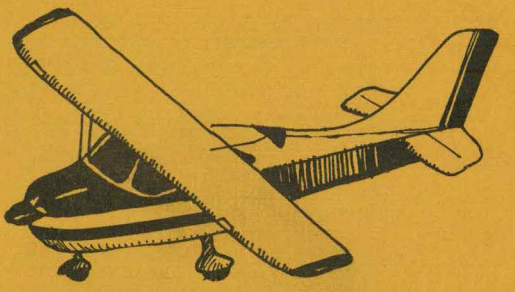
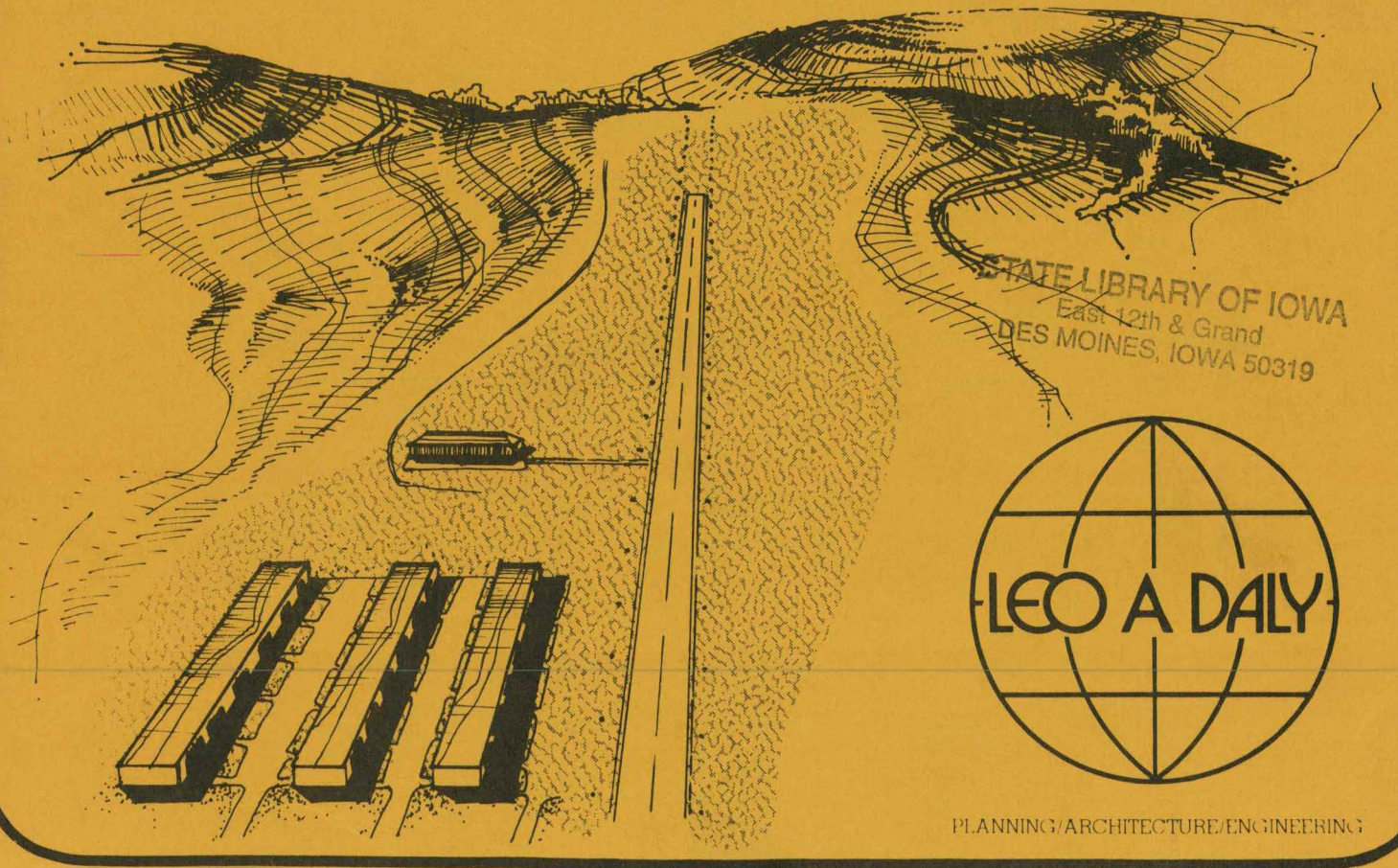
AIRPORT DEVELOPMENT PLAN



for

GLENWOOD, IOWA

JUNE 1978



LEO A DALY

PLANNING/ARCHITECTURE/ENGINEERING

AIRPORT DEVELOPMENT PLAN

FOR

GLENWOOD, IOWA

JUNE 1978

Prepared for

The City of Glenwood, Iowa

under an

Iowa Department of Transportation

State Aid Planning Grant

by

Leo A. Daly Company

Planning/Architecture/Engineering

8600 Indian Hills Drive

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DALY Project No. 041477

LEO A DALY

27 June 1978

The Honorable Dale A. Harper
Mayor of Glenwood
107 South Locust Street
Glenwood, Iowa 51534

Dear Mayor Harper:

An airport for the City of Glenwood has long been a consideration in the minds of City officials and your Chamber of Commerce. We are pleased, therefore, to transmit this report entitled, Airport Development Plan for Glenwood, Iowa.

The report covers the forecast of aviation demand and the corresponding facility requirements for a local airport. The site selection process is addressed, and the selected site is described; an environmental evaluation is then presented; finally, the financial ramifications are outlined.

The conclusion of the overall study is that the airport could be a feasible operation and would be included in the National Airport System Plan classifications. There would be costs to the City for the airport, but there appears to be significant potential for increased economic activity in the area to compensate for the investment.

We certainly appreciate having had this opportunity to assist your community, and we look forward to the continued growth of Glenwood in our region.

Very truly yours,

LEO A. DALY

Edward F. Cambridge
Vice President

EFC:csh

Enc.

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INTRODUCTION

For several years the need for an airport to serve the Mills County area has been discussed by the Iowa Department of Transportation (IDOT). Mills County is presently one of the few counties in Iowa that does not have an existing airport in any of the population centers. As a result of this deficiency, the IDOT has rated the City of Glenwood high on the list of prospective communities for a possible airport site due to its population and distance from other airports. The closest airport to Glenwood is 16 miles away in Plattsmouth, Nebraska.

In recognition of the above and the need for guidance in airport planning, the City Council and Chamber of Commerce of Glenwood, Iowa decided to undertake a feasibility and site selection study for a new airport. The main intent of the study was simply to determine if there is a need for an airport at Glenwood and, if so, where the airport could best be sited.

This document is the result of the information gathered by the Leo A. Daly Company, consultants to the City of Glenwood. The findings presented in this report give aeronautical activity forecasts that may be generated in the Glenwood area, and the extent of airport facility requirements needed to accommodate the projected demand.

The report has been prepared for review and approval by the City of Glenwood, the Iowa Department of Transportation, and the Federal Aviation Administration. Together with appropriate exhibits, the report will be presented in public hearing and will assist officials in making a final decision concerning airport feasibility for Glenwood, Iowa and appropriate site selection.

SYNOPSIS

- The forecast aviation demands for an airport in the Glenwood area are:

	1980	1995
Based Aircraft	12	21
Total Annual Operations	9,200	13,700

- The recommended airport development includes:

  -- Initial: 3,500 ft. paved runway.
  Non-precision instrumentation.
  Runway lighting.
  Small apron.
  Minimal services.

