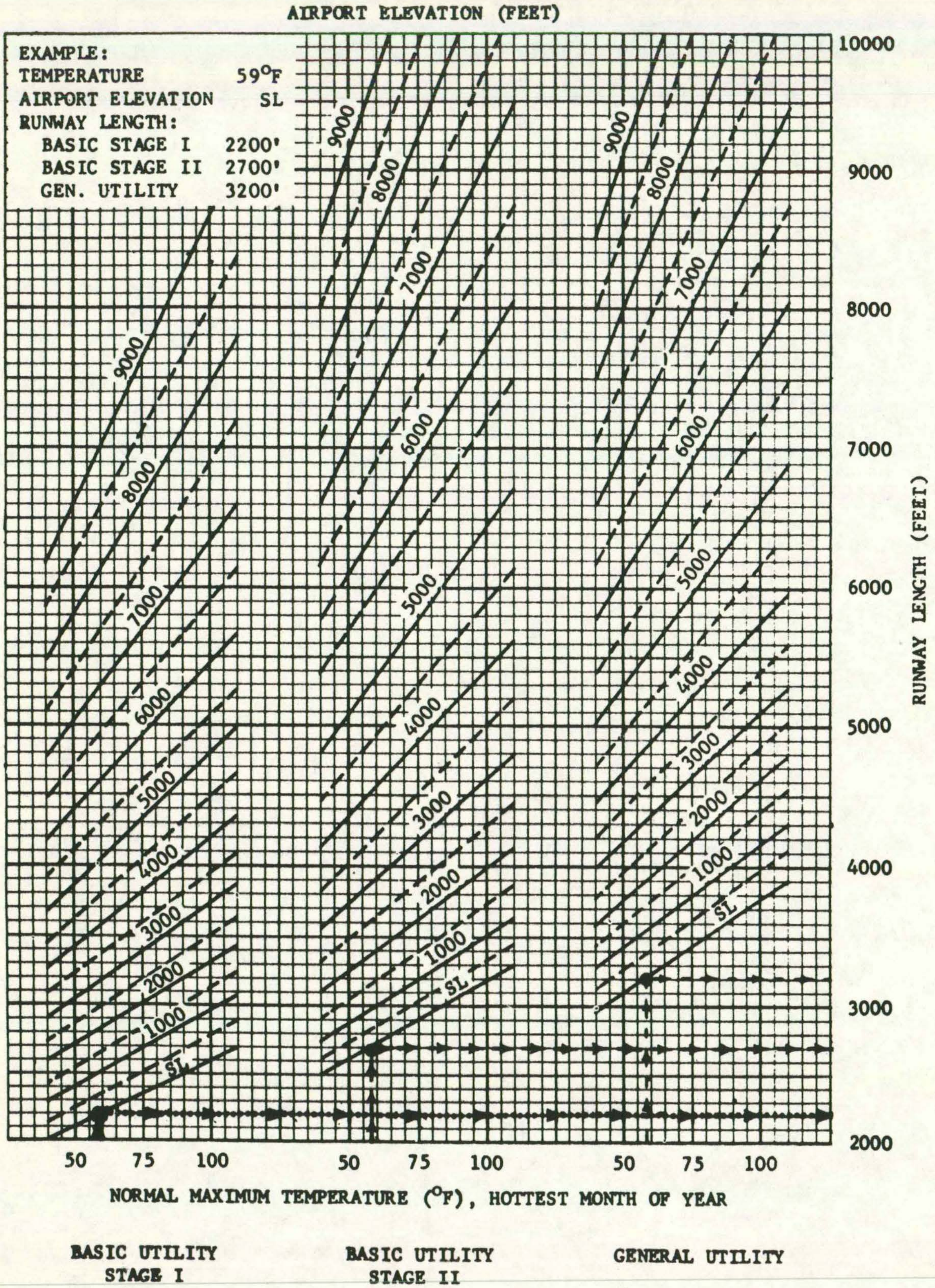
- Elevation: 1228 feet (ASL)
- Temperature: 87.0°F (Omaha)

The runway length reguirement for the Harlan Municipal Airport is as follows:

- General Utility Airport: 4100 feet (Figure)

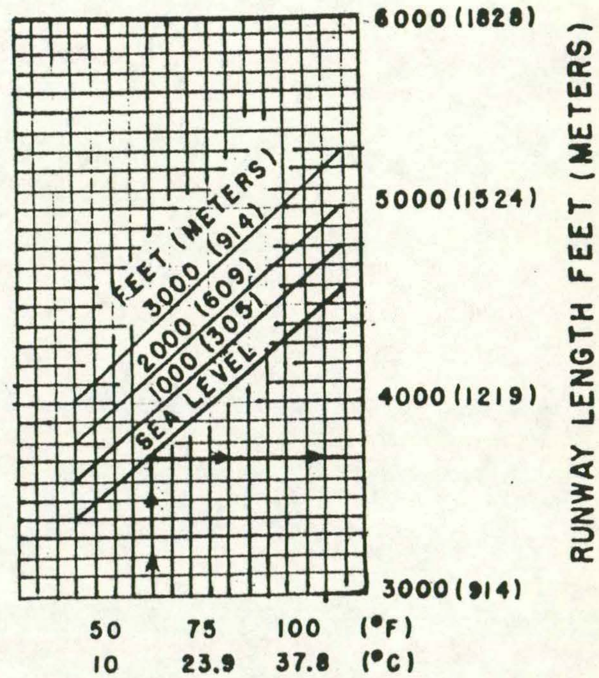
  4400 feet (Figure)

As noted, the desired runway length to accommodate those aircraft with a


AIRPORT ELEVATION (FEET)
EXAMPLE:
TEMPERATURE 59°F
AIRPORT ELEVATION SL
RUNWAY LENGTH:
BASIC STAGE I 2200'
BASIC STAGE II 2700'
GEN. UTILITY 3200'
9000
8000
7000
6000
5000
4000
3000
2000
1000
SL
RUNWAY LENGTH (FEET)
10000
9000
8000
7000
6000
5000
4000
3000
2000
50
75
100
NORMAL MAXIMUM TEMPERATURE (°F), HOTTEST MONTH OF YEAR
BASIC UTILITY STAGE I
BASIC UTILITY STAGE II
GENERAL UTILITY

Source: FAA AC 150/5300-4B CHG 2

Figure 8

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

RUNWAY LENGTH TO ACCOMMODATE AIRPLANES
HAVING A SEATING CONFIGURATION OF 10
PASSENGER SEATS OR MORE

gross weight less than 12,500 pounds and having ten (10) passenger seats or more is 4400 feet. Where it is not feasible to construct a runway to the desired length, no less than 80 percent of the desired length should be constructed. While the crosswind runway should be the same length as the primary runway, it should in no case be less than 3520 feet.

For planning purposes an ultimate length of 4100 feet is recommended. Based upon anticipated use, it would not appear to be cost effective to extend the runway length beyond 4100 feet.

The runway width should be no less the 75 feet for a general utility runway.

TAXIWAY

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

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

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

The taxiway should be no less than 40 feet in width. Existing and future taxiways providing access to hangar facilities need not be more than 20 feet in width in most cases.

TABLE 14 : RUNWAY AND TAXIWAY NEEDS

	RUNWAY		TAXIWAY	
PERIOD	Length	Width	Length	Width
1980-1984	4100	75	Parallel	40'
1985-1989	4100	75	Parallel	40'
1990-2000	4100	75	Parallel	40'

HOLDING APRON

Where a partial or full parallel taxiway is not recommended, an aircraft turnaround is recommended for each runway end. A typical turnaround is depicted in Figure 9 .

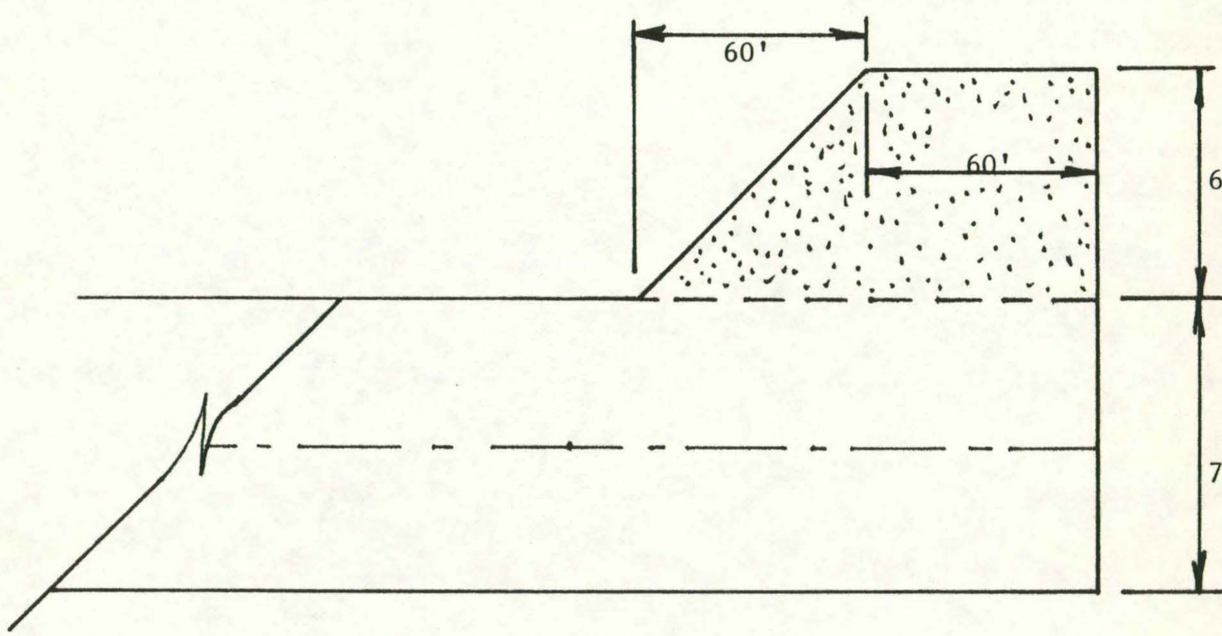


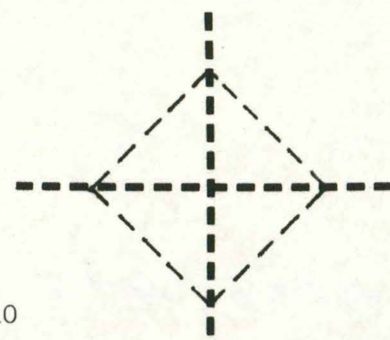
Figure 9 TYPICAL TURNAROUND

RUNWAY GRADE CHANGE AND VISIBILITY

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

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

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



Visibility Zone

Figure 10

- Runway grades; terrain etc. must be such that a line of sight is maintained within the visibility zone of the intersecting runways 5 feet above the centerlines.

  Reference may be made to FAA AC 150/5300-4B concerning the location of runway visibility points.

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

Traverse grades on the runway should be at least one percent and no more than two percent. Within ten feet of the pavement edge, the grade should have a minimum slope of three percent and not to exceed five percent.

