MICHIGAN
SCHEDULED AIR SERVICE STUDY

FINAL TECHNICAL REPORT

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Creighton Associates
INCORPORATED

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Prepared for

Michigan Department of State Highways and Transportation
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by

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PREFACE

This document is the Final Technical Report of the Michigan Scheduled Air Service Study. It was prepared for the Michigan Department of State Highways and Transportation by Roger CREIGHTON ASSOCIATES, Incorporated, Prime Contractor, and Diemler and Diekemper, Incorporated, Subcontractor.

The objectives of the study were first to assess the adequacy of existing scheduled air service and the need for new service in the State and then to develop a series of options to resolve the needs identified. Finally, a detailed plan and program leading to the implementation of improved air service was required. This report describes the activities, methods, and results of the study and provides a carefully documented economically and operationally sound series of strategies for accomplishing improved air service.

The work described in this report consisted of six major tasks.

1. Compilation of historical and current data describing the level of air service supply and demand, the routes operated, the types of aircraft and air carriers providing service and the physical and operational characteristics of the state's airports.

2. Evaluation of the need for new and improved air service using both qualitative survey and market analysis techniques and quantitative analysis of the level of service and passenger demand.

3. Formulation of preliminary service proposals.

4. Evaluation of service proposals by the project's Technical Advisory Committee.

5. Expansion and refinement of service proposals and detailed operational and fiscal analysis covering a wide range of carrier type, aircraft type, and routing options.

6. Development of final system packages for both certificated and commuter solutions and a complete description of the necessary actions on the part of the State, airlines, and communities necessary to implement study recommendations.

ACKNOWLEDGEMENTS

Many individuals and agencies provided valuable input, direction and review for this project. Included among these are Mr. Edward A. Mellman, Project Manager, and the staff of the MDSH&T Aviation Planning Section, Mr. James D. Ramsey of the Michigan Aeronautics Commission and other members of the study's Technical Advisory Committee including representatives from the Federal Aviation Administration, the Upper Great Lakes Regional Commission, Air Wisconsin, Michigan Airways International, North Central Airlines and United Airlines.

Others who made contributions in providing data to support the study include the Civil Aeronautics Board, the Air Transport Association, the Commuter Airline Association, and those individuals and agency representatives who responded to the survey conducted during the study. To all of them we express our thanks.

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I. THE HISTORY OF AIR SERVICE IN MICHIGAN

The development of a comprehensive record of the historical and existing levels of air service in the State of Michigan serves two important functions:

- first, it provides essential input data to be used later in the analysis phases of the study.
- second, it provides the opportunity to gain insight and perspective into past trends and developments in air transportation in Michigan.

From an analytical viewpoint, air service may be thought of as three separate, but strongly interrelated components. These are:

- the supply/demand component
- the aircraft component
- the airport component.

The supply/demand component consists primarily of the services offered by carriers to communities in the state and the response of the communities to those services. In this context, services are defined primarily as scheduled flights although other ancilliary services, i.e., telephone reservations systems, ticketing systems and baggage handling, are also provided by most carriers. The demand aspect is most readily defined as the number of passengers and tons of cargo using the flights offered.

The aircraft component is defined simply as the physical, operational, and performance characteristics of the vehicles used to provide service.

The airport component is composed of those physical characteristics of airports that act as limiting features on the level of service and type of aircraft that can be accommodated.

A. SUPPLY/DEMAND

Twenty-two airports in the State of Michigan are designated Air

Carrier Airports. Of these, half are clustered in the Southern Lower Peninsula, four in the Northern Lower Peninsula, and seven in the Upper Peninsula. The locations of these airports are shown in Figure 1. In 1970, nearly 73% of the population resided with a thirty-minute drive of an air carrier airport and over 93% were within one hour's drive.

In November, 1976, scheduled air service to Michigan's Air Carrier Airports was provided by seven carriers; three certificated and four commuter. The points served by these carriers and the average weekday number of arrivals performed by each are shown in Table 1. More detailed summaries showing individual schedules, equipment, fare, operator type, and stop/connection data for each Michigan air service market are shown in Appendix A. These schedules were compiled to show service "to" the airports under study for May, 1976, and service "from" these airports for November, 1976. These data and similar data compiled for 1966 and 1975 will provide the base service descriptions needed to apply the "Service Classification Scoring System" discussed in Chapter III.

Historically, service by certificated carriers in Michigan has been quite stable. Both United Airlines and North Central Airlines have, with one exception, provided service to the same points as are now served. The one exception is that North Central previously provided service to W. K. Kellogg Regional Airport at Battle Creek. This service was suspended in 1971. The other certificated carrier, Wright Airlines, has provided regular service from Detroit City Airport to Cleveland and Columbus since "graduating" from a commuter airline in the early 1970's.

Formerly, one other certificated carrier provided service in Michigan. This carrier, Lake Central Airlines, provided service to

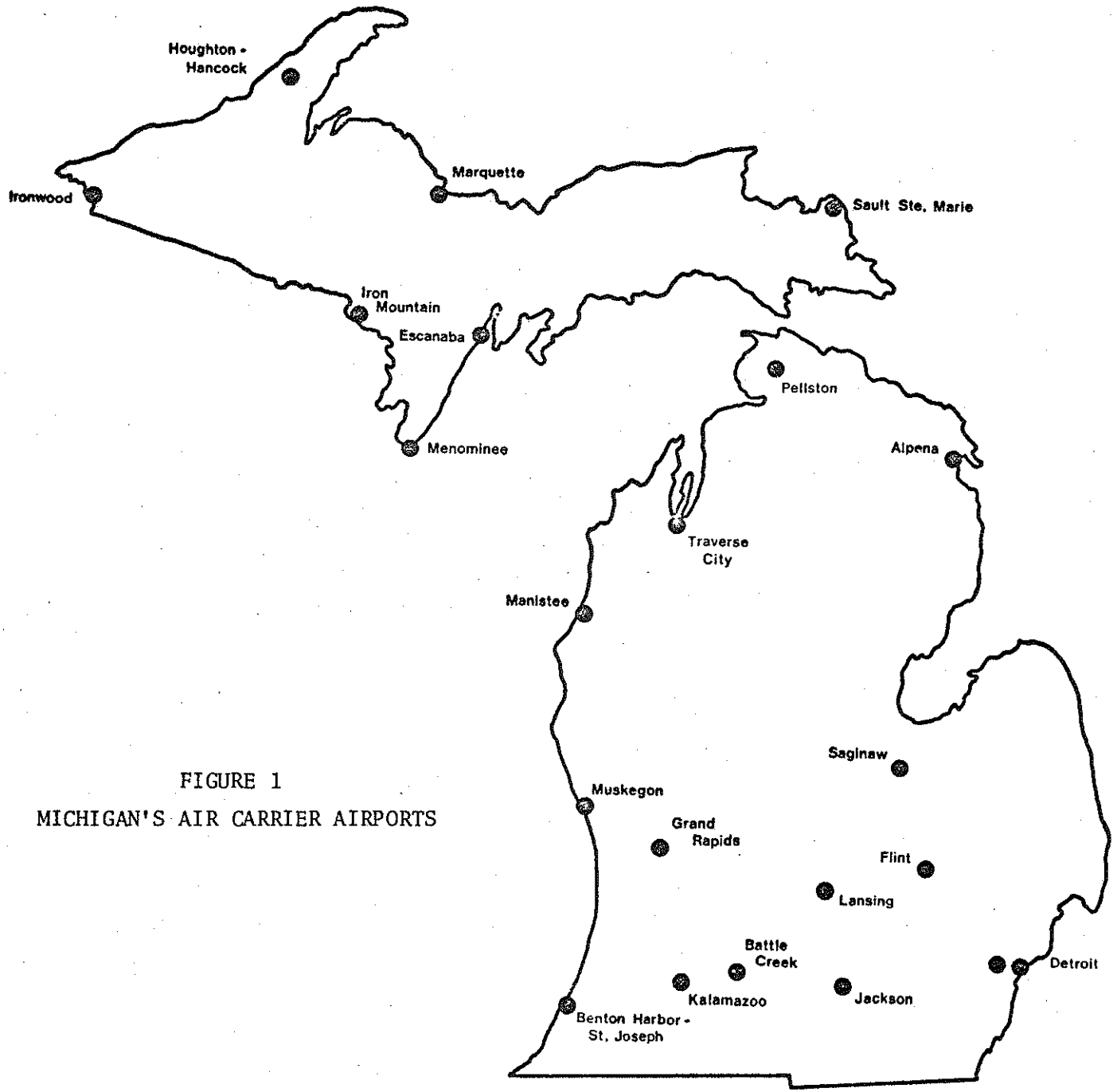


FIGURE 1

MICHIGAN'S AIR CARRIER AIRPORTS

TABLE 1

SCHEDULED DEPARTURES BY PASSENGER CARRIERS
AT MICHIGAN AIRPORTS
November, 1976

	Commuter				Certificated		
	Air Wisconsin	ComutAir	Lake Central	Skystream	Wright	United	North Central
Alpena							2
Battle Creek	13						-
Benton Harbor							7
Detroit City				4	6		-
Detroit Metro 1/	5	3	1				26
Escanaba							6
Flint		3				7	6
Grand Rapids						12	22
Hancock/Houghton			2				3
Iron Mountain							6
Ironwood							3
Jackson							5
Kalamazoo							16
Lansing			1			7	15
Manistee							1
Marquette			5				3
Menominee							5
Muskegon						3	7
Pellston							5
Saginaw						10	6
Sault Ste. Marie							2
Traverse City			4				6

1/ Intrastate flights only

Grand Rapids, Jackson, and Kalamazoo. Subsequently, Lake Central merged with Allegheny Airlines. Allegheny continued to provide service to Grand Rapids and Kalamazoo until the early 1970's. Although Allegheny still holds certification for these two points, no service has been operated since then.

In order to gain some perspective on commuter operations in Michigan, commuter schedules appearing in the July edition of the Official Airline Guide[1/] were reviewed for the period 1968-1976. Prior to 1968 commuter (or air taxi as they were called then) schedules were not published in the OAG. As might be expected, commuter carriers have demonstrated much less stability than the certificated carriers. Since 1968, no less than twenty commuter airlines have provided scheduled passenger service to points in Michigan. The number of carriers operating by year has been highly variable ranging from nine in 1969 to three in 1974 and 1975. Table 2 shows those communities that have been served by scheduled commuter during this period.

Detroit has been the most popular community with commuter carriers. The services offered include regular shuttle type services to other nearby major cities (i.e., Chicago and Cleveland) as well as feeder services from smaller communities outstate. After Detroit the next seven most popular communities are:

Grand Rapids
Lansing
Battle Creek
Hancock
Marquette
Pellston
Traverse City

1/ Official Airline Guide - North American Edition, Reuben H. Donnelly Corp., Chicago, Ill.

TABLE 2

SUMMARY OF SCHEDULED COMMUTER SERVICE
1968 - 1977

Community	Carriers	Years Served	Avg. No. of Weekday Arrivals
Alpena	Trans Michigan Airlines	1969	2
Battle Creek	Air Wisconsin	1974-77	12
	Hub Airlines	1972-73	8
	Skystream Air Lines	1974	6
Benton Harbor	Air Michigan	1970-71	5
	Time Airlines	1969	3
Detroit	Air Metro	1976	4
	Air Michigan	1968-71	3
	Air Wisconsin	1969,70,74-77	7
	Commuter Airlines of Chicago	1968-69	11
	ComutAire of Michigan	1976	6
	Hub Airlines	1968-73	5
	Lake Central Aviation	1977	1
	Manufacturer's Air Trans. Serv.	1972	2
	Midstate Air Commuter	1973	2
	Miller Airlines	1969	3
	Shorter Airways	1972-74	2
	Skystream Air Lines	1974-76	6
	Standard Airways	1968	5
	Tag Airlines	1968-69	23
	Time Airlines	1968-69	6
	Trans Michigan Airlines	1969-73	5
	Wright Airlines	1968-71	17
Escanaba	Trans Michigan Airlines	1970-73	4
Flint	ComutAire of Michigan	1976-77	4
	Trans Michigan Airlines	1969-73	6
Grand Rapids	Air Metro	1976	4
	Air Michigan	1971	10
	Miller Airlines	1968-69	5
	Trans Michigan Airlines	1970,72	4
Hancock/Houghton	Air Metro	1976	2
	Lake Central Aviation	1977	2
	Trans Michigan Airlines	1968-73	2
	Skystream Air Lines	1974	4
Iron Mountain	Trans Michigan Airlines	1971	2
Ironwood	Trans Michigan Airlines	1971	1

TABLE 2 (continued)

Community	Carriers	Years Served	Avg. No. of Weekday Arrivals
Kalamazoo	Air Michigan	1969-71	9
Lansing	Air Metro	1976	5
	Air Michigan	1971	11
	Lake Central Aviation	1977	1
	Skystream Air Lines	1974	8
	Trans Michigan Airlines	1969-73	8
Marquette	Air Metro	1976	4
	Lake Central Aviation	1977	5
	Skystream Air Lines	1974	8
	Trans Michigan Airlines	1970-73	4
Menominee	Trans Michigan Airlines	1971	1
Pellston	Phillip's Flying Service	1970-72	2
	Shorter Airways	1969,72-75	5
	Trans Michigan Airlines	1971	4
Saginaw	Trans Michigan Airlines	1969,71	12
Sault Ste. Marie	Shorter Airways	1974	2
	Trans Michigan Airlines	1971	2
Traverse City	Air Metro	1976	6
	Lake Central Aviation	1977	4
	Skystream Air Lines	1974	4
	Trans Michigan Airlines	1969-73	8

It is interesting to note that five of these seven have commuter service at present.

The overall growth in passenger travel by air in Michigan has been about equal to that which has occurred nationally, 190% from 1965 to 1975.[1/] Growth has been even more marked in the non-Detroit airports where enplanements have increased 215% from 523,696 in 1965 to 1,119,675 in 1975. The trends in growth of enplanements nationally, statewide, and statewide excluding Detroit for this period are presented in Figure 2.

When the demand for air travel from 1965-1976 is viewed at the airport level, the rate of growth is found to vary considerably, from an increase of 590% at Alpena to a decrease of 50% at Detroit City. A summary of the level of passenger activity at each airport is given in Table 3. The percentage increase in enplanements from 1965-1976 is presented for each airport along with its number of enplanements for 1976, its current share of the statewide total, and its rank in 1976 and 1965 with regard to the number of enplanements by the certificated carriers in scheduled domestic service.

Table 4 presents an historical record of enplanements by the certificated carriers. This table in conjunction with Table 3 is valuable in reviewing the growth which has occurred in the ten year period, 1965-1975.

As shown earlier in Table 1, North Central Airlines services all of Michigan's designated air carrier airports except Battle Creek.

1/ Based on the number of passengers enplaned by the certificated carriers on scheduled domestic flights.

FIGURE 2

TRENDS IN AIR PASSENGER ENPLANEMENTS

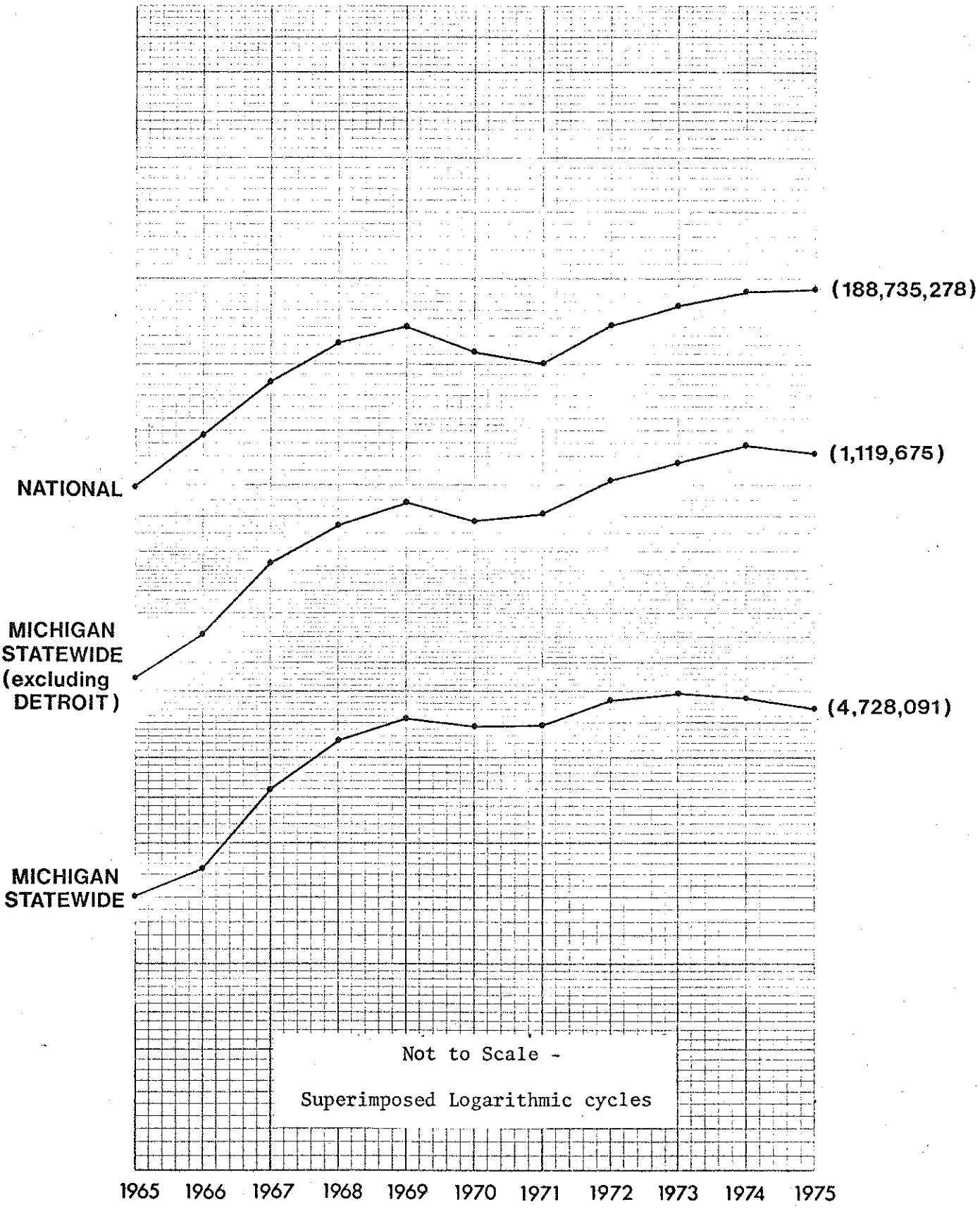


TABLE 3

AIRPORT ENPLANEMENT STATISTICS

Airport	1976 Enplanements[1/]	% Increase Since 1965	Current Share of Statewide Market (%)[2/]	1976 Rank	1965 Rank
Alpena	9757	591	.2	18	22
Battle Creek	22915	(-7)	.4	13	9
Benton Harbor	31347	213	.6	10	12
Detroit (City)	27784	(-49)	.5	11	5
Detroit (Metro)	3957830	188	75.4	1	1
Escanaba	16543	233	.3	16	17
Flint	114107	250	2.2	5	7
Grand Rapids	309624	217	5.9	2	2
Hancock	21857	204	.5	14	15
Iron Mountain	17749	174	.3	15	14
Ironwood	8861	177	.2	21	20
Jackson	8995	152	.2	20	19
Kalamazoo	110082	226	2.1	6	8
Lansing	178235	209	3.4	4	4
Manistee	2985	116	.1	22	21
Marquette	35221	219	.7	9	11
Menominee	9438	153	.2	19	18
Muskegon	77820	179	1.5	7	6
Pellston	25344	226	.5	12	13
Saginaw	189577	241	3.6	3	3
Sault Ste. Marie	14214	154	.3	17	16
Traverse City	61271	284	1.2	8	10

1/ Total enplanements - scheduled domestic service by the certificated air carriers.

2/ Due to rounding total does not add up to 100%.

TABLE 4

ENPLANED PASSENGERS BY CERTIFICATED AIR CARRIERS
IN SCHEDULED DOMESTIC SERVICE

Airport Carrier	Enplaned Passengers for the Year Ending 12/65	12/67	12/69	6/71	12/73	12/75
Alpena						
NC	2,067	4,488	6,095	6,605	8,088	8,879
Battle Creek						
NC	22,521	30,247	33,139	25,565	1/	1/
Benton Harbor						
NC	11,807	18,574	22,106	23,489	27,444	28,127
Detroit 2/						
All	1,984,172	2,819,504	3,632,464	3,361,936	3,894,354	3,608,416
Escanaba						
NC	6,344	7,915	13,359	12,636	13,730	14,446
Flint						
NC	3,619	11,231	13,309	10,896	19,409	16,403
UA	33,805	49,082	74,138	64,326	77,746	79,735
All	37,424	60,313	87,447	75,222	97,155	96,138
Grand Rapids						
LC 3/ (AL)	5,316	4,114	(1,542)	(2,424)	(3,944)	4/
NC	43,273	82,075	111,977	116,478	123,267	120,553
UA	83,785	103,109	117,464	107,448	149,847	165,699
All	132,374	189,298	230,983	226,350	277,058	286,252
Hancock/Houghton						
NC	8,465	12,589	14,930	13,405	16,324	19,191
Iron Mountain						
NC	9,048	11,711	12,346	12,926	13,709	16,309
Ironwood						
NC	3,314	6,181	7,408	7,866	8,729	8,237
Jackson						
LC 3/	288	5/	5/	5/	5/	5/
NC	5,304	7,179	6,079	5,967	8,084	8,646
All	5,592					
Kalamazoo						
LC 3/ (AL)	3,115	1,750	(752)	(117)	4/	4/
NC	33,292	56,649	65,201	65,529	95,322	92,568
All	36,407	58,399	65,953	65,646		
Lansing						
NC	18,537	32,482	43,235	47,403	55,928	63,521
UA	50,788	76,943	83,237	64,258	91,307	96,944
All	69,325	109,425	126,472	111,661	147,235	160,465
Manistee						
NC	2,825	3,286	4,207	2,290	3,477	2,857
Marquette						
NC	13,319	19,705	21,639	22,730	27,804	31,537
Menominee						
NC	5,621	8,051	8,967	7,930	8,141	9,309

TABLE 4 (continued)

Airport Carrier	Enplaned Passengers for the Year Ending 12/65	12/67	12/69	6/71	12/73	12/75
Muskegon						
NC	7,217	14,078	21,812	24,966	33,456	31,948
UA	30,701	44,518	42,527	35,750	33,936	39,963
All	37,918	58,596	64,339	60,716	67,392	71,911
Pellston						
NC	11,220	13,754	18,905	20,348	25,796	27,640
Saginaw						
NC	12,320	28,307	31,537	32,649	35,325	31,298
UA	66,298	81,891	115,346	106,819	135,290	132,635
All	78,618	110,198	146,883	139,468	170,615	163,933
Sault Ste. Marie						
NC	8,281	10,432	10,330	9,179	11,858	12,453
Traverse City						
NC	21,206	31,194	43,416	44,774	55,766	60,777
Total - All	2,507,868	3,591,039	4,577,467	4,256,709	4,978,081	4,728,091
Total Except Detroit	523,696	771,535	945,003	894,773	1,083,727	1,119,675
Total by Carrier (Excluding Detroit Airports)						
LC & AL	8,719	5,864	2,294	2,541	3,944	0
NC	249,600	410,128	509,997	513,631	591,657	604,699
UA	265,377	355,543	432,712	378,601	488,126	514,976

1/ Service provided through Kalamazoo

2/ Includes service to all airports serving Detroit (Metropolitan Wayne County, Detroit City and Willow Run)

3/ Lake Central Airlines subsequently merged with Allegheny Airlines

4/ Service suspended

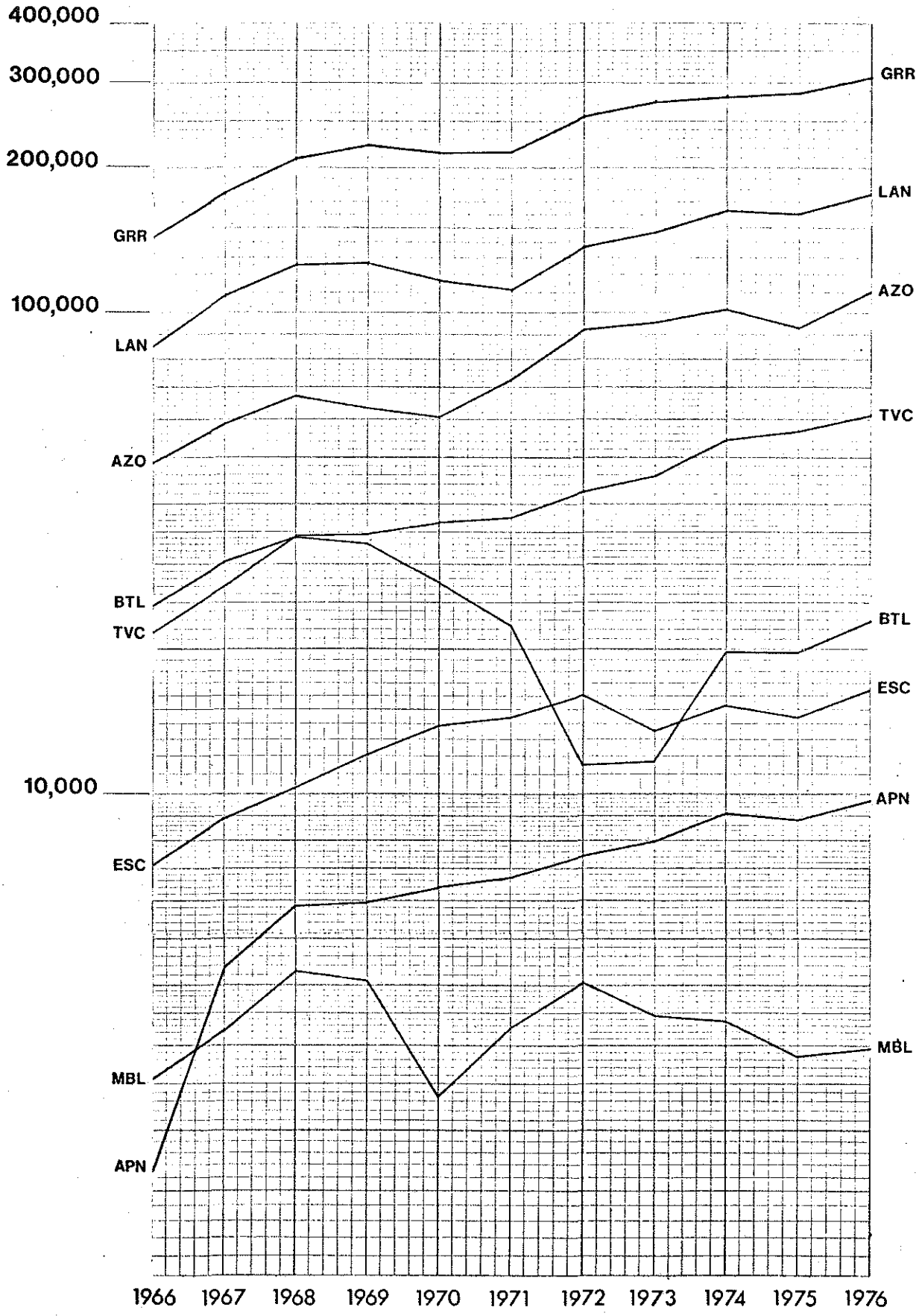
5/ Service suspended then deleted

This level of coverage is reflected in North Central's share of the statewide market. In 1975 North Central carried 54% of all passengers enplaned by certificated carriers at outstate airports, up from 48% in 1965. In the ten year period (1965-1975) North Central's enplanements increased by approximately 250%. This rate of growth is 25% greater than that of United Airlines, the only other certificated carrier that currently operates from outstate stations. United serves Flint, Grand Rapids, Lansing, Muskegon, and Saginaw. United's share of the combined market at these airports alone in 1975 was nearly double that of North Central's. On an individual airport basis, United's enplanements, expressed as a percentage of those of North Central, ranged from 125% at Muskegon to 480% at Flint. In 1965 United led both North Central and Lake Central in the number of enplanements at non-Detroit stations by holding nearly 51% of the market. Since then its share has dropped to 46%. The abandonment of service to Jackson and suspension of service to Grand Rapids and Kalamazoo by Lake Central/Allegheny had an insignificant impact on the total number statewide enplanements. At the time of discontinuation of service Allegheny held less than 1% of the total statewide market. Although the positions each carrier has maintained in the market has changed over time, the overall picture has been relatively stable.

The demand for air travel from 1965-1976 for each of eight representative airports is graphed in Figure 3. The curves illustrate patterns similar to those evidenced by other air carrier airports in the state. In several cases there is considerable deviation from the statewide trend presented earlier in Figure 2.

FIGURE 3

SUMMARY OF ENPLANEMENTS FOR REPRESENTATIVE MICHIGAN AIRPORTS



Many of the changes in demand have occurred in response to service changes instituted by the air carriers. For example, Alpena's tremendous increase in enplanements did not occur without accompanied increases in supply. In this period, the number of daily flights was doubled by North Central. The dropoff in ridership that occurred at Battle Creek (see Table 4) could be linked to the suspension of service there by North Central. Demand has increased at Battle Creek since the commuter carriers have taken over (particularly Air Wisconsin in August, 1973), however, demand for air travel still remains below the 1968 level.

The decrease in ridership which occurred between 1972 and 1973 at Escanaba could be due to the decrease in the number of cities for which single plane service was offered (13 in 1972 vs. 10 in 1973). A decline in air passenger travel was experienced statewide (and nationally) between 1969 and 1971. Nearly all stations exhibit this trend. At Flint both United and North Central cut back on their service during this period. Therefore, the rate of decrease was correspondingly greater here than that exhibited statewide (12% vs. 3%). This pattern of decrease can be seen at other stations where United cut back on service during the same period; for example, Lansing. Grand Rapids was relatively less affected by these service cutbacks perhaps because of its size and position as a regional hub airport. There are several stations which evidenced growth in the number of enplanements during this period contrary to the overall trend. Escanaba's increase could be linked to the commuter service, which was begun by Trans-Michigan Airlines in 1970 with four flights per day. The growth demonstrated by Traverse City

could also have resulted from the institution of commuter service. Kalamazoo exhibited strong growth between 1970 and 1972. During this period there was a corresponding increase in the number of daily flights offered by North Central at Kalamazoo: 11 in 1970, 18 in 1972. This may also be linked to drastic service cutbacks and subsequent suspension of service at neighboring Battle Creek.

The historical data for tons of cargo enplaned is highly variable. Table 5 presents the number of tons enplaned by certificated air carriers in scheduled domestic service for 1965-1976. While there has been a general statewide increase of 133% in this period, 7 of the 22 air carrier airports have experienced a decline. In 1969 the great majority of stations reached a peak in tonnage shipped and have since decreased from that peak to the current level of activity.

B. AIRCRAFT

Other important factors in describing air service are the physical and operational characteristics of the aircraft used to provide the service. This information will be extremely useful in analyzing the productivity and economics of new or replacement air services.

At present ten different types of aircraft are used to provide scheduled passenger service by certificated and commuter carriers in Michigan. Basic capacity, operating cost and performance data for these ten aircraft types and nine others selected to provide a full range of sizes and power options were gathered from actual carrier operating statistics and other published sources. The nineteen aircraft included for study are briefly described in Table 6. Appendix B contains additional detail on these aircraft.