  -- Ultimate: 2,800 ft. turf, crosswind runway.
  Extension of primary runway to 4,100 ft.
  Increased apron area and hangar facilities.
  Administration building.
  Improved services.

- The proposed site is four (4) miles east of Glenwood, on the north ~~side~~ side of U.S. 34.

- There would be no homestead relocations involved.

- The estimated capital costs for the recommended airport are:

-- Initial Airfield Items	$1,000,000
-- Ultimate Airfield Items	$1,160,000
-- Ancillary & Service Related Items	$ 325,000

- Annual operating costs to the City for the airport are estimated at:

  1980 -- $12,420
  2000 -- $18,500

- The projected net annual cost to the City for amortization of the capital airfield costs and for operating cost is:

-- Initial	$16,480
-- Ultimate (approximately 1995)	$22,400

- Travel savings and attracted industrial growth could compensate for the additional costs to the community, making the airport a financially attractive project.

- To initiate the project, three steps are recommended:

  -- Officially designate the site and request State approval.
  -- Pursue the potential of County participation.
  -- Apply for Federal aid for property acquisition, engineering and construction.

SECTION 1

DATA COLLECTION

VICINITY AIRPORTS

A brief summary of several existing airport facilities in the surrounding Glenwood area is depicted on the accompanying Table 1, entitled Vicinity Airports. Physical characteristics and type of ownership are given along with location and distances from Glenwood. It should be noted that the nearest airport to Glenwood (Plattsmouth) is located in Nebraska. The nearest airport to Glenwood in Iowa would be either Council Bluffs or Red Oak. With respect to obtaining an Iowa pilots license, the nearest airport would be 30 miles away from Glenwood.

TABLE 1

VICINITY AIRPORTS

Airport	Owner	Location From Glenwood (mi.)	Principal Runway Length - Surface	Crosswind Runway Length - Surface
Council Bluffs	Municipal	30 NE	3,500' Hard	3,000' Turf
Eppley	Municipal	32 NW	8,200' Hard 4,300' Hard	6,000' Hard
Essex	Municipal	45 SE	2,300' Gravel	- None -
Grundman (Nebraska City)	Private	40 SW	2,500' Hard	- None -
Plattsmouth	Municipal	16 W	3,000' Hard	- None -
Red Oak	Municipal	30 E	2,900' Hard	2,800' Turf 2,700' Turf
Shenandoah	Municipal	40 SE	3,000' Hard	2,600' Turf

POPULATION TRENDS AND AIRCRAFT OWNERSHIP

Data was collected concerning the population distribution of Mills County and the trends in the overall county growth, based on the latest population statistics, Federal and local, and compared against figures and projections for the City of Glenwood. Table 2, entitled Population Data, depicts past growth trends and future population projections for the City of Glenwood and Mills County.

Analysis of this data along with a breakdown of aircraft ownership (see Tables 3 and 4) will give an indication of what the volume of future air travel may be, as presented in a later section of this report.

TABLE 2

POPULATION DATA

HISTORICAL TRENDS	1940	1950	1960	1970
Glenwood	4,501	4,664	4,783	4,421
Mills County	15,064	14,064	13,050	11,832
ESTIMATE	**1975**			
Glenwood	4,965			
Mills County	12,982			
FUTURE PROJECTIONS		**1980**	**1985**	**1995**
Glenwood				
MAPA "Trends"		5,152	5,339	5,713
MAPA "Compact Metro"		5,152	5,489	6,163
Mills County				
MAPA "Tends"		13,270	13,558	14,133
MAPA "Compact Metro"		13,270	13,558	14,133

SOURCES:

1970 Census of Population PC(1) - A17 and PC(1) - A29
1950 Census of Population P-A27
Population Projections by MAPA (Metropolitan Area Planning Agency)

TABLE 3

AIRCRAFT OWNERSHIP IN MILLS COUNTY*

Weber Engineering
John Pitzer
Marvin Brenton
Merrill Johnson
Swift and Company
Walter Phelps
John Mott
Frank Stevens, Jr.
Clifford Ludington
Burl Vinton
Dick Delashmutt
Lynn Goos
Floyd Messinger
Roy Mansfield, Jr.
Merrill Sargent

* From 1975 Records

TABLE 4

BUSINESSES USING AIRPORT FACILITIES

Iowa Highway Patrol
Weber Engineering
Glenwood State Hospital/School
Vinton Elevator
John Deere and Company
Mills County Equipment
Swift and Company
Modern Farm Supplies (Webster City, Iowa)
Caldwell Manufacturing Company (Kearney, Nebraska)
Stor-Mor Incorporated (Fremont, Nebraska)

SECTION 2

FORECASTS OF AVIATION DEMAND

THE METHODOLOGY

Airport development plans are formulated on the basis of forecasts. From these forecasts, the relationships between aviation demand and the capacity of an airport's facilities can be established; and airport requirements can be determined.

Forecasts of aviation demand for public airports were prepared by the Iowa Department of Transportation (IDOT) and published in the "1976 State Airport System Plan". Upon review of the Glenwood and Mills County forecasts, it was noted that much of the data used as the basis for the forecasts needed to be updated. As shown in Appendix I of this report, this forecasting update was completed utilizing the IDOT's methodology.

Forecasts for this study are summarized on the accompanying Table 5, entitled Forecasts of Aviation Demand. They have been developed according to a short (1980), intermediate (1985) and long-range (1995) time periods. It should be noted that the aviation forecast for the near future can be considered reasonably accurate and the 10 and 20-year forecasts are approximate in nature.

BASED AIRCRAFT

Based aircraft are defined as the total number of active general aviation aircraft which use Mills County as "home-base" and have a current airworthiness certificate.

REGISTERED AIRCRAFT

The locational distribution of registered aircraft reflects the residence of the aircraft owner. The difference in numbers of registered aircraft and based aircraft for Mills County results from some aircraft owners basing their aircraft outside the county.

TABLE 5

FORECASTS OF AVIATION DEMAND

FORECAST ELEMENT	1975	FORECAST YEAR 1980	1985	1995
Population				
Glenwood	4,965	5,152	5,489	6,163
Mills County	12,982	13,270	13,558	14,133
Registered Aircraft (County)	15	17	20	25
Based Aircraft (County)	9	12	15	21
Aircraft Mix		100% Type D+E*		
Airport Operational Role		BU	BU	BU
Aircraft Operations				
Annual		9,200	10,800	13,700
Itinerant		3,100	3,800	5,000
Local		6,100	7,000	8,700
Peak-Hour		20	21	24
Enplaned Passengers				
Annual General Aviation		4,650	5,700	7,500
Peak-Hour		20	21	22
Annual Instrument Approaches		16	19	25
National Airport System Role		F3	F3	F3

*100% Type D+E (Light Twin-Engine Piston and Single-Engine Piston)

AIRCRAFT MIX - AIRPORT OPERATIONAL ROLE

These two forecast elements are interrelated. Aircraft mix indicates the types or categories of aircraft which are to be accommodated at an airport facility. The airport operational role is determined by the aircraft mix and the frequency of aircraft operation.

It is anticipated that the initial development of an airport for the Glenwood, Iowa area will be classified as a Basic Utility (BU) airport. This type of airport accommodates approximately 95 percent of the propeller aircraft under 12,500 pounds (light twin-engine piston and single-engine piston aircraft).