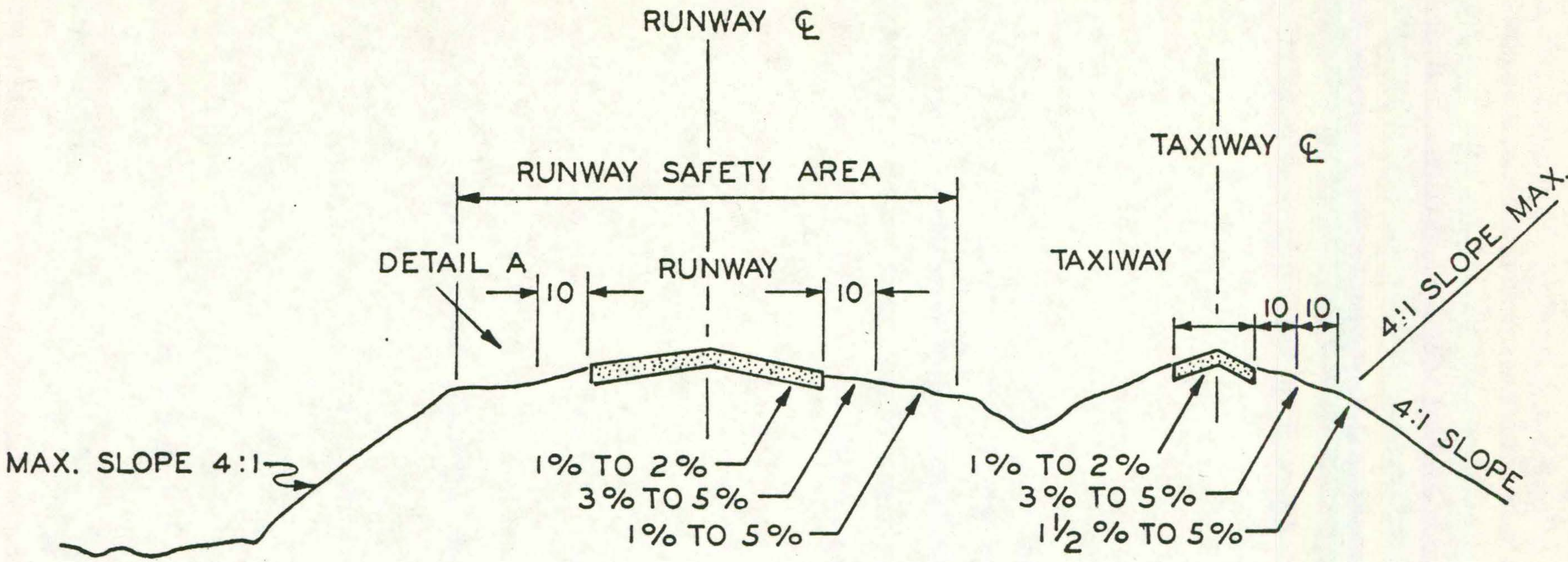
Reference may be made to Figure 11 concerning a typical runway cross section.

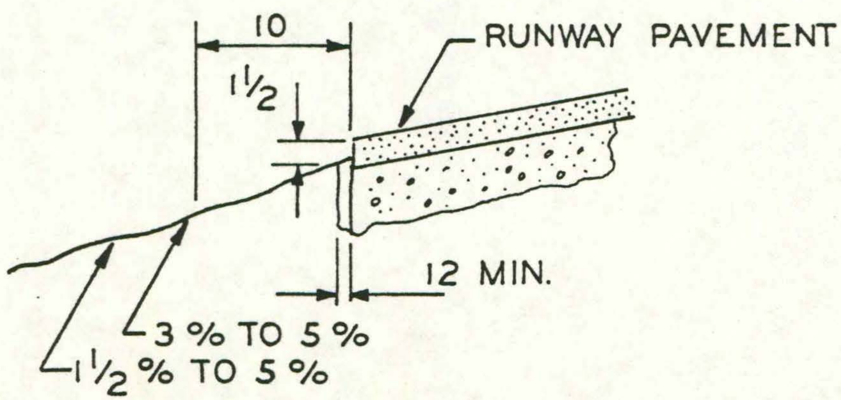
A graded area beyond the runway surface is referred to as the runway safety area. The area, located symmetrically about the runway, extends outward from the runway centerline 75 feet and 200 feet beyond the runway ends. The primary function of the runway safety area is to provide a degree of safety should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

LATERAL WIDTHS AND CLEARANCES

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

- Runway centerline to taxiway centerline	200'
- Runway centerline to building restriction line (BRL) and airplane tiedown area	250'
- Runway centerline to property line (PL)	250'
- Taxiway centerline to airplane tiedown area and to fixed or movable obstacle	50'
- Taxiway centerline to hangar structure one way traffic	37.5' min.
- Runway safety area width	150'





DETAIL A

TYPICAL CROSS SECTION

Figure 11

RUNWAY AND TAXIWAY PAVEMENT DESIGN

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

The "As-Built" drawings prepared in 1968 depict a flexible pavement consisting of 2 1/2 inch bituminous surface course, 4 inch bituminous base course and a 5 inch subbase for RW 15/33.

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

The final design must be based upon a sufficient number of soil borings and soil tests. Reference may be made to the "As-Built" drawings prepared in 1968 for an indication of soil characteristics.

Reference may also be made to FAA AC 150/5320-6C, "Airport Pavement Design and Evaluation" regarding a more detailed discussion. A typical pavement cross section is depicted in figure 11.

PAVEMENT MARKINGS

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

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

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

  Threshold markings consist of eight 150' x 12' stripes. Each stripe is separated by 3 feet except the center where the separation is 16 feet. Where the runway is less than 150 feet, the width of the stripes and separation is reduced proportionally.

Taxiways are marked by a continuous stripe, 6 inches in width, along the taxiway centerline. Holding lines are located on the taxiway 100 feet from the runway edge. Additional information on pavement markings may be obtained from FAA AC 150/5340-1D.

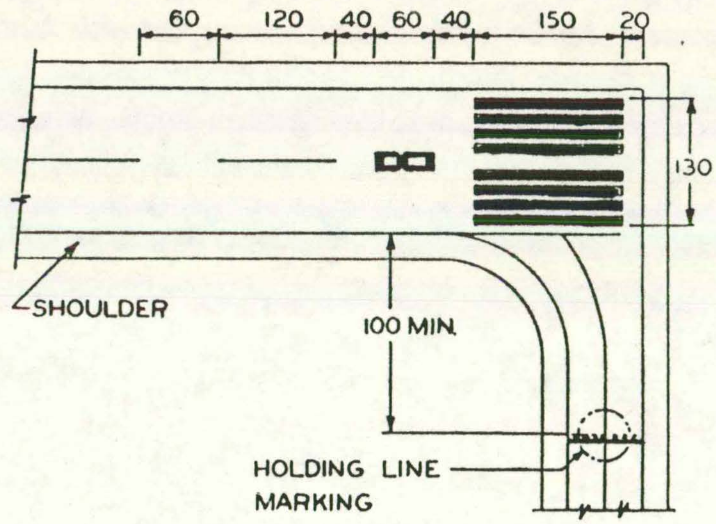


Figure 12 NPI MARKINGS

LANDING AND NAVIGATIONAL AIDS

RUNWAY AND TAXIWAY LIGHTING

A Medium Intensity Runway Light System (MIRL) is currently in operation on RW 15/33. The existing turf runway is not lighted. The existing system on RW 15/33 consists of a L-833 transformer and stake mounted L-802 and L-822 light fixtures.

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

Runway lights are used to outline the edges of the runway during periods of darkness or low visibility. Each runway edge light fixture emits a white light except on instrument runways where yellow is substituted for white on the last 2000 feet or one-half the runway length which ever is less. The yellow lights are located on the end opposite the landing threshold or instrument approach end. The edge light fixtures should be located no more than ten feet from the defined runway edge and spaced

200 feet on center. The runway light stake should be no less than 30 inches high due to snow removal and grass cutting. The lights, located on both sides of the runway should be directly across from each other and perpendicular to the runway centerline. Special requirements exist at runway intersections.

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

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

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

Reference may be made to the following FAA Advisory Circulars:

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

VISUAL APPROACH SLOPE INDICATOR, VASI

A 2-box VASI system is recommended for installation on the primary and crosswind runways. The VASI-2 consists of 2 light units which emits a red and white beam of light. The color beams enable the pilot to determine if his approach is high, on course, or low. The VASI-2 would benefit the facility because of potential noise impacts and structures in the area. Installation of a VASI system is recommended by IDOT when there are 10,000 or more annual operations.

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

RUNWAY END IDENTIFIER LIGHTS, REIL

Runway End Identifier Lights (REIL'S) should be in operation of each runway end. REIL'S should be located in line with the threshold lights, 75 feet from the runway edge. IDOT recommends installation of a REIL system when the annual operations exceed 3000.

Reference may be made to FAA AC 150/5340-14B. AC 150/5300-2C and AC 150/5340025 concerning VASI and REIL design requirements.

AIRPORT BEACON LIGHT

An airport beacon light is in operation at the airport. The FAA recommends a 10-inch rotating beacon light at general utility airports. The beacon light, which emits alternating white and green flashes of light, should be located no closer than 750 feet to a runway centerline.

Reference may be made to FAA AC 150/5340-21 and 150/5300-2c.

SEGMENTED CIRCLE AND LIGHTED WIND TEE

A segmented circle and lighted wind tee is in operation.

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

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

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

TERMINAL AREA

AIRCRAFT HANGAR FACILITIES

The assumption is made that all aircraft based at the Harlan Municipal Airport would be kept in hangars. Existing hangar facilities to include capacity are summarized in the following table.

TABLE 15 EXISTING HANGAR FACILITIES

Hangar Unit Number	Type	Capacity
One	Tee	3
Two	Conventional	3 + shop,office
Three	Tee	5
Four	Tee	3
Five	Tee	4
Six	Tee	5
Seven	Tee	4
Eight	Conventional	2

The eight hangar structures have a storage capacity for 29 aircraft subject to aircraft size and stacking procedures used in the conventional hangars. The maintenance shop, located in Unit 2, is not used for storage.

To accommodate future numbers of based aircraft, it is recommended that a 6 unit tee hangar be constructed within Phase One, 1980-1985. An additional six units may be needed in Phase Three, 1990-2000. An alternative may be to consider use of the existing shop area for storage if and when a new fixed base operator shop is constructed. Subject to aircraft size, the existing shop may accommodate up to three aircraft. This storage may be used as as interim solution to hangar needs. It should also be noted that hangar demand will vary from year to year based not only upon aircraft ownership, but cost per unit as well. The cost of comparable space at area airports will also influence the demand for hangar facilities at Harlan. Futhermore, a number of aircraft owners may choose to tiedown their aircraft rather than lease hangar space should the cost be beyond what the owner is willing to pay.

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

TERMINAL BUILDING

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

- A public waiting room and services area of 500 square feet

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

AUTOMOBILE PARKING

The IDOT recommends a hard surfaced area capable of accommodating a number of parking spaces equal to the number of based aircraft. Based upon the forecast of based aircraft, it would appear that an improved surface lot to accommodate upwards of 41 vehicles may be needed by the year 2000.

APRON TIEDOWNS

An apron area should be maintained to provide for improved surface tiedowns as well as queuing space for aircraft movement. Since all based aircraft are expected to be in hangars, the primary concern is with itinerant aircraft. The following methodology was used to estimate the number of tiedowns required through the year 2000.

Year	Annual Itinerant Operations	Avg/Day	10% Increase For Busy Day	50% on Ground At Any One Time
1980	9309	26	3	15
1985	10135	28	3	16
1990	10626	29	3	16
2000	12102	33	3	18

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

TABLE 16: TIEDOWN NEEDS, 1980 - 2000

Year	Improved Tiedowns	Unimproved Tiedowns
1980	15	-0-
1985	16	-0-
1990	16	-0-
2000	18	-0-

ACCESS ROAD

The 1978 SASP recommends that the primary access road to the terminal area be hard surfaced. The width should be no less than 22 feet in width with provisions for shoulder and drainage.