TABLE 5

ENPLANED REVENUE TONS BY CERTIFICATED AIR CARRIERS
IN SCHEDULED DOMESTIC SERVICE

Airport Carrier	Enplaned Cargo-Tons for the Year Ending 12/65	12/67	12/69	6/71	12/73	12/75
Alpena						
NC	33.06	66.37	82.90	160.95	67.26	39.25
Battle Creek						
NC	254.25	325.57	546.37	320.75	1/	1/
Benton Harbor						
NC	231.08	295.96	333.99	326.53	381.59	250.25
Detroit 2/						
All	56763.98	76799.22	106853.01	86318.67	131916.93	77536.71
Escanaba						
NC	34.13	54.82	77.12	59.40	63.57	53.94
Flint						
NC	46.12	74.94	102.54	36.04	71.68	141.73
UA	782.75	711.25	1352.40	652.43	495.20	242.93
All	828.87	786.19	1454.94	688.47	566.88	384.66
Grand Rapids						
LC 3/ (AL)	95.45	50.24	(51.80)	(33.13)	(65.88)	4/
NC	929.72	1093.83	1158.50	1016.18	1609.48	1222.19
UA	1019.60	1280.40	2090.85	1794.09	1705.22	1262.67
All	2044.77	2424.47	3301.15	2843.40	3380.58	2484.86
Hancock/Houghton						
NC	38.60	105.06	152.10	119.35	199.75	143.42
Iron Mountain						
NC	63.34	120.65	166.02	103.73	86.22	113.39
Ironwood						
NC	11.74	36.41	51.13	20.38	19.84	19.32
Jackson						
LC 3/	23.22	5/	5/	5/	5/	5/
NC	108.64	168.86	99.85	82.54	100.96	70.61
All	131.86					
Kalamazoo						
LC 3/ (AL)	34.10	38.89	(6.91)	(.41)	4/	4/
NC	689.98	1131.54	1222.53	774.70	973.62	838.62
All	724.08	1170.43	1229.44	775.11		
Lansing						
NC	212.69	213.53	248.22	356.69	710.79	449.75
UA	378.71	641.70	1345.80	376.52	583.60	286.36
All	591.40	855.23	1594.02	733.21	1294.39	736.11
Manistee						
NC	21.61	17.89	53.33	41.07	47.22	17.72
Marquette						
NC	68.98	107.70	126.47	135.29	96.48	75.47
Menominee						
NC	47.48	75.05	165.04	93.12	122.67	67.84
Muskegon						
NC	170.26	182.57	482.36	377.99	398.97	215.56
UA	639.95	744.20	850.90	746.09	599.78	485.73
All	810.21	926.77	1333.26	1124.08	998.75	701.29

TABLE 5 (continued)

Airport Carrier	Enplaned Cargo-Tons for the Year Ending 12/65	12/67	12/69	6/71	12/73	12/75
Pellston						
NC	217.81	72.08	69.04	119.59	228.31	135.03
Saginaw						
NC	29.97	45.49	186.69	201.93	208.62	232.37
UA	665.00	641.60	1256.00	872.17	714.44	414.33
All	694.97	687.09	1442.69	1074.10	923.06	646.70
Sault Ste. Marie						
NC	17.93	62.47	82.96	39.00	48.60	39.16
Traverse City						
NC	153.28	206.08	304.91	359.22	662.33	441.53
Total - All	63783.43	85364.37	119519.74	95537.96	142179.01	84795.88
Total - Except Detroit	7019.45	8565.15	12666.73	9219.29	10262.08	7259.17
Total by Carrier (Excluding Detroit Airports)						
LC & AL	152.77	89.13	58.71	33.54	65.88	0.00
NC	3380.67	4456.87	5712.07	4744.45	6097.96	4567.15
UA	3486.01	4019.15	6895.95	4441.30	4098.24	2692.02

1/ Service provided through Kalamazoo

2/ Includes service to all airports serving Detroit (Metropolitan Wayne County, Detroit City and Willow Run)

3/ Lake Central Airlines subsequently merged with Allegheny Airlines

4/ Service suspended

5/ Service suspended then deleted

TABLE 6

SUMMARY OF AIRCRAFT CHARACTERISTICS

Manufacturer	Model	Name	Power*	Passenger Seats
Beech Aircraft Corp.	B-99	-	2-TP	15
Boeing Co.	B727-200	-	3-J	163
	B737-200	-	2-J	115-130
Britten-Norman	BN-2A-20	Islander	2-PP	9
	BN-2A-MK111-2	Trislander	3-PP	17
Canadair Ltd.	CL600	-	2-J	30
Cessna Aircraft Co.	402	-	2-PP	10
Dassault-Breguet	Falcon 50	-	3-J	10-16
deHavilland, Ltd.	DHC-6	Twin Otter	2-TP	20
	DHC-7	Dash 7	4-TP	50
General Dynamics Corp.	Convair 580	-	2-TP	48
	Convair 600	-	2-TP	56
McDonnell Douglas	DC9-30	-	2-J	100-115
	DC9-50	-	2-J	125-139
Piper Aircraft Corp.	PA-23-250	Turbo Aztec F	2-PP	5
	PA-31-350	Navajo Chieftan	2-PP	9
Short Bros. & Harland Ltd.	SD3-30	-	2-TP	30
Swearingen Aviation Corp.	Metro 11	-	2-TP	20
VFW-Fokker	614	-	2-J	40

* Power codes are:
  1st character - number of engines
  2nd character - TP - TURBOPROP
  PP - PISTON PROP
  J - JET

C. AIRPORTS

Historically, airport facilities have been subjected to much more detailed analysis than has service. Consequently, a large volume of airport background data and expansion proposals have been prepared. While airport facilities play an extremely important role in providing scheduled air service, a detailed evaluation of them is not necessary to meet the objectives of this study. A basic understanding of the existing constraining factors and expansion plans for each airport will, however, be important later in the study when alternative service recommendations are made and evaluated.

For planning of new scheduled air service, three physical characteristics of each airport must be known. These are:

1. the usable length of the primary runway.
2. the airport elevation.
3. whether or not an Instrument Landing System is present.

Table 7 summarizes these characteristics for each of the airports under study. In addition, a basic understanding of major expansion plans and proposals is necessary to determine the most likely future configuration of each airport. The Michigan State Airport System Plan[1/] summarizes recommended improvements for each airport for a twenty-year period, 1970-1990. Table 8 shows the major expansion proposals for each air carrier airport in the state.

1/ "Michigan State Airport System Plan", Michigan Department of State Highways and Transportation, August, 1974.

TABLE 7

EXISTING PHYSICAL SPECIFICATIONS OF MICHIGAN AIR CARRIER AIRPORTS

Community	Airport	Arpt. Code	ILS in Place	Primary Runway Specifications			
				End Desig.	Width (feet)	Length* (feet)	Elev. (feet)
Alpena	Phelps Collins	APN	No	18	150	9000	689
Battle Creek	W. K. Kellogg Reg.	BTL	Yes	04-22	150	7000	941
Benton Harbor	Ross Field	BEH	No	09	100	5100	643
Detroit	Detroit City	DET	Yes	15	100	5090	625
Detroit	Metropolitan Wayne Co.	DTW	Yes	03L-21R	200	10,500	639
Escanaba	Delta County	ESC	No	09-27	100	6500	609
Flint	Bishop	FNT	Yes	36	150	7850	781
Grand Rapids	Kent County	GRR	Yes	08R-26L	150	7600	794
Hancock	Houghton Co. Memphis	CMX	Yes	13-31	150	6500	1091
Iron Mountain	Ford	IMT	Yes	01-19	150	6500	1174
Ironwood	Gogebic County	IWD	No	09-27	100	5400	1230
Jackson	Reynolds Municipal	JXN	Yes	23	150	5344	1000
Kalamazoo	Kalamazoo Municipal	AZO	Yes	17-35	150	5300	874
Lansing	Capital City	LAN	Yes	09-27	150	6500	859
Manistee	Manistee Co. Blacker	MBL	No	09-27	100	5500	619
Marquette	Marquette County	MQT	Yes	08-26	100	6500	1419
Menominee	Twin County	MNM	No	14	100	5100	621
Muskegon	Muskegon County	MKG	Yes	05-23	150	6500	628
Pellston	Emmet County	PLN	Yes	14-32	150	6500	720
Saginaw	Tri-City	MBS	Yes	05-23	150	6500	667
Sault Ste. Marie	City-County	SSM	No	14-32	100	5000	720
Traverse City	Cherry Capital	TVC	Yes	10-28	150	6500	624

* Runways shorter than 6500 feet will <u>not</u> accommodate DC9's.

TABLE 8

SUMMARY OF STATE AIRPORT PLAN
MAJOR EXPANSION PROPOSALS

	Major Improvements		
	Short Range (0 - 5 Yrs.)	Intermediate (6 - 10 Yrs.)	Long Range (11 - 20 Yrs.)
Alpena	Install ILS	-	-
Battle Creek	-	-	-
Benton Harbor	Install ILS PR to 5700'	-	PR to 6800'
Detroit City	-	-	-
Detroit Metro	PR to 12,500'	-	-
Escanaba	Install ILS	-	-
Flint	-	PR to 9200'	-
Grand Rapids	PR to 9200'	-	-
Hancock/Houghton	-	-	PR to 6800'
Iron Mountain	PR to 7000'	-	-
Ironwood	Install ILS PR to 5900'	-	-
Kalamazoo	-	-	-
Lansing	PR to 6900'	-	PR to 9200'
Manistee	Install ILS	-	-
Marquette	PR to 6900'	-	-
Menominee	Install ILS PR to 5500	-	PR to 6600'
Muskegon	Install ILS PR to 6800'	-	-
Pellston	PR to 6800'	-	-
Saginaw	PR to 9100'	-	-
Sault Ste. Marie	Install ILS PR to 5600'	-	-
Traverse City	PR to 6800'	-	-

NOTE: ILS is Instrument Landing System
PR is Primary Runway

From reviewing Tables 7 and 8 the configuration of a standard air carrier airport for Michigan may be defined as follows:

1. A primary runway (PR); and supporting taxiways, aprons and terminal facilities; of adequate length to support jet aircraft of the B737-200/DC9-30 class. This length is 6500-7000 feet depending on temperature and elevation.

2. An operational Instrument Landing System (ILS).

At present, twelve of the twenty-two airports under study meet these standard criteria. Of the remaining ten, it will be assumed that five will meet the basic criteria within the short-term. These are:

Alpena	-	ILS to be installed.
Escanaba	-	ILS to be installed.
Kalamazoo	-	Runway to be extended.
Menominee	-	Runway to be extended and ILS to be installed.
Sault Ste. Marie	-	New airport exceeding standards to be established at Kinchloe AFB site.

The assumed configuration of the remaining five airports and of new air carrier airports recommended by the State Airport Plan are as follows:

Benton Harbor	-	ILS to be installed, PR 5700'.
Detroit City	-	No change.
Ironwood	-	ILS to be installed, PR 5900'.
Jackson	-	ILS already in place, PR 5900'.
Manistee	-	ILS to be installed, no change in PR.
New Sault Ste. Marie Municipal Airport	-	New civilian airport to be established at Kinchloe AFB rather than at this site.
New Battle Creek/ Kalamazoo Regional Airport	-	Even though this airport has been recommended by several independent studies, its construction is highly unlikely in light of negative public opinion and the recent approval of a runway extension at Kalamazoo Municipal Airport.
New Site 107	-	For the purposes of this study, it will be assumed that this new airport serving Detroit will not be constructed, but rather that new capacity, if required, will be made available at Metro or Willow Run.

II. NEED FOR ADDITIONAL SCHEDULED AIR SERVICE

The primary objective of this project is to identify feasible service modifications that will make the scheduled air service network more responsive to the needs of the communities in the state. The technique used to make this determination consisted of two steps. The first step, which is discussed in this chapter was to determine in qualitative terms what air service problems are perceived by air service users. The second step, which is discussed later, was to determine what improvements would resolve these problems and then to provide a quantitative assessment of the needs for these improvements.

A. STUDY METHODOLOGY

The perceived need for new or modified air service was developed using two separate analyses. First, a statewide attitudinal survey of selected individuals and agencies expected to be knowledgeable about the habits and problems of Michigan air travelers was undertaken. The purposes of this survey were to provide essential "local awareness" for the study and to be used in the development of air service improvement objectives. Following the survey, a market area analysis was completed for each of the airports under study to point out those which produce a disproportionately low number of passengers. The methods and results of these analyses are discussed in the following sections.

Attitudinal Survey

Initially, a series of four separate survey questionnaires was developed, one for each of the following four groups of target respondents:

- Travel agents
- Chambers of Commerce and Regional Planning Agencies
- Airline and Airport Personnel
- Businesses and Institutions.

Each form consisted of an identification section followed by a series of open-ended questions with the following objectives:

1. To determine what specific air service problems the respondent was aware of either through his contact with the traveling public or from personal experience.

2. To gather primary data developed locally describing air travel behavior.

3. To determine which employers or shippers make frequent use of air service so that they could be contacted directly.

Copies of the four survey instruments are reproduced in Appendix C.

The survey was conducted during the first two weeks in April, 1977. During this period over 100 persons were contacted and asked to respond to the survey. The distribution of respondents by airport and target group is shown in Table 9. About 70% of the interviews were conducted in person; the other 30% were done by phone. While there were a few exceptions, most of the people contacted were knowledgeable about air transportation problems and were quite willing to discuss them.

As stated earlier, the intent of this survey was to develop qualitative rather than the quantitative indicators of need. Figure 4 displays the results of the survey in a Base City-Reference City Matrix. In the figure, both the base cities (the places of residence of the respondents) and the reference cities (points to which travel deficiencies were said to exist) are grouped into geographic zones in an attempt to display regional needs and patterns as well as those for individual communities.

TABLE 9

NUMBER OF SURVEY RESPONDENTS BY TARGET GROUP AND AIRPORT MARKET AREA

Airport	Travel Agents	C of C or RPA	Airport or Airline	Business or Institution	Total
Alpena	1	1	1	-	3
Battle Creek	2	1	1	-	4
Benton Harbor	2	2	1	1	6
Detroit City	-	-	1	-	1
Detroit Metro	-	-	4	-	4
Escanaba	1	2	1	2	6
Flint	4	2	1	1	8
Grand Rapits	2	1	1	-	4
Hancock/Houghton	1	1	1	2	5
Iron Mountain	1	1	1	-	3
Ironwood	1	1	1	-	3
Jackson	2	2	1	2	7
Kalamazoo	2	1	1	-	4
Lansing	3	1	1	1	6
Manistee	1	1	1	1	4
Marquette	1	1	1	1	4
Menominee	1	1	2	2	6
Muskegon	2	1	1	-	4
Pellston	2	-	1	-	3
Saginaw	3	2	1	-	6
Sault Ste. Marie	1	3	1	2	7
Traverse City	3	2	2	-	7
Totals	36	27	27	15	105

FIGURE 4

SUMMARY OF PERCEIVED NEED FOR NEW AIR SERVICE

Base Cities By Geographic Zone		Reference Cities By Geographic Zone[1/]																	
		Southern L.P.						Northern L.P. Eastern U.P.				Western U.P			Bordering State				
		Detroit	Flint	Grand Rapids	Kalamazoo	Lansing	Saginaw	Alpena	Pellston	Sault Ste. Marie	Traverse City	Escanaba	Houghton/Hancock	Marquette	Chicago	Cleveland	Duluth	Milwaukee	Minneapolis
Southern L. P.	Battle Creek	A													A				
	Benton Harbor	**A**				ND									**A**	A			
	Detroit										A								
	Flint	**G** BLM						N		N	N				RE				
	Grand Rapids	*									*A		*	*				*	*
	Jackson	**BM RE**							N		**N**		N		**A**				
	Kalamazoo	G RA													A			A	
	Lansing	**A RLE**								N	ND				RE RLE				
	Muskegon														*				*
	Saginaw	**BLM** RLE								N									
Northern L. P. Eastern U. P.	Alpena	BLM				**ND**									ND				
	Manistee	ND		A		ND					N				**A**			ND	
	Pellston					N					A								
	Sault Ste. Marie	**AD**			N	**N**								**N**	**ND**				
	Traverse City	**G**				**N**						N		N	G				
Western U.P.	Escanaba					**ND**	N				N				**ND**		**N**	**ND**	**N**
	Houghton/Hancock	A				A AD					N				**AD**		N		N
	Iron Mountain	ND	N		N	ND			N	N									N
	Ironwood	A				A				N					A		A		**N**
	Marquette	**A**				**A**					**A**						N		N
	Menominee					AD									AD				A ND

Summary of Codes:

A - More Service Needed
AD- More Direct Service Needed
N - New Service Needed
ND- New Direct Service Needed
G - Long Gaps in Service
M - More Morning Peak (6 a.m.-10 a.m.) Flights Needed
LM- More Late Morning Flights Needed
EA- More Early Afternoon Flights Needed
E - More Evening Peak (6:30 p.m.-7:30 p.m.)Flights Needed
LE- More Late Evening Flights Needed

Notes: "B" Prefix Means From Base City to Ref. City; "R" Means From Ref. City to Base City

BOLD TYPE INDICATES A NEED EXPRESSED BY MORE THAN ONE RESPONDENT

*Unsatisfied service improvements suggested by external reports.

1/ Michigan Points Not Listed Were Not The Object Of Any Service Related Remarks

Service-related remarks made by more than one respondent are shown in bold type.

Market Area Analysis

The second step in the process of determining the need for additional air service at Michigan Air Carrier Airports was a comprehensive analysis of selected demographic and socio-economic characteristics of the market area for each airport. The purpose of this analysis was to highlight those airports which produce below average enplanements and, therefore, may have inadequate service. Obviously many factors other than population, employment, etc., influence airline enplanements; among these are competing modes and competing airports.

In order to undertake this analysis, it was necessary first to define the market area for each airport. This was accomplished using the "proximity analysis" computer program developed by the Michigan Department of State Highways and Transportation. This program produced a summary for each airport in the state of those zones[1/] within each of four fifteen-minute travel time bands. Market area boundaries were then established for each airport using this summary and the rules that follow.

1. If only one air carrier airport was within one hour's travel time from a zone, then that zone was assumed to belong to the market area of that airport exclusively.

2. If more than one airport was within one hour's travel time from a zone, then all such airports, except as described in 3 below, were given a weighted portion of the zone based on the relative travel time to each. The weighting system worked as follows:

1/ "Zone" as used here refers to the 547 Zone Statewide Transportation Modeling System developed by the Michigan Department of State Highways and Transportation.

Time Band from Zone to Airport	Weight
0-15 minutes	4
15-30 minutes	3
30-45 minutes	2
45-60 minutes	1

The weighted portion for each band containing at least one airport was computed by dividing its weight by the sum of the weights of all bands containing at least one airport. If a band contained more than one airport, then its relative share was equally distributed over all contained airports.

3. In cases where there was one or more airports within 30 minutes from a zone, airports greater than 45 minutes from that zone were not considered in the weighting process.

The following table of examples is included to clarify the system:

Zone	Airport[1/]	Timeband	Weight	Portion
32	MBS	30-45	2	2/3
	FNT	45-60	1	1/3
57	BTL	15-30	3	3/5
	AZO	30-45	2	2/5
61	BTL	15-30	3	3/5
	AZO	30-45	2	1/5
	JXN	30-45		1/5
66	JXN	15-30	3	3/5
	BTL	30-45	2	2/5
	AZO	45-60	-	-

Because the State of Michigan doesn't exist as an isolated piece of geography, there is interplay and competition among bordering zones and airports. For example, during the course of the survey described earlier, many respondents from Southwestern Michigan felt that a significant number of passengers were diverting to South Bend, Indiana for service. Similarly, people in the Menominee area feel that many passengers drive to Green Bay, Wisconsin for service. On the other hand, many passengers from Marinette, Wisconsin board aircraft at Menominee.

1/ Airport codes are given in Table 7, page 25.

To account for these influences, the competitive nature of nearby airports in surrounding states and the impact of bordering zones on market areas were included in the analysis. For example, portions of Florence, Forest, and Marinette Counties, Wisconsin were included in the Menominee market area. Similarly, portions of Berrien and Cass Counties, Michigan were discounted because of the proximity of South Bend Airport.

Following the definition of the market area for each air carrier airport, selected 1970 and 1975 demographic and socioeconomic characteristics which were expected to be highly correlated to air travel were summed up for each market area. Those characteristics which best modeled enplanements and the actual number of enplanements for each of the two study years are summarized by airport in Table 10.

The next step in the analysis was to calculate the ratio of each characteristic to the number of observed enplanements for each market area. The results of this step are shown in Table 11. A systematic review of these ratios revealed that including Detroit Metropolitan Airport in the analysis produced a heavily biased, skewed distribution of the results about the mean. By excluding Detroit Metro, a much more balanced distribution of the variables was produced.

Finally, each ratio from Table 11 was reduced to a realized enplanement score (RES) using the following normalizing equation:

$$RES_{ij} = \frac{nR_{ij} - \sum_{j=1}^{n} R_{ij}}{\sum_{j=1}^{n} R_{ij}}$$

TABLE 10

SUMMARY OF MARKET AREA CHARACTERISTICS

	1970				1975	
	Population	Employees	Professionals	Enplanements	Population	Enplanements
Alpena	80,585	24,394	4,753	6,397	103,921	8,871
Battle Creek	257,913	100,087	18,561	27,387	269,829	19,704
Benton Harbor	184,916	71,861	13,096	22,931	192,952	27,854
Detroit City	3,007,132	1,130,940	234,275	51,244	3,015,484	25,711
Detroit Metro	1,537,761	600,786	129,218	3,495,003	1,542,255	3,647,616
Escanaba	48,742	15,451	2,976	13,941	53,486	14,424
Flint	691,056	309,431	51,878	79,542	904,111	96,537
Grand Rapids	573,077	216,165	40,840	215,579	599,652	285,336
Hancock/Houghton	44,588	14,429	3,461	17,377	47,949	19,112
Iron Mountain*	63,906	20,442	4,409	12,886	66,644	16,474
Iron Wood*	51,786	16,841	4,176	7,925	51,186	8,230
Jackson	451,019	174,667	40,918	5,733	470,481	8,610
Kalamazoo	278,014	107,292	20,515	60,296	289,102	92,522
Lansing	316,197	123,454	26,964	117,642	333,295	160,519
Manistee	104,543	35,550	6,563	2,367	119,081	2,857
Marquette	78,610	23,862	4,953	24,301	84,291	31,399
Menominee*	37,112	12,765	2,444	8,332	40,370	9,256
Muskegon	285,469	105,234	18,665	62,755	300,835	72,047
Pellston	46,651	15,258	3,043	15,458	54,139	21,892
Saginaw	525,730	183,163	36,168	138,762	558,367	165,371
Sault Ste. Marie	48,861	12,605	2,937	9,173	54,829	12,448
Traverse City	97,072	32,391	6,657	36,610	110,096	56,216
Total	8,810,740	3,347,068	677,470	4,431,641	9,262,355	4,803,006
Total (Excluding Detroit City & Metro)	4,265,847	1,615,342	313,977	885,394	4,704,616	1,129,679

* Includes area from adjacent state

TABLE 11

SUMMARY OF PRODUCTIVITY RATIOS

	1970 Enplanements / 1000 Pop.	1970 Enplanements / 1000 Emp.	1970 Enplanements / 1000 Prof.	1975 Enplanements / 1000 Pop.
Alpena	79.4	262.2	1345.9	85.4
Battle Creek	106.2	273.6	1475.5	73.0
Benton Harbor	124.0	316.1	1751.0	144.4
Detroit City	17.0	45.3	218.7	8.5
Detroit Metro	2272.8	5817.4	27047.3	2365.1
Escanaba	286.0	902.3	4684.5	269.7
Flint	115.1	257.1	1533.3	106.8
Grand Rapids	376.2	997.3	5278.6	475.8
Hancock/Houghton	389.7	1204.3	5020.8	398.6
Iron Mountain	201.6	630.4	2922.7	247.2
Ironwood	153.0	470.6	1897.7	160.8
Jackson	12.7	32.8	140.1	18.3
Kalamazoo	216.7	562.0	2939.1	320.0
Lansing	372.1	952.9	4362.9	481.6
Manistee	22.6	66.6	360.7	24.0
Marquette	309.1	1018.4	4906.3	372.5
Menominee	224.5	652.7	3409.2	229.3
Muskegon	219.8	596.3	3362.2	239.5
Pellston	331.4	1013.1	5079.9	404.4
Saginaw	263.9	757.6	3836.6	296.2
Sault Ste. Marie	187.7	727.7	3123.3	227.0
Traverse City	377.1	1130.3	5499.5	510.6
Total	6658.5	18587.0	90195.8	7458.7
Total (excluding Detroit Metro)	4385.7	12769.6	63148.5	5093.6

where: RES_{ij} = the realized enplanement score for the i^{th} characteristic for the j^{th} airport

n = the number of airports included in the analysis = 21

R_{ij} = the ratio of the number of enplanements at the j^{th} airport to the value of the i^{th} characteristics for the j^{th} airport.

The resulting scores are shown in Table 12.

Based on the average RES from Table 12, the most productive airport in the state (aside from Detroit Metropolitan Airport) is Traverse City. Iron Mountain, Muskegon and Sault Ste. Marie are average producers. The following six airports have the lowest realized enplanement scores. In order of increasing score they are:

Detroit City Airport
Jackson's Reynolds Municipal
Manistee's Manistee County Blacker
Alpena's Phelps Collins
Battle Creek's W. K. Kellogg
Flint's Bishop.

In developing scores of realized enplanements, competition was considered only in a very localized sense. The rationale for this is that, if all airports had equal service, then the choice of which airport to depart from becomes a problem of personal preference based on accessibility, familiarity, etc. Since all airports are not equal in terms of service or facilities, diversion to larger airports plays a large role in productivity. For example, the three airports closest to Detroit Metro are all near the bottom of the list of scores. Detroit City obviously faces strong competition from Metro; Jackson and Flint also suffer to some extent. Even though they are all about the same distance

TABLE 12

REALIZED ENPLANEMENT SCORES

	RELATIVE SCORES				
	1970 Pop	1970 Emp	1970 Prof	1975 Pop	Average
Alpena	-.62	-.57	-.55	-.65	-.60
Battle Creek	-.49	-.55	-.51	-.70	-.56
Benton Harbor	-.41	-.48	-.42	-.40	-.43
Detroit City	-.92	-.93	-.93	-.96	-.94
Detroit Metro	---------- Not included in analysis ----------				
Escanaba	.37	.47	.56	.11	.38
Flint	-.45	-.58	-.49	-.56	-.52
Grand Rapids	.80	.63	.76	.96	.79
Hancock/Houghton	.87	.97	.67	.64	.79
Iron Mountain	-.03	.03	-.03	.02	.00
Ironwood	-.27	-.23	-.37	-.34	-.30
Jackson	-.94	-.95	-.95	-.92	-.94
Kalamazoo	.04	-.08	-.02	.32	.07
Lansing	.78	.55	.45	.99	.69
Manistee	-.89	-.89	-.88	-.90	-.89
Marquette	.48	.66	.63	.54	.58
Menominee	.08	.07	.13	-.05	.06
Muskegon	.05	-.03	.12	-.01	.03
Pellston	.59	.65	.69	.67	.65
Saginaw	.26	.24	.28	.22	.25
Sault Ste. Marie	-.10	.19	.04	-.06	.02
Traverse City	.81	.84	.83	1.11	.90

from Metro, Flint is less affected. This probably occurs because Flint has a higher quality of air service than Jackson.

B. CONCLUSIONS

From the results of the user survey and market area analysis, service deficient stations and markets were identified. Again, it is important to stress that only qualitative indications of need are presented in this section; the results of the quantitative analysis are given in Chapter III.

In the following paragraphs the specific needs for new scheduled air service are summarized first on an individual airport basis and then by geographical sector.

Southern Lower Peninsula

Battle Creek - While no certificated service is presently provided at W. K. Kellogg Regional Airfield, the commuter service provided by Air Wisconsin eight times daily to Chicago and five times daily to Detroit has been well received. However, both the market area analysis and the survey indicate that more service is required. Some air passengers are diverted to Kalamazoo, Lansing, and Grand Rapids for one of the following reasons:

1. United Airlines single plane services and better connections.
2. Lack of available seats on Air Wisconsin. (Generally on Detroit and Chicago flights departing Monday morning and returning Thursday and Friday.)
3. To avoid commuter type (small, prop) aircraft.

Overall, respondents seemed pleased with the quality and quantity of service.

Benton Harbor - Service at Ross Field is presently provided only by North Central Airlines with service five times daily to Chicago and twice daily to Grand Rapids. The market analysis indicated that Benton Harbor is below average in productivity. This is supported by survey respondents who indicate that a significant number of passengers drive to South Bend and Chicago for air service. The most significant service problem is a complete lack of direct service to and from eastern points, specifically Detroit and Cleveland. Two possible solutions to this problem that were proposed by respondents are:

1. Lengthening the runway to accommodate North Central's DC9 jet flights from Chicago.

2. Instituting service by Air Wisconsin on Chicago - Battle Creek - Detroit flights.

Other less significant service problems mentioned by respondents were the lack of any direct service to Lansing and some seat availability problems to Chicago.

Detroit - The Detroit Metropolitan Area is served by two airports, Metropolitan Wayne County (Metro), and Detroit City. Since Metro is a large hub airport, the needs of most travelers using it are well satisfied by the extensive schedules that are provided by the eleven certificated and four[1/] commuter carriers providing service. Understandably, Metro is the most productive airport in Michigan. On the other end of the scale is Detroit City Airport. City is a small downtown airport with only one carrier providing scheduled

1/ Skystream Airlines was providing service at City Airport through 12/31/77 and then moved to Metro.

passenger service. During the course of the survey in Detroit, only one potentially deficient market was identified--Traverse City. There is some question as to whether this response is a call for more stable commuter service or new service. The commuter airline serving Traverse City from Detroit was perceived by most respondents to be unstable.

Flint - Bishop Airport is served by both United Airlines (7 departures per day) and North Central Airlines (6 departures per day). Supplementary commuter service to Detroit is provided three times daily by ComutAire of Michigan. The pattern of service from Flint is primarily directed toward Detroit and Chicago. Some single plane service to the East coast (New York and Philadelphia) is provided through Cleveland. The most frequently mentioned problem is the need for more service to Detroit. Other points which were cited as likely candidates for new service were Alpena, Sault Ste. Marie and Traverse City. Another problem, which supports the fact that Flint had a relatively low score in the market analysis, is that many Flint passengers are thought to drive to Detroit for service. Several reasons for this were given including:

1. short distance
2. cost
3. more frequent service
4. better connections.

A survey of General Motors installations in Flint shows that the following were the top ten destinations for their air travelers for a nine-month period in 1974:

Milwaukee
Atlanta
New York
Philadelphia
Boston
Newark
Los Angeles
Indianapolis
St. Louis
Madison

Grand Rapids - Kent County Airport is the second most active airport in the state. Service is provided by both North Central and United with 22 and 13 departures per day, respectively. In addition, Allegheny Airlines is certificated at Grand Rapids but, at present, has suspended all service. With the exception of some complaints regarding lack of regular service to the north, specifically Traverse City, no service problems were cited. Grand Rapids was found to score well above average in the market analysis. An air service study[1/] for the Grand Rapids Airport, done in 1975, cites the following as major air service problems:

1. Lack of morning single plane service from New York.

2. Complete lack of single plane service to Cincinnati and inadequate service in other shorter-haul markets to the South (i.e., Dayton, Evansville, Indianapolis and Louisville).

3. Inadequate service to Milwaukee and Minneapolis.

4. Lack of single plane service to Pittsburgh.

1/ Scheduled Air Service Requirements at Grand Rapids, Michigan: 1975-1980, Edward MacNeal, June, 1975.

Other points within Michigan which are cited for some service problems are Hancock, Marquette, Iron Mountain, Traverse City and Detroit.

Jackson - Reynolds Municipal Airport is presently served by North Central Airlines with five departures per day. The most predominate service complaints relate to service to Detroit and Chicago. Frequencies to both cities were thought to be inadequate by several respondents. Lack of service to Detroit in the morning and returning in the evening was a particularly common complaint. Most respondents felt that a large number of residents drive to Detroit and Lansing to get better service, particularly for connecting service. Aside from Detroit City Airport, Jackson was found to have the lowest average relative score in the market analysis. Other points cited as needing new service were Pellston, Traverse City, and Hancock. Jackson residents feel that many of their service problems (particularly to Detroit and Chicago) would be solved if the runway were long enough to accommodate DC9's.

Kalamazoo - Kalamazoo Municipal Airport is served by North Central Airlines with 14 departures a day. Major points served with direct service include Chicago, Detroit, Cleveland, Green Bay, and Milwaukee. Allegheny Airlines is also certificated at Kalamazoo but suspended service in the early 1970's. Predominate service problems involve three points: Chicago, Detroit, and Milwaukee. Specifically, most respondents feel that increased service frequency to and from these points is warranted. In most cases, these problems were linked by respondents directly to the fact that DC9's

cannot land at Kalamazoo. In spite of this, Kalamazoo was found to score above average in the market analysis.

Lansing - Service at Capital City Airport is presently provided by two certificated carriers (North Central and United) and one commuter carrier (Lake Central Aviation) providing a total of 22 departures per day. Service to Detroit was the subject of the most complaints. Specifically, service was said to be not frequent enough particularly from Detroit in the evening. Additional evening flights from Chicago were also said to be needed. Other points requiring more service, according to respondents, are Sault Ste. Marie and Traverse City. The market analysis found Lansing to be well above average in terms of realized enplanement score.

Muskegon - Muskegon County Airport is served by both North Central and United Airlines with a total of ten departures per day. Respondents from the Muskegon area seem to feel that the air service needs of the community are satisfied by existing schedules. The following still unsatisfied service problems were extracted from an air service study[1/] for Muskegon County Airport completed in 1974.

1. Lack of sufficient non-stop service to Chicago.
2. Lack of single plane services to and from New York during the A.M. and P.M. peak periods.
3. Lack of single plane service to and from Minneapolis during the A.M. and P.M. peak periods.

Some diversion of passengers to Grand Rapids was pointed out by survey respondents.

1/ Scheduled Air Service Requirements at Muskegon, Michigan: 1974-1980, Howard, Needles, Tammen & Bergendoff; March, 1974.

Saginaw - United and North Central Airlines provide a total of sixteen departures a day from Tri-City Airport. Single plane service is provided to Alpena, Boston, Detroit, Flint, Traverse City, Chicago, Cleveland, and Denver. Service problems at Saginaw primarily involve service frequencies to Detroit. A new midmorning flight out and a late evening flight back are required as well as supplementary service to relieve seat availability problems. Many survey respondents felt that a large number of passengers drive to Detroit to avoid these problems, although Saginaw had an above average score in the market analysis. In addition, some need for new service to Sault Ste. Marie was expressed.

Summary - Southern Lower Peninsula - The travel patterns of air passengers using the eleven airports in this area are primarily direct east - west toward Detroit and Chicago. Because of the importance of these gateway airports, concerns about air service to them were almost universally expressed during the survey. Another point of concern relative to east - west travel is a widely held desire to avoid the congestion of these larger airports for connecting travel to the coasts. Cleveland's Hopkins Airport does provide some secondary connections to the East and South improving the perceived ease of air travel in these directions. While Denver is beginning to act in a similar capacity for travel to the West and Southwest, most connections still require a long hike, or wait, or both through Chicago's O'Hare Airport. Difficulty in making this connection is an important routing consideration.