The operation role or type of airport facility changes depending upon the type of aircraft projected to be using the airport throughout the planning period. As a demand develops to accommodate a greater number of larger aircraft, it is possible that the Basic Utility airport may need to be expanded to a General Utility (GU) airport category. This type of airport accommodates all propeller aircraft less than 12,500 pounds.

All aircraft currently registered in Mills County, and projected for the County through 1995, fall under the Basic Utility category. However, it is recommended that land use planning for a new airport consider the potential of ultimately expanding to a General Utility airport.

Representative aircraft accommodated at Basic Utility (BU) and General Utility (GU) airports are listed below.

Basic Utility	General Utility
-Cessna 150 through 310 Series	-All BU Aircraft
-Piper Tripacer and Cherokee Series	-Beech King Air and Queen Air
-Aero Commander 500 and 600 Series	-Cessna 400 Series
-Beech Baron and Debonair	-Piper Navajo

AIRCRAFT OPERATIONS

Aircraft operations are comprised of both local and itinerant operations. Local aircraft operations are those which depart and land at the same airport operating within the local vicinity of that airport. Itinerant aircraft operations are those where aircraft land or depart at one airport and have a terminus of the flight at another airport. Local and itinerant operations can be performed by based aircraft or aircraft based at another airport.

The number of operations per aircraft per year has increased during the past years and is expected to increase additionally during the next twenty years. This accelerating rate is due to increased cost of aircraft, increased percent of twin aircraft, and an increase in the percent of total operations for business purposes.

ENPLANED PASSENGERS

General aviation passengers include those passengers of private and personal flying, air taxi, and air charter operations. Forecast of general aviation passenger enplanement is estimated to be 1.5 enplaned passengers per general aviation itinerant operation. Peak-hour passengers are estimated to be 1.5 per peak-hour itinerant operation.

ANNUAL INSTRUMENT APPROACHES

Annual (non-precision) instrument approaches for non-tower general aviation airports are difficult to determine. The forecast of annual instrument approaches for a proposed Glenwood airport is based on analysis of existing, similar size airports throughout the state.

NATIONAL AIRPORT SYSTEM ROLE

The National Airport Classification System is a planning tool that identifies and classifies each airport within the national system of airports. It is based upon the concept that all airports in the system have a functional role based upon level of public service. The particular role of an airport usually dictates the minimum airport facilities to accommodate the existing or forecast level of enplaned passengers (public service) and the existing or forecast level of aircraft operations (aeronautical density) at the airport.

The (F3) National Airport System Plan (NASP) classification for a new Glenwood Airport indicates that the airport facility would be included in a Feeder System category. This is the lowest public service level for airports within the national system and includes most general aviation airports. The (F3) Low Density Feeder System qualifications include less than 50,000 annual enplaned passengers with less than 20,000 annual aircraft operations.

SECTION 3

AIRPORT FACILITY REQUIREMENTS

AIRPORT DESIGN CRITERIA

Criteria for airport development are published by the Federal Aviation Administration for both the Basic Utility type airport and General Utility type airport being considered at Glenwood. The type of airport and corresponding length of primary runway are delineated below for a new facility in the Glenwood vicinity.

BU	Basic Utility - Initial Airport (95% Propeller Aircraft up to 12,500#)	3500'
GU	General Utility Airport (100% Propeller Aircraft up to 12,500#)	4100'

Table 6, entitled Airport Facility Requirements, outlines in more detail the criteria used for the Glenwood study.

TABLE 6

AIRPORT FACILITY REQUIREMENTS

	1980 Initial	Ultimate (a)
GENERAL INFORMATION		
Class of Airport	BU (Stage II)	GU
Critical Aircraft	95% of propeller aircraft under 12,500 pounds	All propeller aircraft under 12,500 pounds
DIMENSIONAL REQUIREMENTS		
Primary Runway		
Length (Ft.)	3,500'	4,100'
Width (Ft.)	60'	75'
Pavement Thickness	6"	6"
Approach Slope	20:1	20:1
Clear Zone		
Near Width (Ft.)	500'	500'
Far Width (Ft.)	800'	800'
Length (Ft.)	1,000'	1,000'
Marking/Instrumentation (SE end only)	NPI	NPI
Lighting	MIRL	MIRL
Associated Taxiway		
Length (Ft.)		4,100'
Width (Ft.)		40'
Pavement Thickness		6"
Crosswind Runway (Turf)		
Length (Ft.)		2,800'
Width (Ft.)		150'
Approach Slope (Visual)		20:1
Clear Zone		
Near Width (Ft.)		250'
Far Width (Ft.)		450'
Length (Ft.)		1,000'

(a) Considered as possibility beyond 1995.

TABLE 6

AIRPORT FACILITY REQUIREMENTS

(continued)

	1980 Initial	Ultimate
Separation Distances		
Runway Centerline To		
Taxiway Centerline		200'
Building Restriction Line & Property Line	250'	300'
Tiedown Area	225'	275'
Taxiway Centerline To		
Tiedown Area		75'
Fixed or Movable Obstacle		50'
Support Facilities		
Apron Area (S.F.)		60,000
Administration Building (S.F.)		1,500
Shop Hangars (S.F.)		7,000
T-Hangars (Spaces)		20
Vehicle Parking (Spaces)		35
Land Acquistion		
Fee Title	109 AC.	48 Add. AC.
Easement	24 AC.	24 Add. AC.

AIRSPACE UTILIZATION

Determination of airspace utilization requires that interairport considerations be taken into account such as proximity of one airport to another, the relationship of runway alignments, and the nature of operations. Ideally, an airport site for the City of Glenwood should be located so that its airspace does not conflict with those of other area airports, such as Eppley and Offutt. However, studies were made of several airport locations in the Glenwood area, as will be presented in the following section of this report, and it was found that all potential sites had some conflicts with Offutt Air Force Base aircraft movements.

For control of aircraft movements, airspace is categorized as terminal airspace, which is used primarily for the control of approach and departure from the airports. Traffic densities in the terminal areas are generally greater than in other segments of airspace due to the concentration of aircraft arriving and departing at the airport. The need to provide orderly procedures and to define airspace areas is thus of great importance. Terminal airspace includes the approach or departure control and transition areas. These airspace reservations, whether they are for Visual Flight Rules (VFR) or Instrument Flight Rules (IFR), have been established by the Federal Aviation Administration (FAA) under the Federal Aviation Regulations (FAR), Part 77.

Airspace conflicts or overlapping of airspace reservation areas does not necessarily mean that a proposed site cannot be developed; it is only an indication that a more detailed analysis must be undertaken. A change of traffic patterns for takeoff and landing could help to avoid possible airspace conflict with other airports. Also, a procedural restriction for airports adjacent to carrier airports under IRF conditions could help to solve an overlapping airspace problem.

Traffic pattern airspace for aircraft operating from Basic Utility (BU) and General Utility (GU) airports should conform to the following longitudinal blocks:

BU & GU - .75 nautical mile on either side of runway and
1.0 nautical mile from each end of runway.

WEATHER CONDITIONS

In the Federal Aviation Administration capacity methodologies, an annual weather condition of ninety percent (90%) VFR and ten percent (10%) IFR is assumed. Generally speaking, weather conditions in the Glenwood vicinity are well within these percentage allocations.

Runways are oriented to maximize favorable wind direction and to minimize crosswind effects. For Basic Utility (BU) and General Utility (GU) airports, the primary runway should have ninety-five (95%) wind coverage with an allowable crosswind of ten knots or 11.5 miles per hour.