FAR PART 77

OBSTRUCTION STANDARDS

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

STANDARDS FOR DETERMINING OBSTRUCTIONS

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

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

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

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

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

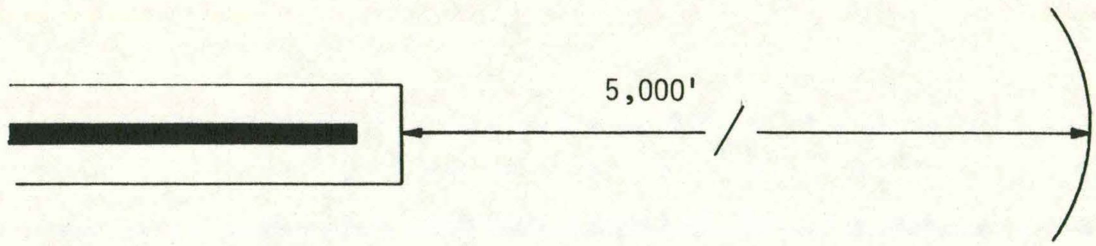
- Interstate Highway	17 feet
- Public Roadway	15 feet
- Private Road	10 feet or height of the highest mobile object
- Railroad	23 feet

IMAGINARY SURFACES

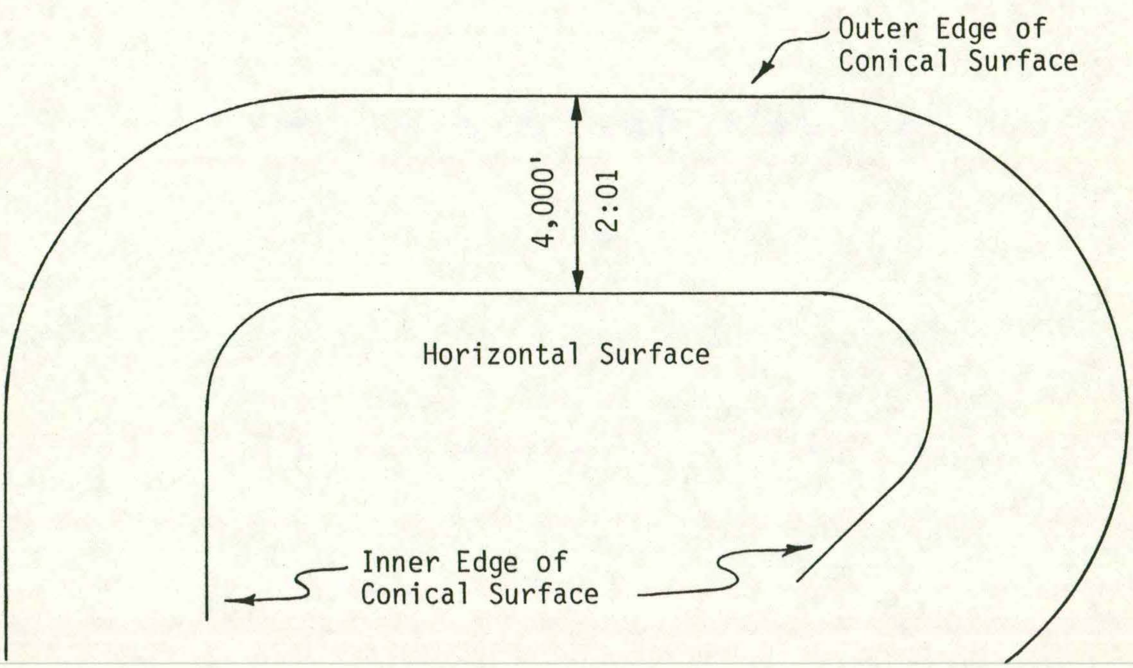
1. Imaginary surfaces establish areas where any object penetrating that surface would be considered an obstruction to air navigation. The imaginary surface establishes an imaginary line that separates ground activities from aircraft activities. In order to select the applicable imaginary surface, the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

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

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



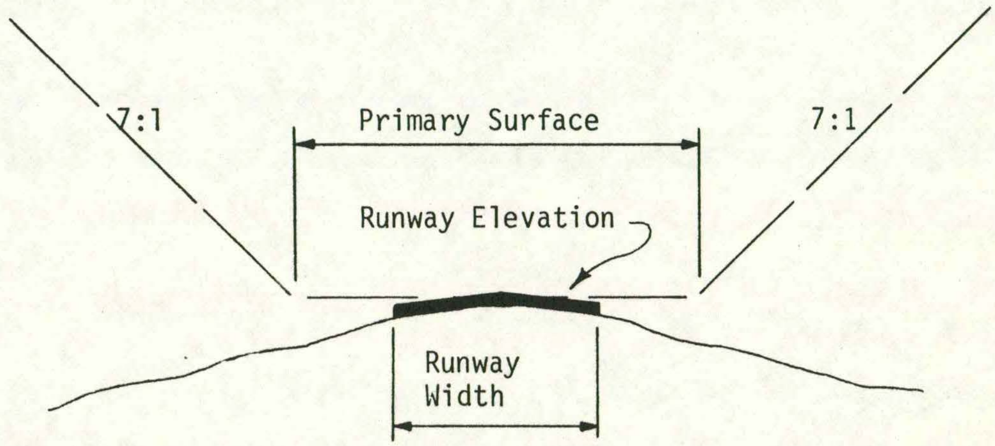
B. Conical Surface: The conical surface extends outward and upward from the periphery of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet at the ends and 7:1 laterally.



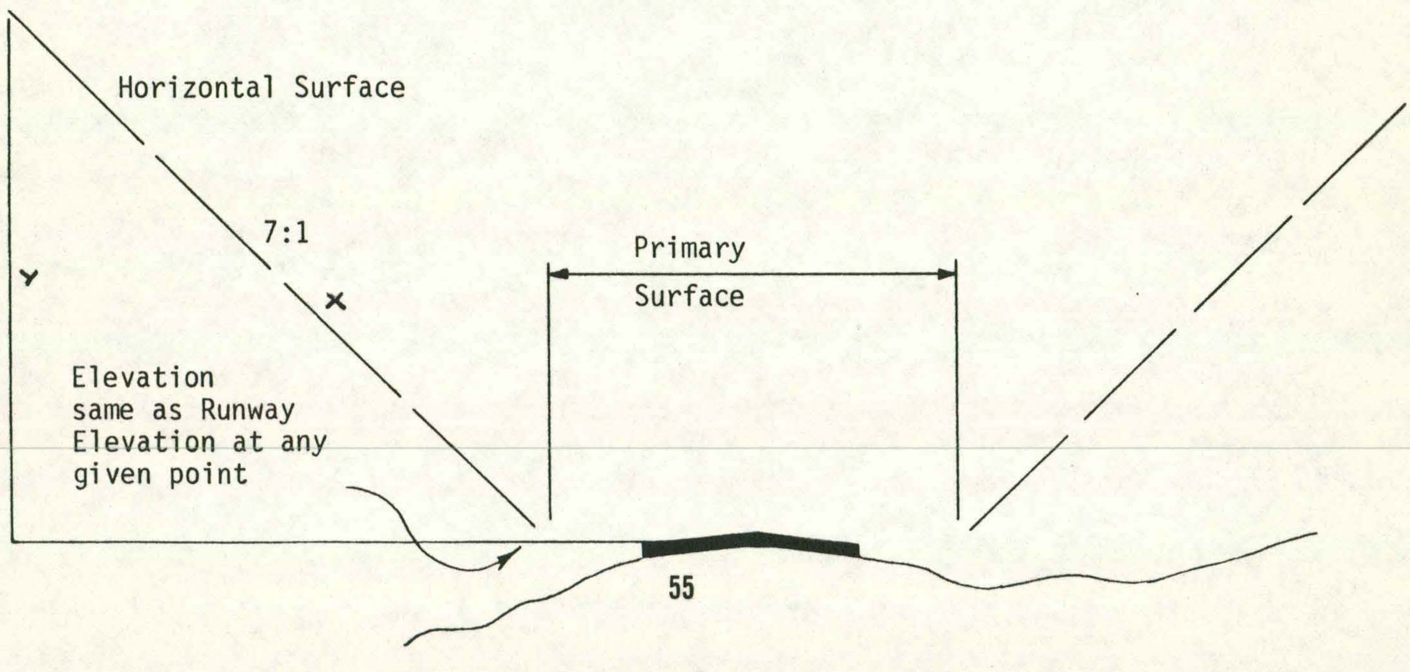
C. Primary Surface: The primary surface is longitudinally centered on the runway and extends 200 feet beyond the runway end in the case of a paved runway. The primary surface end coincides with the runway end in the case of a turf runway. The width of the primary surface varies with the approach.

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

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



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



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

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

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

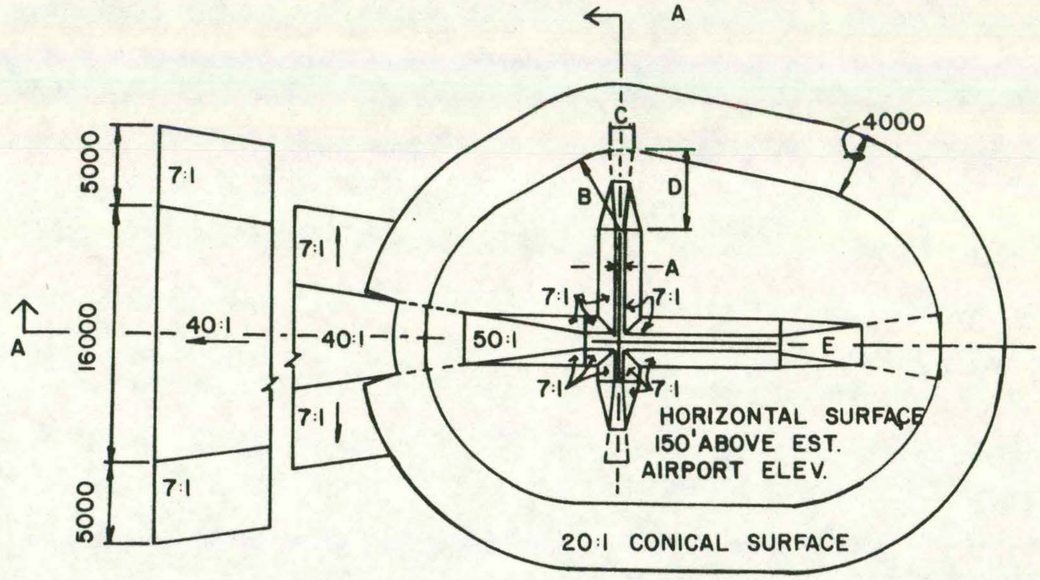
The approach slope also varies:

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

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.