Some concern for travel to the North, particularly Traverse City, was also uncovered during the survey. Although the demand for travel to the North is obviously much smaller than the East - West demand, as this area continues to develop, these travel demands will become increasingly important. Of the eleven airports in this area, three scored in the bottom quarter regarding realized enplanements. These are Battle Creek, Detroit City, and Jackson.

Northern Lower Peninsula & Eastern Upper Peninsula

Alpena - During the survey period, two flights a day were operated by North Central Airlines from Phelps Collins Airport. These flights provide direct service to Detroit, Flint, and Saginaw. Three complaints were expressed by Alpena respondents:

1. The lack of any direct service to Lansing.
2. The lack of any direct service to Chicago.
3. The lack of a midmorning flight to Detroit. (This problem was corrected by the addition of a 10:20 A.M. departure from Alpena to Detroit effective with North Central's April 24, 1977 schedule.)

A large percentage of passengers were thought to drive to Saginaw for service. This observation is supported by the fact that Alpena had the fourth lowest score in the market analysis.

Manistee - One flight a day is provided to Manistee County Blacker Airport by North Central Airlines. This flight provides direct service to Grand Rapids, Benton Harbor, and Chicago. The general attitude at Manistee is that this level of service is inadequate which is supported by Manistee's low market analysis score and a large number of passengers driving to Grand Rapids and Traverse

City for service. The following are service improvements suggested by survey respondents:

1. Schedule at least two flights per day, one out in the morning and one back in the evening.
2. Provide new direct service to Detroit, Lansing, Milwaukee, and Traverse City.
3. Provide additional service to Chicago and Grand Rapids.

Pellston - During the survey period five departing flights a day were scheduled at Emmet County Airport by North Central Airlines. Effective with the April 24, 1977 schedule, two more flights were added, bringing the total number of departures to seven. In general, service at Pellston was characterized by respondents as good. Some additional service to Traverse City was suggested as well as a new service to Lansing. Pellston was one of the best scoring air market areas in the state as far as realized enplanements are concerned.

Sault Ste. Marie - Two flights per day are scheduled by North Central Airlines from City - County Airport. These flights provide direct service to Detroit, Cleveland, Traverse City, and Pellston. During the survey period Sault Ste. Marie was somewhat preoccupied with the closing of Kinchloe Air Force Base. This closing may have a profound impact on the air service requirements of Sault Ste. Marie, not only because of its economic impact, but because it reopens the question of whether or not it is desirable to convert the AFB to civilian air use. For the purposes of the study, it will be assumed that one of the following conditions will prevail:

1. Either the AFB will be converted to a civilian airport with adequate runway length to support DC9 service and adequate ground transportation provided to Sault Ste. Marie, or

2. A new airport will be constructed with a primary runway long enough to accommodate DC9's and with an Instrument Landing System.

Either of these two options will resolve the community's existing facility problems. With regard to service, the following points were mentioned as requiring new service:

Kalamazoo
Lansing
Marquette
Chicago

In addition, increased service frequencies to Detroit were thought to be warranted. Sault Ste. Marie was found to be about average in terms of realized enplanement score.

Traverse City - During the survey period, six flights per day were provided by North Central Airlines and four flights per day by Lake Central Aviation from Cherry Capital Airport. These services provide direct flights to Chicago, Detroit, Grand Rapids, and Milwaukee to the South, and Pellston and Sault Ste. Marie to the North. Respondents suggest the following service improvements:

1. More frequent service to Chicago and Detroit.

2. New service to Lansing and across Lake Michigan to Escanaba and Marquette.

As in Detroit and Lansing, the service provided by Lake Central Aviation seemed to be somewhat discounted by respondents because of a lack of stability. Traverse City was the best scoring market

in the state after Detroit Metro. This is probably caused by three factors:

1. Frequent air service.
2. Drawing passengers from surrounding markets.
3. Significant amount of non-resident recreational travel.

Summary - Northern Lower Peninsula and Eastern Upper Peninsula - Travel to Chicago and Detroit is of predominate concern to air travelers from the five airports in this geographic area, as it was in the Southern Lower Peninsula. Another concern of this area is for service to Lansing directly rather than through Detroit or Grand Rapids. One problem that was nearly universally expressed was the impact of inclement weather on air service. Snow removal is a major problem. In addition, three of the five airports in this region do not have Instrument Landing Systems, which severely limits the effectiveness of air service when visibility is restricted. Two of the five airports in this region were in the bottom quarter of the range of market analysis scores: Alpena and Manistee.

Western Upper Peninsula

Escanaba - Six flights a day are operated by North Central Airlines from Delta County Airport. These flights provide service to Cleveland, Detroit, Grand Rapids, Green Bay, Houghton, Lansing, Marquette, and Menominee. While many service improvements were suggested by respondents in the Escanaba area, the strongest concerns are for improved service to Lansing, Chicago, Milwaukee, and to Western points in adjacent states, specifically Duluth and Minneapolis. Other points to which additional service may be warranted are Saginaw and Traverse City. No serious diversion or production problems were observed for Escanaba.

Hancock/Houghton - North Central Airlines originates three flights a day from Houghton County Memorial Airport. Direct service is provided to Detroit and Chicago via Green Bay with intermediate stops at Iron Mountain, Menominee, Grand Rapids, and Lansing. Additional service is provided by Lake Central Aviation to Lansing and Detroit. While, respondents categorized service at Hancock/Houghton as "good", certain service deficiencies do exist. These include more service to Chicago, Detroit, Lansing and new service to Traverse City, Duluth, and Minneapolis. Hancock/Houghton had the third highest score of realized enplanements.

Iron Mountain - Six flights a day are operated by North Central Airlines from Ford Airport. Three of the flights go South to Chicago via Green Bay, and three go North to Houghton and Marquette. Two major areas of concern were expressed by Iron Mountain respondents:

1. Direct service to the Eastern and Central Lower Peninsula, specifically Detroit, Lansing, Flint, and Kalamazoo, is required. The points are presently served only through connections at Green Bay.

2. East - west service from Iron Mountain to Minneapolis, Pellston, and Sault Ste. Marie.

Although no major diversion patterns were recorded during the survey, Iron Mountain is somewhat below average in the market analysis.

Ironwood - During the survey period three North Central flights per day were provided at Gogebic County Airport. Two of these flights went South to Milwaukee and Chicago with intermediate stops and one went West to Duluth. With the April 24, 1977 schedule change, the southbound flights were unaltered; the westbound flight,

however, now bypasses Duluth and goes instead to Minneapolis. Service to Minneapolis was the most predominate need expressed by survey respondents. Other less important concerns were:

1. Improved service to the South, specifically Detroit, Lansing, and Chicago.

2. Better service to Duluth and new service to Sault Ste. Marie.

While the schedule change noted above resolved the major air service problem from Ironwood, the elimination of service to Duluth undoubtedly has compounded what was a secondary concern.

Marquette - Marquette County Airport is presently served by three North Central flights a day. These flights all go South to Green Bay with intermediate stops and then split off to provide direct service to Boston, Chicago, Cleveland, Detroit, Grand Rapids and Lansing. In addition, two southbound flights a day to Traverse City, Lansing and Detroit, and two northbound flights to Hancock are provided by Lake Central Aviation. Most respondents felt that the number of destinations served from Marquette is adequate and this feeling is substantiated by a well-above average market analysis score. The primary complaints are with the frequency of service to major points and/or the number of stops required enroute. Specific points suffering from these problems are Detroit, Lansing, and Traverse City. There also was some concern about a new direct service into northern Minnesota. Again, as in other cases, the service provided by Lake Central Aviation was discounted by some Marquette respondents. Others, while recognizing that it exists, expressed reservations about using it because of "instability".

Menominee - At present, five flights per day are operated by North Central Airlines from Menominee. Most major destinations to the South are served directly by these flights. Three destinations were cited as needing additional service from Menominee. These are Lansing, Chicago, and Minneapolis. Most respondents linked the solution to these service problems to the lengthening of the runway to accommodate DC9's. Although North Central Airlines has not committed any additional service even if the runway is extended, most respondents believe that new service will be provided. It was pointed out by several respondents that a large number of Menominee/Marinette residents presently drive to Green Bay to get direct jet service, rather than fly prop aircraft from Menominee to Green Bay and then connect to jets. Menominee is slightly above average in the range of realized enplanements scores.

Summary - Western Upper Peninsula - The Western Upper Peninsula is considerably different from the remainder of the State of Michigan in several respects. The most predominate difference is that this area identifies more closely with neighboring Wisconsin and Minnesota than with the downstate area. While the demand for more service to Detroit, Chicago, and Lansing continues, a large number of respondents expressed concern for service to Duluth and Minneapolis and, to a somewhat more limited extent, service to eastern points (Traverse City and Sault Ste. Marie). Of the six airports in this area, only two have realized enplanements scores which are slightly below average.

III. ANALYSIS OF SERVICE DEFICIENCIES

While the qualitative analyses described in the preceding chapter do provide some general guidance in identifying the need for and public attitudes towards improved air service, a more quantitative evaluation of air service quality and associated demand was essential in determining air service needs. Once this had been accomplished, proposals for new or supplemental services could then be developed to resolve market deficiencies.

A. MARKET SELECTION

The starting point in the identification and analysis of service deficiencies was to determine which markets were to be studied. In order to be included, potential markets had to meet at least one of the following criteria:[1/]

- Be an intrastate (Michigan) market.
- Be connected to a Michigan Air Carrier Airport by single plane service in 1975.
- Be one of the top ten markets for a Michigan Air Carrier Airport as determined through origin and destination data.[2/]

Application of the above criteria reduced the over five thousand potential markets to 339. Of these, 214 are interstate and 125 intrastate. Table 13 identifies these markets by the associated Michigan Air Carrier Airport.

1/ The first criteria alone was used in determining Detroit Metro markets.

2/ Civil Aeronautics Board, Domestic Origin-Destination Survey of Airline Passenger Traffic, Washington, D.C., December 31, 1975.

TABLE 13

MARKETS CONSIDERED FOR ANALYSIS

Michigan Air Carrier Airports	Potential Markets			Markets Meeting Criteria		
	Interstate	Intrastate	Total	Interstate	Intrastate	Total
Alpena	160	10	170	10	10	20
Battle Creek	170	3	173	12	3	15
Benton Harbor	232	15	247	12	15	27
Detroit City/Metro	507	20	527	0	20	20
Escanaba	152	11	163	6	11	17
Flint	313	16	329	14	16	30
Grand Rapids	389	14	403	14	14	28
Hancock/Houghton	160	12	172	8	12	20
Iron Mountain	151	13	164	10	13	23
Ironwood/Ashland	138	13	151	10	13	23
Jackson	146	7	153	12	7	19
Kalamazoo	318	13	331	16	13	29
Lansing	351	16	367	13	16	29
Manistee	82	5	87	9	5	14
Marquette	231	12	243	11	12	23
Menominee/Marinette	143	9	152	9	9	18
Muskegon	284	10	294	11	10	21
Pellston	177	10	187	9	10	19
Saginaw	353	14	367	12	14	26
Sault Ste. Marie	172	13	185	8	13	21
Traverse City	261	14	275	9	14	23
Totals	4890	125[1/]	5015	214	125[1/]	339

1/ Actual number of markets are half of those shown. (Each intrastate market serves two Michigan air carrier airports.)

While no distinction was made in the market selection process between services provided by certificated airlines and commuter operators, the unreliability of commuter origin-destination data had the effect of eliminating several commuter markets from the analysis. The underlying difficulty was distinguishing between true origin and destination versus connecting passengers when a portion of the trip was made using a commuter carrier.[1/]

B. THE CONCEPT OF JUSTIFIED AIR SERVICE

The quality of air service consists of a combination of factors, such as frequency, departure time, intermediate stops, connections, and so on. Air service in any market served by scheduled air carriers can be objectively rated by reducing these qualities to a single scale and can be thought of as a series of steps or levels rather than as a continuous function.

The concept of a "justified" service level for every market has been established both through airline initiatives and CAB route proceedings to represent the quality of air service which can reasonably be provided by the airlines under prevailing industry economics to meet passenger demand. This level varies with the distance between the cities and the annual number of enplaned passengers in the market. The concept of justified service level provides a valuable "benchmark" against which present service and demand can be compared to determine its adequacy.

1/ For example, the CAB reported only 20 passengers exchanged between Battle Creek and Chicago in 1975, while Air Wisconsin reports having ticketed 25,569 persons between these points in the same year. Consequently, the definitional or reporting problem renders these results unusable.

C. THE SERVICE CLASSIFICATION SCORING SYSTEM

The Service Classification Scoring System was used to assess the adequacy of air service in the the markets selected for analysis. This system provides a systematic basis for determining the level of service which is provided by the air carriers and that which is justified by passenger demand. Table 14 illustrates the various classes for jet service in markets of 300 miles or more and is a simplification of how service classes relate to service quality. (Similar tables can be prepared for propeller equipment and shorter distance ranges.)

Figure 5 graphically illustrates the different "service classes" as a function of patronage (annual) and distance. The graph can be used to determine justified service levels in different markets, provided that true origin and destination patronage is known. The point on the graph reflecting the patronage and distance separating the city pair determines the class of service that can be justified. For example, a market of 200 miles having an annual patronage of 5,000 persons can justify class 3 service.

In general, each higher service class requires about twice as much patronage as the one immediately below (distance constant). For example, a 1,000 mile market would require slightly greater than 1,000 annual passengers to justify class 7 service. To support better quality service, the number of passengers would have to increase as follows:

Minimum Patronage Required	To Support This Class of Service
1,000	7
2,200	6
4,500	5
9.500	4
20,000	3
42,000	2
88,000	1
180,000	0
380,000	-1
800,000	-2

TABLE 14

APPROXIMATE SCHEDULE EQUIVALENTS TO AIR SERVICE CLASSIFICATIONS FOR JET SERVICE AT 300 MILES OR MORE

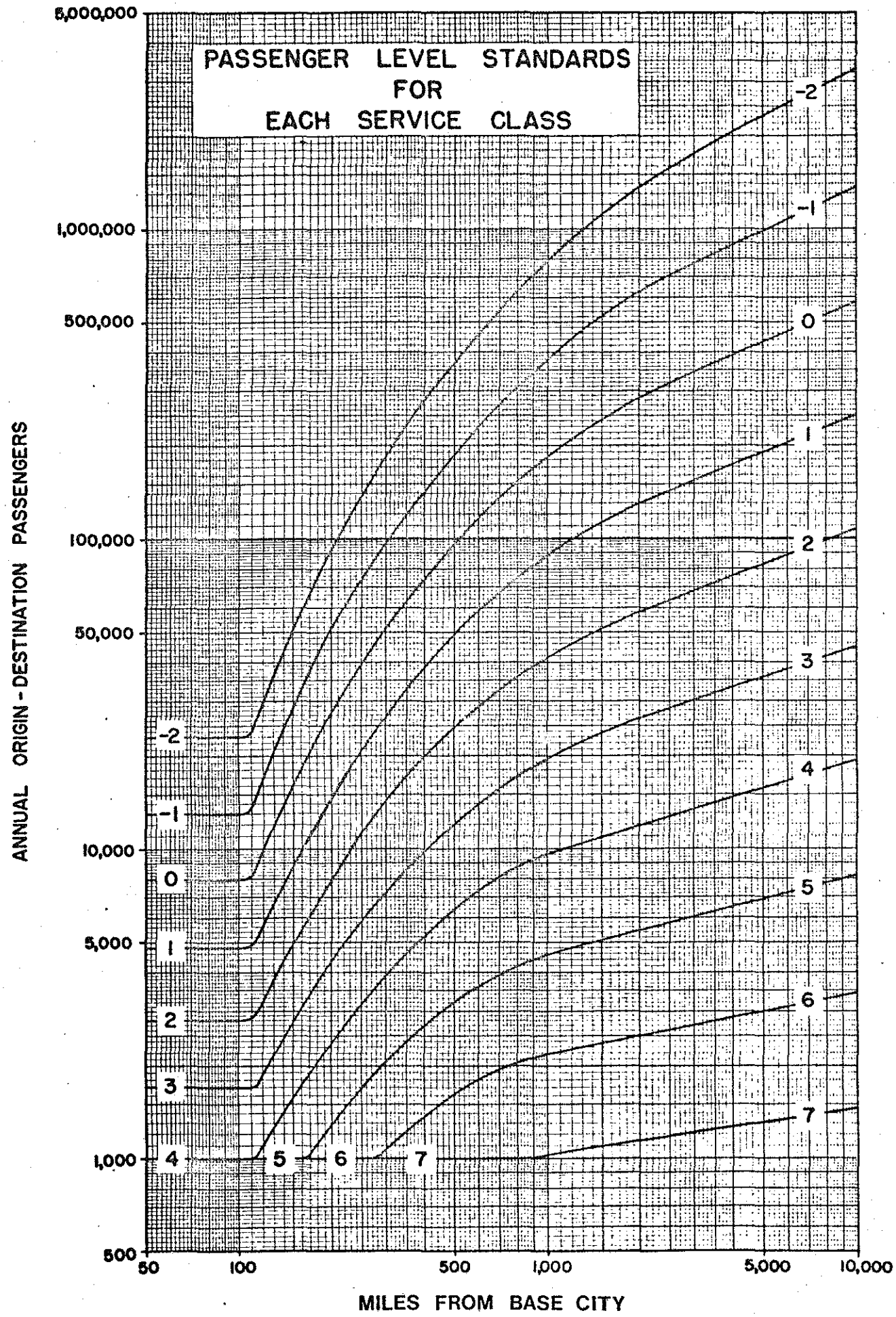
Service Class	Flights During AM and PM Peak Hours[1]		Flights During Mid-Day and Evening
-2	Nonstop about each two hours	AND	Nonstop about each two hours
-1	Nonstops	AND	One-stops in both periods
0	Nonstops	AND	One-stops in one period
1	Nonstops	-	
2	One-stops	OR	Nonstops
3	Two-stops	OR	One-stops[2]
4	Three-stops	OR	Two-stops[2]
5	Nonstop connection[3]	OR	Three-stop single-plane[2]
6	One-stop connection[3]	OR	Nonstop connection[2], [3]
7	Two-stop connection[3]	OR	One-stop connection[2], [3]
8	(Connecting services between multi-stop flights at off-peak		
etc.	hours with long connecting times, by poor schedules at short distances, and other unfavorable combinations.)		

1/ AM peak hour is defined as 6 a.m. to 10 a.m., PM peak hour as 3:30 p.m. to 7:30 p.m.

2/ Or equivalent mixtures.

3/ A "connection" necessitates an additional intermediate stop.

FIGURE 5


PASSENGER LEVEL STANDARDS
FOR
EACH SERVICE CLASS
ANNUAL ORIGIN - DESTINATION PASSENGERS
5,000,000
1,000,000
500,000
100,000
50,000
10,000
5,000
1,000
500
50
100
500
1,000
5,000
10,000
MILES FROM BASE CITY
-2
-1
0
1
2
3
4
5
6
7

Similarly as the distance between cities increases, a greater number of passengers is required to support the same quality of service.

The scoring technique summarized in Table 15 was applied to air carrier service in selected markets for May (an average month) in 1965 and 1975. This provided a ten-year time span over which to observe the effect of variations in service qualities on passenger demand.

D. "BEFORE AND AFTER" ANALYSIS

Justified service levels for individual markets can be determined directly from Figure 5 provided that patronage data is available. Since 1975 patronage data was available, justified service levels could readily be developed for that year. This is not the case for 1977 and 1980. Passenger demands will be different primarily due to changes in population and economic conditions. Also a factor are changes in air service (e.g. higher level service itself will cause a greater demand). Before future year justified service could be determined, a "Before and After" analysis was necessary to project the impact of natural growth and market stimulation. The resulting factors were used in developing estimates of 1977 and 1980 patronage.

The service stimulation factor was developed to estimate the changes in demand which result from service level changes. This factor was derived as follows:

1. May, 1965 service was scored identically to May, 1975 service (provided that true origin-destination patronage occurred in both years).

2. Air service scores were then compared.

3. Markets were then grouped according to the change in service class occurring during this period. A median passenger change was calculated for each group.

4. A statistical regression was performed on the grouped data to correlate the percent patronage change to the service change. An 11.3 percent change was found for

TABLE 15

TECHNIQUE USED IN THE SERVICE CLASSIFICATION SCORING SYSTEM

A. Analyze morning peak hour (6 a.m. - 10 a.m.) departures to the base city or best alternative service earlier or later, using May, 1965 and 1975 schedules.

1. Score one point to start.
2. Add one point for each scheduled stop enroute (not counting arrival at base city).
3. Add one point for propeller equipment, if flight is for 300-999 miles; and two points if 1,000 miles or more. Add an additional point for scheduled air commuter flights of less than 150 miles, and two points if 150 miles or more.
4. Add two points for each connection between flights.
5. Add one point if not departing between 6 a.m. and 10 a.m. inclusive; and an additional point if departing prior to 4:59 a.m. or after 1 p.m.
6. Add one point on connections for each hour or fraction thereof over a 90 minute connection.

B. Analyze afternoon peak hour (3:30 p.m. - 7:30 p.m.) departures to the base city or best alternative service earlier or later in a similar way, except add one point if not departing between 3:30 p.m. and 7:30 p.m. inclusive, and an additional point if departing after 11:01 p.m. or before 12:59 p.m. (except that on eastbound flights one-half hour earlier is permitted for each 300 miles or fraction thereof over 2,000 miles, to recognize actual carrier practices, and passenger preferences due to time zone differentials upon arrivals at an eastern destination).

C. If there is only one schedule or connection a day possible, score the "second service" at the value of the "first service" plus five points. Since the first service is the score of the only single-plane or connecting service possible in one direction, five points are added to penalize for the lack of either an AM or PM flight. Never exceed this five point difference.

D. If both the morning and afternoon services involve connections, add one point to each of their scores.

E. For each connection used which requires a circuitous routing (distance) in excess of 20% of the straight line distance between city-pairs, add one point for each 20% circuity or fraction thereof over the first 20% circuity.

F. Add all scores together and divide by two to determine the average.

TABLE 15 (Continued)

TECHNIQUE USED IN THE SERVICE CLASSIFICATION SCORING SYSTEM

G. Allowing a score proportional to one point for each 100 miles of the direct airline distance from base to reference, add an amount equal to half of the excess over the allowable score (e.g. a score of 5.0 at 532 miles remains at score 5.0 without penalty; a score of 5.0 at 350 miles becomes 5.75, since only a score of 3.5 is allowable without penalty and half of 1.5 is .75).

H. If flights of quality score 2 or better exist during both peak periods, go on to I; otherwise round the final result up if .50 or greater, down if less than .50. (Quality score is determined prior to H ignoring the time penalty.)

I. Reduce the service score by .50 if there are flights of quality score 2 or better in two of the four-hour time periods (6:00 - 10:00 a.m., 10:01 a.m. - 2:00 p.m., 2:01 - 6:00 p.m., 6:01 - 10:00 p.m.); by one point if three of these four-hour periods are covered; by two points if all periods are covered.

J. Reduce the service score by an additional .25 if there are flights of quality score 1 in four or more of the eight two-hour time periods (6 - 8 a.m., 8:01 - 10:00 a.m., 10:01 a.m. - 12:00 noon, 12:01 - 2:00 p.m., 2:01 - 4:00 p.m., 4:01 - 6:00 p.m., 6:01 - 8:00 p.m., 8:01 - 10:00 p.m.) with no more than three of the underlined periods missing; by .50 if there are 5 or more such flights with no more than two of underlined periods missing; by .75 if there are 6 or more such flights with no more than one underlined period missing; and by one point if there are 7 or more such flights with none of the underlined periods missing.

K. Round up or down as described in H.

a one-step change in air service as per the following equation:

$$y = 167.88e^{0.107x}$$

where: y = change in patronage (percent)
x = change in service level (in steps)
r = 0.977 (correlation coefficient)

The data used in this regression are presented in Figure 6 along with a plot of the resultant service stimulation factor of 11.3 percent.

Growth in air traffic will occur regardless of a lack of improvement in air service. This is primarily due to increases in local population and changes in various socio-economic factors such as increases in per capita income and changes in type of employment. The rate of natural growth, determined as a "by-product" of the "Before and After" analysis, was found to be approximately 5.3 percent per year compounded. Based on historical trends, this amount of annual growth can be expected to occur independent of any market stimulation caused by service improvements. This rate can be derived from the location of the line in Figure 6 at the point which corresponds to no change in service quality (point zero).

Appendix D presents the complete results of the "Before and After" analysis. For each market studied, changes in both the number of enplaned passengers and service levels are described.

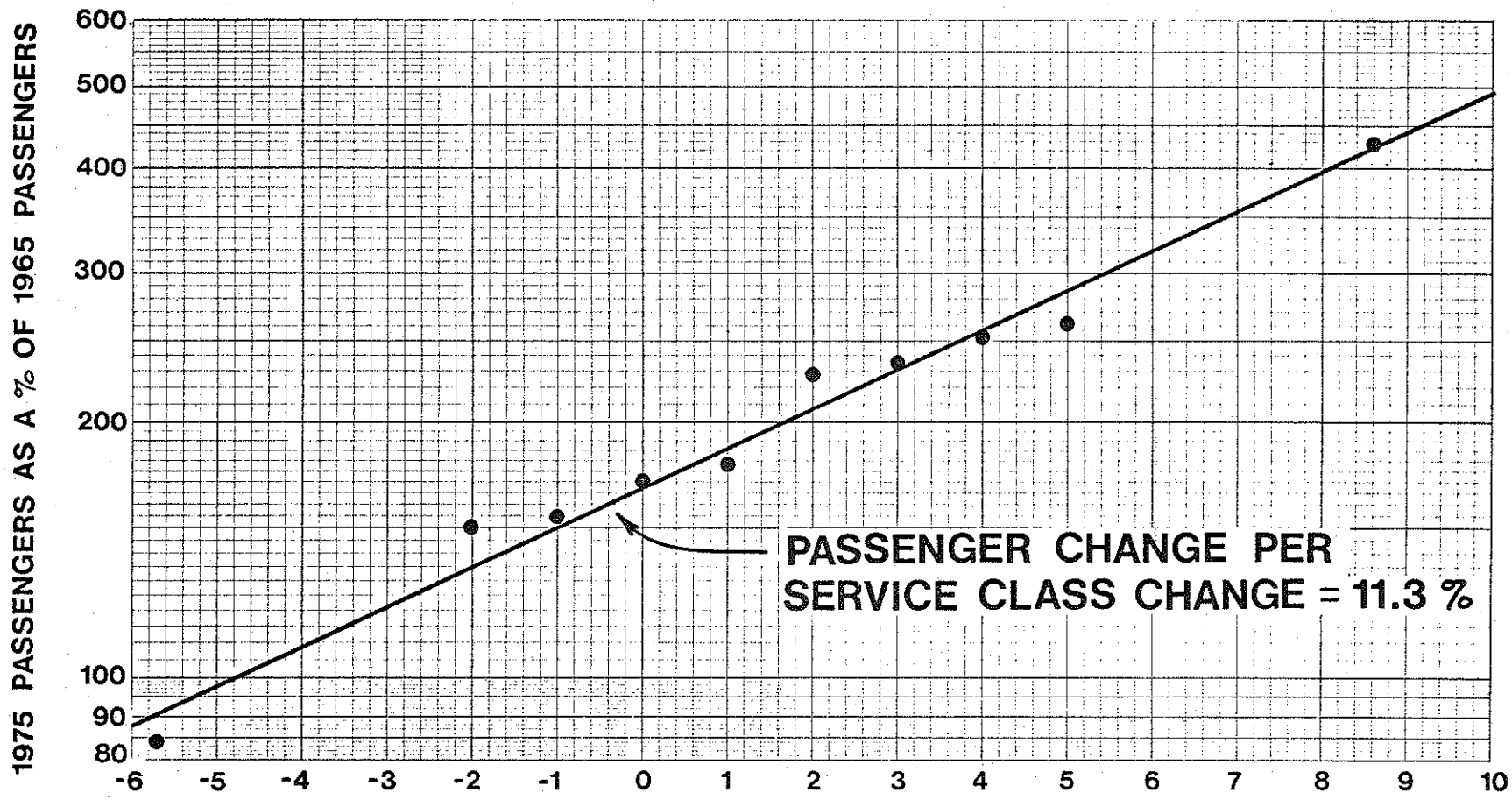
E. ESTIMATING PATRONAGE AND JUSTIFIED SERVICE LEVELS

The process of estimating patronage and justified service levels is iterative and may require several test applications of both the natural growth and stimulation factors.

The starting point is 1975 patronage (true origin and destination passengers) and distance between cities. From this, a "first pass" justified service level was computed for each market. The result was

SERVICE QUALITY STIMULATION OF PASSENGERS

Before And After Analysis Of The Effect Of Change In The Quality Of Air Service On Passenger Volume



Service Steps Better (Worse)	1975 Passengers As a % of 1965 (Median)	Service Steps Better (Worse)	1975 Passengers As a % of 1965 (Median)
(5)	98%	2	228%
(2)	150	3	234
(1)	154	4	251
(0)	170	5	261
1	178	8	395

FIGURE 6

then compared with the actual service. If a higher service level was justified, the stimulation factor was applied to the actual patronage multiplied by the number of steps existing service was found to be deficient. The resulting increase in demand may cause an even higher level of service to be warranted. In this case, the resulting patronage was stimulated again until a final justified service level and demand estimate were established.

The 1975 passenger demand estimate was then projected to 1977 and 1980, using the natural growth rate. If a higher service level was justified, the stimulation factor was again applied to the estimated 1977 or 1980 patronage. Resulting demand estimates are shown in Table 16.

> Example. The Flint-Milwaukee market is used to illustrate the method employed. In 1975, the CAB estimated that 4,180 persons traveled by scheduled air service between these two cities. The distance between them is 211 miles. From Figure 5, level 4 service should have been provided. Actual service in 1975 was level 9, a five point deficiency. To determine what the patronage would have been had level 4 service been offered, the actual patronage was multiplied five times by the stimulation factor to obtain an estimate of 7,140. From Figure 5, this amount of patronage would justify level 3 service. Therefore, the stimulation factor was applied again to obtain a 1975 demand estimate of 7,950. To determine 1977 patronage, the 1975 estimated patronage was multiplied twice by the natural growth factor to obtain the estimate of 8,810 at level 3 service. The same method was used to estimate 1980 patronage. In this case, the application of the natural growth factor produces a patronage estimate justifying level 2 service. Consequently, the stimulation factor was applied once more to obtain 1980 demand estimate of 11,450.

TABLE 16

AVERAGE CURRENT AND PROSPECTIVE AIR SERVICE DEFICIENCIES FOR MICHIGAN MARKETS

City - Pair	Distance	1975 True O-D Passenger	Actual '75	Actual '77	Service Quality — Required — 1975	Required 1977	Required 1980	Steps Deficient 1975	Steps Deficient 1977	Steps Deficient 1980	Estimated O-D Pass. At Required Service 1975	At Required Service 1977	At Required Service 1980	Deficiency Points (000) 1975	Deficiency Points (000) 1977	Deficiency Points (000) 1980
Alpena																
- Chicago	306	980	6	7	NR	6	6	-	1	1	980	1090	1270	-	1	1
Detroit																
- Escanaba	305	3370	7	7	4	4	4	3	3	3	4650	5150	6020	14	13	15
- Grand Rapids	126	22550	-1	0	-1R	-1R	-1R	-	1	1	22550	25000	29190	-	25	29
- Hancock	425	8050	9	7	3	3	3	6	4	4	15300	16970	19810	92	51	68
- Iron Mountain	345	3990	8	7	4	4	4	4	3	3	6120	6790	7920	24	20	24
- Ironwood	466	1570	10	10	6	6	5	4	4	5	2410	2670	3470	10	11	17
- Marquette	363	9200	8	8	3	3	2	5	5	6	15710	17420	22640	79	87	136
- Menominee	295	1590	6	6	6	6	5	-	-	1	1590	1760	2290	-	-	2
- Sault Ste Marie	294	4200	6	5	4	4	4	2	1	1	5200	5770	6740	10	6	7
- Traverse City	207	18020	2	2	1	1	1	1	1	1	20060	22240	25970	20	22	26
Escanaba																
- Chicago	267	4260	5	5	4	4	3	1	1	2	4740	5260	6830	5	5	14
- Lansing	238	3510	7	7	4	3	3	3	4	4	4840	5970	6970	15	24	23
- Milwaukee	195	1590	7	5	5	4	4	2	1	1	1970	2440	3360	4	2	3
Flint																
- Cleveland	145	8100	2	2	2	1	1	-	1	1	8100	10000	11670	-	10	12
- Milwaukee	211	4180	9	7	3	3	2	6	4	5	7950	8810	11450	48	35	57
Grand Rapids																
- Cleveland	216	21900	2	2	1	1R	1R	1	1	1	24370	27030	31560	24	27	32
- Hancock	330	1770	6	6	6	6	5	-	-	1	1770	1960	2550	-	-	3
- Iron Mountain	240	1550	6	6	5	5	5	1	1	1	1730	1910	2230	2	2	2
- Marquette	271	2840	6	5	5	4	4	1	1	1	3160	3900	4550	3	4	5
- Milwaukee	120	16020	1	1	-1	-1	-1	2	2	2	19850	22000	25690	40	44	51
- Minneapolis	408	15820	3	3	3	3	2	-	-	1	15820	17540	22800	-	-	23
- Traverse City	128	1160	4	6	4	4	4	-	2	2	1160	1290	1500	-	3	3
Hancock																
- Lansing	358	3780	8	6	4	4	4	4	2	2	5800	6430	7510	23	13	15
- Minneapolis	277	900	12	11	NR	NR	5	-	-	6	900	1000	2470	-	-	15
Iron Mountain																
- Lansing	273	2300	7	7	5	5	4	2	2	3	2850	3160	4110	6	8	12
Ironwood																
- Chicago	350	3800	7	6	4	4	4	3	2	2	5240	5810	6780	11	12	14
- Milwaukee	279	1930	6	6	5	5	5	1	1	1	2150	2380	2780	2	2	3

TABLE 16 (Cont'd)

AVERAGE CURRENT AND PROSPECTIVE AIR SERVICE DEFICIENCIES FOR MICHIGAN MARKETS

City - Pair	Distance	1975 True O-D Passenger	Actual '75	Actual '77	Service Quality Steps Required 1975	Required 1977	Required 1980	Deficient 1975	Deficient 1977	Deficient 1980	Estimated O-D Pass. At Required Service 1975	At Required Service 1977	At Required Service 1980	Deficiency Points (000) 1975	Deficiency Points (000) 1977	Deficiency Points (000) 1980
Kalamazoo																
- Cleveland	202	5920	7	7	2	2	2	5	5	5	10110	11210	13090	51	56	65
- Milwaukee	129	2310	6	6	3	3	2	3	3	4	3180	3530	4590	10	11	18
- Minneapolis	426	4530	4	5	5	5	4	-	-	1	4530	5020	6530	-	-	7
Lansing																
- Cleveland	171	11830	2	2	1	1	1	1	1	1	13170	14600	17050	13	15	17
- Marquette	298	4770	7	7	4	4	3	3	3	4	6580	7290	9480	20	22	38
- Menominee	222	900	6	8	NR	6	5	-	2	3	900	1240	1610	-	2	5
- Minneapolis	455	8980	4	4	4	4	3	-	-	1	8980	9960	12940	-	-	13
Manistee																
- Chicago	182	1250	10	10	4	4	4	6	6	6	2380	2630	3080	14	16	18
Marquette																
- Chicago	322	8470	6	5	3	3	3	3	2	2	11680	12950	15120	35	26	30
- Cleveland	453	1330	10	9	6	6	5	4	3	4	2040	2260	2940	8	7	12
- Milwaukee	248	3670	8	6	4	4	4	4	2	2	5630	6240	7290	23	12	15
- Minneapolis	296	2680	11	11	4	4	3	7	7	8	5670	6290	8170	40	57	65
Muskegon																
- Chicago	118	22640	0	0	-1R	-1R	-2R	1	1	2	25200	27940	36310	25	28	36
Pellston																
- Chicago	295	8560	5	5	3	3	3	2	2	2	10600	11760	13730	21	24	28
Saginaw																
- Cleveland	185	14100	2	2	1	1	1	1	1	1	15690	17400	20320	16	17	20
Sault Ste Marie																
- Chicago	360	3490	8	8	5	4	4	3	4	4	4810	5940	6930	14	24	28
Traverse City																
- Chicago	226	18590	3	3	1	1	1	2	2	2	23030	25530	29810	46	51	60
- Cleveland	297	2930	8	7	4	4	4	4	3	3	4500	4990	5820	18	15	17
- Minneapolis	375	1750	8	9	6	5	5	2	4	4	2170	2680	3480	4	11	14

Note: NR denotes that a justified service level does not exist.