Almost all of the airport facilities in the Midwest do not have consistent ninety-five percent (95%) primary runway wind coverage with ten knot (11.5 mph) maximum crosswind component. Thus, there is the need for a crosswind runway to accommodate operations when the wind direction and/or wind velocity dictates the need. The planned Glenwood airport would have 94 percent wind coverage on the primary runway and 98 percent coverage with addition of the crosswind, based on historical weather conditions.

NAVIGATIONAL AIDS AND LIGHTING

For a proposed airport in the Glenwood vicinity, a minimum approach system is included as a basic assumption. This Non-directional Beacon Approach System (NDB) is the least precise landing approach system available. Its principal component is a non-directional beacon which is a low-frequency facility that is greatly affected by weather conditions. IFR landing minima for such a system are seldom below a Minimum Descent Altitude (MDA) of 600 feet and one mile visibility.

A preliminary analysis of runway approach lighting for a General Utility airport indicates a need for the REIL and VASI systems. The Runway End Identifier Lights system consists of a pair of synchronized flashing lights, one of which is located laterally on each side of the runway threshold facing the approach area. The Visual Approach Slope Indicator System gives visual decent guidance

information during approach to the runway. The standard VASI System consists of downwind and upwind light bars that provide a visual glide path which provides safe obstruction clearance within the approach zone.

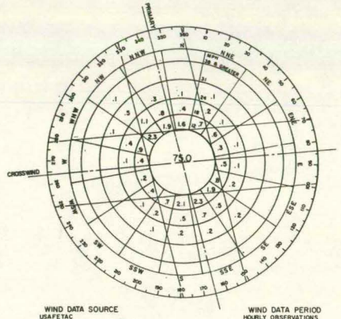
Preliminary indications for airport runway and taxiway lighting show the need for a Medium Intensity Runway Lighting System (MIRLS).

PRELIMINARY AIRPORT LAYOUT PLAN

Figure 1 shows the preliminary airport layout plan for the proposed Glenwood airport, based on the above criteria.

FIGURE 1

PRELIMINARY AIRPORT LAYOUT PLAN



WIND DATA SOURCE
USAF/TAC
AIR WEATHER SERVICE (MAC)
OFFUTT AFB
OMAHA, NEBRASKA

WIND DATA PERIOD
HOURLY OBSERVATIONS
JAN 1964 - DEC 1970
320,184 OBS.
CALM 16.8%

PRIMARY 100 - 5.7 = 94.3%
CROSSWIND 100 - 16.8 = 83.2%
PRIMARY & CROSSWIND 100 - 2.1 = 97.9%

WIND ROSE

BASIC DATA TABLE RUNWAY DATA	RUNWAY 17-35		RUNWAY 9-27	
	INITIAL	ULTIMATE	INITIAL	ULTIMATE
EFFECTIVE GRADIENT (IN %)	0	0		0
% WIND COVERAGE (12 M.P.H.)	94.3	94.3		83.2
NONPRECISION INSTRUMENT RUNWAY	R/W 17	R/W 17		NONE
PAVEMENT STRENGTH	12.5s	12.5s		TURF
APPROACH SLOPES	20:1	20:1		20:1
LIGHTING	MIRL	SAME		NONE
MARKING	NPI	SAME		SEGMENTED MARKING
NAVIGATIONAL AIDS	NONE	VASI-2		NONE

BASIC DATA TABLE AIRPORT DATA	INITIAL	ULTIMATE
AIRPORT ELEVATION	1255.00	SAME
AIRPORT REFERENCE POINT (ARP) COORD.	LAT. 41°05'30" LNG. 95°58'18"	
MEAN MAX. TEMP. HOTTEST MONTH	90°	SAME
TAXIWAY MARKING	STANDARD	SAME
NAVIGATIONAL AIDS	NDB	NDB

LEGEND		
INITIAL	ULTIMATE	
		BUILDING RESTRICTION LINE (BRL)
1250		GROUND CONTOURS
	F	AIRPORT PROPERTY LINE
		FACILITIES
		CLEAR ZONES

EASEMENTS REQUIRED FOR CLEAR ZONES

NORTH
MAG. DEC. 8° 30'

100 50 0 100 200 300 400
SCALE

ENGINEERING
ARCHITECTURE
PLANNING
LEO A DALY

SECTION 4

SITE EVALUATION

SITE SELECTION PROCESS

Initial planning stages for the subject project at Glenwood began with a review of U.S.G.S. maps for the area surrounding Glenwood. Desirable locations require a fairly flat terrain. Ideally, three-quarters of a mile of level ground is needed.

Any site having satisfactory topography was then screened against soil surveys, historical and archaelogical site maps, obvious physical or environmental conflicts, and a preliminary airspace review by the Federal Aviation Administration.

POTENTIAL AIRPORT SITES

Two potential sites were initially selected, but were rejected by the FAA due to serious airspace conflicts with Offutt Air Force Base. The rejected sites were located southwest of Glenwood near the water treatment and two miles south of the U.S. 34 - IA. 385 interchange, below the bluffs. Both sites are directly under the approach for aircraft landing at Offutt. Violent turbulence created by the large Offutt aircraft would cause serious problems for small aircraft.

Four alternative locations were selected and approval was obtained from the FAA. Figure 2 indicates the locations of these sites. Also presented is a comparison chart (Table 7) to which a rating method was applied in order to select Site "B" as the location with the highest potential for an airport development.