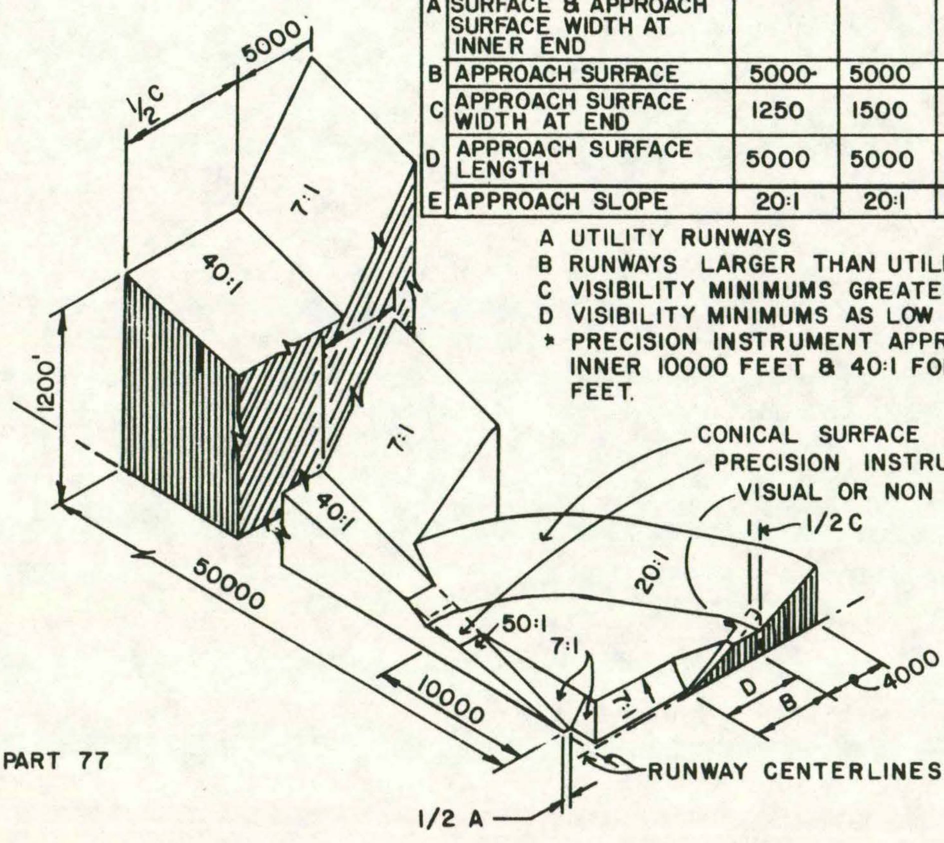
Visual:	250' x 1,000 x 450'	Utility Runway
NPI:	500' x 1,000 x 800'	Utility Runway

Figure 13



	ITEM	DIMENSIONAL STANDARDS (in feet)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISIO INSTRUME 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

LAND USE

LAND USE

Airport land use may be discussed in terms of the

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

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

GOALS

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

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

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

IV. AIRPORT DEVELOPMENT ALTERNATIVES

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

LAND USE COMPATIBILITY

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

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

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

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

LAND AREA REQUIREMENTS

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

-Natural Corridors

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

-Open Space Areas

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

-Industrial and Transportation Facilities

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

-Airport and Aviation Oriented Facilities

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

-Commercial Facilities

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

A detailed consideration of all aspects associated with a given development alternative is not the subject of this report. Such consideration is typically accomplished within an environmental impact assessment process. This process is beyond the scope of work under contract.

The IDOT does not, in all cases, require the preparation of an environment assessment for a proposed action prior to implementation. Should FAA assistance be sought, a "Full Blown" assessment of environmental impact may be required. Reference should be made to FAA Order 1050.1C Appendix 6 concerning the preparation of an Environmental Assessment Report.

The section herein examines the most feasible and prudent alternatives associated with the long range development of the Harlan Municipal Airport. The termsfeasible and prudent are separate criteria and refer to sound engineering and judgement respectively. For example, a certain alternative may be feasible if, as a matter of sound engineering principles, it can be built. However, it may not be prudent because of environmental, social or economic consequences. Generally, the action selected for implementation is the one which is most feasible and prudent, and outweighs the benefits of all other alternatives.

The major actions under consideration involve the implementation of those facility needs discussed in Section Three. The most salient action having a major impact upon the present and future development of the airport concerns the location of the crosswind runway facility.

The study gave no consideration to the following:

- Airport relocation
- Alternative alignments for the primary runway
- Relocation of the terminal area

PRIMARY RUNWAY:

The primary runway, RW 15/33, represents an existing facility component for which no alternative alignment exists that would increase the service level of the airport. The major consideration regarding RW 15/33 concerns the length and width.

An extension to RW 15/33 is considered feasible only on RW 15 due to the proximity of the County Road and industrial land uses off RW 33. To obtain the desired length of 4100 feet, an additional 700 feet of runway would be required. This action would require the acquisition of additional land to accommodate the runway and clear zone requirements.

As noted in Figure 16 , the terrain increases rapidly. Applying a non-precision approach on RW 15 (with a 20:1 approach slope) finds the terrain penetrating the approach slope. In addition, the maximum runway end elevation can not exceed 1231 feet and meet runway profile criteria without major grade changes on the existing runway. It would also not be prudent to consider excavation as a mitigating measure. As such, the approach minimums would exceed the desired 20:1 approach slope.

Application of a clear zone (500' x 1000' x 800') as required for a non - precision approach on RW 33 would find the following limitations:

- The west edge of the approach surface would not allow for the required 15' vertical clearance between the county road and approach surface.

  Approach surface elevation = 1204.38'

  Approx. road elevation = 1193'

  Road elevation = 1193 + 15' = 1208'

- Existing structures would fall within the clear zone. However none of these structures penetrate the 20:1 approach surface.

Alternatives for mitigating the above might include the displacement of the runway threshold, relocation of the county road, acquisition and removal of the structures within the NP1 clear zone and/or the maintenance of a visual approach on RW 15/33 thereby reducing the clear zone and approach surface requirements.

The most appropriate course of action appears to be the displacement of the threshold by a distance that would allow for the 15' vertical clearance over the county road and place the existing structures outside the clear zone. In this case, the threshold would have to be displaced by some 320 feet.

CROSSWIND RUNWAY:

There are a number of constraints to the development of a crosswind runway to a desired length of 4100 feet. Primary among these are those related to topographic and drainage features and existing cultural features to include roads, power lines, and farm operations. In addition, IDOT standards require a 60 degree separation between runway facilities.

Given the above, along with the primary objective of aligning the crosswind runway so as to provide for ultimate wind coverage, few viable alternatives exist.

Proposed herein is a crosswind runway with an alignment of N 40' E. The maximum length that can be obtained without road closures is 2900 feet. An alternative alignment of N 90 E was considered, but discarded due to topographic constraints.

As previously noted, the crosswind runway should be of the same length as the primary runway and in no case less 80 percent or 3,200 feet. Offered for consideration is the following scenario:

- Construct crosswind runway to Basic Utility StageII standards

  3,400 feet (desired length)

  2,720 feet (80% of primary BU-II length)

- Proposed runway width and length

  60' x 2900'

The existing crosswind runway is a turf facility. Due to financial constraints and the availability of funding, the crosswind runways at small general aviation airports have often not been hard surfaced. It would be reasonable to assume that this may also be the case at Harlan where ultimate development of the crosswind runway is of a low priority.

Immediate emphasis on the crosswind component might find the acquisition of land and clear zone protection as the most salient priorty while grading, hard surfacing and lighting might be a long term objective.

The power lines within the northeast approach to the runway are to be placed underground. This action is contemplated in 1982. As land is acquired for the crosswind runway, the power lines in the southwest approach would also have to be relocated or placed underground.

TERMINAL AREA:

The terminal area of the airport represents an investment made over a number of years. While it would be more desireable to locate the terminal area closer to the mid-point of the primary runway, the relocation cost would not be justified. As such, no relocation alternative to the existing terminal area was examined. The primary objective herein was to set forth a long range development concept for the existing terminal area complex.

The development concept proposed assumes that the Harlan Municipal Airport will support a fixed base operator (FBO). As such, construction of an FBO facility is considered a high priority. In addition to a 60' x 80' structure (min.), a new terminal building should also be constructed.

Two development concepts are offered. The first locates a new FBO facility adjacent to the existing apron. The second finds the development of a new apron - FBO facility north of the existing tee hangars. Each concept offers certain advantages and disadvantages.

The first would allow for the continued utilization of the existing apron, fuel pumps etc. It would however require the demolition of the existing terminal building and hangar to the north.

The second concept would require the construction of a new apron area, access road, vehicle parking lot and utility infrastructure. It would , however, allow the continued use of the two existing structures for aircraft storage.

Concept One

Advantages:

- Maintain existing access and vehicle parking
- Maintain existing fuel storage and pumps
- Use of existing apron for tiedowns and queuing space.

Disadvantages:

- Demolition of two hangar structures
- Minimal area for additional parking
- Minimal area for improved surface tiedowns
- Minimal area for expansion of FBO facility in future

Concept Two

Advantages:

- More centrally located to primary and crosswind runways
- Use of two existing hangar structures for aircraft storage
- Adequate area to accommodate vehicle parking, apron tiedown and FBO facility expansion

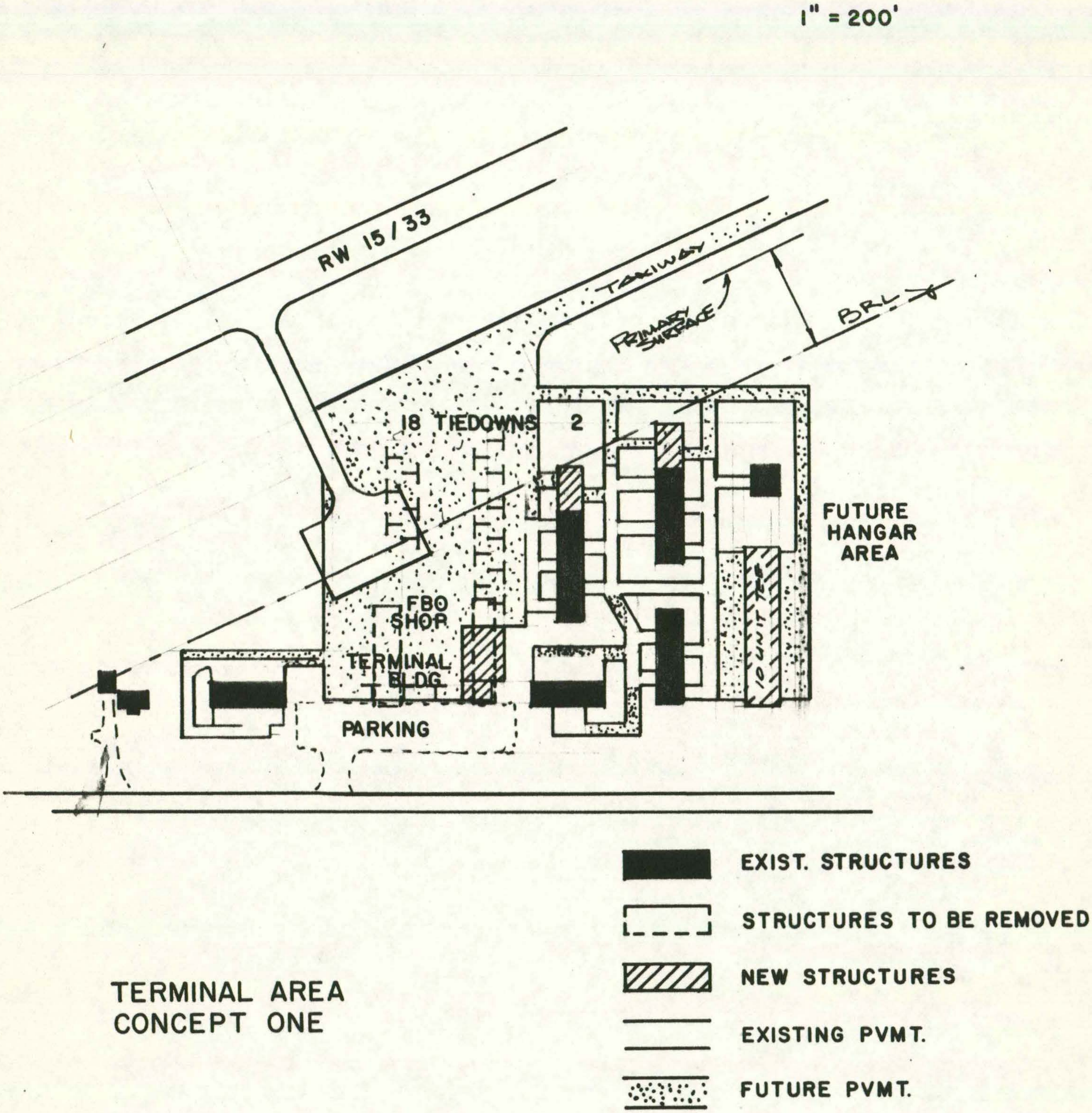
Disadvantages:

- Relocation of fuel storage facility
- Construction of a new access road and parking area
- Construction of utility infrastructure

Due to financial constraints, a consensus was obtained from the Airport Commission to proceed with a variation of Alternative One. The existing FBO shop area and terminal building would be used through 1988. A new entrance and side walk would be constructed on the north side of the structure. Such would allow for the separation of pedestrian and aircraft traffic.