R indicates that restricted competition is warranted. Two or more carriers must offer nonstop and/or one-stop flights.

F. AIR SERVICE DEFICIENCIES

Using the service classification scoring system, an evaluation of services offered in May, 1977 was completed. This step provided the necessary data to carry out a comparison of actual versus justified service level for 1977 and 1980.[1/] The analysis was performed for all intrastate markets and additionally for markets involving travel between Michigan points and six "gateway" airports: Chicago, Cleveland, Denver, Green Bay, Milwaukee, and Minneapolis. These six gateways serve as major connecting points for travel between Michigan cities and other more distant cities.

The next step was to establish the order of magnitude of the deficiency based on passenger demand at the justified service level. For each market, the number of steps deficient was multiplied by the projected number of true origin-destination passengers and divided by 1,000 to arrive at the number of points by which the market is deficient in the year of interest. As shown in Figure 5, markets exchanging less than 1,000 passengers annually only warrant class 8 or higher service. Such markets were excluded from this portion of the analysis as they cannot support single plane service on their own and, therefore, cannot provide a basis for the development of route proposals. In fact, at this level of demand, there are no required service levels.

Table 16 presents those study markets whose needs were identified in the preceding analyses as being undermet by present air services. Actual and justified service levels are shown along with the number of steps by which the market is deficient.

1/ It was assumed that the quality of air service provided in 1980 would remain at 1977 levels.

The 339 markets meeting the original screening criteria for the "Before and After" analysis (214 interstate and 125 intrastate) were reduced during the deficiency analysis to 202 markets (81 interstate and 121 intrastate). For a presentation of the criteria used to select markets for the deficiency analysis see the first footnote on Table 20, page 78. In 1975, 35 of these were found to be deficient. Even though service improvements were made in some markets, the number of those found to be deficient increased to 40 in 1977. By 1980, the number of deficient markets is projected to increase to 46 unless a number of service improvements are made. These findings are summarized in Table 17.

TABLE 17

NUMBER OF DEFICIENT MARKETS

	1975		1977		1980	
Type	No.	Percent	No.	Percent	No.	Percent
Interstate	22	27.2	24	29.6	28	34.6
Intrastate	13	10.7	16	13.2	18	14.9
Total	35	17.3	40	19.8	46	22.8

Table 17 shows that roughly 80 percent of existing markets are being adequately served by present carriers. Thus, a conclusion could be drawn that present air service is basically quite good. However, the table also indicates that the number of deficient markets is gradually increasing both for interstate and intrastate travel. This may seem surprising; the general belief has been that the quality of air service has been improving over time. However, the quality of air service provided must keep pace with the demand for better service.

Simply identifying the deficient markets isn't enough; the size of the deficiency is rather important. Size has two dimensions: the number

of steps deficient and the affected annual patronage. A market deficiency of one or two steps may seem unimportant. However, it may be quite significant if appreciable patronage is affected. The reverse situation also holds. These two dimensions have been combined together and treated as a simple measure (deficiency points). The number of points by which each market is or will be deficient is shown in Table 16. The number of markets falling into five different severity categories is shown in Table 18.

TABLE 18

SEVERITY OF DEFICIENT MARKETS

Severity (deficiency points)	1975		1977		1980	
	No.	Percent	No.	Percent	No.	Percent
0 to 9	9	26	11	28	11	24
10 to 19	10	29	12	30	16	35
20 to 29	8	23	10	25	8	17
30 to 59	6	17	6	15	6	13
60 and up	2	6	1	3	5	11
Average (deficient markets)	22.6		20.5		24.3	

This table shows that 55 to 60 percent of deficiencies are fairly small (less than 20 deficiency points). While the average deficiency decreased somewhat between 1975 and 1977, this decrease was more than offset by the increased number of markets found to be deficient. By 1980, the average deficiency is projected to increase by nearly 20 percent over 1977 unless service improvements are made. More importantly, the number of severely deficient markets is anticipated to increase substantially (from one to five).

The second dimension of deficiency, that of number of passengers annually affected, is considered in the calculation of deficiency points. It is important, however, to put this dimension into perspective by comparing the numbers of passengers affected by deficiencies with the total number of passengers exchanged (study markets only). Although only 24.3% of the number of markets studied were projected to have deficiencies in 1980, these markets were carrying 44% of the total 1975 O-D passengers who travelled by air in those markets analyzed. Table 19 indicates how extensive the deficiencies are when viewed in terms of the number of passengers affected.

TABLE 19

NUMBER OF 1975 O-D PASSENGERS IN DEFICIENT MARKETS
(1980 Deficiencies)

Type	1975 O-D Pass. in Markets Analyzed	1975 O-D Pass. in Deficient Markets (1980)	As a % of Pass. in Markets Analyzed	% of Total Pass. Affected (By Type)
Interstate	516,080	202,510	39%	68%
Intrastate	153,980	95,120	61%	32%
Total	670,060	297,630	44%	-

Finally, the location of the deficiency is also rather important, especially in developing new or supplemental services. Table 20 shows the number of interstate and intrastate markets found to be deficient and the severity involved by Air Carrier Airport for 1977 and 1980. Within a given airport, the proportion of deficient markets can range up to nearly 50 percent. Particularly affected are Detroit, Escanaba,

TABLE 20

MARKETS ANALYZED AND DEFICIENCIES FOUND

Michigan Air Carrier Airports	Markets Analyzed for Deficiencies[1]			Markets Found Deficient in 1977[2] Number			Severity					Markets Found Deficient in 1980[2] Number			Severity					Percentage of Markets Deficient	
	Interstate	Intrastate	Total	Interstate	Intrastate	Total	1	2	3	4	5	Interstate	Intrastate	Total	1	2	3	4	5	1977	1980
Alpena	3	10	13	1	0	1	1					1	0	1	1					8	8
Battle Creek	0	0	0	0	0	0						0	0	0						0	0
Benton Harbor	5	15	20	0	0	0						0	0	0						0	0
Detroit City	0	19	19	0	9	9	2	2	3	1	1	0	9	9	2	2	3		2	47	47
Escanaba	4	11	15	2	2	4	2	1	1			2	2	4	1	2	1			27	27
Flint	4	16	20	2	0	2		1		1		2	0	2		1		1		10	10
Grand Rapids	6	14	20	2	4	6	3		2	1		3	5	8	4		2	2		30	40
Hancock/Houghton	4	12	16	0	2	2		1		1		1	3	4	1	2			1	13	25
Iron Mountain	5	12	17	0		3	2		1			0	3	3	1	1	1			18	18
Ironwood/Ashland	6	13	19	2	1	3	1	2				2	1	3	1	2				16	16
Jackson	4	7	11	0	0	0						0	0	0						0	0
Kalamazoo	5	13	18	2	0	2		1		1		3	0	3	1	1			1	11	17
Lansing	6	16	22	1	5	6	2	2	2			2	5	7	1	4	1	1		27	32
Manistee	2	5	7	1	0	1		1				1	0	1		1				14	14
Marquette	6	12	18	4	3	7	2	1	2	1	1	4	3	7	1	2		2	2	39	39
Menominee/Marinette	5	9	14	0	2	2	2					0	2	2	2					14	14
Muskegon	4	10	14	1	0	1			1			1	0	1				1		7	7
Pellston	2	9	11	1	0	1			1			1	0	1			1			9	9
Saginaw	3	14	17	1	0	1		1				1	0	1			1			6	6
Sault Ste. Marie	4	12	16	1	1	2	1		1			1	1	2	1		1			13	13
Traverse City	3	14	17	3	2	5	1	2	1	1		3	2	5	1	2	1		1	29	29
Totals	81	121	202	24	16	40						28	18	46						20	23

1/ Originally, 214 interstate and 125 intrastate markets met the screening criteria. The number of interstate markets was further reduced by requiring the non-Michigan point to be one of six gateway cities: Chicago, Cleveland, Denver, Green Bay, Milwaukee, and Minneapolis. Duluth was also considered as a gateway city for several stations located in the Western Upper Peninsula. Unreliable patronage data and other difficulties accounted for the small reduction in intrastate markets.

2/ Based on the following points:

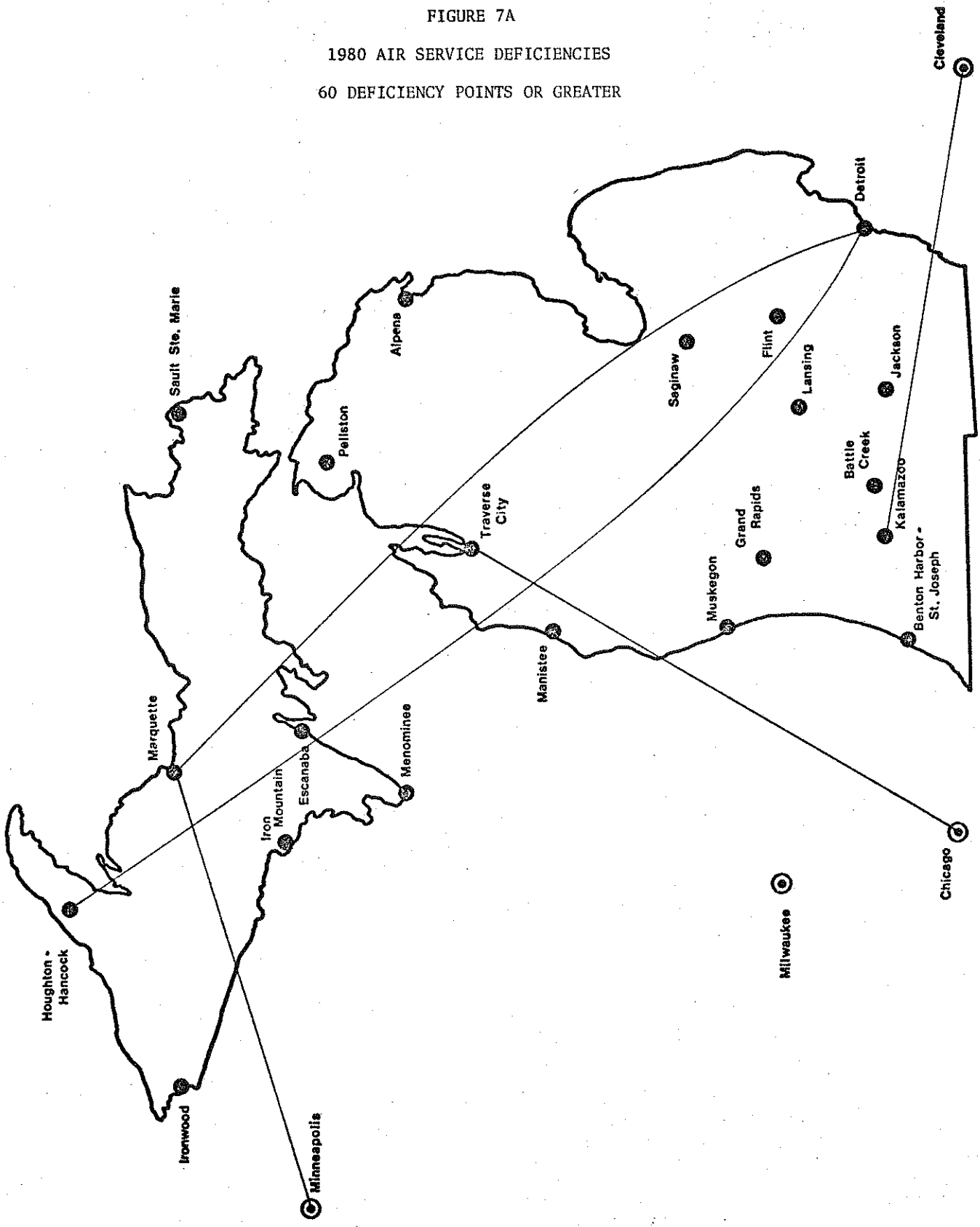
1 0 - 9 deficiency points
2 10 -19 deficiency points
3 20 -29 deficiency points
4 30 -59 deficiency points
5 60 up deficiency points

Grand Rapids, Lansing, Marquette, and Traverse City. The results shown in Table 20 have also been shown graphically in Figures 7A - 7E. These figures visually identify the deficient interstate and intrastate markets grouped into five severity categories.

FIGURE 7A

1980 AIR SERVICE DEFICIENCIES

60 DEFICIENCY POINTS OR GREATER



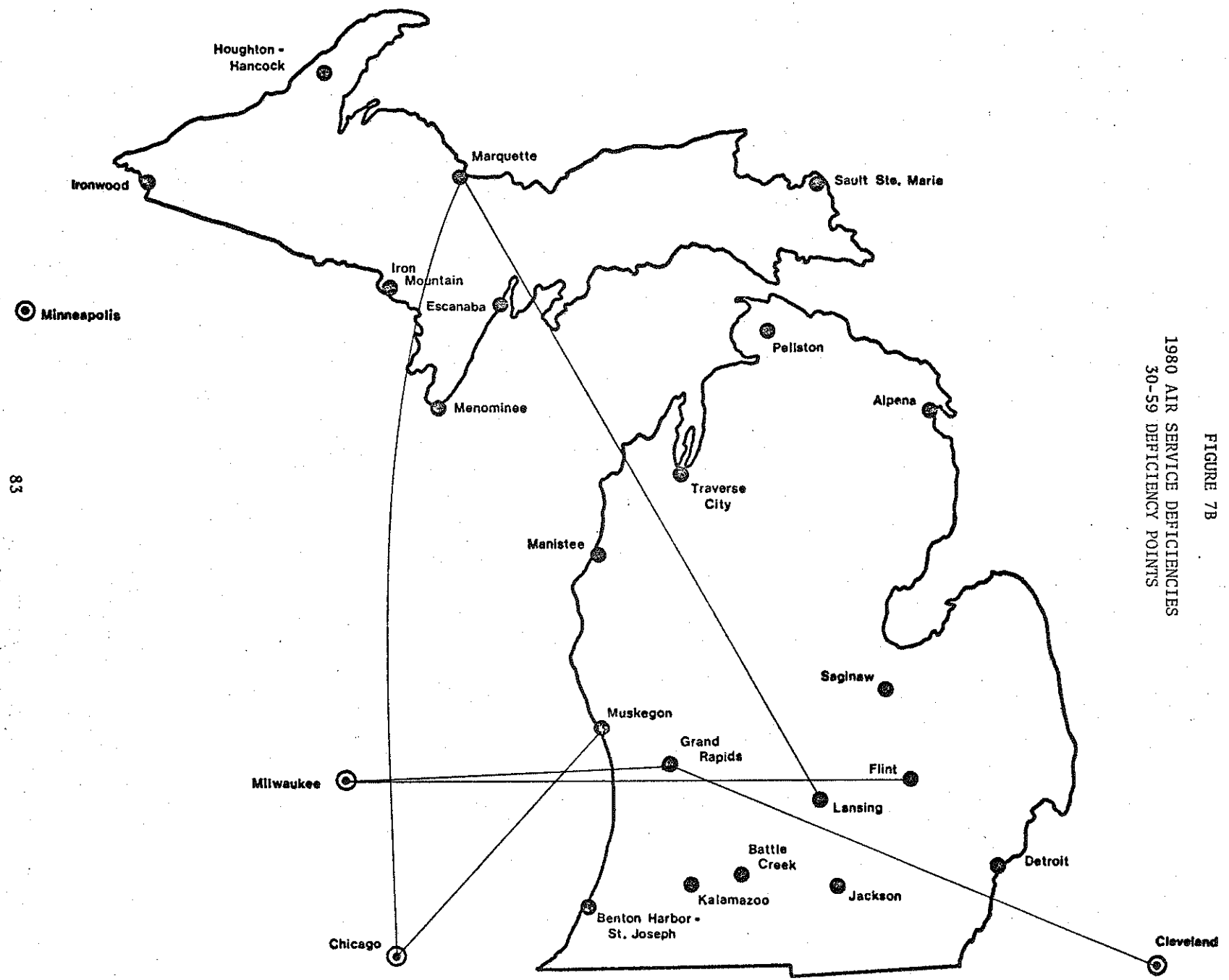


FIGURE 7B
1980 AIR SERVICE DEFICIENCIES
30-59 DEFICIENCY POINTS

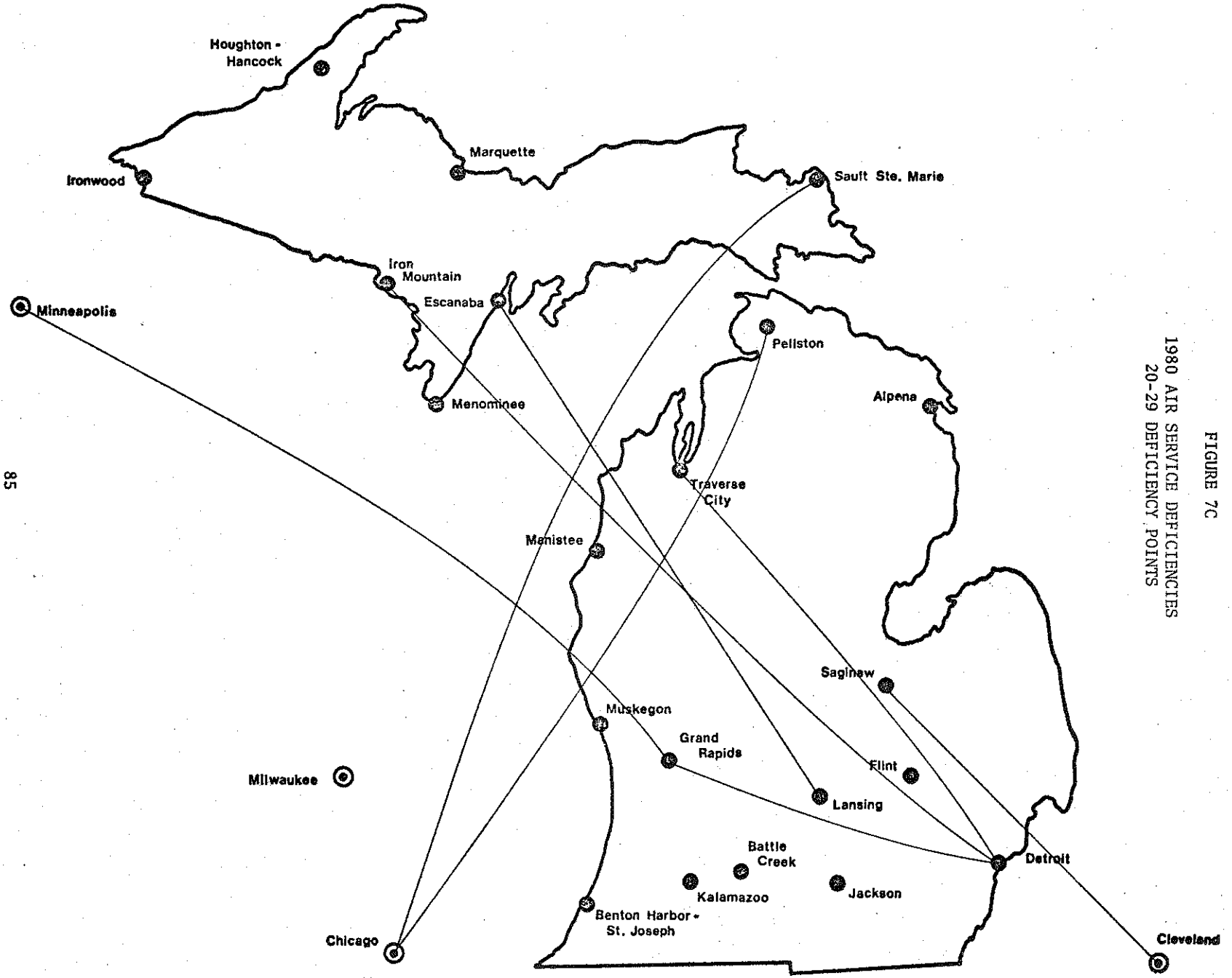


FIGURE 7C
1980 AIR SERVICE DEFICIENCIES
20-29 DEFICIENCY POINTS

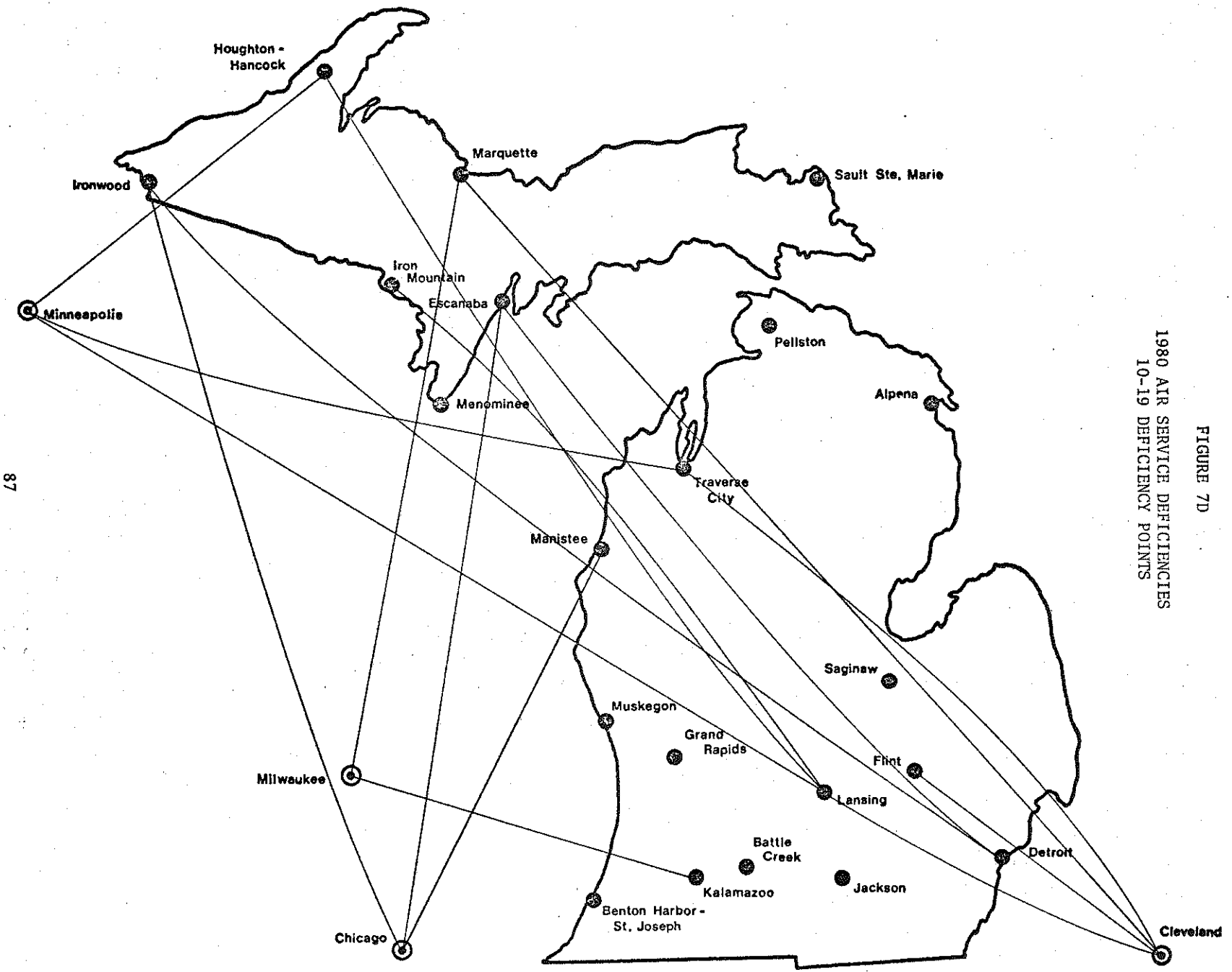
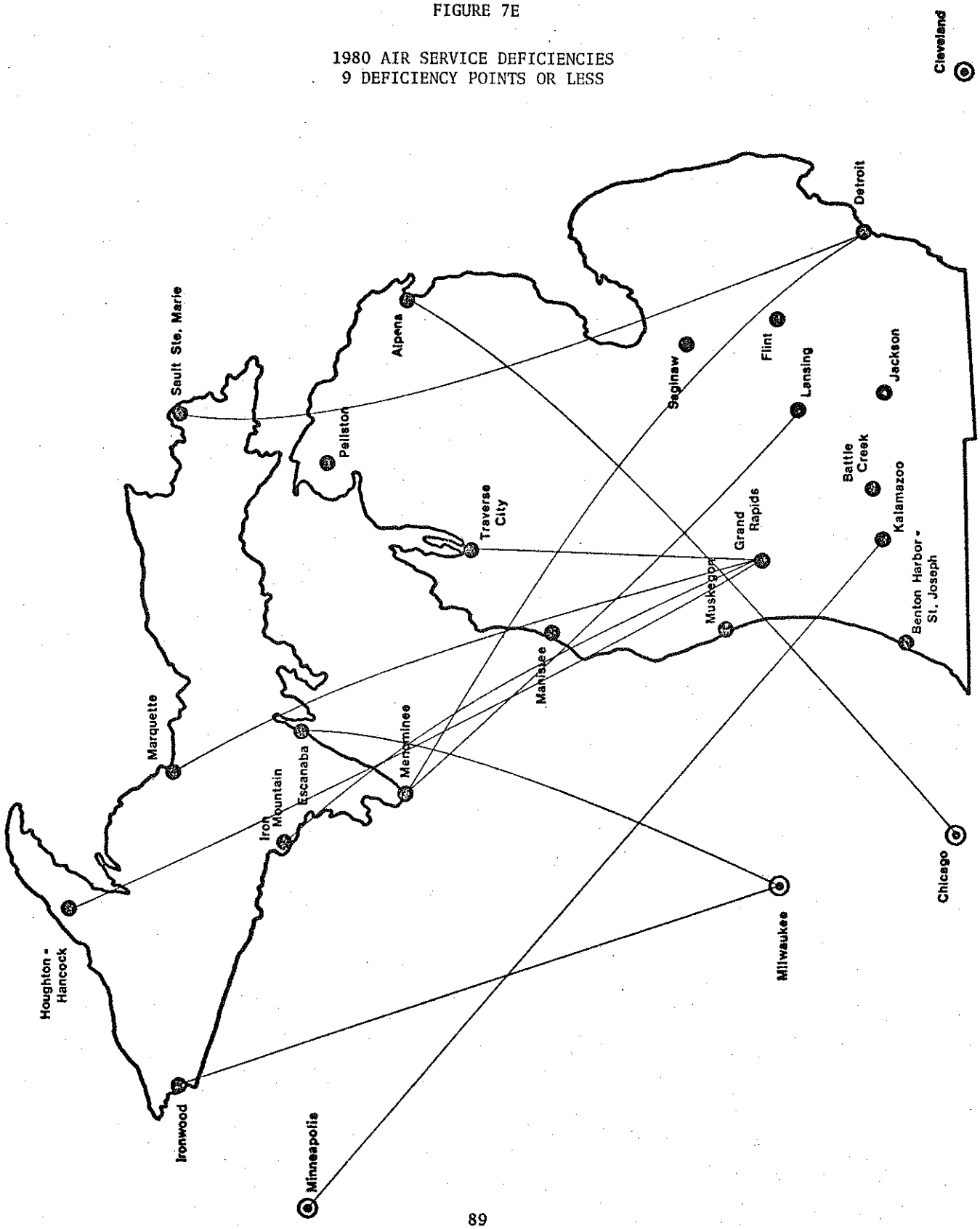


FIGURE 7D

1980 AIR SERVICE DEFICIENCIES
10-19 DEFICIENCY POINTS

FIGURE 7E

1980 AIR SERVICE DEFICIENCIES
9 DEFICIENCY POINTS OR LESS



IV. DEVELOPMENT AND EVALUATION OF SERVICE OPTIONS

The development and evaluation of alternative service options to resolve the needs identified in the preceding chapter had to be done using a "trial and error" process whereby a service was first proposed and then tested to see whether it satisfactorily resolved the deficiency and was economically feasible. Feasibility meant that the revenue from passenger service must be adequate to cover the total operating cost incurred in providing the service. Secondary considerations included logical spatial patterns, efficient use of aircraft, and providing service commensurate with demand.

A. PRELIMINARY SERVICE PROPOSALS

As a first cut at developing service proposals, displays were prepared for 1975 service showing the different ranges of deficiency. These were similar to those presented in Figures 7A - 7E. Deficient markets were assembled into route proposals based on the lines of travel demand. The most seriously deficient markets provided the "backbones" for these proposals. Several rules were adopted to guide the development of service proposals.

- In order to insure a break-even operation, average per mile passenger load factors of at least 0.6 (that is 60 percent utilization of the total seat miles provided) were sought.
- The minimum acceptable service frequency on any route was assumed to be two round trips per day (one each during the A.M. and P.M. peak periods).
- Markets (city pairs) separated by 100 miles or less were assumed to exchange no air passengers.
- A maximum of two intermediate stops per route (four stations served) was adopted in order to insure adequate service quality.

- Each route was to be structured so that service to at least one of the seven gateway airports was provided.

- In developing the initial passenger forecasts, a per step stimulation factor of 12.5 percent was assumed based on work done by others in Muskegon and Grand Rapids and the preliminary results of the "before and after" analysis. No natural growth factor was applied.

Using these rules and the market deficiency displays, several alternative route and system service proposals were developed. These proposals were designed to serve all of the markets in the top three deficiency categories (those with 20 or more deficiency points) and then to provide as much service as possible to the remaining smaller markets (1 to 19 deficiency points).

Each service proposal was then scored to determine its suitability for resolving market deficiencies. Following this, preliminary passenger forecasts were prepared.

The most promising proposals were then presented to the Technical Advisory Committee at an informal workshop session. This committee consisted of representatives of the State of Michigan, airline companies providing service in the state, the Federal Aviation Administration, and other interested public agencies. During the session, each of the service proposals was described in detail. The reactions and suggested modifications of the Advisory Committee were then recorded for use in preparing final service proposals.

The preliminary service proposals consisted of nine separate routes providing either supplemental[1/] or full replacement service. In addition to these new service proposals, six markets were also cited in which

1/ The term supplemental service as used in this report should be considered as additional scheduled service.

additional service by the existing carrier was the best alternative for providing the justified level of service. Figure 8 shows these preliminary service proposals.

B. FINAL SERVICE PROPOSALS

While the process used to develop final service proposals was similar to that just described, several rather important refinements were made which resulted in a far more rigorous evaluation procedure. These process changes are discussed below.