FIGURE 2

ALTERNATIVE AIRPORT SITES

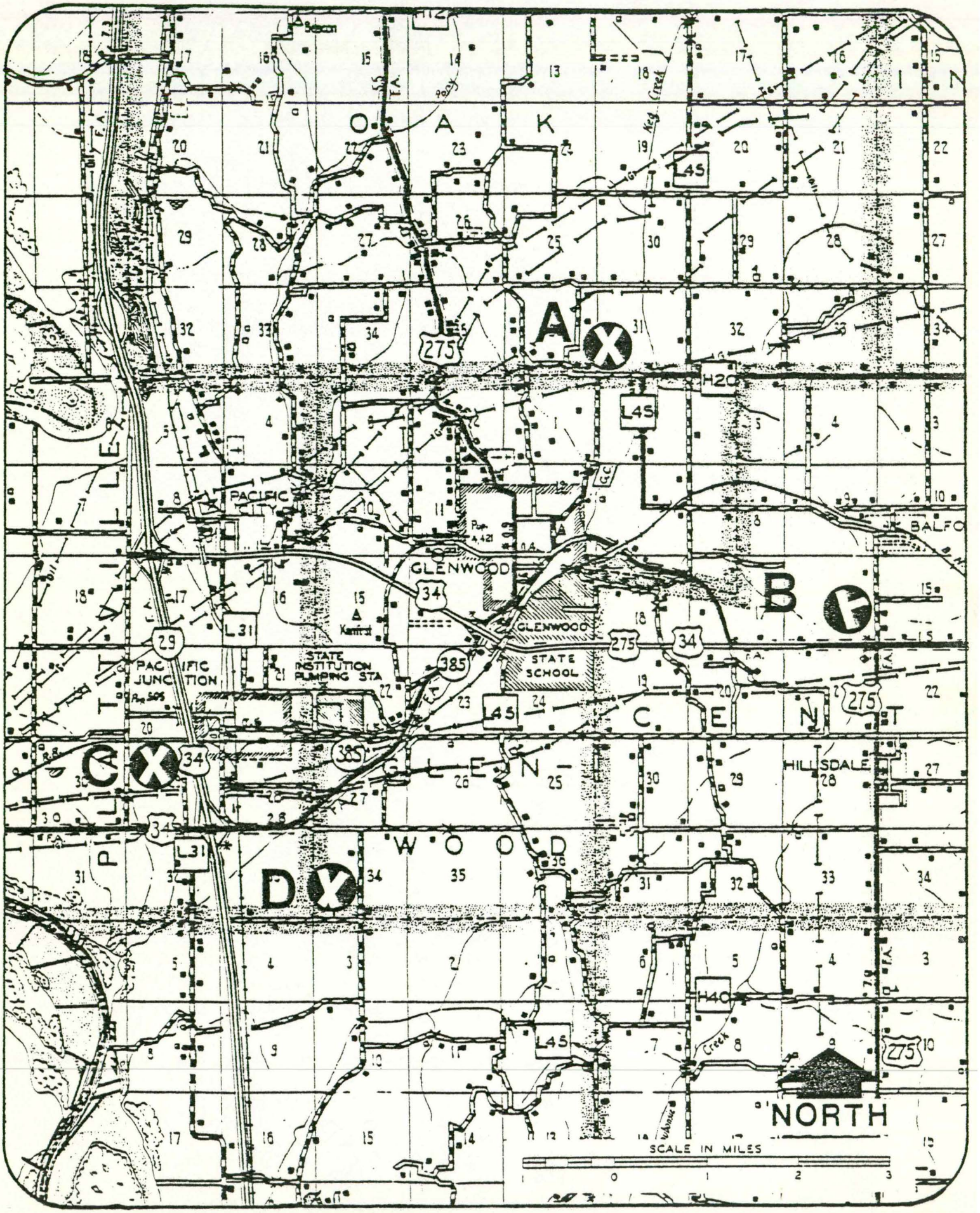


TABLE 7

AIRPORT SITE COMPARISON

SITE	"A"	"B"	"C"	"D"
Topography	2% side slope with drainageway - some grading required	Hilltop ridge - minimum grading required	Flat bottom land with major drainage ditch - large culvert under runway required	Flat bottom land - minimum grading required
Access	3 miles northeast of Glenwood via paved county road	4 miles east of Glenwood via U.S. Route 34	6 miles southeast of Glenwood via Iowa Route 385	5 miles southeast of Glenwood via Iowa Route 385 and 1½ miles county gravel road
Compatibility with surrounding land use	Fair - may conflict with residential growth pattern	Good	Very good - industrial	Very good - industrial
Relocations	Possible conflict with one homestead in southeast clear zone	None	None	None
Air Space	No objection	No objection	IFR north, conflict when simultaneous with Offutt	Same as C
Site Size (initial/ultimate)	120 ac./200 ac.	109 ac./157 ac.	180 ac./220 ac.	180 ac./200 ac.
Soil	Fair	Fair	Very Poor	Poor
Road Closures	None	None	None	None
Historical/ Archaelogical Sites	None	None	None	None

THE SELECTED SITE

The selected site, Site "B", is located approximately four miles east of Glenwood on the north side of U.S. Route 34. The site is on an expansive hilltop ridge, well oriented for placement of runways relative to the prevailing winds, as indicated by the 94% wind coverage for the primary runway.

Because of the well suited topography and the good access on Route 34, the site has long been thought to have good potential for an airport by the local community. Also, the location east of Glenwood relates well to the rest of Mills County and Malvern, the second largest community in the county.

As previously outlined, the proposed initial development includes one 3,500 foot, hard surfaced runway in the primary direction, with minimal support facilities. Ultimate expansion could include extending the primary runway to 4,100 feet and adding a 2,800 foot crosswind runway, a primary taxiway, and substantially improved support facilities. The ultimate support facilities could include an administration building, a shop hangar, tee hangars, a paved apron, and a paved access road.

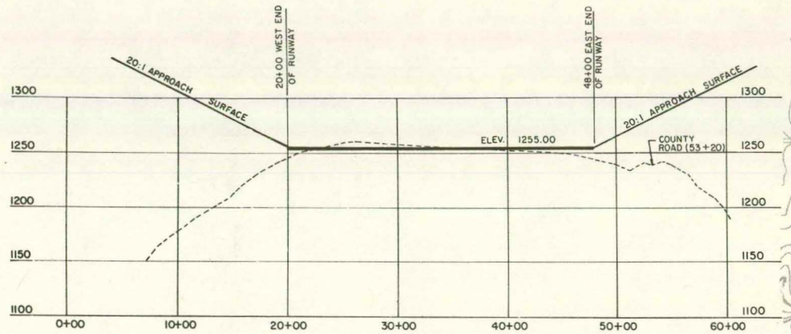
The initial development would take approximately 109 acres plus 24 acres of easement (see Figure 3). The easement area would be in the clear zones, and the easement would restrict construction height to avoid any encroachment into the 20:1 approach slope. At the critical corner of the easement areas, the height restriction would be approximately 25 feet; and the limit would increase away from the runway at a rate of one foot in twenty feet. Considering the agricultural nature of the area, the height restriction should not represent a serious constraint in the easement areas.

The ultimate development would require an additional 48 acres plus another 24 acres of clear zone easement (see Figure 3).

Much of the property taken for the airport would be for clearances parallel to the runways, and some excess property would be taken in order to avoid leaving uneconomic remnants. Much of the clearance and excess area could be farmed. Figure 3 shows that 74 acres initially and 83 acres ultimately could be farmed.