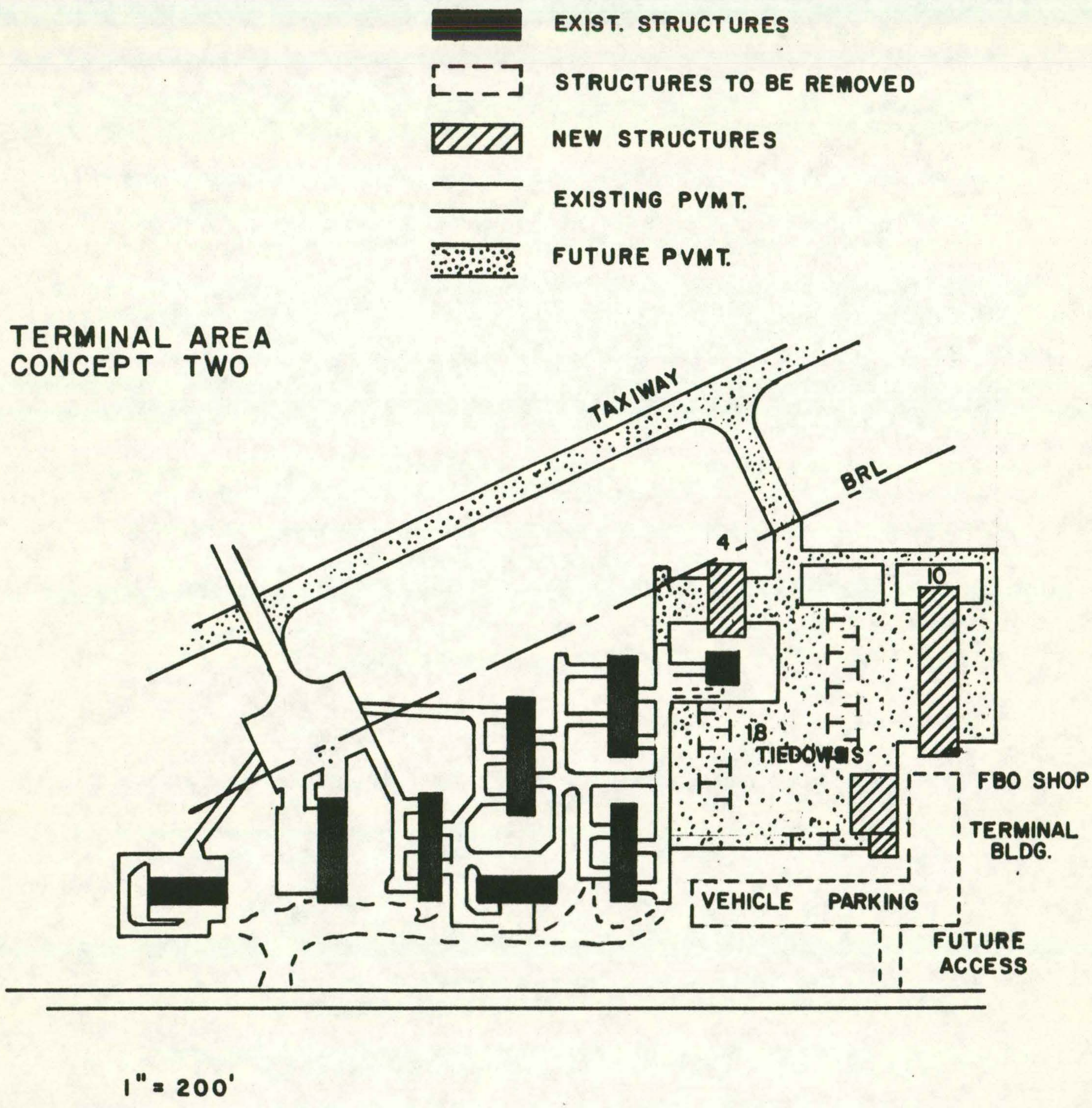
Consideration would be given to the construction of a terminal building in Phase II (1989-1992). The 5 unit hangar would be removed and an itinerant aircraft apron to include 7 tiedowns constructed. Should demand exist for additional aircraft storage, the private sector would be encouraged to respond to the demand by constructing a new hangar facility.

The remaining terminal area improvements would be made in Phase III (1993-2002). Such actions would include the construction of a new FBO shop. The itinerant apron would also be expanded should demand for additional improved surface tiedowns exist.



TERMINAL AREA
CONCEPT ONE

TERMINAL AREA CONCEPT TWO



SOCIOECONOMIC
ENVIRONMENTAL CONSIDERATIONS

The airport is located some 5 miles south of Harlan on U.S. Highway 59. The community of Corley is located approximately one-half mile southeast of the airport. Agricultural land uses surround the airport with the exception of a agricultural related industry immediately southeast of the airport.

NEED:

The need for the proposed actions are supported by the anticipated levels of aviation activity summarized in Section II.

ALTERNATIVES:

In addition to the alternatives previously discussed , the following alternative was also available.

1.No Project Alternative

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

ENVIRONMENTAL CONSEQUENCES

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

2. Compatible Land Use: In general, industrial, agricultural, and open space land uses are compatible with the operation of the airport. The proposed actions are consistent with such community planning as has been carried out.

3. Social Impacts: The proposed actions will not involve the relocation of any existing residence or place of business. The proposed actions will require the removal of crop land from production.

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

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

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

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

8. Historical, Architectural, Archaeological, and Cultural Resources:

There are no known historical or cultural resources which would be affected by the proposed actions.

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

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

11. Wetlands: There are no major wet land areas on the airport.

12. Flood Plain: The airport does not lie within a designated flood plain area.

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

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

15. Light Emissions: No detrimental impacts are expected.

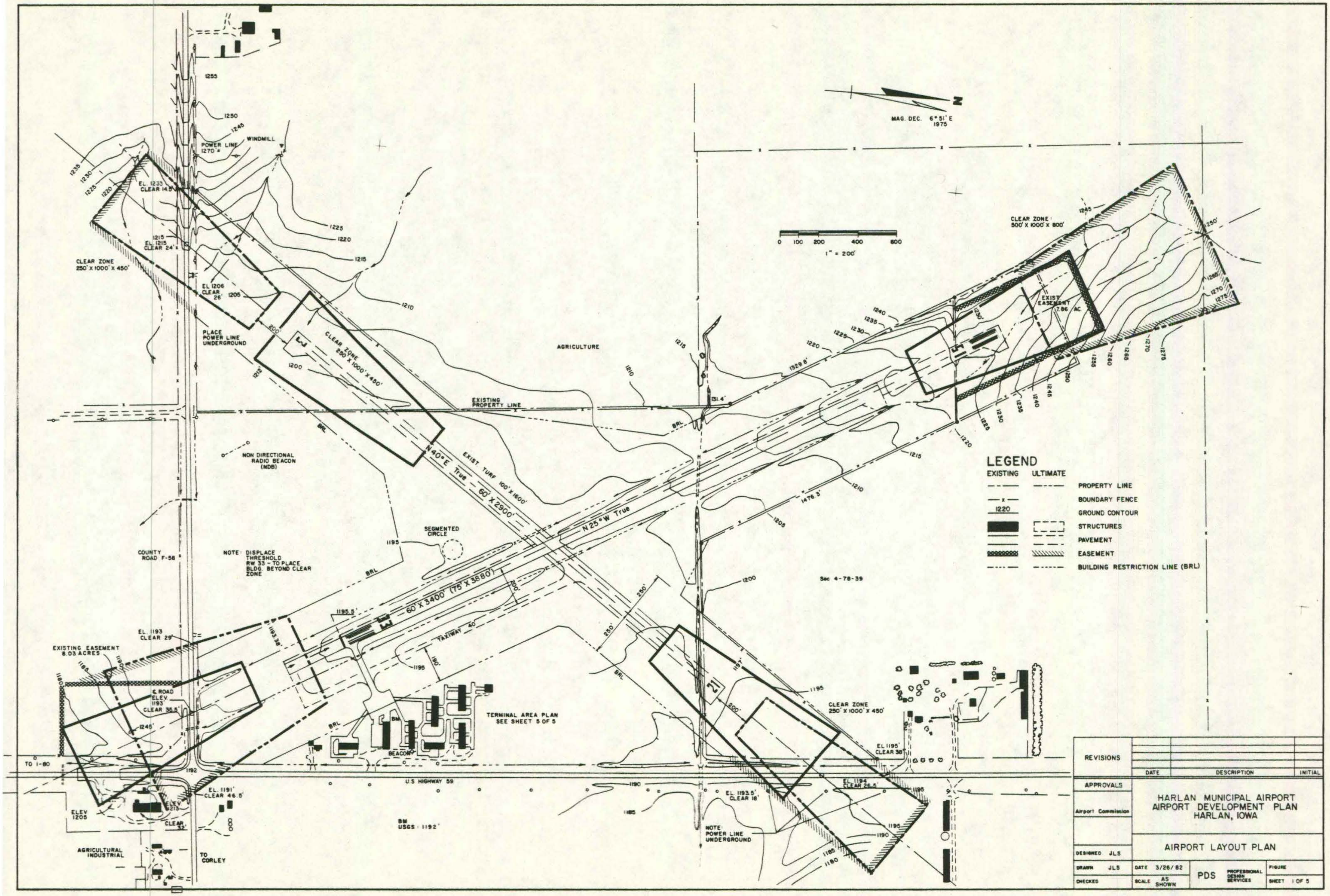
16. Solid Waste:

17. Construction Impacts: Such impacts resulting from construction are of a short term nature and should have not detrimental impact provided mitigating measures are employed.

The above outlines subject matter typically contained within an Environmental Assessment. As previously noted, the Iowa DOT does not require a full-blown

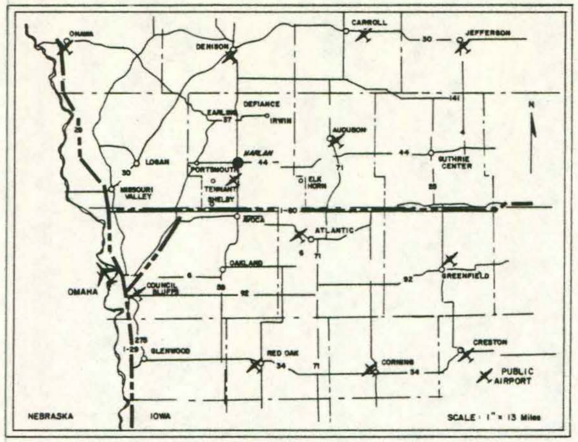
Environmental Assessment. As such, no in depth analysis was accomplished for items 1 through 17 above. Should any of the above have an impact or be impacted by the proposed actions, a detailed evaluation of the impact should be accomplished prior to proceeding with implementation.