Developing Final Route Proposals

Final route proposals were developed starting with the preliminary proposals, the routing modifications suggested by the Technical Advisory Committee, the analysis of 1977 and 1980 service deficiencies shown in Table 16 and the results of the qualitative analyses described in Chapter II. The object was to design routings which would respond to the most significant deficiencies and then, through route extensions and modifications, also respond to as many of the lower order deficiencies as feasible while still maintaining required service levels in the major markets. Final route proposals are shown in Figure 9.

Selecting Appropriate Service Parameters

In the preliminary analysis, the service frequency, aircraft type, and the economics of the proposed service were dealt with in a general way. In the final analysis, however, it became essential that these service parameters be specified as carefully and precisely as possible so that the economic feasibility of the route could be established. Since proposals may ultimately be solicited from operators to provide

FIGURE 8

PRELIMINARY ROUTE PROPOSALS

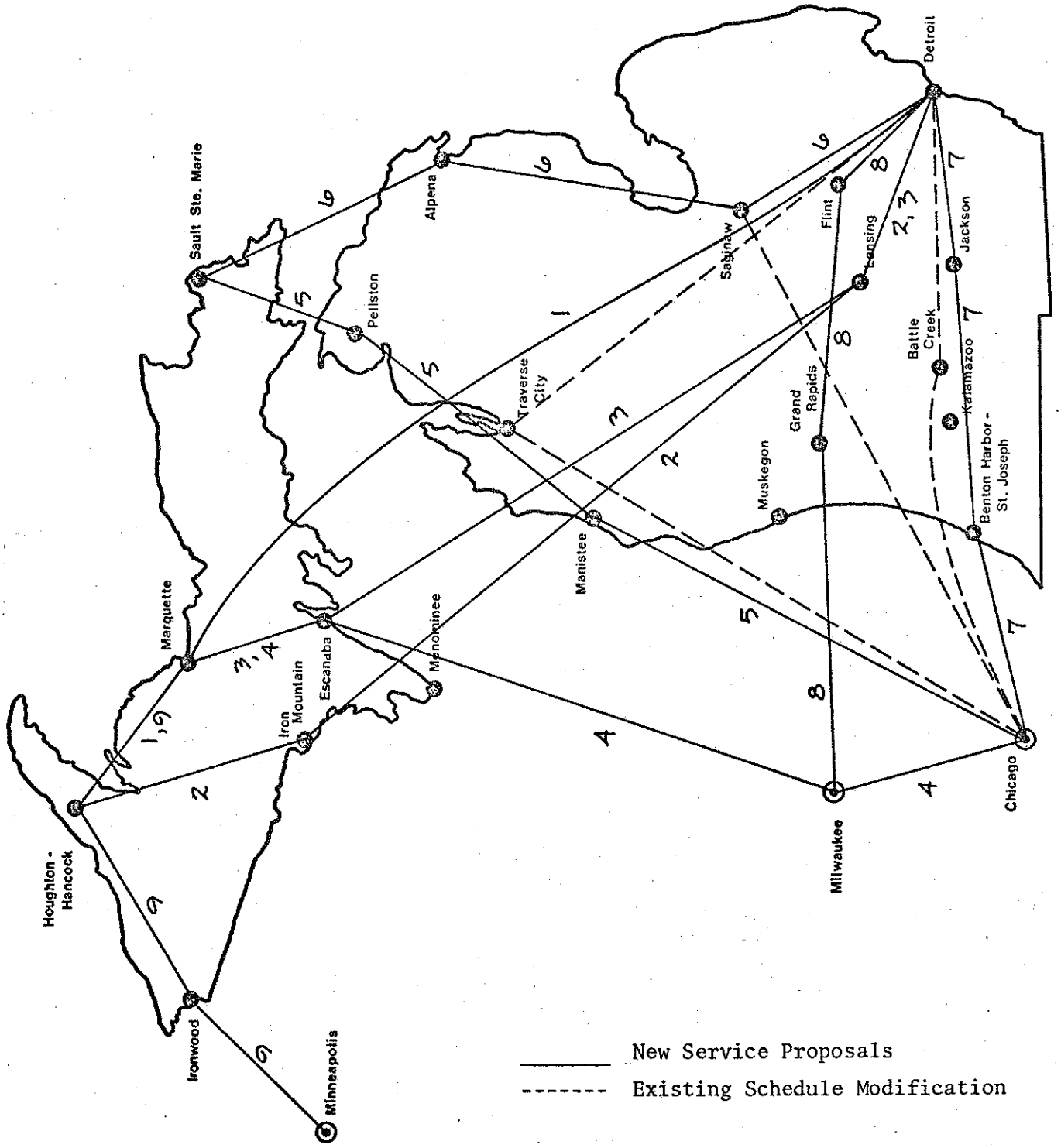
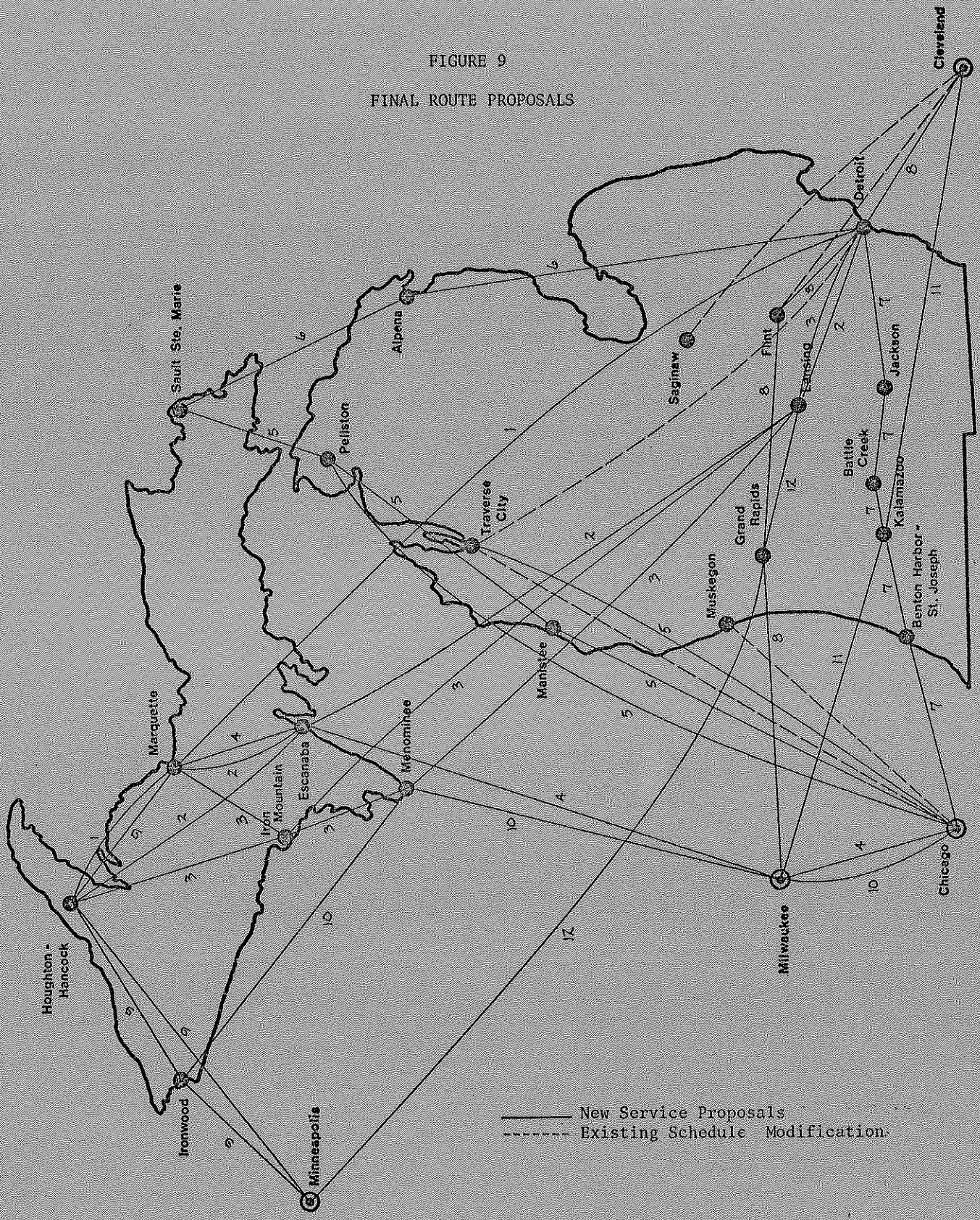


FIGURE 9

FINAL ROUTE PROPOSALS



these services, the practicality and workability of these routes had to be determined beforehand.

Following the establishment of routes, the next step was to consider what type of operation and service frequency should be required. Four different operating scenarios were defined to address the question of type of operation:

Case A - Jet Service by a Certificated Carrier
Case B - Propeller Service by a Certificated Carrier
Case C - Jet Service by a Commuter Carrier
Case D - Propeller Service by a Commuter Carrier.

These four cases respond to the distinctions made in the Service Classification Scoring System between certificated and commuter operations and between jet and propeller service. The cases are presented in order from the most desirable (Case A) to the least desirable (Case D).

Three different frequency levels were also specified:

Frequency 2 - Two round trips each weekday, one during each of the peak periods, and one round trip each weekend day at mid-day.

Frequency 3 - Three round trips each weekday, one during each of the peak periods and one at mid-day. Two Saturday round trips, one at mid-morning and one at mid-afternoon. One Sunday round trip at mid-day.

Frequency 4 - Four round trips each weekday, one during each of the peak periods, one at mid-morning and one at mid-afternoon. Two round trips each weekend day, one at mid-morning, and one at mid-afternoon.

For each final route proposal, an evaluation was made of the service

option corresponding to the appropriate[1/] operating scenarios and level of frequency. Initially, this provided up to twelve different combinations (3 frequencies x 4 cases). However, if following subsequent steps, no economically feasible alternative had been developed, additional frequencies were analyzed.

Preparing Patronage and Revenue Forecasts

The Service Classification Scoring System process described in Chapter III provided the mechanism for developing patronage estimates under the new service assumptions. Two distinct sub-tasks were involved, (1) developing forecasts for total traffic in each market being studied, and then (2) developing market shares in those markets where some competition between new and existing services would exist. Each service option within each market was evaluated using the Service Classification Scoring System. The resulting scores were then compared to the justified service level determined from the analysis described in Chapter III. This comparison served as a basis for determining how well each service option resolved the market deficiencies.

1/ Appropriate scenarios were established by determining which case adequately resolved all market deficiencies on a particular route and then analyzing it and all lower order cases. For example, given a route serving three cities - X, Y, and Z and by analysis, determining the service deficiencies between X and Y can be fully resolved by Case C (commuter jet) service, between X and Z by Case B service and between Y and Z by Case C service, then Case B is the most appropriate scenario and it along with all lower order scenarios (namely C and D) would be analyzed. Case A service would be totally unwarranted in this example.

In addition, each market was assessed in terms of the aggregate or overall quality of both new and existing services. This aggregate score was used as the basis for developing total market patronage estimates for both 1977 and 1980. Then, using the individual scores of the competing services (new vs. existing and/or new vs. new), the proportion of the total market using each of the services was estimated. The method used to proportion the patronage favored the higher quality services and, in fact, services scoring two or more points below the best service were assumed to carry no passengers. This should not be construed to mean that, for example, a service from Houghton-Hancock to Detroit with four intermediate stops (quality score 5 service) will not carry <u>any</u> passengers from Houghton if competitive one-stop service to Detroit (quality score 2) is introduced, but rather that the quality 5 service will not carry any passengers <u>to Detroit</u> as long as seats are available on the quality 2 service. The quality 5 service will continue to carry passengers from Houghton to intermediate stations and from intermediate stations to Detroit. The following example illustrates the procedure used to proportion patronage in competitive markets.

<u>Example</u>. Assume that the six flights presently operated between Flint and Cleveland will continue to be operated unchanged. It is proposed that new certificated propeller service be instituted. The first step in determining market shares was to score all services to be operated in this market. The percentage of the total market carried by each of these flights was assumed to be proportional to the inverse of the service score. Present (1977) services are summarized as follows:

No. of One-Way Flights (A)	Service Score (B)	Proportion (A) x $\frac{1}{(B)}$
2	1	2.00
3	2	1.50
2	3	.67

The proposed flights will all be of service level 1 in quality. Therefore, the two existing flights of service level 3 were excluded from the calculation of market shares (score is two steps below than that of the best flights). The market share of the proposed services is dependent on the frequency of operation as shown below.

Proposed Service			Existing Service	Market Share of
No. of One-Way Flights (A)	Service Score (B)	Proportion 1 (A)x(B)	(Y) Total Proportion	New Service (X) / (X) + (Y)
4	1	4.00	3.50	53%
6	1	6.00	3.50	63%
8	1	8.00	3.50	69%

Once the patronage in each market for each route proposal had been determined, the final step leading up to development of revenue forecasts was to determine the appropriate fare structure for 1977 and 1980. This was accomplished by extracting from the OAG the current (May, 1977) fare charged by certificated carriers and commuter carriers in those markets where service is currently reported. These fares were used directly. For markets where no service presently exists (and thus no fare has been established), a statistical regression of fare versus distance was performed for each carrier type. This resulted in two fare estimating equations, one to determine certificated carrier fares and one to determine commuter fares. These equations were used to determine the remaining 1977 fares.

1980 fares were calculated directly from the 1977 fares by assuming an annual fare increase of 10 percent per year compounded over the three-year period. The rate of increase percent was determined based on historical data developed earlier in the study. The established trend was assumed to be valid through 1980. The resulting 1977 fare structures by carrier type are presented in Table 21.

TABLE 21

ONE-WAY AIR FARES - 1977

Market		Distance (Miles)	Certificated Fare ($)	Commuter Fare ($)
Alpena	- Cleveland	300	52.00	46.00*
	Detroit	206	43.00	36.00*
	Saginaw	110	34.00	25.00*
	Sault Ste. Marie	140	36.00*	28.00*
Battle Creek	- Chicago	132	35.00*	34.00
	Detroit	108	32.00*	33.00
	Jackson	40	25.00*	17.00*
Benton Harbor	- Chicago	71	30.00	20.00*
	Detroit	168	39.00	31.00*
	Jackson	102	32.00*	24.00*
	Kalamazoo	42	25.00*	17.00*
Detroit	- Escanaba	317	60.00	48.00*
	Flint	53	25.00	18.00*
	Grand Rapids	144	32.00	29.00*
	Hancock	432	69.00	59.00
	Iron Mountain	354	59.00	52.00
	Jackson	66	27.00	20.00*
	Kalamazoo	126	33.00	26.00*
	Lansing	79	28.00	25.00
	Marquette	378	65.00	56.00
	Menominee	301	57.00	46.00*
	Saginaw	96	30.00	23.00*
	Sault Ste. Marie	346	56.00	51.00*
Escanaba	- Chicago	269	51.00	43.00*
	Hancock	120	34.00	26.00
	Lansing	238	52.00	46.00*
	Marquette	61	27.00	19.00*
	Milwaukee	195	43.00	34.00*
Flint	- Cleveland	147	31.00	29.00*
	Grand Rapids	91	30.00*	23.00*
	Milwaukee	211	63.00	62.00
Grand Rapids	- Cleveland	216	37.00	38.00*
	Hancock	340	58.00	51.00*
	Lansing	48	24.00	18.00*
	Marquette	271	51.00	43.00*
	Milwaukee	120	30.00	26.00*
	Minneapolis	400	56.00	56.00*
Hancock	- Cleveland	556	82.00	75.00
	Iron Mountain	95	32.00	23.00*
	Ironwood	95	31.00*	23.00*
	Lansing	370	61.00	53.00
	Marquette	69	28.00*	15.00
	Menominee	148	38.00	29.00*
	Minneapolis	268	50.00*	43.00*
Iron Mountain	- Lansing	275	51.00*	43.00*
	Marquette	67	27.00	20.00*
	Menominee	53	26.00*	18.00*

NOTE: *Denotes estimated fare.

TABLE 21

ONE-WAY AIR FARES - 1977 (Cont'd)

Market		Distance (Miles)	Certificated Fare ($)	Commuter Fare ($)
Ironwood	- Chicago	384	59.00	56.00*
	Marquette	164	39.00*	31.00*
	Menominee	160	40.00	30.00*
	Milwaukee	310	51.00	47.00*
	Minneapolis	173	45.00	32.00*
Jackson	- Chicago	173	39.00	32.00*
	Kalamazoo	60	27.00	19.00*
Kalamazoo	- Chicago	113	34.00	25.00*
	Cleveland	202	39.00	35.00*
	Milwaukee	129	39.00	27.00*
Lansing	- Marquette	299	59.00	51.00
	Menominee	222	45.00*	37.00*
	Minneapolis	448	70.00*	63.00*
Manistee	- Chicago	182	44.00	33.00*
	Pellston	127	34.00*	27.00*
	Sault Ste. Marie	193	42.00*	34.00*
	Traverse City	58	27.00*	19.00*
Marquette	- Chicago	330	57.00	50.00*
	Cleveland	487	76.00	67.00*
	Menominee	120	34.00*	26.00*
	Milwaukee	256	49.00*	41.00*
	Minneapolis	337	58.00*	50.00*
Menominee	- Chicago	224	45.00	38.00*
	Milwaukee	150	38.00	29.00*
Pellston	- Chicago	309	54.00	47.00*
	Sault Ste. Marie	66	29.00	20.00*
	Traverse City	69	29.00	20.00*
Saginaw	- Cleveland	190	35.00	34.00*
	Sault Ste. Marie	250	48.00*	41.00*
Sault Ste. Marie	- Chicago	375	62.00	55.00*
	Cleveland	440	62.00	62.00*
	Traverse City	135	35.00	28.00*
Traverse City	- Chicago	240	49.00	39.00*

NOTE: *Denotes estimated fare.

Finally, from the patronage forecasts, fares, and service parameters, passenger revenue forecasts were developed for each route for each case/frequency option. Forecasts for the most promising options are presented in a summary table (Table 30) at the end of this chapter.

Estimating Service Cost

The costs associated with providing air service are generally grouped into four categories. These are:

- Flyaway Costs - the costs of purchasing aircraft including appropriate avionics. These costs consist of interest expense paid on borrowed capital and/or interest income foregone on committed capital used to purchase flight equipment.
- Direct Operating Costs - the costs associated with actually providing air service. Included are the costs of fuel and oil, maintenance, depreciation (of flight equipment only), hull and liability insurance and flight crew costs.
- Indirect Operating Costs - the costs associated with ground side operations and passenger service. Included are depreciation (of ground equipment), aircraft and traffic servicing, passenger service, general and administrative, reservations and sales, and development and pre-operation costs.
- Return on Investment - this category reflects the profit due on the equity of investors.

While the direct and indirect costs of providing new air service can be determined fairly readily from airline financial reports and manufacturers specifications, the costs in the other two categories are much less predictable because of the wide range of different capitali-

zation options available. Rather than attempt to develop an average condition for such highly variable costs, flyaway costs and return on investment cost were omitted from the service cost analysis in favor of handling these costs on an individual case basis during the implementation stage of the project. However, assumptions described later in the evaluation section do tend to establish conditions having the effect of providing a "buffer" for these costs.

Direct operating costs (DOC) vary widely from operation to operation and among various types of aircraft. In order to estimate DOC, individual cost elements were estimated independently and then summed. Several sources of data were used to make these estimates. Included among them are:

1. CAB semi-annual reports on operating costs and performance of certificated carriers.
2. Aircraft manufacturers' specifications.
3. Airline Transport Association operating cost summaries.
4. Commuter Airline Association of America data.
5. Various reports from commuter operators.

The first cost element to be estimated was crew costs. These are defined as salary paid to flight deck personnel (not flight attendants). Three variables were used to estimate crew costs. These are aircraft passenger capacity, type of power (propeller or jet) and size of crew required. The table below presents the estimated crew costs for all germane combinations of these variables.

TABLE 22

ASSUMED CREW COSTS ($/block hour)

Aircraft Specifications		Persons/Crew		
Pass. Capacity	Power	1	2	3
0-9	Prop	$18.00	$ -	$ -
10-19	Prop	-	30.00	-
10-19	Jet	-	50.00	-
20-30	Prop	-	50.00	-
20-30	Jet	-	80.00	-
Over 30	Prop	-	150.00	-
31-50	Jet	-	180.00	-
Over 50	Jet	-	200.00	300.00

NOTE: A summary of passenger capacity and power type for each aircraft is given in Chapter II, Table 6 (Page 23).

These estimates were based on reported crew costs for certificated carriers interpolated and extrapolated to cover the full range of craft size, crew size, and power options. Table 23 shows the resulting crew costs for those aircraft that were considered.

Another important element of DOC is the cost of fuel consumed in flight operations. Unfortunately, because neither the price paid for fuel or the amount of fuel consumed is reported in any uniform way to a regulatory body by commuter carriers, actual operating data on fuel costs for many of the aircraft being studied were unavailable. To fill this void, a procedure was developed to estimate these costs from manufacturers' specifications and from data reported by certificated carriers to

TABLE 23

TOTAL CREW COSTS

Aircraft:	Size of Flight Crew	Crew Costs Per Average Block Hour ($)
Beech 99	2	30
Boeing 727-200	3	300
Boeing 737-200	2	200
B-N. Islander	1	18
B-N Trilander	2	30
Canadair CL600	2	80
Cessna 402	1	18
D-B Falcon 50	2	50
deHav. Twin Otter	2	50
deHav. Dash 7	2	150
Convair 580	2	150
Convair 600	2	150
Douglas DC9-30	2	200
Douglas DC9-50	2	200
Piper Turbo Aztec F	1	18
Piper Navajo Chieftan	1	18
Shorts SD3-30	2	50
Swearingen Metro II	2	50
VFW-Fokker 614	2	180

the CAB.

The amount of fuel consumed per block hour can be subdivided into two parts, the fuel consumed at cruise speed and fuel consumed during taxi, take-off, landing, and maneuvering. The fuel consumed at cruise is a common statistic reported both by the manufacturers themselves, and in Janes.[1/] Using this statistic as a base, ratios of the fuel consumed at cruise per hour to the total fuel consumed per block hour by certificated carriers using aircraft of similar size and in similar stage lengths to those assumed appropriate for the study (100-200 miles) were developed. The average of these ratios was 1:1.15. This ratio was used to calculate total fuel consumed per block hour for those craft for which no operating experience was recorded.

Once the fuel consumed had been estimated, the next factor to be determined was the cost of fuel. The current average price paid per gallon of fuel by domestic trunk and local service carriers in June, 1977 was 36.85¢.[2/] This can be compared to 89.5¢/gal. which was the average price charged by fixed base operators in the Albany, New York area in July, 1977. Since it was not reasonable to expect that the relatively small commuter operations being evaluated in this study could contract for fuel on quite such a favorable basis as the certificated carriers, nor was it reasonable

1/ Janes' All The Worlds Aircraft, S. Low, Marston & Co., Ltd. London, 1977.
2/ Fuel Cost and Consumption Report, CAB, June, 1977.

to expect them to pay the full "at-the-pump" price, the following were adopted as compromise prices:

Fuel Type	Cost/Gallon
Jet fuel	57¢
100 octane gasoline	67¢

Applying these prices to the average fuel consumed per block hour for each aircraft being considered resulting in the fuel costs per average block hour shown in Table 25.

Maintenance and maintenance burden (M & MB) costs are costs associated with performing regularly scheduled and as required maintenance, repair and overhead on flight equipment. Also included are the costs of parts in stock and maintenance crew and shop overhead costs. For a typical operation, M & MB costs are related to three basic variables; aircraft size, number and type of engines, and cost and availability of replacement parts. From published reports and manufacturers' specification, the first two variables; aircraft size (as measured by passenger capacity) and number and type of engines, were related to average M & MB costs per block hour. These estimates are shown in Table 24.

TABLE 24

AVERAGE MAINTENANCE AND MAINTENANCE BURDEN COSTS
(Per Block Hour)

Aircraft Specifications		
Pass. Capacity	Engines and Type	M & MB Costs ($)
0-9	2-PP	30
10-19	3-PP	50
10-19	2-TP	60
10-19	2-J	150
20-30	2-TP	70
20-30	2-J	175
Over 30	2-TP	175
	4-TP	150
31-50	2-J	180
Over 50	2-J	200
Over 50	3-J	220

TABLE 25

FUEL CONSUMED AND FUEL COSTS

Aircraft:	Fuel Type	Per Average Block Hour	
		Fuel Consumed (gallons)	Fuel Costs ($)
Beech 99	Jet	70	40
Boeing 727-200	Jet	1300	745
Boeing 737-200	Jet	900	510
B-N Islander	100 Oct.	28	19
B-N Trilander	100 Oct.	40	27
Canadair CL600	Jet	500	287
Cessna 402	100 Oct.	30	20
D.B. Falcon 50	Jet	334	190
deHav. Twin Otter	Jet	78	45
deHav. Dash 7	Jet	250	143
Convair 580	Jet	350	200
Convair 600	Jet	275	158
Douglas DC9-30	Jet	900	510
Douglas DC9-50	Jet	1100	625
Piper Turbo Aztec F	100 Oct.	24	16
Piper Navajo Chieftan	100 Oct.	28	19
Shorts SD3-30	Jet	100	57
Swearingen Metro II	Jet	96	55
VFW-Fokker 614	Jet	533	304

The third variable, cost and availability of replacement parts, was used as the basis for increasing or decreasing these average costs for each aircraft being considered. For example, given two aircraft of the same size category and power, but one of U.S. manufacture and one foreign, it was assumed that the parts for the foreign aircraft would be both more costly and more difficult to get (implying a larger stock required). Estimated M & MB costs per block hour for each of the aircraft being considered are shown in Table 26 .

Insurance costs are those costs incurred to cover passenger liability and aircraft damage claims in the event of accident. While insurance costs incurred by certificated carriers flying the larger Boeing, Douglas, and Convair aircraft were available from data reported to the CAB and ATA, documented scheduled flight experience for the smaller aircraft were generally unavailable. The following formula was used to estimate the insurance costs per average block hour for these aircraft:

$$\text{Insurance Costs} = \frac{SR \times n}{U} + \frac{HR \times c}{U}$$

where:

SR = insurance cost per seat per year = $285.
HR = insurance rate for hull = 1%
n = number of seats from aircraft specs
c = aircraft cost from specs
U = annual aircraft utilization = 2000 hours.

Depreciation cost is simply the decrease in aircraft value amortized over the useful life of the aircraft for passenger service. Again, the depreciation costs for aircraft in certificated service

TABLE 26

ESTIMATED MAINTENANCE AND MAINTENANCE BURDEN COSTS

Aircraft:	$/Block Hour
Beech 99	60
Boeing 727-200	220
Boeing 737-200	200
B-N Islander	40
B-N Trilander	50
Canadair CL600	175
Cessna 402	30
D-B Falcon 50	150
deHav. Twin Otter	65
deHav. Dash 7	150
Convair 580	185
Convair 600	165
Douglas DC9-30	190
Douglas DC9-50	220
Piper Turbo Aztec F	20
Piper Navajo Chieftan	30
Shorts SD3-30	75
Swearingen Metro II	60
VFW-Fokker 614	200

NOTE: A summary of passenger capacity and number and type of engines for each aircraft is given in Chapter II, Table 6 (page 23).

are readily available from CAB and ATA data. For other aircraft it was necessary to estimate these costs. The following formula was used to prepare these estimates.

$$\text{Depreciation Cost} = \frac{C \times (100 - S)}{U \times L}$$

where:

C = aircraft cost from specs
S = assumed value of aircraft at end of useful life = 20% of new cost
U = annual aircraft utilization = 2000 hours
L = useful life of aircraft assumed as follows:

Cost of Aircraft	Useful Life
over $2 Million	16 years
$.4 Million - $2 Million	12 years
under $.4 Million	8 years

Generally, the method used to estimate useful aircraft life is equivalent to stratifying by aircraft power type for the aircraft being considered. Under this method of stratification, category 1 (over $2 Million) contains jet aircraft; category 2, turboprop aircraft; and category 3, piston-prop aircraft. The only exception to this equivalence is the deHavilland Dash 7 which, although it is a turboprop aircraft, costs over $3 million. Because of its high initial cost, a 16-year service life is more appropriate.

The results of the insurance and depreciation cost estimating processes are shown in Table 27.

The method used to estimate five components of direct operating costs have been described in detail in the preceding section. Under the standardized method of cost accounting used by airline companies, these five components are the major contributors to DOC.

TABLE 27

ESTIMATED INSURANCE AND DEPRECIATION COSTS

Aircraft:	Purchase Price	Seats	Per Average Block Hour: Insurance Cost	Per Average Block Hour: Depreciation Cost
Beech 99	$ 800,000	15	$ 5	$ 25
Boeing 727-200	-	-	5*	180*
Boeing 737-200	-	-	5*	125*
B-N Islander	220,000	9	3	13
B-N Trilander	400,000	17	4	23
Canadair CL600	5,000,000	30	27	123
Cessna 402	180,000	9	2	10
D-B Falcon 50	4,200,000	15	20	108
deHav. Twin Otter	720,000	20	8	26
deHav. Dash 7	3,100,000	50	25	80
Convair 580	-	-	6*	80*
Convair 600	-	-	4*	150*
Douglas DC9-30	-	-	13*	120*
Douglas DC9-50	-	-	17*	150*
Piper Turbo Aztec F	130,000	5	2	8
Piper Navajo Chieftan	210,000	9	3	12
Shorts SD3-30	1,150,000	30	10	40
Swearingen Metro II	1,000,000	20	8	37
VFW-Fokker 614	5,000,000	44	32	123

Utilization = 2000 hours
% new cost = 1%
Rate/Seat = $285
Depreciation to 20% residual at:

craft cost	term
>$2M	16 years
$.5M-$2M	12 years
<$.5M	8 years

* From CAB and ATA Reports.

For the purposes of the study, several lesser cost categories have been assumed to be inconsequential. These include the cost of oil and the cost of rentals. From review of published data, it has been determined that oil costs are generally on the order of 0.1% of DOC. Rental charges are incurred only when some flight equipment is rented rather than purchased. It has been assumed that all flight equipment is purchased and the depreciation of purchased equipment has been included in the DOC estimates. A summary of the estimated DOC by each major component and total per average block hour for each of the nineteen aircraft considered in the study is present in Table 28. Throughout the cost-estimating process a conscious effort was made to estimate costs conservatively high. This effort is reflected in several of the assumptions described in the preceding section. For example, in estimating fuel costs, prices considerably higher than those reported by certificated carriers were used to reflect differences in the size of typical certificated operations versus those being considered in this study. Another conservative assumption was an annual utilization rate of 2000 hours used in estimating insurance costs and depreciation costs. Typically small airline companies tend to operate their equipment at 2500-3000 hours per year. Using 2000 rather than these values resulted in insurance and depreciation costs that were 25-50% higher than would have been the case otherwise.

In summary, the DOC presented in Table 28 reflect costs that have been estimated using real data and accepted industry estimating

TABLE 28

SUMMARY OF TOTAL DIRECT OPERATING COST

(Per Average Block Hour)

Aircraft:	Crew	Fuel	M & MB	Insurance	Depreciation	TDOC
Beech 99	$ 30	$ 40	$ 60	$ 5	$ 25	$ 160
Boeing 727-200	300	745	220	5	180	1450
Boeing 737-200	200	510	200	5	125	1040
B-N Islander	18	19	40	3	13	93
B-N Trilander	30	27	50	4	23	134
Canadair CL600	80	287	175	27	123	692
Cessna 402	18	20	30	2	10	80
D-B Falcon 50	50	190	150	20	108	518
deHav. Twin Otter	50	45	65	8	26	194
deHav. Dash 7	150	143	150	25	80	548
Convair 580	150	200	185	6	80	621
Convair 600	150	158	165	4	150	627
Douglas DC9-30	200	510	190	13	120	1033
Douglas DC9-50	200	625	220	17	150	1212
Piper Turbo Aztec F	18	16	20	2	8	64
Piper Navajo Chieftan	18	19	30	3	12	82
Shorts SD3-30	50	57	75	10	40	232
Swearingen Metro II	50	55	70	8	37	220
VFW-Fokker 614	180	304	180	32	123	819

formulae. However, since cost estimating is an area where some latitude is practiced, we have opted to estimate costs high to provide built-in insurance against recommending service proposals that ultimately will prove unprofitable.

Indirect operating costs (IOC) are those costs associated with the ground-side and passenger service portions of an airline's operations. Included are the costs of inflight cabin crew, development cost, depreciation of ground equipment, and general administration.

Within any particular class of air carrier, IOC when viewed as a percentage of Total operating costs (TOC), tends to be relatively constant both among various carriers and for the class as a whole. For example, data reported to the ATA by local service carriers for calendar 1974 and 1975 revealed the following:

Carrier	IOC/TOC		
	1974	1975	average
North Central	.511	.482	.50
Ozark	.484	.469	.48
All Local Ser.	.477	.490	.48

Similar, albeit less complete, data for commuter carriers indicates an IOC/TOC factor of .37. The lower rate for commuters results from the relative size of commuter airlines versus certificated carriers. Generally, commuters operate with very small or no ground crews (flight crew members perform ticketing and baggage handling functions), off-line counter and gate space, less sophisticated ticketing systems, less promotion, etc. It must be pointed out that the development of the commuter IOC/TOC factor was highly influenced by data from Air

Wisconsin and, therefore, the factor is somewhat higher than for the typical commuter operation which has failed so frequently in Michigan. Since the IOC/TOC ratio is a fairly constant value for individual carrier types, IOC was estimated as a DOC multiplier rather than attempting to quantify its individual components. The summary below describes how these multipliers were developed:

Given:

$$TOC = DOC + IOC$$

and $IOC = DOC\ (IOC/DOC)$

then:

(1) $$TOC = DOC + DOC\ (IOC/DOC) = DOC\ (1 + IOC/DOC)$$

where:

IOC/DOC is the Indirect operating cost multiplier.