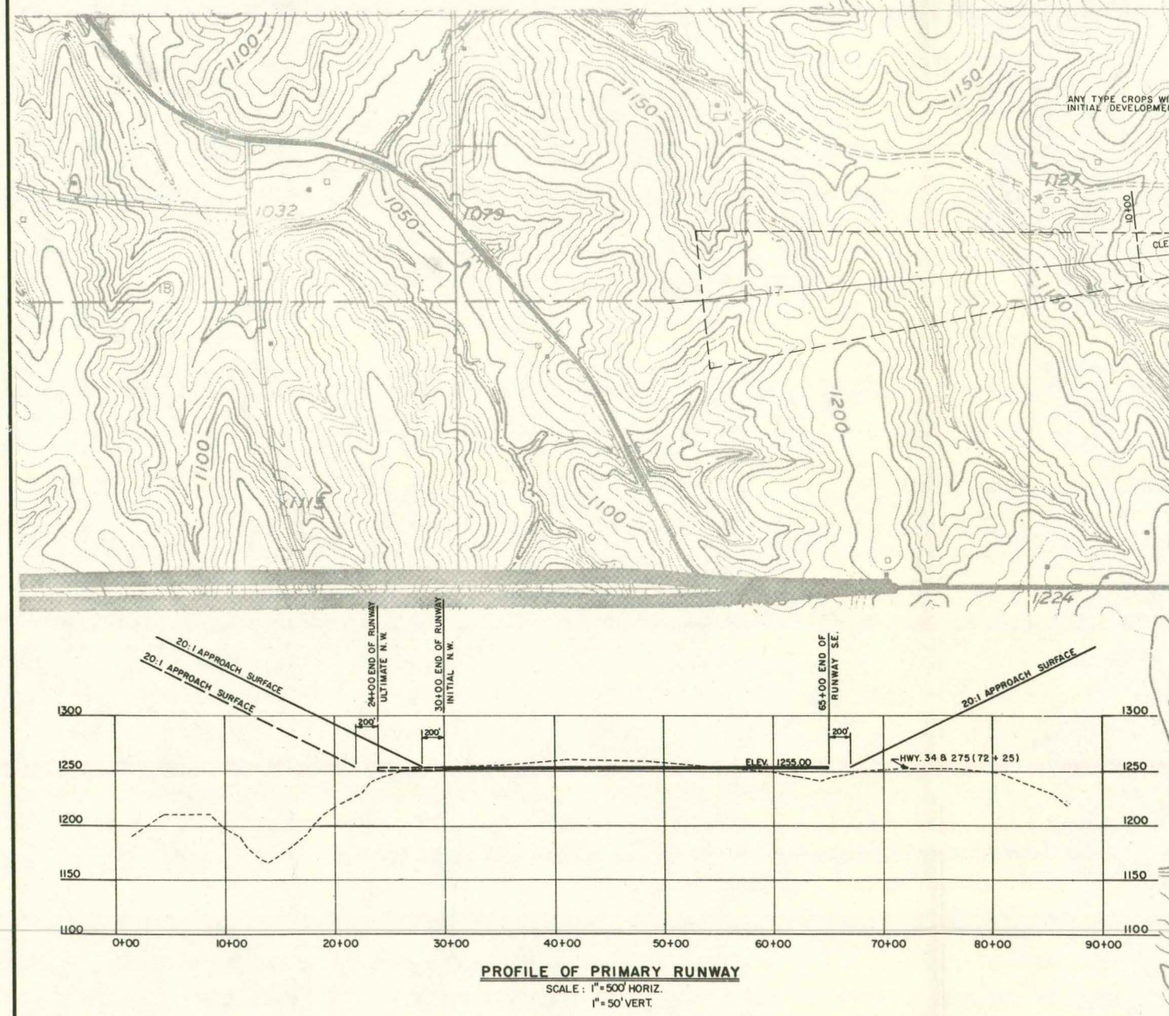
FIGURE 3

AIRPORT SITE PLAN



PROFILE OF CROSSWIND RUNWAY

SCALE: 1"=500' HORIZ.
1"=50' VERT.



PROFILE OF PRIMARY RUNWAY

SCALE: 1"=500' HORIZ.
1"=50' VERT.

LAND USE

	INITIAL	ULTIMATE
AIRPORT ACTIVITIES	35	74
LOW GROWING CROPS	36	53
ANY TYPE CROPS	38	30
	109 AC	157 AC

LEGEND		
INITIAL	ULTIMATE	
1250		GROUND CONTOURS
	F	AIRPORT PROPERTY LINE
		FACILITIES
		CLEAR ZONES / APPROACH ZONES

EASEMENTS REQUIRED FOR CLEAR ZONES

NORTH
MAG. DEC. 8° 30'

500 250 0 500 1000
SCALE

ENGINEERING
ARCHITECTURE
PLANNING
LEO A DALY

The entire site, as well as the approach zones, is currently in agricultural use; and county land use plans indicate no change in the vicinity land use. Thus, there is no problem with incompatible land use (i.e., schools, hospitals, residential development). There would be no homestead or business relocations involved.

The potential noise patterns were also examined. The analysis shows that the area of noise intensity objectionable for residential purposes would be confined to the airport site, and would not affect any surrounding homesteads.

SECTION 5

SOCIO-ECONOMIC & ENVIRONMENTAL IMPACT

IMPACT ON THE NATURAL ENVIRONMENT

The natural environment is our home and must be protected. The impact of the proposed airport on this environment is of importance to all.

Wildlife

None of the area around the proposed airport site is noted as a productive hunting area, nor is the area a known nesting area for any classification of wildlife other than rabbits, some species of birds that feed on agricultural produce, and the occassional crossing of migrating deer. There is no record of any rare or endangered species on or near the project.

The site would not appear to affect any major waterfowl flying corridors.

There is no record of any virgin prairie grasses or native vegetation within the area. Therefore, the only effect upon the vegetation would be the elimination of agricultural plant materials.

Ground Water and Water Pollution Abatement

Ground water is not likely to be affected detrimentally by airport construction.

The water table at the Glenwood site is far below the surface. There are no foundation support problems for runways or pavement anticipated if proper surface drainage is designed.

A septic tank and lateral tile field system are proposed for the airport development. This treatment facility would be designed and maintained in accordance with acceptable health standards.

IMPACT ON THE HUMAN ENVIRONMENT

The human environment relates to the direct impacts on the health and well being of society, which must be considered with any proposed development.

Relocation of Persons

Land considered in all the alternative airport sites is in agricultural use. Relocation possibilities due to possible airport development vary from site to site. Any occupied farmstead that would be purchased with the family being relocated must conform with requirements set forth in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. This Act provides for uniform and equitable treatment of persons displaced from their homes, business, or farms by federal and federally assisted programs. The law specifies a payment of moving and related expenses; the provision, if required, of replacement housing; and relocation assistance advisory services.

Aircraft Exhaust Emissions

Exhaust emissions from aircraft are also recognized as an impact upon the human environment. Aircraft exhaust emissions from light piston type aircraft, however, are low in comparison to other aircraft type.

Data on ambient air quality or quantity of suspended particulates has not been collected at this time in the Glenwood vicinity. In this case, a comparative situation will be described in order to provide a basis for evaluation of aircraft exhaust emission impact.

The Omaha-Douglas County Health Department maintains several air quality monitoring stations. One of these stations is located adjacent to the North Omaha Airport. This airport accommodates single-engine and light twin-engine aircraft. With aircraft exhaust emissions, the suspended particulate matter of the area is as follows:

ANNUAL GEOMETRIC MEAN SUSPENDED PARTICULATES
NORTH OMAHA STATION

1971 -- 53.8 ug/m^3*
1972 -- 50.6 ug/m^3
1973 -- 68.2 ug/m^3

* ug/m^3 = micrograms per cubic meter

AIR QUALITY STANDARDS

	Primary (ug/m^3)	Secondary (ug/m^3)
Suspended Particulate Matter -		
Annual Geometric Mean	75	60
24-Hour Concentration	260*	150*

* Not to be exceeded more than once a year.

Source: Annual Compilation of Air Quality -- (1973) State Department of Environmental Control

Comparing the annual geometric mean (suspended particulates) with air quality standards, it appears that aircraft exhaust emissions from light piston aircraft do not significantly affect air quality.

UNAVOIDABLE ENVIRONMENTAL IMPACTS

The noise and air pollution produced by aircraft operation and the conversion of land from natural or agricultural uses to airport use are considered adverse environmental factors and are unavoidable. The severity of the conflict of community interests between the demand for improved aviation facilities and the desire to retain the environment at present or improved levels of quality is principally a matter of degree of environmental impact. The aviation operations would cause such a slight air pollutant production as to be considered a very slight impact and not a significant conflict. No other adverse impact of importance is likely to be created.

No public land is adversely affected by airport improvement on any of the sites.

No water pollution other than temporary, minor soil erosion during construction of the airport is expected. This condition could be minimized by prompt replanting.

SHORT TERM EFFECTS AND LONG TERM BENEFITS

The conversion of farmland would be a negative impact on affected farmers, which could be reasonably offset by equitable compensation.

The following airport construction activities are recognized as potential adverse short-term impacts:

- Clearing and grubbing (minimal).
- Temporary airborne dust and noise pollution associated with construction.
- Reduction in agricultural farming acreage.

Methods and techniques that will be used to minimize these short-term adverse impacts are presented in the following Federal manuals:

- FAA AC 150/5370-1A, Standard Specifications for Construction of Airports.
- FAA AC 150/5320-5B, Airport Drainage.
- FAA AC 150/5370-7, Airport Construction Controls to Prevent Air and Water Pollution.