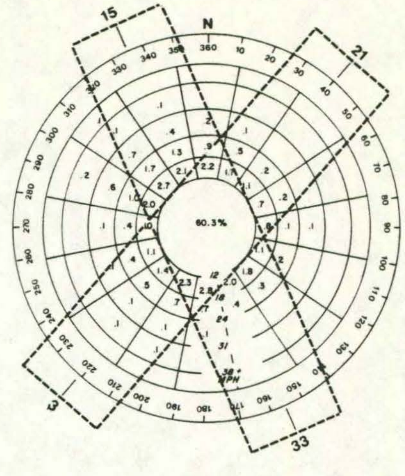
V. AIRPORT PLANS



MAG. DEC. 6°51' E
1975
N
0 100 200 400 600
1" = 200'
POWER LINE
1270'±
WINDMILL
EL. 1233
CLEAR 14.5'
EL 1215
CLEAR 24'±
CLEAR ZONE
250' X 1000' X 450'
EL 1206
CLEAR
26'
PLACE
POWER LINE
UNDERGROUND
CLEAR ZONE
250' X 1000' X 450'
AGRICULTURE
EXISTING
PROPERTY LINE
BRL
NON DIRECTIONAL
RADIO BEACON
(NDB)
N 40° E True
EXIST TURF 100' X 1600'
60' X 2900'
N 25° W True
SEGMENTED
CIRCLE
COUNTY
ROAD F-58
NOTE: DISPLACE
THRESHOLD
RW 33 - TO PLACE
BLDG. BEYOND CLEAR
ZONE
60' X 3400' (75' X 3880')
TAXIWAY
EL. 1193
CLEAR 29'
EXISTING EASEMENT
8.03 ACRES
℄ ROAD
ELEV
1193'
CLEAR 35.5'
TERMINAL AREA PLAN
SEE SHEET 5 OF 5
BEACON
CLEAR ZONE
250' X 1000' X 450'
EL 1195'
CLEAR 38'
EL. 1194
CLEAR 26.5'
EL. 1193.5'
CLEAR 18'
EL. 1191'
CLEAR 46.5'
U.S HIGHWAY 59
TO I-80
ELEV
1205
ELEV
1213
CLEAR
33'
BM
USGS - 1192'
NOTE:
POWER LINE
UNDERGROUND
AGRICULTURAL
INDUSTRIAL
TO
CORLEY
CLEAR ZONE
500' X 1000' X 800'
EXIST.
EASEMENT
7.86 AC.
Sec 4-78-39
LEGEND
EXISTING
ULTIMATE
PROPERTY LINE
BOUNDARY FENCE
GROUND CONTOUR
STRUCTURES
PAVEMENT
EASEMENT
BUILDING RESTRICTION LINE (BRL)
REVISIONS
DATE
DESCRIPTION
INITIAL
APPROVALS
Airport Commission
HARLAN MUNICIPAL AIRPORT
AIRPORT DEVELOPMENT PLAN
HARLAN, IOWA
AIRPORT LAYOUT PLAN
DESIGNED JLS
DRAWN JLS
CHECKED
DATE 3/26/82
SCALE AS SHOWN
PDS
PROFESSIONAL DESIGN SERVICES
FIGURE
SHEET 1 OF 5

VICINITY MAP





SOURCE: DES MOINES 1951–1960

WIND ROSE - All Weather

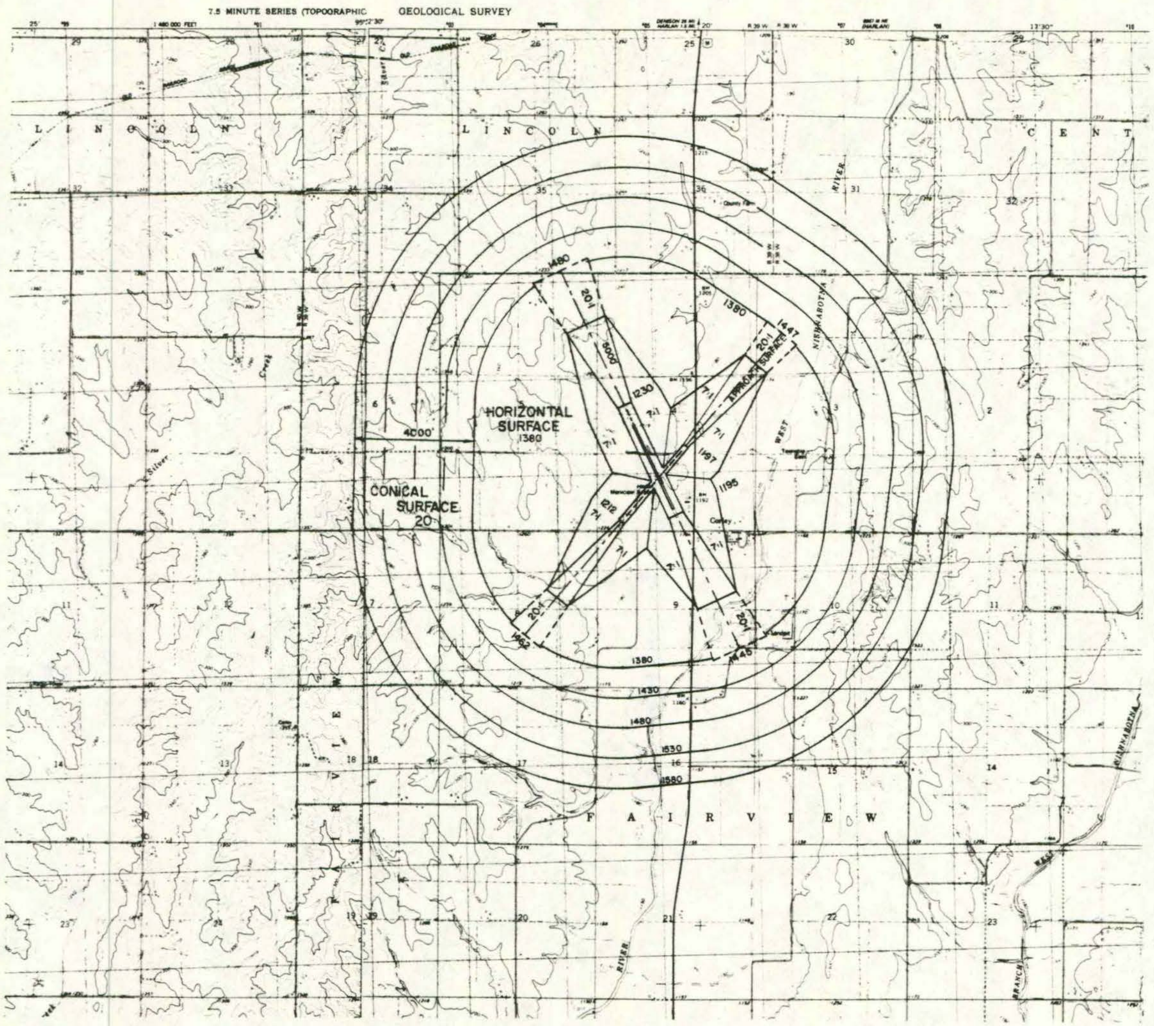
RUNWAY DATA	RUNWAY 15/33		RUNWAY 3/21	
	EXISTING	FUTURE	EXISTING	FUTURE
EFFECTIVE RUNWAY GRADIENT	.71%	.95%	—	.9%
% WIND COVERAGE (12 MPH)	88%	88%	80.3%	80.3%
INSTRUMENT RUNWAY	NPI	NPI	—	VISUAL
APPROACH SURFACE - DESIGN	RW 15-32:1, RW 33-35:1	20:1	20:1	20:1
RUNWAY LENGTH	3400'	3680'	1600±'	2900'
RUNWAY WIDTH	60'	75'	100'	60'
RUNWAY STRENGTH	11000 lb SW	12500 lb SW	TURF	12500 lb SW
RUNWAY SAFETY AREA	150'	150'	—	150'
RUNWAY LIGHTING	MIRL	MIRL	—	MIRL
LANDING AIDS	—	VASI-2, REIL	—	—
RUNWAY MARKINGS	BASIC	NPI	—	BASIC

AIRPORT DATA		
	EXISTING	FUTURE
AIRPORT ELEVATION	1217'	1230' ASL
AIRPORT LOCATION POINT	LONG	95° 20'
ALP COORDINATES	LAT	40° 35'
MEAN MAX. TEMP.	89°	SAME
% WIND COVERAGE (combined mph)	95.9%	95.9%
AIRPORT NAVIGATIONAL AIDS	NDB	NDB
EASEMENTS	YES	YES
FBO FACILITIES	YES	YES
FUEL	YES	YES
BEACON	YES	YES
SEGMENTED CIRCLE	YES	YES
LIGHTED WIND TEE	YES	YES

NOTES

1. THRESHOLD RW33 TO BE DISPLACED 320' SO AS TO PLACE STRUCTURES (EXISTING) BEYOND CLEAR ZONE.

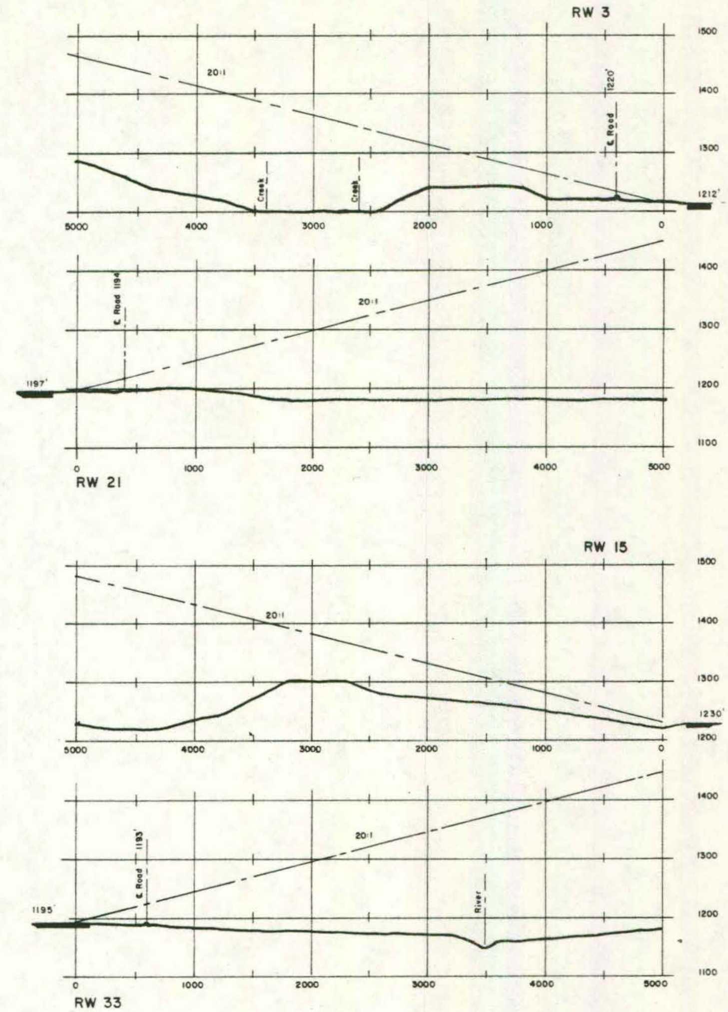
REVISIONS	DATE	DESCRIPTION	INITIAL
APPROVALS	HARLAN MUNICIPAL AIRPORT AIRPORT DEVELOPMENT PLAN HARLAN, IOWA		
Airport Commission			
DESIGNED JLS	AIRPORT LAYOUT PLAN		
DRAWN JLS	DATE 3/26/82	PDS PROFESSIONAL DESIGN SERVICES	FIGURE
CHECKED	SCALE AS SHOWN		SHEET 2 OF 5



0 1000 2000 4000 6000
Scale in feet (1" = 2000')