The indirect operating cost multiplier for the types of airline operations being considered is shown in the following table.

Carrier Type	IOC/TOC	DOC/TOC	IOC Multiplier
Local service	.50	.50	1.00
Commuter	.37	.63	.59

For simplicity in calculating costs, these multipliers were rounded to 1.0 and .6.

From these results and formula (1) above, the total operating costs for Local Service Carriers and Commuter Carriers can be calculated as follows:

Local Service $TOC = DOC\ (1 + 1.0) = 2\ DOC$

Commuter $TOC = DOC\ (1 + .6) = 1.6\ DOC$

Since the methods used to estimate DOC and the IOC multiplier generally used 1977 costs, these formulae yield estimates of the total operating cost by carrier type and aircraft for 1977. In order to estimate 1980 TOC, a cost increase factor of 10% per year compounded (or a total factor of 1.331) was assumed. Total operating costs by carrier type and aircraft type are shown in Table 29 .

TABLE 29

1977 and 1980 TOTAL OPERATING COSTS

(Per Average Block Hour)

Aircraft:	1977		1980	
	Local Service	Commuter	Local Service	Commuter
Beech 99	$ 320	$ 256	$ 426	$ 341
Boeing 727-200	2,900	*	3,860	*
Boeing 737-200	2,080	*	2,768	*
B-N Islander	186	149	248	198
B-N Trilander	268	214	357	285
Canadair CL600	1,384	1,107	1,842	1,474
Cessna 402	160	128	213	170
D-B Falcon 50	1,036	829	1,379	1,103
deHav. Twin Otter	388	310	516	413
deHav. Dash 7	1,096	877	1,459	1,167
Convair 580	1,242	994	1,653	1,322
Convair 600	1,254	1,003	1,669	1,335
Douglas DC9-30	2,066	*	2,750	*
Douglas DC9-50	2,424	*	3,226	*
Piper Turbo Aztec F	128	102	170	136
Piper Navajo Chieftan	164	131	218	175
Shorts SD3-30	464	371	618	494
Swearingen Metro II	440	352	586	469
VFW-Fokker 614	1,638	1,310	2,180	1,744

* Inappropriate Aircraft for Commuter Operators

Developing Detailed Final Service Proposals

In an earlier section, the routes over which new or supplemental air service is warranted were described (See Figure 9, Page 97). While this description provides the necessary spatial perspective for new service proposals, in order to completely specify them, three additional aspects must be described. These are (1) operations, (2) economics, and finally (3) the effectiveness of the proposed services in resolving air service deficiencies. These additional details are provided in this section.

The operational component of air service consists of several strongly inter-related factors. These are service schedule, service frequency, aircraft type and carrier type. As was described earlier, for each route alternative a large number of frequency/carrier type/ aircraft type cases were postulated and evaluated as part of the patronage forecasting technique. For each of these cases, patronage by market was estimated. Using these market forecasts as a base, patronage estimates for each leg or stage of service were developed for each option by adding and subtracting passengers on and off at each station. The resulting "passengers per stage" estimates were used to identify particular aircraft having the appropriate power type (power type is a variable used in developing service quality scores used as the basis for patronage forecasting and thus is an inherent specification) and passenger capacity large enough to accommodate the projected demand. Once the specific aircraft to be used in providing service had been identified, its performance

characteristics and the stage length between adjacent stations on the proposed route were used to determine the service schedule over the route. In developing service schedules, a ten-minute dwell time at each station was assumed for unloading and loading passengers.

The economics of providing any particular air service option were evaluated by comparing the total annual cost to operate the service with the total annual passenger revenue expected to be derived from that operation. This comparison was performed for both the first year of operation (assumed to be 1977) and at market maturity (1980).

The total cost to operate air service is dependent on three factors; aircraft operating cost per block hour, aircraft utilization, and the analysis year. Aircraft utilization estimates were developed by simply multiplying the scheduled service time over the route by the annual frequency of service. Total annual operating costs were then developed by multiplying annual aircraft utilization by the per block hour total operating cost for that aircraft for the analysis year.

Finally, the total annual operating cost were compared against the total passenger revenue forecasts for each service option for each analysis year. On the basis of this comparison, the most promising service options for each route were selected. The operational and economic characteristics of these final service proposals are shown in Table 30. A summary (Table 30A) at the end of the table describes the codes used and meanings of the column headings.

A review of Table 30 reveals that for each route studied, at least one service proposal was developed that, by 1980, shows an operating profit. While this is a satisfying result, in order to provide the state with as much flexibility as possible, all services with a revenue/cost ratio greater than 0.9 are included as options. As a result, a large variety of different carrier type/frequency/aircraft type options are presented. To aid in the review of these options, Table 31 summarizes operational and economic characteristics of them in a much more condensed form.

Several of the service options deserve some special discussion because of their unique characteristics or conditions regarding their development or implementation requirements.

Route 1C1 - this option entails commuter jet service from Houghton/Hancock to Detroit with one intermediate stop at Marquette. The aircraft used to provide this service is the Canadair Learstar 600. While this aircraft is presently unavailable, it is the only jet aircraft even in the prototype state, that has a capacity commensurate with the expected patronage on this route. Several orders for the Learstar 600 had been placed so it is reasonable to assume that it will be available shortly.

Routes 2 and 3 were structured in the preliminary service options to serve primarily the Houghton/Hancock-Lansing, Marquette-Lansing, Escanaba-Detroit and Iron Mountain-Detroit markets. Although these routes do provide service in the Houghton/Hancock-Detroit and Marquette-Detroit markets, no patronage was assumed in these markets on Routes 2 and 3 since a superior service is offered by Route 1.

TABLE 30

ALTERNATIVE SERVICE OPTIONS

Route	Stage	Stage Length (Miles)	Carrier Type	Aircraft Specifications			Daily Service Frequency (Round Trips)			Scheduled Service Time (Minutes)	1977 Revenue $ (000)	1977 Cost $ (000)	1977 Prod	1980 Revenue $ (000)	1980 Cost $ (000)	1980 Prod	Aircraft Utilization (Hours/Yr)
				Type	Pass.Cap.	Power	M-F	Sat	Sun								
1B1	Hancock-Marquette	69	Cert	SD3-30	30	2TP	3	2	1	40			.33			.40	
	Marquette-Detroit	363								166			.70			.87	
	Total	432								206	2673	2982	.64	4312	3969	.79	6427
1B2	Hancock-Marquette	69	Cert	SWM 11	20	2TP	4	2	2	33			.35			.45	
	Marquette-Detroit	363								131			.80			1.00	
	Total	432								164	2673	3003	.73	4312	3996	.91	6822
1C1	Hancock-Marquette	69	Comm	CL600	30	2J	2	1	1	23			.50			.57	
	Marquette-Detroit	363								76			1.00			1.00	
	Total	432								99	2172	2279	.92	2920	3033	.93	2059
1D1	Hancock-Marquette	69	Comm	SD3-30	30	2TP	2	1	1	40			.43			.53	
	Marquette-Detroit	363								166			.93			1.00	
	Total	432								206	2062	1589	.85	2856	2115	.92	4285
1D2	Hancock-Marquette	69	Comm	SWM 11	20	2TP	3-4	2	1-2	33			.45			.40	
	Marquette-Detroit	363								131			.95			.85	
	Total	432								164	2062	1803	.87	3153	3200	.78	5117-6822
1D3	Hancock-Marquette	69	Comm	BN-MK111	17	3TP	4	2	2	48			.41			.47	
	Marquette-Detroit	363								208			.88			1.00	
	Total	432								256	2062	2279	.80	3153	3028	.92	10650
2B1	Hancock-Escanaba	120	Cert	B99	15	2TP	3	2	1	46			.47			.60	
	Escanaba-Lansing	238								81			.87			1.00	
	Lansing-Detroit	79								34			.47			.60	
	Total	437								161	1590	1606	.69	2387	2138	.82	5023
2D1	Marquette-Escanaba	61	Comm	C402	9	2PP	3	2	1	33			.22			.22	
	Escanaba-Lansing	238								99			.78			1.00	
	Lansing-Detroit	79								40			.44			.56	
	Total	378								172	743	685	.62	1192	912	.78	5366

TABLE 30

ALTERNATIVE SERVICE OPTIONS (Continued)

Route	Stage	Stage Length (Miles)	Carrier Type	Aircraft Specifications Type	Pass.Cap.	Power	Daily Service Frequency (Round Trips) M-F	Sat	Sun	Scheduled Service Time (Minutes)	1977 Revenue $ (000)	1977 Cost $ (000)	1977 Prod	1980 Revenue $ (000)	1980 Cost $ (000)	1980 Prod	Aircraft Utilization (Hours/Yr)
3B1	Marquette-Iron Mtn.	67	Cert	B99	15	2TP	3	2	1	30			.27			.33	
	Iron Mtn.-Menominee	53								26			.67			.73	
	Menominee-Lansing	222								77			.80			.87	
	Lansing-Detroit	79								34			.33			.33	
	Total	378								167	1189	1668	.68	1984	2220	.74	5210
3B2	Marquette-Iron Mtn.	67	Cert	B99	15	2TP	2	1	1	30			.40			.53	
	Iron Mtn.-Lansing	275								93			1.00			1.00	
	Lansing-Detroit	79								34			.40			.47	
	Total	421								157	1005	1044	.79	1396	1390	.83	3266
3D1	Hancock-Iron Mtn.	95	Comm	C402	9	2PP	3	2	1	46			.33			.33	
	Iron Mtn.-Menominee	53								30			.78			.89	
	Menominee-Lansing	222								93			1.00			1.00	
	Lansing-Detroit	79								40			.33			.44	
	Total	449								209	779	833	.71	1191	1108	.75	6520
3D2	Hancock-Iron Mtn.	95	Comm	C402	9	2PP	2	1	1	46			.33			.44	
	Iron Mtn.-Lansing	275								113			1.00			1.00	
	Lansing-Detroit	79								40			.33			.33	
	Total	449								199	516	528	.67	827	703	.76	4139
4A1	Marquette-Escanaba	61	Cert	DC9-30	105	2J	2	1	1	22			.39			.44	
	Escanaba-Milwaukee	195								48			.51			.61	
	Milwaukee-Chicago	74								24			.44			.52	
	Total	330								94	3645	4040	.47	5824	5376	.56	1955
4B1	Marquette-Escanaba	61	Cert	SD3-30	30	2TP	4	2	2	36			.63			.67	
	Escanaba-Milwaukee	195								94			.87			.97	
	Milwaukee-Chicago	74								42			.73			.80	
	Total	330								172	3394	3320	.79	5281	4420	.88	7155
4D1	Marquette-Escanaba	61	Comm	C402	9	2PP	3	2	1	33			.22			.22	
	Escanaba-Milwaukee	195								83			.78			1.00	
	Milwaukee-Chicago	74								38			.44			.56	
	Total	330								154	562	614	.61	879	818	.76	4805

TABLE 30

ALTERNATIVE SERVICE OPTIONS (Continued)

Route	Stage	Stage Length (Miles)	Carrier Type	Aircraft Specifications Type	Pass.Cap.	Power	Daily Service Frequency (Round Trips) M-F	Sat	Sun	Scheduled Service Time (Minutes)	1977 Revenue $ (000)	1977 Cost $ (000)	1977 Prod	1980 Revenue $ (000)	1980 Cost $ (000)	1980 Prod	Aircraft Utilization (Hours/Yr)
5B1	Sault Ste. Marie-Pellston	66	Cert	SWM11	20	2TP	2	1	1	32			.30			.35	
	Pellston-Manistee	127								52			.60			.70	
	Manistee-Chicago	182								71			.90			1.00	
	Total	375								155	1203	1419		1782	1888		3224
	Pellston-Chicago	309	Cert	SWM11	20	2TP	2	1	1	113	1145	1035	.85	1787	1377	1.00	2350
	Traverse City-Chicago	240	Cert	SWM11	20	2TP	6	4	2	90	3086	2471	.85	4781	3287	1.00	5616
	Traverse City-Chicago	240	Cert	DHC-7	50	4TP	2-3	1-2	1	95	2861	2165	.94	4581	4322	.76	1976-2964
5D1	Sault Ste. Marie-Pellston	66	Comm	B99	15	2TP	3	2	1	30			.20			.27	
	Pellston-Chicago	309								103			.87			1.00	
	Total	375								133	1156	1061	.75	1790	1411	.87	4150
	Manistee-Chicago	182		C402	9	2PP	2-3	1-2	1	78	257	208	.86	401	414	.71	1622-2434
6B1	Sault Ste. Marie-Alpena	140	Cert	B99	15	2TP	2	1	1	52			.33			.33	
	Alpena-Detroit	206								72			.87			.93	
	Total	346								124	758	824	.65	1178	1098	.69	2579
6D1	Sault Ste. Marie-Alpena	140	Comm	C402	9	2PP	3	2	1	63			.22			.33	
	Alpena-Detroit	206								87			.78			1.00	
	Total	346								150	707	597	.55	915	796	.73	4680
7B1[1/]	Detroit-Kalamazoo	126	Cert	SWM11	20	2TP	4	2	2	52						1.00	
	Kalamazoo-Chicago	113								48						1.00	
										100				4462	2436	1.00	4160
	Detroit-Jackson	66	Cert	SWM11	20	2TP	2	1	1	32						.60	
	Jackson-Kalamazoo	60								30						.60	
	Kalamazoo-Benton Harbor	42								24						.60	
	Benton Harbor-Chicago	71								34						1.00	
	Total	239								120				1679	1461	.61	2496

TABLE 30

ALTERNATIVE SERVICE OPTIONS (Continued)

Route	Stage	Stage Length (Miles)	Carrier Type	Aircraft Specifications Type	Pass.Cap.	Power	Daily Service Frequency (Round Trips) M-F	Sat	Sun	Scheduled Service Time (Minutes)	1977 Revenue $ (000)	1977 Cost $ (000)	1977 Prod	1980 Revenue $ (000)	1980 Cost $ (000)	1980 Prod	Aircraft Utilization (Hours/Yr)
7B1 1/ (cont'd)	Detroit-Battle Creek	108	Cert	SWM11	20	2TP	2	1	1	46			.75				
	Battle Creek-Chicago	132								54			.85				
	Total	240								100			.81	1787	1218	.81	2080
	Jackson-Battle Creek	40	Cert	SWM11	20	2TP	2	1	1	23			.40				
	Battle Creek-Chicago	132								54			.85				
	Total	172								77			.75	1063	938	.75	1602
	Benton Harbor-Chicago	71	Cert	SWM11	20	2TP	4	2	2	33			1.00	1997	804	1.00	1373
	Kalamazoo-Chicago	113	Cert	SWM11	20	2TP	7	4	3	48			.95	3756	2049	.95	3494
	Battle Creek-Chicago	132	Cert	SWM11	20	2TP	1	1	0	54			.95	546	329	.95	562
7B2 2/	Detroit-Jackson	66	Cert	SWM11	20	2TP	2	1	1	32			.45				
	Jackson-Battle Creek	40								23			.45				
	Battle Creek-Benton Harbor	62								31			.45				
	Benton Harbor-Chicago	71								34			.95				
	Total	239								120			.60	1473	1461	.60	2496
	Detroit-Battle Creek	108	Cert	SWM11	20	2TP	2	1	1	46			.50				
	Battle Creek-Chicago	132								54			.95				
	Total	240								100				1630	1218		2080
	Jackson-Battle Creek	40	Cert	SWM11	20	2TP	2	1	1	23			.40				
	Battle Creek-Chicago	132								54			.95				
	Total	172								77				1180	938		1602
	Benton Harbor-Chicago	113	Cert	SWM11	20	2TP	4	2	2	48			1.00	1947	1171	1.00	998
7D1 3/	Benton Harbor-Chicago	113	Comm	SWM11	20	2TP	3	2	1	48			1.00	1011	702	1.00	1498
	Detroit-Jackson	66	Comm	B99	15	2TP	3	2	1	30			.33				
	Jackson-Battle Creek	40								22			.53				
	Battle Creek-Chicago	132								50			.93				
	Total	238								102			.70	1386	1084	.70	3182
	Detroit-Battle Creek	108	Comm	B99	15	2TP	3	2	1	42			.20				
	Battle Creek-Benton Harbor	62								29			.27				
	Benton Harbor-Chicago	71								31			1.00				
	Total	241								102			.45	944	1084	.45	3182

1/ Full replacement for service to: Kalamazoo, Jackson, Benton Harbor and Battle Creek.

2/ Replacement for service to: Jackson, Battle Creek and Benton Harbor.

3/ Replacement for service to: Jackson, Battle Creek and Benton Harbor.

TABLE 30

ALTERNATIVE SERVICE OPTIONS (Continued)

Route	Stage	Stage Length (Miles)	Carrier Type	Aircraft Specifications			Daily Service Frequency (Round Trips)			Scheduled Service Time (Minutes)	1977 Revenue $ (000)	1977 Cost $ (000)	1977 Prod	1980 Revenue $ (000)	1980 Cost $ (000)	1980 Prod	Aircraft Utilization (Hours/Yr)
				Type	Pass.Cap.	Power	M-F	Sat	Sun								
8B1	Cleveland-Detroit	94	Cert	SWM11	20	2TP	2	1	1	41			.20			.20	
	Detroit-Flint	53								28			.55			.60	
	Flint-Grand Rapids	91								40			.70			.85	
	Grand Rapids-Milwaukee	120								50			.75			.90	
	Total	358								159	1278	1455	.56	2090	1937	.66	3307
8B2	Cleveland-Detroit	94	Cert	B99	15	2TP	3	2	1	38			.20			.27	
	Detroit-Flint	53								26			.67			.80	
	Flint-Grand Rapids	91								37			.80			.93	
	Grand Rapids-Milwaukee	120								46			.73			.87	
	Total	358								147	1513	1468	.60	2456	1952	.72	4586
8D1	Flint-Grand Rapids	91	Comm	B99	15	2TP	2-3	1-2	1	37			.40			.40	
	Grand Rapids-Milwaukee	120								46			.67			.67	
	Total	211								83	586	442	.55	1148	882	.55	1726-2590
8D2	Flint-Grand Rapids	91	Comm	C402	9	2PP	4	2	2	44			.33			.44	
	Grand Rapids-Milwaukee	120								55			.67			.89	
	Total	211								99	663	527	.52	1204	701	.70	4118
9B1	Marquette-Hancock	69	Cert	B99	15	2TP	2	1	1	31			.40			.47	
	Hancock-Ironwood	95								39			.53			.67	
	Ironwood-Minneapolis	173								62			.60			.73	
	Total	337								132	641	879	.54	1066	1171	.66	2746
9D1	Marquette-Hancock	69	Comm	C402	9	2PP	2	1	1	36			.67			.67	
	Hancock-Minneapolis	268								111			.89			1.00	
	Total	337								147	431	392	.84	747	520	.93	3058

TABLE 30

ALTERNATIVE SERVICE OPTIONS (Continued)

Route	Stage	Stage Length (Miles)	Carrier Type	Aircraft Specifications Type	Pass.Cap.	Power	Daily Service Frequency (Round Trips) M-F	Sat	Sun	Scheduled Service Time (Minutes)	1977 Revenue $ (000)	1977 Cost $ (000)	1977 Prod	1980 Revenue $ (000)	1980 Cost $ (000)	1980 Prod	Aircraft Utilization (Hours/Yr)
10B1	Ironwood-Menominee	160	Cert	B99	15	2TP	2-3	1-2	1	58			.67			.60	
	Menominee-Milwaukee	150								55			1.00			.93	
	Milwaukee-Chicago	74								32			.87			.73	
	Total	384								145	1020	965	.84	1830	1926	.75	3016-4524
10D1	Ironwood-Menominee	160	Comm	C402	9	2PP	2	1	1	70			.67			.78	
	Menominee-Milwaukee	150								66			.78			.89	
	Milwaukee-Chicago	74								38			.56			.67	
	Total	384								174	446	463	.69	701	617	.80	3619
11B1	Cleveland-Kalamazoo	202	Cert	B99	15	2TP	2	1	1	71			.67			.80	
	Kalamazoo-Milwaukee	129								49			.20			.27	
	Total	331								120	626	798	.49	1018	1062	.59	2496
11D1	Cleveland-Kalamazoo	202	Comm	C402	9	2PP	2-3	1-2	1	86			1.00			.78	
	Kalamazoo-Milwaukee	129								58			.33			.33	
	Total	331								144	497	383	.74	795	766	.60	2995-4493
12B1	Lansing-Grand Rapids	48	Cert	SWM11	20	2TP	2	1	1				.3			.35	
	Grand Rapids-Minneapolis	400											.8			1.00	
	Total	448											.75	2274	2059	.93	3515

TABLE 30A

SUMMARY OF HEADINGS AND CODES

Route - The first digit of the route code identifies the route using the numbering system from Figure 9. The second digit of the route code refers to the operating scenario cases adopted in the route development analysis. These are:

A - Certificated Jet
B - Certificated Propeller
C - Commuter Jet
D - Commuter Propeller

The third digit is used to distinguish between options serving the same route with the same service area. These were assigned sequentially.

Stage - defines the two endpoints of a non-stop service leg.

Stage Length - the length in statute miles of a non-stop service leg.

Carrier Type - describes the type of carrier operating the service; Cert. is certificated, Comm. is Commuter.

Aircraft Specifications:

Type - identifies the particular aircraft used to provide service coded as follows:

B99 - Beechcraft model 99
BN-MK111 - Britten-Norman model ZA-MK111-2 (Trislander)
CL600 - Canadair Limited model 600
C402 - Cessna model 402B
DHC-7 - deHavilland Limited model DHC-7 (Dash 7)
DC9-30 - McDonnell Douglas model DC9-30
SD3-30 - Short Bros. & Harland Limited model SD3-30
SWM 11 - Fairchild-Swearingen Metro 11

Passenger Capacity - number of passenger seats.

Power - number of engines and type. The first digit is the number of engines. Engine type is coded as follows:

PP - piston driven propeller
TP - Turbine driven propeller
J - Turbine driven jet

Daily Service Frequency -

M-F - the service frequency on weekdays in round trips
Sat - the service frequency on Saturday in round trips
Sun - the service frequency on Sunday in round trips

Where only one number is given, it applies for both 1977 and 1980. Where two numbers separated by a hyphen are given, the first is the 1977 frequency and the second the 1980 frequency.

Scheduled Service Time - the scheduled service time (block-to-block time plus dwell time) in minutes over each stage and total for each route.

1977 Revenue - the projected 1977 total annual passenger revenue in thousands of dollars calculated by:

$$\text{Revenue}_j = \sum_{m=1}^{n} (P_{mj} \times T_m)$$

where:

- j = the route number
- m = the number of markets served by the route
- P_{mj} = the projected 1977 patronage for market m over route j
- T_m = the passenger fare in dollars for market m

1977 Cost - the estimated 1977 total annual operating cost in thousands of dollars calculated by:

$$\text{Cost}_j = \frac{S_j \times C}{60} (F_j \times 52)$$

where:

- j = the route number
- S_j = the scheduled service time in minutes over route j
- C = the estimated 1977 total operating cost per block hour for the aircraft providing service
- F_j = the proposed 1977 weekly frequency

1977 Prod - the productivity (or seat mile utilization) for each leg and the total route.

1980 Revenue, Cost and Prod are defined similarily.

Aircraft Utilization - the number of aircraft hours per year in service for the route. Where only one number is given, it applies to both 1977 and 1980. Where two numbers separated by a hypen are given, the first applies to 1977 and the second to 1980.

TABLE 31

SUMMARY OF ALTERNATIVE SERVICE OPTIONS

Route	Carrier Type	Rev/Toc Ratio 1977	Rev/Toc Ratio 1980	Aircraft Type	1980 Annual Aircraft Hrs.
4A1	Certificated	.902	1.083	DC9-30	1955
1B1	Certificated	.896	1.086	SD3-30	6427
1B2	Certificated	.890	1.079	SWM 11	6822
2B1	Certificated	.990	1.116	B99	5023
3B1	Certificated	.713	.894	B99	5210
3B2	Certificated	.963	1.004	B99	3266
4B1	Certificated	1.022	1.195	SD3-30	7155
5B1	Certificated	1.167	1.189	SWM 11/DHC-7	14154
6B1	Certificated	.920	1.073	B99	2579
7B1	Certificated	-	1.656	SWM 11	15767
7B2	Certificated	-	1.184	SWM 11	7176
8B1	Certificated	.878	1.079	SWM 11	3307
8B2	Certificated	1.031	1.258	B99	4586
9B1	Certificated	.729	.910	B99	2746
10B1	Certificated	1.057	.950	B99	4524
11B1	Certificated	.784	.959	B99	2496
12B1	Certificated	-	1.104	SWM 11	3515
1C1	Commuter	.953	.963	CL600	2059
1D1	Commuter	1.298	1.350	SD3-30	4285
1D2	Commuter	1.144	.985	SWM 11	6822
1D3	Commuter	.905	1.041	BN-MK111	10650
2D1	Commuter	1.085	1.307	C402	5366
3D1	Commuter	.935	1.075	C402	6520
3D2	Commuter	.977	1.176	C402	4139
4D1	Commuter	.915	1.075	C402	4805
5D1	Commuter	1.113	1.201	B99/C402	6584
6D1	Commuter	1.184	1.149	C402	4680
7D1	Commuter	-	1.164	SWM 11/B99	7862
8D1	Commuter	1.326	1.302	B99	2590
8D2	Commuter	1.258	1.718	C402	4118
9D1	Commuter	1.099	1.437	C402	3058
10D1	Commuter	.963	1.136	C402	3619
11D1	Commuter	1.298	1.038	C402	4493

During the process of moving from preliminary to final route options, it was suggested that Routes 2 and/or 3 be altered to provide additional Menominee-Lansing-Detroit service. Options are described in Table 30 which provide this service; however, in developing these options, it was necessary to alter the terminal points of Routes 2 and 3 to achieve more uniform passenger loadings on commuter options. This results in some confusion in distinguishing between these routes in Figure 9.

Route 5 service options include at least two round trips per day between Manistee/Ludington and Chicago. During formulation of service options, numerous attempts were made to devise a service for this market that would at least break even; however, none was found. Therefore, unprofitable service to Manistee was coupled with highly profitable service to other Route 5 markets to provide internal cross-subsidization.

Route 6 was originally structured to provide additional service in the Saginaw-Cleveland market. Because no break-even service was found for the original routing proposal, Saginaw was dropped from the route and Detroit, instead of Cleveland, was selected as the southern terminal point. It is recommended that noted deficiencies between Saginaw and Cleveland be resolved through alteration of existing carrier schedules.

Route 7 was developed as a special case. The deficiency analysis presented in Chapter III revealed no serious local service problems in the Detroit-Chicago corridor. In response to a request by the TAC, service options were developed for Route 7 to address the possibility of future service curtailments in the corridor because of restricted runway lengths at Benton Harbor, Jackson and Kalamazoo. Because of the contingent nature of the route proposals, only a 1980 analysis was performed. The assumptions used to develop the Route 7 service options are given in footnotes in Table 30. It must be stressed that the service options developed relate only to the present configuration of airports. No attempt was made to evaluate the advisability of constructing a new regional airport serving Kalamazoo/Battle Creek. Only two service type cases were evaluated for service in this corridor; certificated propeller and commuter propeller, primarily because no local jet service is presently operated in the corridor. Given the volumes of passengers moving in these markets, it is highly probable that a profitable jet service could be developed if jet-length runways are constructed in the corridor.

Route 8 was originally proposed to provide service to Cleveland, Detroit, Flint, Grand Rapids and Milwaukee. In the final options, two certificated propeller services were devised that profitably serve this route configuration. At the commuter level, however, because of the relatively high quality service presently offered along the Flint-Detroit-Cleveland portion of the route, few passengers were attracted by proposed services. For commuter

options, Route 8 terminates on the eastern end at Flint. It is recommended that noted deficiencies between Flint and Cleveland be resolved through alteration of existing carrier schedules.

Route 9 certificated proposals included service in the Ironwood-Minneapolis market. At the commuter level, no service coming up to the .90 revenue/cost ratio level could be devised while including Ironwood and, therefore, it was dropped. It should also be noted that the 1980 revenue/cost ratio of Route 9 certificated proposals would be above the 1.00 level without the Ironwood stop.

Route 12 was designed to resolve market deficiencies that can be expected to occur by 1980 but do not exist today. Consequently, only the 1980 analysis is included in Table 30. If Route 12 service is ultimately implemented, one additional service point in Wisconsin should be added to the route to break up the long (for the recommended aircraft) stage length between Grand Rapids and Minneapolis. In selecting such a point, careful consideration of its impacts on patronage and aircraft productivity is imperative.

Now that the important geographical, economic and operational aspects of the final service options have been described, the final question remaining to be answered is "How well do the various options perform in resolving air service problems"? The most direct way to answer this question is to go back to the quantitative expressions of need described by market in Table 16 (page 72) and compare these

directly with the service quality scores of the final service options. This comparison for 1980 deficient air markets is shown in Table 32. These results are further summarized in Table 33 which presents overall average needs and quality scores for each service option. In reviewing Tables 32 and 33, it is important to keep in mind that the lowest scores represent the highest quality services and that the best possible service score is -2.

Several important observations and conclusions are evident. The first of these is that, although the most desirable approach to resolving air service deficiencies should be to seek necessary adjustments through existing air carriers, it is possible to completely resolve market deficiencies by implementing new certificated air carrier service and that this can be done on at least a break-even basis. The performance of commuter operations is less satisfactory, but does reflect significant improvements over existing services.

In structuring service options, several service objectives were adopted. These ranged from establishing minimum acceptable service frequency criteria through economic viability criteria. The service options have been carefully structured to meet or exceed each of these objectives. While the service options as presented can generally be categorized as supplemental in nature, they do provide a strong basis for developing full replacement service for outstate Michigan Air Carrier Airports should this action become necessary. Several markets have been identified in which correction by existing carrier is the only recommended option, but if necessary, equal or better quality full replacement services could be readily developed for these markets as well.

TABLE 32

PROPOSED SERVICE LEVELS FOR 1980 DEFICIENT MARKETS

Route	Market		1980 Justified Service Level	1980 Proposed Service Level	1977 Actual Service Level
1B1	Hancock	-Detroit	3	3	7
	Marquette	-Detroit	2	2	8
1B2	Hancock	-Detroit	3	3	7
	Marquette	-Detroit	2	1	8
1C1	Hancock	-Detroit	3	4	7
	Marquette	-Detroit	2	3	8
1D1-3	Hancock	-Detroit	3	5	7
	Marquette	-Detroit	2	4	8
2B1	Hancock	-Lansing	4	3	6
	Hancock	-Detroit	3	4	7
	Escanaba	-Lansing	3	1	7
	Escanaba	-Detroit	4	3	7
2D1	Marquette	-Lansing	3	3	7
	Marquette	-Detroit	2	5	8
	Escanaba	-Lansing	3	3	7
	Escanaba	-Detroit	4	5	7
3B1	Marquette	-Lansing	3	4	7
	Marquette	-Detroit	2	5	8
	Iron Mountain	-Lansing	4	2	7
	Iron Mountain	-Detroit	4	4	7
	Menominee	-Lansing	5	1	8
	Menominee	-Detroit	5	3	6
3B2	Marquette	-Lansing	3	3	7
	Marquette	-Detroit	2	4	8
	Iron Mountain	-Lansing	4	0	7
	Iron Mountain	-Detroit	4	3	7
3D1	Hancock	-Lansing	4	6	6
	Iron Mountain	-Lansing	4	4	7
	Iron Mountain	-Detroit	4	6	7
	Menominee	-Lansing	5	3	8
	Menominee	-Detroit	5	5	6
3D2	Hancock	-Lansing	4	5	6
	Hancock	-Detroit	3	6	7
	Iron Mountain	-Lansing	4	3	7
	Iron Mountain	-Detroit	4	5	7
4A1	Marquette	-Milwaukee	4	2	6
	Marquette	-Chicago	3	3	5
	Escanaba	-Milwaukee	4	1	5
	Escanaba	-Chicago	3	2	5
4B1	Marquette	-Milwaukee	4	2	6
	Marquette	-Chicago	3	4	5
	Escanaba	-Milwaukee	4	1	5
	Escanaba	-Chicago	3	2	5
4D1	Marquette	-Milwaukee	4	4	6
	Marquette	-Chicago	3	6	5
	Escanaba	-Milwaukee	4	3	5
	Escanaba	-Chicago	3	4	5
5B1	Sault Ste. Marie	-Chicago	4	4	8
	Pellston	-Chicago	3	2	5
	Traverse City	-Chicago	1	-1	3
	Manistee	-Chicago	1	1	10
5D1	Sault Ste. Marie	-Chicago	4	4	8
	Pellston	-Chicago	3	3	5
	Manistee	-Chicago	1	3	10
6B1	Sault Ste. Marie	-Detroit	4	3	5
6D1	Sault Ste. Marie	-Detroit	4	4	5
7B1	Detroit	-Battle Creek	*	-1	0
	Detroit	-Benton Harbor	NR	4	9
	Detroit	-Kalamazoo	0	-1	-1
	Detroit	-Jackson	NR	0	2
	Kalamazoo	-Chicago	-2R	-2	-2
	Jackson	-Chicago	2	2	2
	Battle Creek	-Chicago	*	-1	0
	Benton Harbor	-Chicago	0	-2	-1

* Due to the unreliability of traffic data reported for Battle Creek no determination of justified service levels was made.