No long-term negative effects of consequence are foreseen, as air and noise pollution effects are considered minor. The long-term effect of an improved community facility is quite important as a citizen service and for industrial and economic development of the area.

Increasingly, the community airport is a key element in attracting industry. The economic benefit of air service to a business executive required to make a thousand mile round trip per week is a saving of travel time over automobile travel of over $11,000 per year. The "1976 State Airport System Study" estimated a travel savings of approximately $1.25 per operation for a Glenwood airport. Other studies indicate a multiplier effect of 2.0 as these savings circulate through the community.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOUCRES

No irreversible or irretrievable commitments of resources would be involved in the proposed improvement program except that the capital, labor and material associated with construction would be consumed in the implementation of the project.

SECTION 6

FINANCIAL PLAN

THE BASIS

No plan, of course, is realistic unless it is financially feasible. This section of the report presents the financial feasibility of the Glenwood Airport Plan.

The feasibility analysis assumes Federal participation. Current directives indicate that after this year the Federal share of applicable projects will be 80 percent. The State of Iowa also provides assistance in some instances, but generally this has been limited to projects that did not receive Federal assistance. Thus, assuming Federal participation, no state assistance is included in the analysis.

The analysis does assume that 25 percent of the local, non-Federal share (5% of total capital costs) would be borne by Mills County. With its central location, the airport would serve much of Mills County; and many of the benefits would accrue to county residents outside Glenwood. Also, any new industry or commerce that would be attracted to the area by the airport would very probably locate outside the Glenwood city limits. Thus, it seems reasonable to assign a portion of the cost to the County. The actual percentage would be a matter of negotiation; it is emphasized that the 25 percent figure used in the analysis is only an assumed value for purposes of evaluation.

CAPITAL COSTS

The estimated capital costs for development of the airport are presented in Tables 8-A, 8-B, and 8-C.

Table 8-A presents the cost estimate for initial development of those elements that comprise the basic airfield, not including ancillary facilities associated with airplane storage and services. Generally, this estimate can be considered the minimum cost for which the airport could be initially constructed to meet Federal guidelines. These elements are eligible for Federal participation.

Table 8-B presents the cost estimate for the ultimate development. This category covers the expansion of the airfield to the extent that might reasonably be anticipated in the future. These costs would be eligable for Federal participation.

Table 8-C presents the cost estimate for those elements of the plan generally related to aircraft storage and ancillary services. None of these elements are mandatory for initial development of the airport. These elements should draw revenue from hangar rental fees, service charges, etc.; and like any business development, these elements should develop in phases corresponding to indicated demand for the services. The total for this category represents a level of development that would reasonably correspond with ultimate development of the airfield. These elements would not be eligible for Federal participation.

TABLE 8-A

COST ESTIMATE

FEDERAL AID ELIGIBLE

Initial Development
Basic Utility (BU) Airport

LAND ACQUISITION		
Fee - 109 Ac. @ $2500/Ac.		$ 272,000
Easement - 24 Ac. @ $1,000/Ac.		24,000
	Subtotal	$ 296,000
UTILITY RELOCATION (POWER LINES)		
Hwy. 34 and 275		$ 4,000
CONSTRUCTION		
1. Grading and drainage - 100,000 C.Y. @ $0.50/C.Y.		$ 50,000
2. Fencing 13,500 L.F. @ $2/L.F.		27,000
3. Paving - 28,400 S.Y. @ $15/S.Y.		426,000
Primary Runway (60 x 3500)		
Turnarounds (9100 S.F.)		
Connecting Taxiway (30 x 360)		
Apron (236 x 110)		
4. Seeding 30 Ac. @ $200/Ac.		6,000
5. Lighting and Marking		
Primary runway - 3500 L.F. @ $12/L.F.		42,000
Apron (lighting and power)		5,000
6. Navigational aids		22,000
Rotating beacon		
Lighted wind indicator		
Segmented circle		
NDB		
7. Access road (aggregate) 5700 S.Y. @ $1.50/S.Y.		9,000
8. Planning, engineering and testing 10%		53,000
	Subtotal	$ 640,000
CONTINGENCIES - 10%		$ 64,000
	TOTAL	$1,000,000

TABLE 8-B

COST ESTIMATE

FEDERAL AID ELIGIBLE

Ultimate Development
General Utility (GU) Airport

LAND ACQUISITION		
Fee - 48 Ac. @ $2500/Ac.		$ 120,000
Easement - 24 Ac. @ $1000/Ac.		24,000
	Subtotal	$ 144,000
CONSTRUCTION		
1. Grading and drainage - 50,000 C.Y. @ $0.50/C.Y.		$ 25,000
2. Fencing - 6,600 L.F.		10,000
New - 3,000 L.F. @ $2/L.F.		
Relocate - 3,600 L.F. @ $1/L.F.		
3. Storm sewer - 3040 L.F. @ $25/L.F.		76,000
4. Paving - 39,700 S.Y. @ $15/S.Y.		595,000
Primary runway widening (15 x 3500)		
Primary runway extension (75 x 600)		
Taxiway (40 x 4100)		
Connecting taxiway (40 x 360)		
T-hangar taxiway (20 x 1735)		
Apron (28 x 100) + (236 x 185)		
5. Seeding 45 Ac. @ $200/Ac.		9,000
6. Lighting and marking		
Primary runway relocation - 3500 L.F. @ $6/L.F.		21,000
Primary runway extension 600 L.F. @ $12/L.F.		7,000
Apron		5,000
7. Navigational aids VASI - 2 (one end)		9,000
8. Access road (concrete) 5700 S.Y. @ $15/S.Y.		85,000
9. Planning, engineering and testing		81,000
	Subtotal	$ 923,000
CONTINGENCIES - 10%		$ 93,000
	TOTAL	$1,160,000

TABLE 8-C

COST ESTIMATE

FEDERAL AID NON-ELIGIBLE

CONSTRUCTION

1.	Lighting - T-hangars	$ 5,000
2.	Utilities	
	Well, storage and septic tank	30,000
	Water distribution - 1000 L.F. @ $15/L.F.	15,000
3.	Administration building - 1500 S.F. @ $15/S.F.	23,000
4.	Shop hangar - 7000 S.F. @ $15/S.F.	105,000
5.	T-hangars - 20 spaces @ $3500/space	70,000
6.	Parking and road to T-hangars (concrete) 1330 S.Y. @ $15/S.Y.	20,000
	Parking - 36 spaces (184 x 60)	
	Road to T-hangar (39 x 22)	
7.	Planning, engineering and testing - 10%	27,000
	Subtotal	$ 295,000
CONTINGENCIES - 10%		$ 30,000
	TOTAL	$ 325,000

OPERATING COSTS

To develop an estimate of operating costs, telephone interviews with surrounding communities were conducted. Table 9 presents the approximate operating costs for the surrounding community airports compared with estimated operations.

Table 9 shows basic operation and maintenance costs, not including a full time manager. Generally, when the level of activity requires a full time manager, a fixed base operator is retained. The fixed base operator handles the ancillary services at the airport, as a private business enterprise. He thereby derives a significant portion of his income from these services.

As indicated in Table 9, the composite operating cost for the surrounding communities is $1.35 per operation. More detailed statistical analysis of the data also indicates $1.35 per operation to be a reasonable figure. It is, therefore, used in the subsequent cost analysis for the Glenwood airport.

ANNUAL COST SUMMARY

Table 10 presents the annual cost summary based on the previously presented capital and operating costs. The source of revenue to help meet the annual costs would be cash rent from the airport lands that could be used for crops. The analysis is based on constant dollars and does not account for the costs of the ancillary items listed in Table 8-C.