N

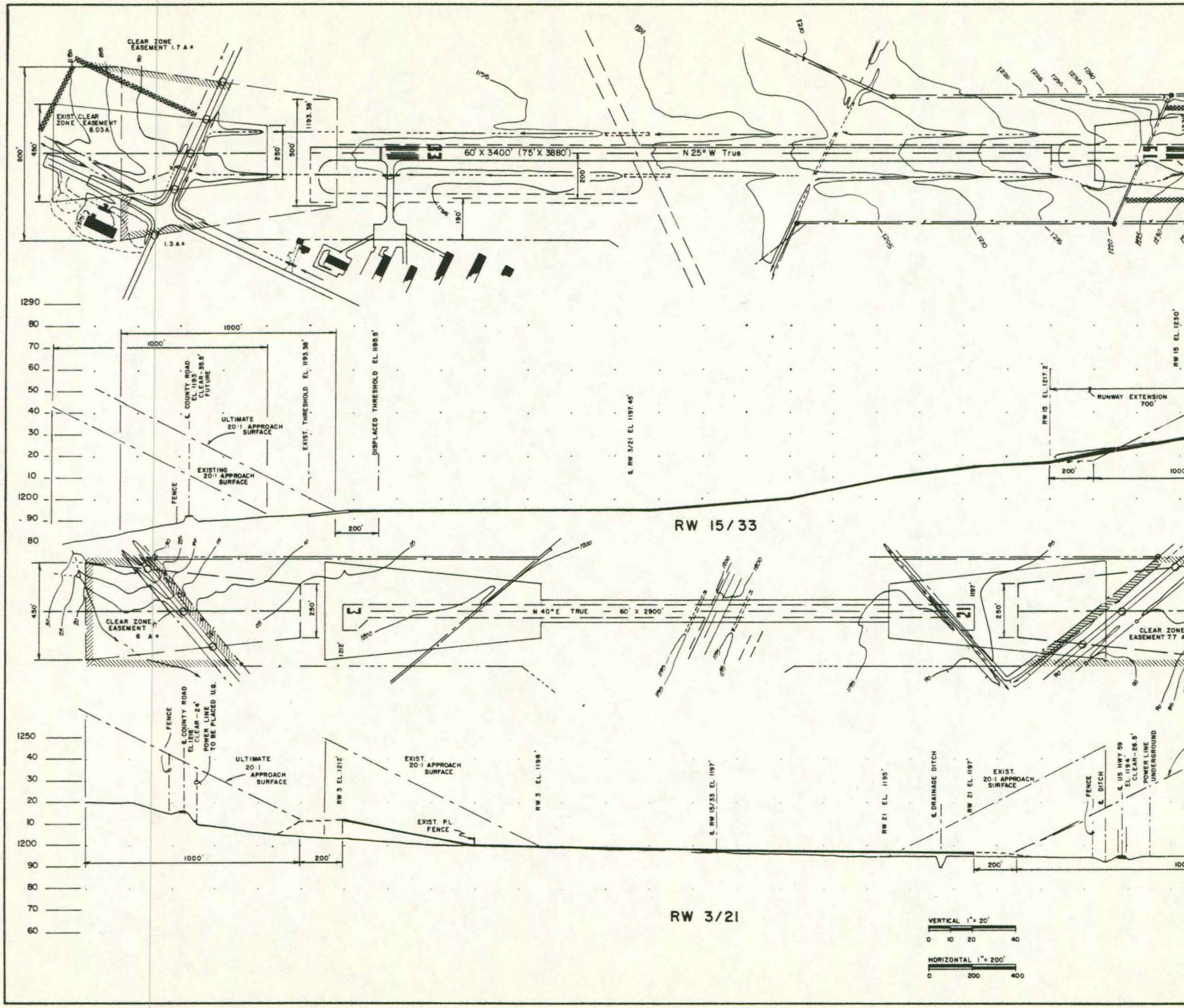
ESTABLISHED AIRPORT ELEVATION - 1230' ASL



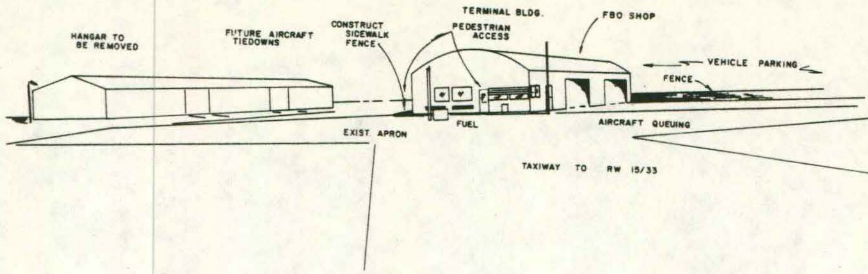
0 500 1000 1500
HORIZONTAL SCALE

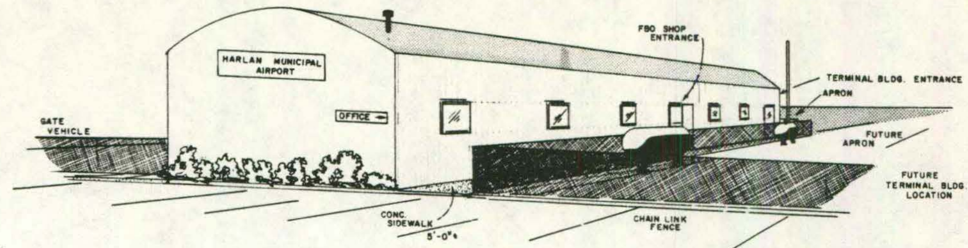
0 100 200 300
VERTICAL SCALE

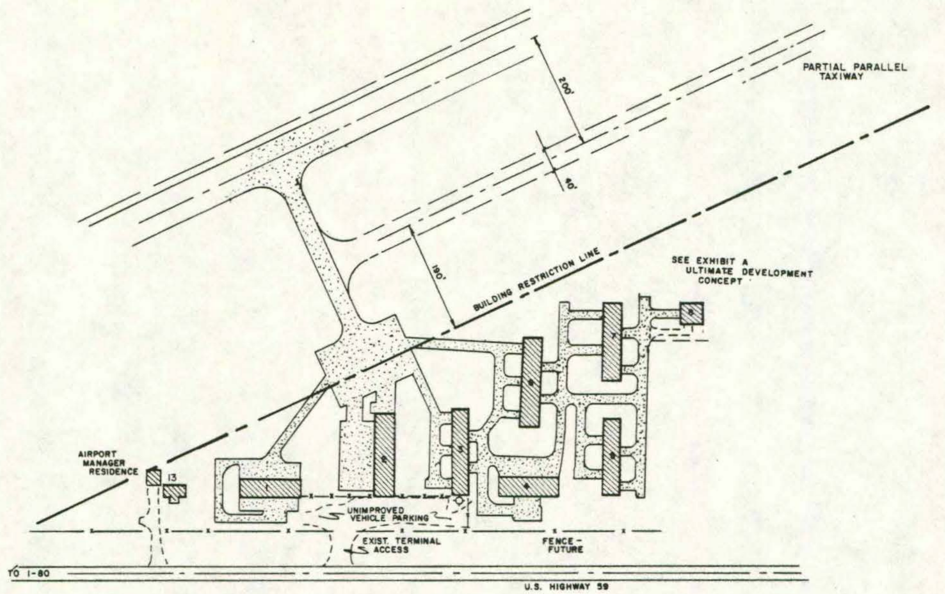
REVISIONS	DATE	DESCRIPTION	INITIAL
APPROVALS	HARLAN MUNICIPAL AIRPORT AIRPORT DEVELOPMENT PLAN HARLAN, IOWA		
Airport Commission			
DESIGNED JLS	AIRPORT AIRSPACE		
DRAWN JLS	DATE 3/26/82	PDS PROFESSIONAL DESIGN SERVICES	FIGURE
CHECKED	SCALE 1" = 2000'		SHEET 3 OF 5



APPROVALS	HARLAN MUNICIPAL AIRPORT AIRPORT DEVELOPMENT PLAN HARLAN, IOWA		
Airport Commission			
DESIGNED: JLS	CLEAR ZONE PLAN/PROFILE		
DRAWN JLS	DATE 3/26/82	PDS PROFESSIONAL DESIGN SERVICES	FIGURE
CHECKED	SCALE AS SHOWN		SHEET 4 OF 5







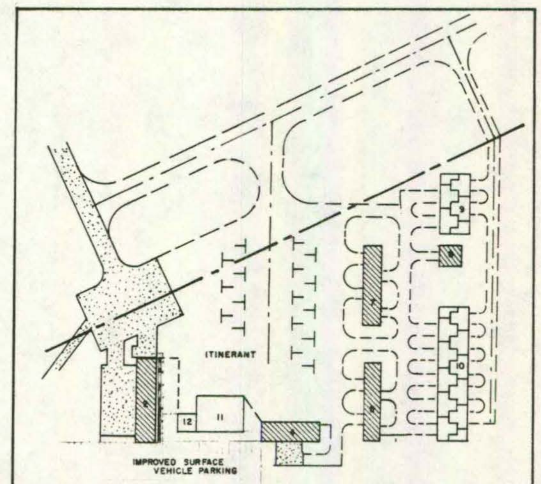


EXHIBIT "A" ULTIMATE DEVELOPMENT CONCEPT

STRUCTURES

UNIT NO.	TYPE - CAPACITY
ONE	TEE - 3
TWO	CONVENTIONAL (TERMINAL, SHOP) - 3 ±
THREE	TEE - 5
FOUR	TEE - 3
FIVE	TEE - 4
SIX	TEE - 5
SEVEN	TEE - 4
EIGHT	CONVENTIONAL - 2 ±
NINE	TEE-4 52' X 102'
TEN	TEE-10 52' X 225'
ELEVEN	FBO SHOP 60' X 80'
TWELVE	TERMINAL BLDG 32' X 32'
THIRTEEN	AIRPORT MANAGERS RESIDENCE

LEGEND

- EXISTING FACILITIES
- FUTURE FACILITIES
- EXISTING PVMT.
- FUTURE PVMT.

NOTES

REVISIONS	DATE	DESCRIPTION	INITIAL
APPROVALS Airport Commission	HARLAN MUNICIPAL AIRPORT AIRPORT DEVELOPMENT PLAN HARLAN, IOWA		
DESIGNED JLS	TERMINAL AREA PLAN		
DRAWN JLS	DATE 3/26/82	PDS PROFESSIONAL DESIGN SERVICES	FIGURE
CHECKED	SCALE AS SHOWN		SHEET 5 OF 5

VI. DEVELOPMENT SCHEDULE STRATEGY FOR IMPLEMENTATION

DEVELOPMENT SCHEDULE

INTRODUCTION

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

PHASE ONE:	1982 - 1987
PHASE TWO:	1988 - 1992
PHASE THREE:	1992 - 2002

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

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

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

IMPLEMENTATION

PHASE ONE: 1982 - 1987

ITEM 1 LAND ACQUISITION AND FENCING

A. Fee Title		
1) RW End 15	7.9 Acres	$ 19,700
2) Survey, Appraisal Fees		4,000
B. Fencing		
1) 1750 L.F.		3,063
2) Engr., Legal, Admin.		613
C. TOTAL LAND ACQUISITION AND FENCING		$ 27,376

ITEM 2 CLEAR ZONE PROTECTION

A. Easements		
1) RW 15	12 Acres	$ 15,000
2) RW 33	3 Acres	3,750
3) Survey, Legal, Appraisal		3,500
B. TOTAL CLEAR ZONE		$ 22,250

ITEM 3 OVERLAY - RW 15/33

A. 60' x 3400'	
1) Bit. Surface - 2"	
22,667 S.Y. @ 4.00/S.Y.	$ 90,668
2) Engr. Legal, Admin., Cont. (30%)	27,200
B. TOTAL OVERLAY	$117,868

ITEM 4 PVMT MARKING - RW 15/33

A. NPL

1) Lump Sum	$ 5,250
2) Engr. Legal, Admin., Cont. (30%)	1,575
B. TOTAL MARKING	$ 6,825

PHASE TWO: 1988 - 1992

ITEM 1 TERMINAL BUILDING

A. Structure: 32' x 32'

1) 1024 S.F.	$ 40,960
2) Engr. Legal, Admin, Cont. (30%)	12,288
B. TOTAL TERMINAL BLDG.	$ 53,248