TABLE 32 (cont'd.)

PROPOSED SERVICE LEVELS FOR 1980 DEFICIENT MARKETS

Route	Market		1980 Justified Service Level	1980 Proposed Service Level	1977 Actual Service Level
7B2	Detroit	-Battle Creek	*	-1	0
	Detroit	-Benton Harbor	NR	5	7
	Detroit	-Jackson	NR	1	2
	Battle Creek	-Chicago	*	-1	0
	Jackson	-Chicago	2	2	2
	Benton Harbor	-Chicago	0	-1	-1
7D1	Detroit	-Battle Creek	*	0	0
	Detroit	-Benton Harbor	NR	4	9
	Battle Creek	-Jackson	NR	1	2
	Battle Creek	-Chicago	*	1	0
	Jackson	-Chicago	2	3	2
	Benton Harbor	-Chicago	0	0	-1
8B1	Cleveland	-Flint	1	0	2
	Cleveland	-Grand Rapids	1R	3	2
	Detroit	-Grand Rapids	-1R	0	0
	Flint	-Milwaukee	2	3	7
	Grand Rapids	-Milwaukee	-1	-1	1
8B2	Cleveland	-Flint	1	0	2
	Cleveland	-Grand Rapids	1R	2	2
	Detroit	-Grand Rapids	-1R	0	0
	Flint	-Milwaukee	2	2	7
	Grand Rapids	-Milwaukee	-1	-1	1
8D1	Flint	-Milwaukee	2	4	7
	Grand Rapids	-Milwaukee	-1	0	1
8D2	Flint	-Milwaukee	2	4	7
	Grand Rapids	-Milwaukee	-1	0	1
9B1	Marquette	-Minneapolis	3	4	4
	Hancock	-Minneapolis	5	2	11
9D1	Marquette	-Minneapolis	3	5	4
	Hancock	-Minneapolis	5	3	11
10B1	Ironwood	-Milwaukee	5	3	6
	Ironwood	-Chicago	4	4	6
10D1	Ironwood	-Milwaukee	5	5	6
	Ironwood	-Chicago	4	6	6
11B1	Kalamazoo	-Cleveland	2	1	7
	Kalamazoo	-Milwaukee	2	1	6
11D1	Kalamazoo	-Cleveland	2	3	7
	Kalamazoo	-Milwaukee	2	2	6
12D1	Lansing	-Minneapolis	3	3	4
	Grand Rapids	-Minneapolis	2	2	3

* Due to the unreliability of traffic data reported for Battle Creek no determination of justified service levels was made.

TABLE 33

AGGREGATE SERVICE QUALITY SCORES

Route Proposal	Stations Served	1980 Justified Service Level	1980 Proposed Service Level	1977 Actual Service Level
1B1	Hancock, Marquette, Detroit	2.5	2.5	7.5
1B2	Hancock, Marquette, Detroit	2.5	2.0	7.5
1C1	Hancock, Marquette, Detroit	2.5	3.5	7.5
1D1	Hancock, Marquette, Detroit	2.5	4.5	7.5
1D2	Hancock, Marquette, Detroit	2.5	4.5	7.5
1D3	Hancock, Marquette, Detroit	2.5	4.5	7.5
2B1	Hancock, Escanaba, Lansing, Detroit	3.5	2.8	6.8
2D1	Marquette, Escanaba, Lansing, Detroit	3.0	4.0	7.3
3B1	Marquette, Iron Mtn., Menominee, Lansing, Detroit	3.8	3.2	7.2
3B2	Marquette, Iron Mtn., Lansing, Detroit	3.3	2.5	7.3
3D1	Hancock, Iron Mtn., Menominee, Lansing, Detroit	4.4	4.8	6.8
3D2	Hancock, Iron Mtn., Lansing, Detroit	3.8	4.8	6.8
4A1	Marquette, Escanaba, Milwaukee, Chicago	3.5	2.0	5.3
4B1	Marquette, Escanaba, Milwaukee, Chicago	3.5	2.3	5.3
4D1	Marquette, Escanaba, Milwaukee, Chicago	3.5	4.3	5.3
5B1	Sault Ste. Marie, Pellston, Traverse City, Manistee, Chicago	2.3	1.5	6.5
5D1	Sault Ste. Marie, Pellston, Manistee, Chicago	2.7	3.3	7.7
6B1	Sault Ste. Marie, Alpena, Detroit	4.0	3.0	5.0
6D1	Sault Ste. Marie, Alpena, Detroit	4.0	4.0	5.0
7B1	Detroit, Jackson, Battle Creek, Kalamazoo, Benton Harbor, Chicago	-	-0.1	1.1
7B2	Detroit, Jackson, Battle Creek, Benton Harbor, Chicago	-	0.8	1.7
7D1	Detroit, Jackson, Battle Creek, Benton Harbor, Chicago	-	1.5	2.0
8B1	Cleveland, Detroit, Flint, Grand Rapids, Milwaukee	0.4	1.0	2.4
8B2	Cleveland, Detroit, Flint, Grand Rapids, Milwaukee	0.4	0.6	2.4
8D1	Flint, Grand Rapids, Milwaukee	0.5	2.0	4.0
8D2	Flint, Grand Rapids, Milwaukee	0.5	2.0	4.0
9B1	Marquette, Hancock, Ironwood, Minneapolis	4.0	3.0	7.5
9D1	Marquette, Hancock, Minneapolis	4.0	4.0	7.5
10B1	Ironwood, Menominee, Milwaukee, Chicago	4.5	3.5	6.0
10D1	Ironwood, Menominee, Milwaukee, Chicago	4.5	5.5	6.0
11B1	Cleveland, Kalamazoo, Milwaukee	2.0	1.0	6.5
11D1	Cleveland, Kalamazoo, Milwaukee	2.0	2.5	6.5
12B1	Lansing, Grand Rapids, Minneapolis	2.5	2.5	3.5

V. IMPLEMENTING IMPROVED AIR SERVICE

The previous chapter dealt primarily with developing a series of service options to resolve air service deficiencies in Michigan. While these options represent feasible solutions to Michigan air service problems, moves to immediately adopt and begin implementing them might preclude other, conceptually easier, solutions.

Implementing improved air service may be accomplished in three ways: (1) getting existing carriers to alter their service to better meet the needs of Michigan travelers, (2) bringing in new carriers to supplement existing service or (3) bringing in new carriers to replace existing service. The first method describes the most logical and efficient approach to resolving problems. Subsequent methods imply a greater degree of involvement on the part of MDSH&T and the affected communities. The extent to which each of these methods will be employed in resolving deficiencies will depend on (1) the attitudes of present carriers, (2) the willingness of the state and communities to strive for improved air service, and to a lesser extent (3) pending changes in Federal airline regulation. Just how improved service will come about cannot be predetermined; many twists and turns will occur as implementation takes place. Hence, air service planning must be viewed as a continuing activity and responsibility which will be shaped and molded by events anticipated over the next several years.

A. BASIS FOR IMPLEMENTING IMPROVED AIR SERVICE

Before detailing out specific, action-oriented recommendations, the basis or philosophy to be used in implementing improved air service must be set forth. This has been done in the following paragraphs.

Partnership with Local Governments

Historically, the responsibility for obtaining improved air service has rested with local officials and the business community. Most communities have at times devoted major efforts toward securing improved service through extended liaison with airlines and through formal CAB route proceedings. Those communities which have persevered on both promotional and regulatory fronts have tended to be more successful than those which have sought improvements only spasmodically. In the past, state government's attention has been primarily directed toward physical improvements (e.g., increasing runway length and strength, new taxiways and aprons, navigational aids) with the expectation that better service would naturally flow from such improvements. However, service changes do not automatically flow from capital improvements.

For the first time, air service needs in Michigan have been studied on a system basis. Instead of leaving it totally up to individual communities to promote their own needs, the state is now in a position to lend substantial support to solving the air service needs for all

Air Carrier Airports in the state. The study results and subsequent implementation activities should reinforce local promotional efforts where they coincide with study findings. Thus the process of obtaining improved air service becomes a shared responsibility, a partnership between state and local governments.

Resolving present deficiencies is not particularly easy; certificated airlines are generally not all that eager to change or add services in small markets. In Michigan, commuter carriers have historically been unstable and, therefore, have had difficulty in gaining acceptance by the traveling public. Several requirements have to be met for full-scale state assistance in helping secure improved air service. First, there must be genuine interest and desire on the part of local governments to work in partnership with the state. Second, both state and local promotional activities must be based on a clearly-defined goals or an agreed-to plan for specific improvements within a stated time frame. This arrangement might best be formalized through a memorandum of understanding between the state and local community. Third, actions taken by both parties must be coordinated, which in turn necessitates frequent communication. Considerable time and effort will be required of the airport managers in documenting and otherwise assisting in building a case for improved air service and in obtaining the support of local officials and the business community. Fourth, local officials must recognize the possible need for concessions on their part in order to attract or sustain new services. This becomes particularly important in getting a commuter carrier established in a particular market. Finally, airlines react best to local initiatives, especially

when well organized. In working with existing carriers, the state role should primarily be one of supporting and guiding the work of local officials, rather than assuming full leadership and responsibility. State responsibility will increase if it becomes necessary to seek other airlines or operators to provide required services.

Service Preferences

Before considering new carriers, MDSH&T should first work to convince existing certificated carriers of the desirability of supplementing existing service by (1) adding flights, (2) rescheduling to include AM or PM departures, and/or (3) eliminating intermediate stops and connections. The underlying policy is that the state would prefer to have such service provided by existing carriers, if this can be worked out through negotiations within a reasonable time period.

While it could well be impractical to implement all routes at once, the concept is to establish a time-sequenced implementation plan or schedule for route additions/supplemental services for a two- to three-year period. Emphasis would be on implementing study-defined deficiencies on a total package basis. Obviously, some routes will not have the potential to justify the use of jet and turbo-prop equipment typically utilized by certificated carriers. In these cases, MDSH&T would expect existing carriers to support state efforts to find another certificated airline or commuter operator capable of providing the required services.

Should there be deficiencies which existing carriers are unwilling or unable to solve, then MDSH&T should try to interest another carrier in providing the necessary services. This should be done as much as possible on a package or area basis. Preference should be given to certificated carriers servicing adjacent markets in a system sense, rather than piecemeal.

Finally, if MDSH&T cannot find a certificated carrier willing to provide the desired services, then the State should seek voluntary applications from qualified commuter operators. While this could be done on a route-by-route basis, the better way would be to group routes together into logical packages. Obviously, operators will be attracted to those routes that are considered most viable; however, there are routes where operators might be reluctant to operate unless coupled with more attractive routes. Example System Packages for both certificated and commuter operators are shown in Table 34.

Voluntary versus Regulatory Actions

To the maximum extent possible, MDSH&T should rely on persuasion, rather than the regulatory process, to implement service improvements. The latter is always a possibility, but should only be utilized where airlines appear to be overly resistant or unresponsive. Actually the process works two ways. Airlines are always seeking route extensions or changes, particularly those involving new, interstate markets or the bypassing of existing gateways. Many of these extensions would benefit Michigan residents although they have not been identified as a deficiency. State support of reasonable route extensions before regulatory agencies in return for service improvements of a more local character is a practical means of accomplishing what is desired by the parties involved.

TABLE 34

EXAMPLE SYSTEM PACKAGES

Certificated System #1

Routes:
1B2, 2B1, 3B2-3B1, 4B1, 5B1, 6B1,
8B2, 9B1, 10B1, 11B1, 12B1

System Economics:

1977 System Passenger Revenue	$21,515,000
1977 System Total Operating Cost	20,997,000
1977 Revenue/TOC Ratio	1.025
1980 System Passenger Revenue	36,717,000
1980 System Total Operating Cost	32,916,000
1980 Revenue/TOC Ratio	1.115

1980 Fleet Statistics:

7 - SWM 11	@	3075 hrs./year
8 - B99	@	3395 hrs./year
2 - SD3-30	@	3578 hrs./year
1 - DHC-7	@	2964 hrs./year

Certificated System #2

Routes:
7B1

System Economics:

1980 System Passenger Revenue	$15,290,000
1980 System Total Operating Cost	9,235,000
1980 Revenue/TOC Ratio	1.656

1980 Fleet Statistics:

5 - SWM 11	@	3153 hrs./year

Certificated System #3

Routes:
7B2

System Economics:

1980 System Passenger Revenue	$4,283,000
1980 System Total Operating Cost	3,617,000
1980 Revenue/TOC Ratio	1.184

1980 Fleet Statistics:

2 - SWM 11	@	3089 hrs./year

TABLE 34 (Continued)

EXAMPLE SYSTEM PACKAGES

Commuter Package #1

Routes:
1D2, 2D1, 3D1, 4D1, 8D1, 9D1, 10D1

System Economics:

1977 System Passenger Revenue	$5,609,000
1977 System Total Operating Cost	5,232,000
1977 Revenue/TOC Ratio	1.072
1980 System Passenger Revenue	9,011,000
1980 System Total Operating Cost	8,057,000
1980 Revenue/TOC Ratio	1.118

1980 Fleet Statistics:

2 - SWM 11	@	3411 hrs./year
1 - B99	@	2590 hrs./year
7 - C402B	@	3338 hrs./year

Commuter Package #2

Routes:
5D1, 6D1

System Economics:

1977 System Passenger Revenue	$2,120,000
1977 System Total Operating Cost	1,866,000
1977 Revenue/TOC Ratio	1.136
1980 System Passenger Revenue	3,106,000
1980 System Total Operating Cost	2,621,000
1980 Revenue/TOC Ratio	1.185

1980 Fleet Statistics:

2 - B99	@	2075 hrs./year
2 - C402	@	3557 hrs./year

Commuter Package #3

Routes:
7D1

System Economics:

1980 System Passenger Revenue	$2,330,000
1980 System Total Operating Cost	2,168,000
1980 Revenue/TOC Ratio	1.075

1980 Fleet Statistics:

2 - B99	@	3182 hrs./year

TABLE 34 (Continued)

EXAMPLE SYSTEM PACKAGES

Commuter Package #4

Routes:
11D1

System Economics:

1977 System Passenger Revenue	$497,000
1977 System Total Operating Cost	383,000
1977 Revenue/TOC Ratio	1.298
1980 System Passenger Revenue	795,000
1980 System Total Operating Cost	766,000
1980 Revenue/TOC Ratio	1.038

1980 Fleet Statistics:
2 - C402B @ 2247 hrs./year

Obtaining Authority

In the past, the instability of commuter air service has been due to underfinanced operators serving the wrong markets with the wrong equipment. Licensing of intrastate air service using appropriate route award criteria in choosing certificated carriers or commuter operators will help avoid such problems in the future. Such award criteria should include consideration of the best route structure from a demand and economic standpoint, aircraft choice and utilization, and the use of the cross-subsidy concept where the award of a more profitable route is contingent upon serving a marginal route.

MDSH&T must therefore apply to the legislature for authority and funding to control market entry and intrastate routes and services of commuter operators. In addition, some start-up financial assistance may be essential to attract operators. Otherwise, it may prove to be virtually impossible to solve noted deficiencies over the longer term through commuter operators.

B. EFFECT OF REGULATORY REFORM LEGISLATION

Over the past two and a half years, there has been considerable debate over Federal airline regulation. The basic purpose of the debate before the Congressional aviation committees is to determine to what extent the present system of strict Federal economic regulations can be relaxed so that the competitive market forces can play a greater role in determining the price, quality and service options available to the public. The purpose of this section is not to comment on or debate the issues involved, but as a practical matter to evaluate

the final outcome of the regulatory reform and to anticipate the effect any changes the current law will have on the development of air services in the State of Michigan.

As far as this study is concerned, the effect of the proposed deregulation can be categorized into two specific areas of carrier definition:

- The first concerns itself with the presently certificated air carriers in the State of Michigan, and for purposes of this study, this would include Allegheny (even though they are not presently operating, they do have certain air carrier authority), North Central and United Airlines.

- Secondly, it is anticipated that there will be a new certificated class of airline which will likely be titled Local Air Carrier. It is this class of carrier in particular which is of interest as far as the study being conducted herein is concerned.

Current Certificated Air Carriers

The potential effect of the final legislation is uncertain. As best as can be determined, today's certificated air carriers are likely to:

- Be required to continue serving those markets where they currently provide service.

- The unused authority that they presently have is likely to be transferred to a new class of carrier.

- The communities now receiving certificated service are likely to continue to be served by these carriers, at least for the initial time frame of three to five years following passage of the legislation (expected sometime early in 1978).

Local Air Carriers

Of more interest and concern to this study is the Local Air Carrier airlines that would be created by the legislation. The final legislation is expected to assure, at least over the next ten-year period, that no community would lose air service, and any new communities (including those previously deleted) would be eligible for federally subsidized service.

A Local Air Carrier Certificate would be issued by the CAB to operators of small aircraft who are found fit, willing and able to provide scheduled service; and they would become full participants in the nation's air transportation system.

The final legislation is expected to impose an aircraft size limitation on these carriers. The Local Air Carriers would be restricted to aircraft no larger than those having a maximum certificated gross take-off weight of 40,000 pounds, and a manufacturer's empty weight of 23,000 pounds. In effect, this would provide for aircraft with a seating capacity of approximately 36.

Today's commuter airlines would continue to have the option to operate as air carriers that are exempt from certificate provisions of the Federal Aviation Act. It is assumed, however, that many of these carriers would wish to become certificated under the attractive and convenient certification procedures created for Local Air Carriers. These carriers would be free to develop new markets and operate with minimal government interference. The communities would, however, be

assured of continuing air service by being listed as points on a Government's guaranteed service list. The Federal subsidy system would be redesigned so that improved service to these communities would be assured.

The CAB would define "essential air service" for each subsidized point after consultation with the community involved, and would set forth the fares, frequency, and other requirements for each individual market. Subsidy would then be available to any certificated air carrier willing to provide service at level commensurate with the service and aircraft size appropriate for the market.

One additional item of significance that is likely to be included in the final legislation concerns an air carrier's exit from certificated points. The following is likely to be included as part of the legislation:

- All certificated air carriers would be required to provide 90-days notice of intent to cease service at a community.
- In the case where an airline is the only certificated air carrier serving the particular point, the CAB could suspend the carriers service termination for perhaps a 90-day period, or longer if required, to secure a replacement carrier and airline service.

State Government Regulation of Airline Services

At the present time, there are some states which regulate intrastate carriers. Additionally, there are some states which regulate Federally-certificated airlines on operations by those airlines which serve one or more points in a state. There are also states which regulate the activities of the present small commuter airlines even though those airlines operate pursuant to an exemption from regulation by the CAB and operate across state lines. It is unlikely that the states

will be permitted to continue their present regulatory schemes, or to develop new schemes, which would be more rigid than the new Federal standards.

This Federal pre-emption would apply only to economic regulation of the airlines and not to any other facet of state or local regulations of airline or aviation activity, nor to the proprietary rights of the airport operators. The Federal pre-emption will only relate to those carriers which operate in interstate service. This pre-emption will be likely to encourage intrastate operators (such as those currently operating in California, Texas and Florida) to expand to interstate services. If these intrastate airlines seek and receive interstate routes, they obviously would become regulated by the Civil Aeronautics Board. The States, however, would through their regulatory bodies be able to continue to regulate the intrastate operations of these carriers.

Summary

The following are the conclusions which form the basis for developing the proposed routes in this study, as follows:

- The present certificated carriers will be able to continue to operate in a fashion similar to that at the present time -- at least for the next three to five years.
- There will be a new certificated type of air carrier (Local Air Carrier). These carriers will be limited only to size of aircraft they may operate, as previously discussed.
- The interstate portions operated by these carriers will be under the control and jurisdiction of the Civil Aeronautics Board.

- There will be a relaxation on the entry of new carriers into new markets, including those markets which are presently authorized to the current certificated air carriers but which authority is presently unused.

- The final conclusion is that as far as this study is concerned, and the proposed air service requirements and service improvements that are recommended, the legislation will have very little effect, except to the extent that it will protect the new class of carriers as well as the presently certificated air carriers.

C. IMPLEMENTING STUDY FINDINGS

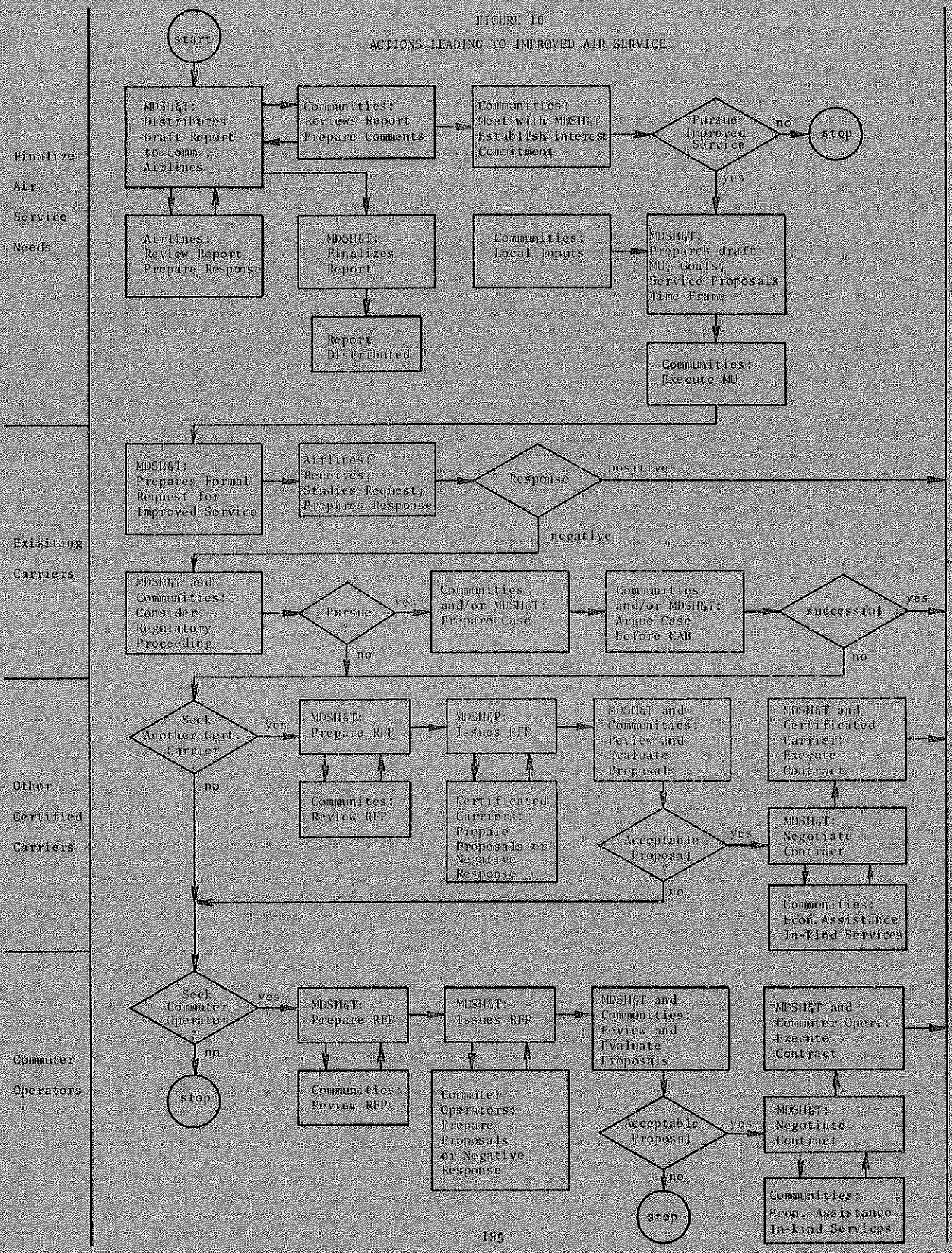
Figure 10 shows in flow chart form the actions that should be taken by the MDSH&T and communities to implement improved air service. The chart suggests four distinct work phases: (1) finalizing air service needs through interaction with communities and airlines, (2) determining the willingness and ability of present certificated carriers to meet identified needs, (3) exploring the possibilities of other certificated carriers meeting identified needs (assuming that some deficiencies cannot be met by present carriers), and finally (4) interesting commuter operators in providing services which apparently cannot be met by certificated airlines. The latter two phases represent "fall-back" positions if and when it is concluded that existing certificated carriers will not or cannot provide service which will resolve identified deficiencies. Each of the phases is discussed in the following paragraphs.

Finalizing Air Service Needs

The first task which should begin immediately is one of providing an opportunity for communities and airlines to review the draft report and to make comments and suggestions prior to MDSH&T publication and

FIGURE 10

ACTIONS LEADING TO IMPROVED AIR SERVICE



general distribution of the final report. This can be supplemented by meetings for exchanging views and concerns. Where deficiencies have been identified, MDSH&T should meet with the affected communities to ascertain their interest and commitment in resulting identified deficiencies. Such commitment is best formalized through a memorandum of understanding which would spell out the responsibilities and obligations of both the MDSH&T and local communities in working together (partnership) to achieve better air service.

Encouraging Present Carriers

Major efforts should first be made to convince existing carriers to provide supplemental or higher quality replacement service which will eliminate present deficiencies. This can be done in many different ways: (1) adding flights, (2) rescheduling to include AM or PM departures, and/or (3) eliminating intermediate stops and/or connections. Such improvements can best come through rescheduling using presently-owned aircraft. They do not require implementing the new routes and services developed in the previous chapter. They do not necessarily require the purchase of smaller aircraft. Such improvements can be scheduled over a period of time, so long as the most important deficiencies are met first. While MDSH&T ideally would like to have existing carriers resolve all deficiencies through service improvements, the Department recognizes that such expectations may not be realistic.

The immediate need is to have the existing carriers carefully review the findings of this study and then to conduct whatever internal

studies are necessary to determine whether they can resolve deficiencies through rescheduling. MDSH&T is particularly concerned over carrier willingness to stay in the smaller markets and to change or modify long-standing operating patterns so as to achieve service improvements. MDSH&T hopes that this will lead to a frank discussion and sharing of corporate thinking on the changes being contemplated which affect Michigan.

From this, preliminary conclusions should be drawn as to which deficiencies can and will be met by existing carriers. For those that are not met, the MDSH&T and the affected communities must decide whether to (1) further persuade the appropriate carrier to provide the desired service, (2) to seek redress through the regulatory process, or (3) drop the idea of obtaining improved service by existing carriers. The former can involve a tradeoff where a carrier agrees to improve service in return for state support of route extensions (being sought by the carrier before the CAB) that will be of value to Michigan travelers. Considerable opportunity exists for negotiation and bargaining. Seeking improved service through route proceedings does require the development of a documented case and the engagement of professionals qualified in presenting the case before the CAB. In addition there is the likelihood that considerable time will pass before a decision is rendered (plus the possibility for appeals), and the possibility that the petition for improved service may be denied. Use of the regulatory process to gain service improvement should be done only after a very careful decision has been made weighing the pros and cons of such action. The possibility of a petition's denial raises the fact that existing carriers may

have solid reasons why they cannot provide the desired service and that improved service should be sought from other certificated or commuter airlines. There is a certain permanency to such a conclusion; once other carriers or operators are brought in, it unleashes a series of events for which there is no turning back. If such a decision is made, MDSH&T would expect carrier support and cooperation in finding another certificated carrier or commuter operator to provide the required service.

Seeking Another Certificated Carrier to Provide Supplemental Service

In some cases, a decision will have to be made whether or not to seek another certificated carrier to provide supplemental and possibly replacement service. The starting point would be to determine which carriers are capable of providing such service and whether there is indeed sufficient interest to pursue a formal RFP/proposal process. Generally, the choice will be limited to smaller carriers flying smaller aircraft and serving adjacent markets. Relatively few carriers presently meet these criteria.

If it is decided to solicit proposals, MDSH&T should, with community assistance, prepare and issue a RFP to certificated carriers interested in providing supplemental or replacement service in selected markets (Chapter IV). The submitted proposals, which should follow a prescribed format, would then be reviewed by both MDSH&T and affected communities using pre-established evaluation criteria (financial, operational, etc.) and a joint decision made as to whether to bring in another carrier to provide the desired service. If so, MDSH&T would then negotiate

and execute an appropriate contract. As a condition for this, communities may be required to provide certain types of economic assistance or in-kind services. These are discussed later in this chapter.

The advent of a new certificated carrier in a market presently served (albeit poorly) by an existing carrier does have some risk. While under the pending legislation, communities now receiving certificated air service, are likely to be continued by these carriers (at least initially), the law will make it easier for the existing certificated air carrier to exit from points also being served by another carrier. While such an event would normally be beneficial to the new carrier, local people might interpret such an event as a loss in service. Thus, it becomes important to insure that the new carrier has the fiscal resources to provide replacement as well as supplemental service should the existing certificated carrier ultimately decide to exit from the market.

Seeking a Commuter Operator to Provide Supplemental Service

If MDSH&T cannot find a certificated carrier willing to provide the desired services, then the next course of action is to seek a commuter operator. The starting point is to screen the qualifications of potential and current commuter operators to determine those which have sufficient experience and fiscal resources to provide the required services. Once a list has been established, MDSH&T should then prepare and issue an RFP identifying the specific markets in which service is desired. The submitted proposals, which should follow a prescribed format, would then be carefully reviewed and evaluated. The ultimate

choice of a carrier would be made jointly by MDSH&T and affected communities. MDSH&T would then negotiate and execute an appropriate contract. As was the case previously, communities may be required to provide certain types of economic assistance or in-kind services as their contribution to instituting improved air service.

In addition, the commuter operator will be required to negotiate interline ticketing agreements with certificated air carriers (and other commuters), to actively seek freight contracts, to promote charter and other special services, to offer group and other discount rates to promote travel, especially during non-peak hours, and to cooperate with MDSH&T in making adjustments to service standards and policies to reflect changing conditions.

D. ASSISTANCE OPTIONS

There are a number of options available to MDSH&T (and local governments) for providing assistance to encourage other certificated carriers or commuter operators to provide the desired services. These options are briefly discussed in the following paragraphs.

The "least involvement" option is simply one of providing information. The Michigan Air Services Study provides an objective assessment of market opportunities which can be provided to Michigan communities and operators to elicit their interest and possible response if present carriers decide not to make the desired service improvements. The study provides information on the routes considered most appropriate for service and the estimated economics of associated with these routes.

A passive approach may not be enough. Some economic assistance may be necessary, especially during the "start-up" period. Possibilities

include: (1) economic assistance payments to offset operating deficits or to guarantee a minimum return on investment, (2) providing free, or reduced cost, terminal space, (3) waiving landing fees, and (4) aggressive promotion programs to attract passengers. The cost of economic assistance payments, if utilized, should either be borne locally or by both state and local governments. Under the proposed Federal legislation, subsidy-eligible communities served by certificated air carriers may have some say in how the subsidy is distributed among the various markets served by those carriers. The other possibilities should be carried out at the local level. In any event, active community support is essential in seeking various ways of reducing the operator's expenses or increasing his revenue.

E. MONITORING AND EVALUATION

The usage of service provided by certificated carriers and commuter operators is continually changing. Similarly, adjustments to existing service are made from time-to-time as flights are added or deleted and intermediate stops or connections changed. Thus air service needs change over time.

A monitoring and evaluation program should be instituted concurrent with service implementation, particularly that provided by other certificated carriers and commuter operators. MDSH&T must stay abreast of the quality of service being provided and usage thereof. Adjustments will inevitably have to be made -- often, the tradeoff is one of increasing or retaining service in the face of potential but not yet

realized patronage. These decisions are difficult, since operator profitably or state/local economic assistance may be at stake.

Finally, a complete reassessment of air service needs should be undertaken every three to five years. Such a reassessment should become an integral responsibility of the MDSH&T Aviation Planning Section. The air service needs developed in this study only cover the period through 1980.