Table 11 presents a cost revenue analysis for the ancillary facilities listed in Table 8-C. The basic source of revenue used is hangar fees. The estimated deficiency would have to be supported by other revenues from services at the shop hangar and administration building, etc., or be reimbursed by the City. However, it is again emphasized that these elements are not mandatory for operation of the airport, especially such high cost items as the shop hangar; and the elements should be considered separately when evaluating the economics of the airport.

TABLE 9

AIRPORT OPERATING COSTS

COMMUNITY	APPROXIMATE ANNUAL OPERATING COST	TOTAL ANNUAL AIRCRAFT OPERATIONS	OPERATING COST PER OPERATION
Atlantic	$ 30,000	15,000	$2.00
Audubon	$ 10,000	7,000	$1.43
Bedford	$ 3,000	5,000	$0.60
Greenfield	$ 9,000	8,500	$1.06
Harlan	$ 14,000	18,000	$0.78
Ida Grove	$ 13,000	7,500	$1.73
Shenandoah	$ 21,000	13,000	$1.62
Winterset	$ 9,000	7,000	$1.29
TOTALS	$109,000	81,000	$1.35

TABLE 10

ANNUAL COST SUMMARY

APPROXIMATELY 1980 (INITIAL)	
Amortization of Capital Costs	
Capital Cost = $1,000,000	
15% City Share = $150,000*	
$150,000 @ 6% for 20 Years =	
$150,000 (0.08718) =	$13,080
Operating Costs	
9,200 Operations @ $1.35 = $12,420	
75% City Share** =	9,320
Total	$22,400
Revenue from Farmland Rental	
74 Ac. @ $80 =	5,920
Net Annual Costs	$16,480
APPROXIMATELY 1995 (ULTIMATE)	
Amortization of Capital Costs	
Capital Cost = $1,160,000	
15% City Share = $174,000*	
$174,000 @ 6% for 20 Years =	
$174,000 @ (0.08718) =	$15,170
Operating Costs	
13,700 Operations @ $1.35 = $18,495	
75% City Share** =	13,870
Total	$29,040
Revenue from Farmland Rental	
83 Ac. @ $80 =	6,640
Net Annual Costs	$22,400

* 80% Federal, 5% Mills County, 15% City of Glenwood

** 25% Mills County, 75% City of Glenwood -- Mills County could use its road equipment for snow removal, mowing, etc.

TABLE 11

ANCILLARY FACILITIES COST/REVENUE COMPARISON

ANNUAL COSTS		
Amortization of Capital Costs $325,000 @ 6% for 20 Years = $325,000 (0.08718) =		$28,330
Annual Maintenance Cost		1,670
	Total	$30,000
ANNUAL REVENUES		
Hangar Rental 20 Spaces @ $360		$ 7,200
DEFICIENCY		$22,800

The initial investment on the part of the City would probably come from a general obligation bond issue. As indicated by the previous analysis, there would be a net cost to the City of $16,480 per year initially, or $1.80 per projected operation. To compensate for this cost two items should be considered:

- The "1976 State Airport System Study" estimated a travel savings of $1.25 per operation. The savings could be expected to double as they are circulated through the community.

- An airport is an important factor in the industrial and commercial growth of a community. Using a mill levy rate of 23.0, typical for Glenwood residents, an industrial investment of $1,000,000 would generate an annual property tax revenue of $23,000, which would exceed the estimated local annual airport cost ($16,480 City; $5,490 County). In addition there would be the multiplier effect on the general economy due to the added investment in the community.

Thus, it is indicated the the airport could be a feasible proposition for the community. If the City accepts the report of feasibility, three steps should then be followed by the City to initiate the project:

- Officially designate the site and request IDOT approval.

- Pursue the potential for County participation.

- Apply for Federal "Airport Development Aid Program" (ADAP) funds for property acquisition, engineering, and construction.

APPENDIX

STATISTICAL SUMMARY OF FORECAST DATA

REGISTERED AIRCRAFT PROJECTIONS

	United States		Iowa		Mills County
Year	Total[a]	Aircraft[b]/ 10,000 Population	Aircraft[c]	Aircraft/ 10,000 Pop.	Registered Aircraft
1975	158,000	7.386	3,150	11.386	15
1980	186,000	8.300	3,700	13.454	17
1985	220,000	9.357	4,070	14.806	20
1995	264,000[c]	10.205	4,820	17.517	25

(a) Source: Federal Aviation Administration, Aviation Forecasts Fiscal Years 1975-1986, 1974.

(b) Rates based on U.S. Census series population projections.

(c) Forecast analysis by Engineering Research Institute, Iowa State University.

BASED AIRCRAFT PROJECTION

Ratio value, B, calculated as: $B = \frac{\text{1975 based aircraft in county}}{\text{1975 registered aircraft in county}} = \frac{9}{15} = 0.60$

Then 1995 county based aircraft estimated to be:

$BA(95) = B^{1/3} \times$ (1995 registered aircraft in county)

$= 0.84 \times 25 = 21$

1985 county based aircraft estimated to be:

$BA(85) = B^{1/2} \times$ (1985 registered aircraft in county)

$= 0.77 \times 20 = 15$

1980 based aircraft assumed to be the average of 1975 and 1985 values:

BA 1975 = 9
BA 1985 = 15

BA 1980 = $24 \div 2 = 12$

FORECAST OF AIRMEN

Year	FAA Total Airmen U. S. [a]	FAA Total Airmen Iowa [b]	FAA Airmen/10,000 Population (d) U.S.	FAA Airmen/10,000 Population (d) Iowa	Iowa Airmen IAC[c]	Iowa Airmen/10,000 Population	Mills County Airmen
1975	742,400	12,000[e]	34.704	43.374	8,070	28	36
1980	901,700	13,300[e]	40.230	48.360	8,650[e]	31	41
1985	1,055,000[e]	14,200[e]	44.871	51.657	9,230[e]	33	45
1995	1,346,800[e]	15,800[e]	52.055	57.423	10,270[e]	37	52

(a) Federal Aviation Administration, Aviation Forecasts Fiscal Years 1975-1986, 1974.

(b) Historical data from FAA Statistical Handbook of Aviation, Annual Reports.

(c) Historical data from Iowa Aeronautics Commission (IAC) Annual Reports.

(d) United States populations from U.S. Bureau of the Census, Series E; Iowa populations from Iowa State University Extension Service, Series 4 Projections.

(e) Forecast analysis by Engineering Research Institute, Iowa State University.

GENERAL AVIATION TOTAL OPERATIONS

ISU-ERI/IDOT Formula: Log (total operations) = 2.614 + 0.501 log (Co. airmen x based aircraft)

1980: Anti-Log [2.614 + 0.501 Log (41 x 12)] = 9,176

1985: Anti-Log [2.614 + 0.501 Log (45 x 15)] = 10,752

1995: Anti-Log [2.614 + 0.501 Log (52 x 21)] = 13,682

GENERAL AVIATION ITINERANT OPERATIONS

ISU-ERI/IDOT Formula: Log (annual itinerant operations) =
1.865 + 0.605 Log (based aircraft x county airmen)

1980: Anti-Log [1.865 + 0.605 Log (12 x 41)] = 3,116

1985: Anti-Log [1.865 + 0.605 Log (15 x 45)] = 3,773

1995: Anti-Log [1.865 + 0.605 Log (21 x 52)] = 5,048