ITEM 2 APRON

A. Itinerant Apron - 7 Tiedowns

1) Subgrade Prep. - 5950 S.Y.	$ 5,950
2) 4" Granular Subbase - 5950 S.Y.	7,438
3) 5" P.C.C. - 5950 S.Y.	71,400
4) Mooring Eyes - 21	1,050
5) Engr. Legal, Admin. Cont. (30%)	25,752
B. TOTAL APRON	$111,590

ITEM 3 RUNWAY EXTENSION, RW 15/33

A. 60' x 700', Turnaround

1) Subgrade Prep. - 10000 C.Y.	$ 20,000
2) 4" Granular Subbase 5266 S.Y.	6,582
3) 4" Bit Base Course 5266 S.Y.	34,229
4) 2 1/2" Bit Surface Course 5266 S.Y.	25,014
5) Eng. Legal, Admin, Cont. (30%)	25,748
B. TOTAL EXTENSION	$111,573

ITEM 4	PVMT. MARKING	
A. RW End 15 - NPI		
1) Lump Sum		$ 2,800
2) Engr. Legal, Admin, Cont. (30%)		840
B. TOTAL MARKING		$ 3,640
ITEM 5	LIGHTING	
A. MIRL - Runway Extension		
1) Lump Sum		$ 3,700
2) Engr. Legal, Admin. Cont. (30%)		1,110
B. TOTAL LIGHTING		4,810
ITEM 6	HANGAR	
A. Tee Hangar - 10 Unit		
1) 52' x 225'		117,000
2) Engr. Legal, Admin, Cont.		35,100
B. TOTAL HANGAR		152,100
ITEM 7	TAXIWAY	
A. Hangar Service - 20' width		
1) Subgrade Prep. 1711 S.Y.		1,711
2) 4" Granular Subbase - 1711 S.Y.		2,139
3) 4" Bit. Base Course - 1711 S.Y.		11,122
4) 2 1/2" Bit Surface Course - 1711 S.Y.		8,127
5) Engr. Legal, Admin, Cont. (30%)		6,930
B. TOTAL TAXIWAY		30,029

PHASE THREE: 1993 - 2002

ITEM 1 LAND ACQUISITION AND FENCING

A. Fee Title		
	1) RW 3/21 26 Acres ±	65,000
	2) Survey, Legal Appraisal	6,000
B. Fencing		
	1) 4150 L.F.	7,263
	2) Engr. Legal, Admin.	1,453
C. TOTAL LAND ACQUISITION		79,716

ITEM 2 CLEAR ZONE PROTECTION

A. Easements		
	1) RW 3 6.0 Acres ±	7,500
	2) RW 21 7.7 Acres ±	9,625
	3) Survey, Legal, Appraisal	3,500
B. TOTAL CLEAR ZONE EASEMENT		20,625

ITEM 3 RUNWAY 3/21

A. Turf Runway - 100' x 2900'		
	1) Subgrade Prep.	62,963
	2) Pipe	4,000
	3) Seeding	3,000
	4) Engr. Legal, Admin. Cont. (30%)	20,989
B. TOTAL RUNWAY		90,952

ITEM 4 PARALLEL TAXIWAY

A. 40' x 1370' Partial Parallel		
	1) Subgrade Prep. 1200 C.Y.	2,400

	2) 4" Granular Subbase 6088 S.Y.	7,610
	3) 4" Bit Subbase 6088 S.Y.	39,572
	4) 2 1/2" Bit. Surface 6088 S.Y.	28,918
	5) Engr. Legal, Admin, Cont. (30%)	23,550
B. TOTAL TAXIWAY		102,050

ITEM 5 APRON

A. Itinerant Apron - 10 tiedowns

	1) Subgrade Prep. 6611 S.Y.	6,611
	2) 4" Granular Subbase 6611 S.Y.	8,264
	3) 5" P.C.C. 6611 S.Y.	79,332
	4) Mooring Eyes 30	1,500
	5) Engr. Legal, Admin, Cont. (30%)	28,712
B. TOTAL APRON		124,419

ITEM 6 HANGAR

A. Tee Hangar - 4 Unit

	1) 52' x 102'	53,040
	2) Engr. Legal, Admin. Cont. (30%)	15,912
B. TOTAL HANGAR		68,952

ITEM 7 FBO SHOP

A. Shop

	1) 60' x 80'	144,000
	2) Engr. Legal, Admin, Cont. (30%)	43,200
B. TOTAL SHOP		187,200

ITEM 8 TAXIWAY

A. Hangar Service 20' width

1) Subgrade Prep. 2711 S.Y.	2,711
2) 4" Granular Subbase 2711 S.Y.	3,389
3) 4" Bit Base Course 2711 S.Y.	17,622
4) 2 1/2" Bit Surface 2711 S.Y.	12,877
5) Engr. Legal, Admin. Cont. (30%)	10,992

B. TOTAL TAXIWAY 47,631

ITEM 9 LANDING AIDS

A. SAVASI, REIL - RW 15/33

1) Lump Sum	8,200
2) Engr. Legal, Admin. Cont.	2,460

B. TOTAL LANDING AIDS 10,660

ITEM 10 WIDEN RW 15/33

A. 15' x 4100', Relocate lights

1) Lump sum	129,316
2) Engr. Legal, Admin. Costs	38,795

B. TOTAL WIDING 168,111

SUMMARY

PHASE ONE - 1982 - 1987

Item 1	LAND ACQUISITION AND FENCING - RW15	27,376
Item 2	CLEAR ZONE PROTECTION - RW 15/33	22,250
Item 3	OVERLAY - RW 15/33	117,868
Item 4	PVMT. MARKING - RW 15/33	6,825
TOTAL PHASE ONE		174,319

PHASE TWO - 1988 - 1992

Item 1	TERMINAL BUILDING	53,248
Item 2	APRON - 7 TIEDOWNS	111,590
Item 3	RUNWAY EXTENSION - RW 15/33	111,573
Item 4	PVMT. MARKINGS - RW 15	3,640
Item 5	LIGHTING - MIRL - RW 15	4,810
Item 6	10 UNIT TEE HANGAR	152,100
Item 7	TAXIWAY - HANGAR SERVICE	30,029
TOTAL PHASE TWO		466,990

PHASE THREE - 1992 - 2002

Item 1	LAND ACQUISITION AND FENCING - RW 3/21	79,716
Item 2	CLEAR ZONE PROTECTION	20,625
Item 3	RW 3/21	90,952
Item 4	PARTIAL PARALLEL TAXIWAY	102,050
Item 5	APRON	124,419
Item 6	4 UNIT TEE HANGAR	68,952
Item 7	FBO SHOP	187,200
Item 8	TAXIWAY - HANGAR SERVICE	47,631

Item 9	LANDING AIDS - RW 15/33	10,660
Item 10	WIDEN RW 15/33	168,111
TOTAL PHASE THREE		900,316

Considered beyond the twenty year development schedule is the hard surfacing of RW 3/21 and the increase in width of RW 15/33 from 60' to 75'. While each of these actions are recommended, they were considered a low priority by the Airport Commission. The widing of RW 15/33 should be accomplished in Phase Three and would require the relocation of the runway light system.

The costs were based upon 1982 prices. No effort was made to anticipate future levels of inflation. The cost estimates are preliminary in scope and were not based upon detailed engineering plans and specifications.

STATE & FEDERAL ASSISTANCE

The Department of Transportation, Federal Aviation Administration, (FAA) provided financial assistance for a number of airport components under the Airport and Airway Development Act of 1970. The FAA provided up to 80 percent of the total cost on eligible items. In general, eligible items include all airport requirements except those which specifically benefit the private sector. For example, hangar facilities and the taxiway 20 - foot out from the hangar are not eligible. Vehicle parking lots and internal road systems are not eligible. Terminal buildings are not eligible except at CAB certificated air carrier airports.

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

Total assistance available from the FAA and IDOT for general aviation airports in Iowa, has not historically exceeded 1.2 million dollars annually. Available funding from both sources is presented in the following table.

Table 17

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

	1982	1983	1984	1985	1986	1987
AIR CARRIER						
Federal (90%) [2]	2,852	2,852	2,852	2,852	2,852	2,852
Local Match (10%) [3]	316	316	316	316	316	316
Total	3,168	3,168	3,168	3,168	3,168	3,168
GENERAL AVIATION						
Construction						
Federal-formula (90%)	677	677	677	677	677	677
-discretionary (90%)	200	200	200	200	200	200
Local Match (10%) [3]	97	97	97	97	97	97
Subtotal	974	974	974	974	974	974
State (70%)	1,070	1,138	1,219	1,300	1,372	1,453
Local Match (30%) [3]	458	487	522	557	588	622
Subtotal	1,528	1,625	1,741	1,857	1,960	2,075
Total Construction	2,502	2,599	2,715	2,831	2,934	3,049
Safety						
State (50%) [4]	60	60	60	60	60	60
Local Share (50%)	60	60	60	60	60	60
Total	120	120	120	120	120	120

Notes: [1] This does not include possible federal-aid discretionary funds for commuter and reliever airports.
[2] This amount is the sum of the allocations for 9 locations.
[3] Includes only estimates of local funds needed to match federal and state funds. Does not include 100% locally financed improvements.
[4] State funds reserved for cooperative safety improvements, 50% state; 50% local.

FEASIBILITY

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

It is recommended that the City of Harlan establish a fund to provide the local match. Based upon the development program, it would appear that an annual allocation of 15000 dollars would enable implementation of the proposed actions. Such monies would be placed in an account to be drawn upon when needed. Subject to inflationary trends, some increase or decrease in the annual allocation could be expected. As previously noted, the estimated costs are based on 1982 dollars.

A bond issue may be required to allow for construction of a terminal building and FBO shop. These items are not eligible for state or federal assistance.

Three variables must be examined prior to project implementation:

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

A major criteria in determining need is that action which will protect the public investment. Land acquisition and clear zone protection will enable the airport to develop required facilities to meet future aviation demand levels. A second major priority is the maintenance of facilities that have been constructed. A strategy for implementation is outlined as follows;

PHASE ONE 1982 - 1987

(1) Land acquisition and fencing - RW 15; (2) Clear Zone Protection - RW 15/33; (3) Overlay - RW 15/33; (4) Pvmt. Markings - RW15/33

ITEMS	TOTAL	STATE 70%	LOCAL 30%	PRIVATE 100%
1-4	$174,319	$122,023	$ 52,296	-0-
TOTAL	$174,319	$122,023	$ 52,296	0

PHASE TWO 1988 - 1992

(1) Terminal Building; (2) Apron - 7 Tiedowns; (3) Runway Extension - RW 15; (4) Pvt.Markings - RW 15; (5) MIRL Lighting - RW 15; (6) 10 Unit Tee Hangar; (7) Taxiway - Hangar Service

ITEMS	TOTAL	STATE 70%	LOCAL 30-100%	PRIVATE 100%
1	$ 53,248	-0-	$ 53,248	-0-
2,3,4,5,7	$261,642	$183,149	$ 78,493	-0-
6	$152,100	-0-	-0-	$152,100
TOTAL	$466,990	$183,149	$131,741	$152,100

PHASE THREE 1993 - 2002

(1) Land Acquistion and Fencing - RW 3/21; (2) Clear Zone Protection - RW 3/21; (3) RW 3/21 - Turf; (4) Partial Parallel Taxiway; (5) Apron; (6) 4 Unit Tee Hangar; (7) FBO Shop; (8) Taxi - Hangar Service; (9) Landing Aids - RW 15/33; (10) Widen RW 15/33

ItEMS	TOTAL	STATE 70%	LOCAL 30-100%	PRIVATE 100%
1-5,8-10	$644,164	$450,915	$193,249	-0-
6	$ 68,952	-0-	-0-	$ 68,952
7	$187,200	-0-	$187,200	-0-
TOTAL	$900,316	$450,915	$380,449	$ 68,952