APPENDIX A

SUMMARIES OF SCHEDULED PASSENGER SERVICE

AT MICHIGAN AIR CARRIER AIRPORTS
May & November, 1976

SUMMARY OF SCHEDULED AIR SERVICE

MONTH MAY YEAR 1976

BASE CITY (TO) / REFERENCE CITY	Overall Avg. Flight Time (Min.)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP: Flights	THREE-STOP: Average Flight Time (Min)
ALPENA																				
Cleveland	160	1		1	1	160	49					1					1	160		
Detroit	78	2			2	78	40					2			2	78				
Saginaw	32	2			2	32	32					2	2	32						
BATTLE CREEK																				
Chicago	50	3	3	2				3	50	32		3	4	40	4	60				
Detroit	33	6	1	1				6	33	31		6	6	33						
Elkhart, Ind.	30	4		1				4	30	19		4	4	30						
BENTON HARBOR																				
Chicago	30	4	1	2	4	30	29					4	4	30						
Cleveland	160	1			1	160	44					1							1	160
Detroit	105	1			1	105	36					1					1	105		
Grand Rapids	25	3		2	3	25	27					3	3	25						
Lansing	65	1			1	65	30					1			1	65				
Manistee	70	1		1	1	70	35					1			1	70				

SUMMARY OF SCHEDULED AIR SERVICE

MONTH MAY YEAR 1976

(TO) BASE CITY / REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
DETROIT (CITY)																				
Chicago	81	4	1	1				4	81	39		4	2	67	2	95				
Cleveland	40	6	2	2	6	40	25					6	6	40						
*DETROIT (METRO)																				
Alpena	75	2	1		2	75	40					2			2	75				
Battle Creek	30	6	2	2				6	30	21		6	6	30						
Escanaba	186	3	1	1	3	186	57					3							3	186
Flint	23	4	1	1	4	23	24					4	4	23						
Grand Rapids	49	9	3	3	7	43	31	2	52	25	2	7	4	39	5	58				
Hancock	231	1		1	1	231	65					1							1	231
Jackson	21	3		2	3	21	26					3	3	21						
Kalamazoo	39	7	1	2	7	39	32					7	5	34	2	52				
Lansing	26	11	3	4	8	25	27	3	30	10	4	7	11	26						
Marquette	195	4	2	1	2	215	61	2	155	50	2	2					2	155	2	215
Menominee	222	1		1	1	222	53					1							1	222
Muskegon	65	4	1	1	4	65	31				2	2			4	65				
Saginaw	34	4	1	1	4	34	28				1	3	3	29	1	49				
Sault Ste Marie	112	2			2	112	53					2			1	94	1	130		
Traverse City	34	6	3	3	2	60	41	4	96	33	1	5	1	50	4	95	1	115		

SUMMARY OF SCHEDULED AIR SERVICE

MONTH MAY YEAR 1976

(TO) BASE CITY / REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
ESCANABA																				
Cleveland	241	1	1		1	241	65				1								1	241
Detroit	193	3	1	1	3	183	57				2	1							3	183
Grand Rapids	116	3	1	1	3	116	46				2	1			2	104	1	141		
Green Bay	93	3	1		3	93	30				2	1	2	86	1	106				
Hancock	34	1		1	1	34	32					1	1	34						
Lansing	140	2	1	1	2	140	49				2						2	140		
Marquette	20	2	1		2	20	26				2		2	20						
Menominee	78	1		1	1	78	25					1	1	78						
FLINT																				
Alpena	40	1	1		1	40	35					1	1	40						
Atlanta	236	1	1		1	236	75				1						1	236		
Boston	184	1			1	184	74				1				1	184				
Chicago	103	6	2	1	6	103	37				4	2	2	50	2	93			2	168
Cleveland	52	4		1	4	52	29				3	1	3	39			1	90		
Detroit (Metro)	25	4		1	4	25	24					4	4	25						
Kalamazoo	92	2			2	92	34					2			2	92				
Lansing	20	1		1	1	20	20				1		1	20						
Muskegon	30	1			1	30	26				1		1	30						

SUMMARY OF SCHEDULED AIR SERVICE

MONTH MAY YEAR 1976

(TO) BASE CITY / REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
FLINT (CONT'D)																				
New York	174	1	1		1	174	63				1				1	174				
Pittsburgh	121	1	1		1	121	39					1			1	121				
Saginaw	16	1			1	16	23					1	1	16						
South Bend, Ind	134	2	1		2	134	37					2					2	184		
GRAND RAPIDS																				
Benton Harbor	24	2		1	2	24	27					2	2	24						
Chicago	46	10	1	3	10	46	29				8	2	8	41	2	66				
Cleveland	79	6	1		6	79	35				4	2	3	47	1	99	2	116		
Columbus	159	1	1		1	159	47				1						1	159		
Detroit	47	11	3	4	9	44	31	2	61	25	3	8	5	33	6	59				
Escanaba	112	3	1	1	3	112	46				2	1			2	109	1	116		
Ft. Lauderdale	246	1		1	1	246	112				1				1	246				
Grand Forks, ND	272	1			1	272	79				1						1	272		
Green Bay	35	3	1	1	3	35	37				2	1	3	35						
Hancock	98	1		1	1	98	54					1							1	98
Lansing	20	7	1	2	5	20	24	2	20	15	3	4	7	20						
Madison	117	1		1	1	117	40				1				1	117				
Manistee	30	1		1	1	30	30					1	1	30						

SUMMARY OF SCHEDULED AIR SERVICE

MONTH MAY YEAR 1976

(GTO)
BASE CITY

REFERENCE CITY

REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
GRAND RAPIDS (CONT'D)																				
Marquette	141	2	1		2	141	48				2						2	141		
Menominee	89	1		1	1	89	39					1			1	89				
Milwaukee	32	2	1	1	2	32	28				1	1	2	32						
Minneapolis	152	2		1	2	152	53				2				2	152				
New York	197	2			2	197	69				2				2	197				
Pellston	70	1			1	70	40				1				1	70				
Reno	305	1			1	305	148				1				1	305				
Saginaw	27	2	1		2	27	24				2		2	27						
Traverse City	40	3	1		1	30	32	2	45	23	1	2	3	40						
Washington	164	1	1		1	164	62				1				1	164				
HANCOCK																				
Chicago	175	1		1	1	175	58				1								1	175
Cincinnati	205	1	1		1	205	81				1								1	205
Detroit	194	3		1	1	232	65	2	175	54		3					2	175	1	232
Escanaba	33	1		1	1	33	32					1	1	32						
Grand Rapids	164	2			1	182	54	1	145	49		2					1	145	1	182
Green Bay	129	3	1		3	129	39				2	1			2	120	1	147		
Iron Mountain	85	2			2	85	30				2		2	85						

SUMMARY OF SCHEDULED AIR SERVICE

MONTH MAY YEAR 1976

(GO)
BASE CITY
REFERENCE CITY

REFERENCE CITY	Overall Avg. Flight Time (Min)	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Daily A.M. Flights	CERTIFICATED CARRIERS: Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE STOP: Flights	ONE STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
HANCOCK (cont'd)																				
Marquette	25	2						2	25	20		2	2	25						
Menominee	59	1		1	1	59	36					1			1	59				
Milwaukee	117	2	1	1	2	117	50				2						2	117		
Traverse City	95	2						2	85	38		2			2	95				
IRON MOUNTAIN																				
Chicago	125	2		1	2	125	48				2						2	125		
Cincinnati	170	1	1		1	170	71				1						1	170		
Green Bay	25	3	1		3	25	58				3		3	25						
Hancock	25	2	1		2	25	30				2		2	25						
Marquette	20	1		1	1	20	26				1		1	20						
Milwaukee	143	2	1	1	2	143	40				2				2	143				
Oshkosh	55	1			1	55	32				1				1	55				
Rochester, Minn	202	1			1	202	51				1								1	202

SUMMARY OF SCHEDULED AIR SERVICE

MONTH MAY YEAR 1976

(TO) BASE CITY / REFERENCE CITY

	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
IRONWOOD																				
Chicago	183	2	1	1	2	183	56					2							2	183
Duluth	29	1			1	28	30					1	1	28						
Green Bay	70	1	1		1	70	37					1			1	70				
Madison	95	1	1		1	95	45					1					1	95		
Menominee	43	1			1	43	37					1	1	43						
Milwaukee	135	1			1	135	43					1							1	135
Oshkosh	117	1		1	1	117	40					1					1	117		
Rhinelander	22	1			1	22	27					1	1	22						
Stevens Point, Wis	50	1	1		1	50	32					1			1	50				
Wausau	50	1	1		1	50	32					1			1	50				
JACKSON																				
Beloit, Wis	154	1	1		1	154	45					1					1	154		
Chicago	73	3	1	1	3	73	74					3			3	73				
Detroit (Metro)	23	2	1		2	23	26					2	2	23						
Flint	77	1			1	77	29					1			1	77				
Kalamazoo	21	2		1	2	21	26					2	2	21						
La Crosse	244	1	1		1	244	57					1							1	244
Madison	189	1	1		1	193	44					1							1	189

SUMMARY OF SCHEDULED AIR SERVICE

MONTH MAY YEAR 1976

(GO)
BASE CITY
REFERENCE CITY

REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
(cont'd) JACKSON																				
Milwaukee	151	2		1	2	151	38					2					2	151		
S. Bend, Ind	30	1		1	1	30	30					1	1	30						
KALAMAZOO																				
Beloit	120	1	1		1	120	40					1			1	120				
Chicago	50	10	3	1	10	50	32					10	6	40	4	64				
Detroit	41	6	3	1	6	41	45					6	4	35	2	53				
Duluth	335	1			1	335	67					1							1	335
Flint	116	2			2	116	34					2			1	127	1	105		
Ironwood	300	1			1	300	65					1							1	300
Jackson	20	2	1		2	20	26					2	2	20						
La Crosse	150	1	1		1	150	53					1							1	150
Madison	150	3			3	150	40					3			1	115	2	163		
Milwaukee	115	2		1	2	115	36					2			2	115				
Rhinelander	268	1		1	1	268	57					1							1	268
Saginaw	153	1			1	153	36					1					1	153		
S. Bend	21	4	1		4	21	25					4	4	21						
Stevens Point	233	1		1	1	233	50					1							1	233
Wausau	233	1		1	1	233	50					1							1	233

SUMMARY OF SCHEDULED AIR SERVICE

MONTH MAY YEAR 1976

(TO)
BASE CITY
REFERENCE CITY

REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
LANSING																				
Charleston, W. Va.	132	1	1		1	132	50				1				1	132				
Chicago	93	3	2	2	3	93	32				6	2	3	48	1	91	4	127		
Cleveland	63	5	2		5	68	32				3	2	2	41	3	85				
Detroit	28	9	1	3	7	27	27	2	30	10	2	7	9	25						
Escanaba	147	3	1	1	3	147	49				2	1					2	144	1	152
Flint	54	2		2	2	54	20				1	1	1	19	1	99				
Grand Rapids	20	6	1	2	4	20	25	1	20	15	3	2	6	20						
Green Bay	73	3	1	1	3	73	42				2	1			3	73				
Hancock	165	3	1	2	1	194	57	2	150	48		3					2	150	1	194
Marquette	145	4	2		2	175	56	2	115	46	2	2			2	115			2	175
Menominee	125	1		1	1	125	47					1					1	125		
Milwaukee	66	4	1	1	4	66	32				2	2			4	66				
Muskegon	26	4	1	1	4	26	29				2	2	4	26						

SUMMARY OF SCHEDULED AIR SERVICE

MONTH MAY YEAR 1976

(TO)
BASE CITY
REFERENCE CITY

REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
MANISTEE																				
Benton Harbor	73	1			1	73	35					1			1	73				
Chicago	115	1			1	115	41					1					1	115		
Grand Rapids	30	1			1	30	30					1	1	30						
MARQUETTE																				
Chicago	140	1			1	140	53				1								1	140
Cleveland	272	1	1		1	272	71				1								1	272
Detroit	175	4	1	2	2	209	61	2	140	50	2	2			2	140			2	209
Escanaba	20	2			2	20	26				2		2	20						
Grand Rapids	134	2	1		2	134	44				2						2	134		
Green Bay	116	3	1		3	116	34				3				3	116				
Hancock	25	2	1					2	25	20		2	2	25						
Iron Mountain	20	1			1	20	26				1		1	20						
Lansing	112	2	1	1	2	112	46				2								2	112
Oshkosh	85	1			1	85	39				1						1	85		
Rochester	232	1			1	232	57				1								1	232
Traverse City	50	2						2	50	36		2	2	50						

SUMMARY OF SCHEDULED AIR SERVICE

MONTH MAY YEAR 1976

BASE CITY / REFERENCE CITY	Overall Avg. Flight Time (Min)	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Daily A.M. Flights	CERTIFICATED CARRIERS: Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
MENOMINEE																				
Chicago	102	2		1	2	102	43					2			1	78	1	125		
Detroit (Metro)	165	1			1	165	53					1					1	165		
Escanaba	18	1		1	1	18	25					1	1	13						
Grand Rapids	115	1			1	115	39					1			1	115				
Green Bay	20	2			2	20	25					2	2	20						
Hancock	60	1		1	1	60	36					1			1	60				
Ironwood	41	1	1		1	41	37					1	1	41						
Manitowoc	23	1			1	23	29					1	1	23						
Oshkosh	67	1		1	1	67	29					1			1	67				
MUSKEGON																				
Boston	239	1			1	239	81				1						1	239		
Chicago	73	6	1	2	6	73	23				4	2	2	42	4	88				
Cleveland	112	2	1		2	112	39				2				1	94	1	129		
Detroit	68	4	1	1	4	68	31					4			4	68				
Flint	85	2		2	2	85	28				1	1	1	32			1	137		
Grand Rapids	19	1	1		1	19	23					1	1	19						
Lansing	26	3		1	3	26	29					3	3	26						
Milwaukee	27	4	1	1	4	27	29				2	2	4	27						

SUMMARY OF SCHEDULED AIR SERVICE

MONTH MAY YEAR 1976

(CTO)
BASE CITY
REFERENCE CITY

REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
PELLSTON																				
Chicago	99	1			1	99	51				1				1	99				
Cleveland	125	1			1	125	53				1				1	125				
Detroit	79	2			2	179	45					2	1	60	1	97				
Sault Ste. Marie	23	2			2	23	27					2	2	23						
Traverse City	24	2			2	24	27				1	1	2	24						
SAGINAW																				
Alpena	30	1			1	30	32					1	1	30						
Atlanta	275	1			1	275	77					1							1	275
Baltimore	145	1		1	1	145	59				1				1	145				
Chicago	77	5			5	77	36				5		3	53	2	111				
Cleveland	91	5		3	5	91	33				3	2	1	45	3	97	1	120		
Denver	193	1		1	1	193	102				1				1	193				
Detroit	41	5		1	5	41	29				1	4	3	31	2	55				
Flint	20	4		1	4	20	22				2	2	4	20						
Grand Rapids	27	2			2	27	24				2		2	27						
Jacksonville	337	1			1	337	90				1						1	337		
Los Angeles	444	1			1	444	161				1								1	444
Moline, Ill	159	1		1	1	159	49				1				1	159				

SUMMARY OF SCHEDULED AIR SERVICE

MONTH MAY YEAR 1976

(TO)
BASE CITY
REFERENCE CITY

	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
SAGINAW (cont'd)																				
New York	100	1			1	100	65				1		1	100						
Omaha	234	1		1	1	234	69				1						1	234		
Pittsburgh	160	1	1		1	160	42				1						1	160		
Reno	363	1			1	363	153				1						1	363		
San Francisco	473	2	1		2	473	161				2				1	337			1	609
Santa Barbara	524	1			1	524	161				1								1	524
Traverse City	27	1		1	1	27	31				1		1	27						
Washington	145	1		1	1	145	59				1				1	145				
SAULT STE. MARIE																				
Cleveland	176	1			1	176	59					1					1	176		
Detroit (Metro)	122	2			2	122	53					2			1	111	1	132		
Pellston	23	3			3	23	27					3	3	23						
Traverse City	59	1			1	59	33					1			1	33				

SUMMARY OF SCHEDULED AIR SERVICE

MONTH MAY YEAR 1976

(LTD)
BASE CITY
REFERENCE CITY

REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
TRAVERSE CITY																				
Chicago	67	2			2	67	46				2		1	49	1	84				
Cleveland	141	1			1	141	50				1						1	141		
Detroit (Metro)	84	6		2	2	63	41	4	94	33	1	5	3	65	1	71	2	117		
Grand Rapids	40	3		1	1	29	32	2	45	28	1	2	3	40						
Hancock	85	2	1					2	85	38		2			1	85				
Marquette	50	2	1	1				2	50	36		2	2	50						
Pellston	23	2	1		2	23	27				1	1	2	23						
Saginaw	29	1			1	28	31				1		1	28						
Sault Ste Marie	56	1			1	56	33					1			1	56				

SUMMARY OF SCHEDULED AIR SERVICE

MONTH Nov YEAR 1976

(FROM) BASE CITY / (TO) REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
ALPENA																				
Cleveland	143	1	1		1	143	51					1					1	143		
Detroit	75	2	1		2	75	42					1			2	75				
Flint	40	1	1		1	40	37					1	1	40						
Saginaw	30	1			1	30	33					1	1	33						
BATTLE CREEK																				
Chicago	56	8	2					8	56	33		8	3	40	5	65				
Detroit	30	5	2	2				5	30	32		5	5	30						
Elkhart Ind	20	5	1	1				5	20	18		5	5	20						
BENTON HARBOR																				
Chicago	32	5	1	1	5	32	30					5	5	32						
Grand Rapids	24	2		1	2	24	28					2	2	24						
Hamistec	73	1			1	73	37					1			1	73				
DETROIT (CITY)																				
Chicago	113	4	1	1				4	113	39		4	3	75	1	225				
Cleveland	30	6	2	2	6	30	26					6	6	30						

SUMMARY OF SCHEDULED AIR SERVICE

MONTH NOV YEAR 1976

(FROM) BASE CITY (TO) REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
*DETROIT (METRO)																				
Alpena	80	2			2	80	42					2			2	80				
Battle Creek	33	5	1	1				5	33	32		5	5	33						
Benton Harbor	105	1			1	105	33					1					1	105		
Escanaba	183	3	1	1	3	183	59				2	1							3	183
Flint	31	7	1	2	4	25	25	3	40	25		7	6	25	1	70				
Grand Rapids	44	9	2	3	9	44	32				3	6	5	33	4	58				
Hancock	206	2	1		1	232	68	1	180	59		2					1	180	1	232
Jackson	23	2	1		2	23	27					2	2	23						
Kalamazoo	41	6	2	1	6	41	33					6	4	35	2	53				
Lansing	27	7	1	2	7	27	28				2	5	7	27						
Marquette	187	3	2	1	2	210	63	1	140	56	2	1			1	140			2	210
Menominee	105	1			1	105	56					1					1	105		
Muskegon	68	4	1	1	4	68	32					4			4	63				
Pellston	79	2			2	79	47					2	1	60	1	97				
Saginaw	41	5		1	5	41	29				1	4	3	31	2	55				
Sault Ste. Marie	122	2			2	122	55					2			1	111	1	132		
Traverse City	67	3	1		2	63	43	1	75	40	1	2	2	65	1	71				

* INTRASTATE SERVICE ONLY

SUMMARY OF SCHEDULED AIR SERVICE

MONTH Nov YEAR 1976

(FROM) BASE CITY (TO) REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
ESCANABA																				
Cleveland	238	1	1		1	238	68				1								1	238
Detroit	186	3	1	1	3	186	59				2	1							3	196
Grand Rapids	112	3	1	1	3	112	48				2	1			2	110	1	116		
Green Bay	33	3	1	1	3	33	31				2	1	2	26	1	46				
Hancock	33	1		1	1	33	33					1	1	33						
Lansing	147	3	1	1	3	147	51				2	1					2	144	1	152
Marquette	20	2			2	20	27				2		2	20						
Menominee	18	1			1	18	26					1	1	18						

SUMMARY OF SCHEDULED AIR SERVICE

MONTH Nov YEAR 1976

(FROM) BASE CITY (TO) REFERENCE CITY	Overall Avg. Flight Time (Min)	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Daily A.M. Flights	CERTIFICATED CARRIERS: Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
FLINT																				
Chicago	133	7	1	3	7	133	39				4	3	1	52	3	103			3	203
Cleveland	57	3	2	1	3	57	30				2	1	2	40	1	91				
Detroit (Metro)	24	7	3	1	4	23	25	3	25	25		7	7	24						
Jackson	90	1			1	90	30					1			1	90				
Kalamazoo	123	2			2	123	36					2			1	128	1	118		
Lansing	60	2		2	2	60	21				1	1	1	20	1	100				
Manitowoc	174	1			1	174						1							1	174
Milwaukee	212	2		1	2	212	39					2							2	212
Muskegon	85	2		2	2	85	29				1	1	1	33			1	137		
New York	172	1	1		1	172	65				1				1	172				
Providence	184	1			1	194	75				1				1	184				
Saginaw	20	4		1	4	20	23				2	2	4	20						
S. Bend	160	1			1	160	39					1					1	160		

SUMMARY OF SCHEDULED AIR SERVICE

MONTH NOV YEAR 1976

(FROM) BASE CITY (TO) REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
GRAND RAPIDS																				
Benton Harbor	25	3		2	3	25	28					3	3	25						
Chicago	44	13	2	4	13	44	30					9	9	42	3	73	1	122		
Cleveland	83	5		2	5	83	37				4	1	2	47	2	99	1	119		
Columbus	122	1		1	1	122	48				1				1	122				
Denver	160	1	1		1	160	101				1		1	160						
Detroit	43	7	1	2	7	43	32				2	5	3	35	4	53				
Escanaba	116	3	1		3	116	48				2	1			2	103	1	141		
Ft. Lauderdale	250	1	1		1	250	117				1				1	250				
Grand Forks	219	1	1		1	219	82				1						1	219		
Green Bay	35	3	1		3	35	59				2	1	3	35						
Hancock	122	1			1	122	56					1							1	122
Lansing	20	5	1	1	5	20	25				3	2	5	20						
Manistee	30	1			1	30	31					1	1	30						
Marquette	135	2	1		2	135	50				2						2	135		
Menominee	115	1			1	115	40					1			1	115				
Milwaukee	39	3	1	2	3	39	30				2	1	2	30	1	47				
Minneapolis	142	1	1		1	142	55				1				1	142				
Moline, Ill.	141	1	1		1	141	43				1				1	141				
Muskegon	19	1	1		1	14	24					1	1	19						

SUMMARY OF SCHEDULED AIR SERVICE

MONTH NOV YEAR 1976

(FROM) BASE CITY (TO) REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
GRAND RAPIDS (cont'd)																				
Omaha	217	1	1		1	217	67				1						1	217		
Philadelphia	222	1			1	222	69				1						1	222		
Pittsburgh	58	1	1		1	58	47				1		1	58						
Saginaw	28	2			2	28	25				2		2	28						
Traverse City	29	1			1	29	33				1		1	29						
Washington	133	1			1	133	65				1				1	133				
HANCOCK																				
Chicago	127	2	1		2	127	61				2						2	127		
Detroit	206	2		1	1	231	68	1	180	59		2					1	180	1	231
Escanaba	34	1		1	1	34	31					1	1	34						
Grand Rapids	158	1		1	1	158	56					1							1	158
Green Bay	70	3	1	1	3	70	40				2	1			2	61	1	98		
Iron Mountain	25	2	1		2	25	31				2		2	25						
Lansing	180	2	1	1	1	194	60	1	166	45		2					1	166	1	194
Marquette	28	2	1					2	28	15		2	2	28						
Menominee	60	1		1	1	60						1			1	60				
Traverse City	92	2	1					2	92	43		2			2	92				

SUMMARY OF SCHEDULED AIR SERVICE

MONTH Nov YEAR 1976

(FROM) BASE CITY / (TO) REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
IRON MOUNTAIN																				
Chicago	90	3	1	1	3	90	50				3				3	90				
Green Bay	25	3	1	1	3	25	30				3		3	25						
Hancock	85	2			2	85	31				2		2	85						
Marquette	20	1			1	20	27				1		1	20						
IRONWOOD																				
Chicago	217	2	1		2	217	58					2							2	217
Duluth	29	1			1	29	31					1	1	29						
Green Bay	81	1	1		1	81	39					1					1	81		
Kalamazoo	300	1			1	300	69					1							1	300
Menominee	56	1	1		1	56	37					1			1	56				
Milwaukee	154	2	1		2	154	50					2							2	154
Oshkosh	127	1	1		1	127	42					1							1	127
Rhinelander	24	2	1		2	24	28					2	2	24						
Wausau	52	1			1	52	33					1			1	52				

SUMMARY OF SCHEDULED AIR SERVICE

MONTH ADV YEAR 1976

(FROM) BASE CITY (TO) REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
JACKSON																				
Chicago	75	2	1		2	75	39					2			2	75				
Detroit	21		1		3	21	27					3	3	21						
Flint	97	1			1	97	30					1			1	97				
Green Bay	217	1	1		1	217	51					1							1	217
Kalamazoo	27	2	1		2	20	27					2	2	27						
Manitowoc	206	1			1	206	43					1							1	206
Milwaukee	142	2			2	142	39					2					2	142		
Oshkosh	127	1	1		1	127	43					1							1	127

SUMMARY OF SCHEDULED AIR SERVICE

MONTH NOV YEAR 1976

(FROM) BASE CITY (TO) REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
KALAMAZOO																				
Chicago	49	9	2	3	9	49	33					9	5	40	4	59				
Cleveland	100	2	1	1	2	100	39					2			2	100				
Detroit	38	9	1	2	9	38	33					9	5	34	2	49				
Flint	104	2			2	104	36					2			1	85	1	123		
Green Bay	132	1	1		1	182	47					1							1	182
Jackson	23	2			2	23	27					2	2	23						
Manitowoc	144	2		1	2	144	43					2			1	116	1	171		
Menominee	138	1			1	138	50					1					1	138		
Milwaukee	112	3	1	1	3	112	38					3			3	112				
Oshkosh	152	1	1		1	152	43					1					1	152		
South Bend	18	4	1	1	4	18	26					4	4	18						

SUMMARY OF SCHEDULED AIR SERVICE

MONTH NOV YEAR 1976

(FROM) BASE CITY / (TO) REFERENCE CITY	Overall Avg. Flight Time (Min)	CERTIFICATED CARRIERS: Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	Average Flight Time (Min)	Fare ($)	COMMUTER CARRIERS: Daily Flights	Average Flight Time (Min)	Fare ($)	EQUIPMENT: Jet Flights	Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
LANSING																				
[illegible]	65	1			1	65	31					1			1	65				
CHICAGO	89	8	1	1	8	89	33				4	4	3	50	1	90	4	119		
CLEVELAND	70	6	1	1	6	70					5	1	1	43	4	83				
DET. METRO	26	8	1	1	8	26	28				4	4	8	26						
ESCANABA	140	1	1	1	1	140	51				1						1	140		
FLINT	19	1		1	1	19	21				1		1	19						
GRAND RAPIDS	20	5	1	1	5	20	25				3	2	5	20						
GREEN BAY	70	2	1	1	2	70	43				2				2	70				
HANCOCK	173	1		1				1	173	45		1					1	173		
MARQUETTE	159	3	1	2	2	171	58	1	137	42	2	1			1	137			2	171
MILWAUKEE	69	3		1	3	69	34					3			3	69				
MUSKEGON	26	3		1	3	26	30					3	3	26						
PHILADELPHIA	157	1		1	1	157	65				1				1	157				
WASHINGTON	148	1	1		1	148	61				1				1	148				
TRAVERSE CITY	48	1		1				1	48	32		1	1	48						
MANISTEE																				
BENTON HARBOR	70	1		1	1	70	37					1			1	70				
CHICAGO	60	1		1	1	60	43					1					1	60		
GRAND RAPIDS	30	1		1	1	30	31					1	1	30						

SUMMARY OF SCHEDULED AIR SERVICE

MONTH Nov. YEAR 1976

BASE CITY / REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
MARQUETTE																				
CHICAGO	120	1		1	1	120	56				1						1	120		
CLEVELAND	269	1	1		1	269	74				1								1	269
DETROIT	190	3	1	1	2	215	63	1	140	63	3				1	140			2	215
ESCANABA	20	2	1		2	20	27				2		2	20						
GRAND RAPIDS	131	2	1		2	131	50				2						2	131		
GREEN BAY	57	3	1	1	3	57	36				3				3	57				
HANCOCK	29	3		1				3	29	15		3	3	29						
IRON MOUNTAIN	20	1		1	1	20	27				1		1	20						
LANSING	160	3	2		2	175	58	1	130	42	2	1			1	130			2	175
TRAVERSE CITY	54	2	1	1				2	54	41		2	2	54						

SUMMARY OF SCHEDULED AIR SERVICE

MONTH Nov. YEAR 1976

(FROM) BASE CITY (TO) REFERENCE CITY	Overall Avg. Flight Time (Min)	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Daily A.M. Flights	CERTIFICATED CARRIERS: Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
MENOMINEE																				
CHICAGO	164	2	1		2	164	44				2								2	164
DETROIT	162	1	1		1	162	56				1								1	162
ESCANABA	18	1		1	1	18	26					1	1	18						
GREEN BAY	19	3	1	1	3	19	26					3	3	19						
HANCOCK	59	1		1	1	59	37					1			1	59				
IRONWOOD	54	1			1	54	39					1			1	54				
MILWAUKEE	105	2	1		2	105	37					2					2	105		
OSHKOSH	66	2	1		2	66	30					2			2	66				
RHINELANDER	26	1	1		1	26	31					1	1	26						
MUSKEGON																				
CHICAGO	70	6	2	2	6	70	33				2	4	2	42	4	84				
CLEVELAND	117	4	1	1	4	117	46				3	1			1	98	3	123		
DETROIT	65	4	1	1	4	65	32				2	2			4	65				
FLINT	30	1			1	30	27				1				1	30				
LANSING	26	4	1	1	4	26	30				2	2	4	26						
MILWAUKEE	28	4	1	1	4	28	30					4	4	28						

SUMMARY OF SCHEDULED AIR SERVICE

MONTH Nov. YEAR 1976

BASE CITY / REFERENCE CITY	Overall Avg. Flight Time (Min.)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
PELLSTON																				
CHICAGO	122	1			1	122	53				1						1	122		
CLEVELAND	123	1			1	123	56					1			1	123				
DETROIT	81	2	1		2	81	47					2	1	64	1	97				
GRAND RAPIDS	70	1			1	70	41				1				1	70				
SAULT STE MARIE	23	2			2	23	28					2	2	23						
TRAVERSE CITY	23	2	1		2	23	28				1	1	2	23						

SUMMARY OF SCHEDULED AIR SERVICE

MONTH Nov. YEAR 1976

BASE CITY (From) / REFERENCE CITY (To)	CERTIFICATED CARRIERS							COMMUTER CARRIERS			EQUIPMENT		NON-STOP		ONE-STOP		TWO-STOP		THREE-STOP (or more)	
	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	Daily Flights	Average Flight Time (Min)	Fare ($)	Daily Flights	Average Flight Time (Min)	Fare ($)	Jet Flights	Prop. Flights	Flights	Average Flight Time (Min)	Flights	Average Flight Time (Min)	Flights	Average Flight Time (Min)	Flights	Average Flight Time (Min)
SAGINAW																				
ALPENA	31	2		1	2	31	33				1	1	2	31						
ATLANTA	192	1		1	1	192	80				1				1	192				
BALTIMORE	178	1	1		1	170	61				1				1	178				
CHICAGO	89	6	1		6	89	38				5	1	4	55	1	90			1	228
CLEVELAND	44	2	1	1	2	44	34				2		2	44						
DENVER	220	1	1		1	220	106				1				1	220				
DETROIT	34	4	1	1	4	34	29				1	3	3	29	1	49				
FLINT	20	1			1	20	24					1	1	20			1	331		
FT. LAUDERDALE	331	1		1	1	331	116				1									
GRAND RAPIDS	27	2	1		2	27	25				2		2	27						
KALAMAZOO	153	1			1	153	37					1					1	153		
NEW YORK	88	1			1	88	67				1		1	88						
TAMPA	229	1	1		1	229	104				1				1	229				
TRAVERSE CITY	28	1			1	28	28				1		1	28						
WASHINGTON	178	1	1		1	178	61				1				1	178				

SUMMARY OF SCHEDULED AIR SERVICE

MONTH Nov. YEAR 1976

(FROM) BASE CITY (TO) REFERENCE CITY	Overall Avg. Flight Time (Min)	Daily Flights	Daily A.M. Flights	Daily P.M. Flights	CERTIFICATED CARRIERS: Daily Flights	CERTIFICATED CARRIERS: Average Flight Time (Min)	CERTIFICATED CARRIERS: Fare ($)	COMMUTER CARRIERS: Daily Flights	COMMUTER CARRIERS: Average Flight Time (Min)	COMMUTER CARRIERS: Fare ($)	EQUIPMENT: Jet Flights	EQUIPMENT: Prop. Flights	NON-STOP: Flights	NON-STOP: Average Flight Time (Min)	ONE-STOP: Flights	ONE-STOP: Average Flight Time (Min)	TWO-STOP: Flights	TWO-STOP: Average Flight Time (Min)	THREE-STOP (or more): Flights	THREE-STOP (or more): Average Flight Time (Min)
SAULT STE. MARIE																				
CLEVELAND	163	1			1	163	61					1					1	163		
DETROIT	122	2			2	122	55					2			1	111	1	132		
PELLSTON	23	2			2	23	28					2	2	23						
TRAVERSE CITY	56	1			1	56	35					1			1	56				
TRAVERSE CITY																				
CHICAGO	86	2	1		2	86	48				2				2	86				
DETROIT	65	3	1	2	2	60	43	1	75	40	1	2	2	63	1	70				
GRAND RAPIDS	30	1			1	30	33				1		1	30						
HANCOCK	92	2						2	92	43		2			2	92				
MARQUETTE	54	2						2	54	41		2	2	54						
MILWAUKEE	40	1	1		1	40	43				1		1	40						
PELLSTON	24	2			2	24	28				1	1	2	24						
SAGINAW	27	1		1	1	27	32				1		1	27						
SAULT STE. MARIE	59	1			1	59	35					1			1	59				
LANSING	48	1	1					1	48	32		1	1	48						

APPENDIX B

AIRCRAFT CAPACITY, COST, & PERFORMANCE DATA

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT B99 TYPE OF CARRIER LOCAL SERVICE

Aircraft Operating Expenses
(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)	73.78								51.31	
Total Depreciation & Rentals	28.45								32.34	
Crew	30.19								38.12	
Fuel and Oil	30.08								14.10	
Insurance and Other	1.34								2.82	
Total Flying Operations	61.61								55.03	
Total Operating Expense	163.85								138.68	
Per Airborne Hour ($)	216.11								174.08	
Per Revenue Passenger Mile (Scheduled Service)(¢)	15.407								16.209	
Per Available Seat Mile (Scheduled Service)(¢)	7.967								5.917	

Performance
(All revenue services unless noted otherwise)

Stage Length (Miles)	92								89	
Airborne Speed (MPH)	183								196	
Block to Block Speed (MPH)	154								162	
Fuel Consumed (All Services) (Gallons/Block Hour)	70								70	
Ton Load Factor (Scheduled Revenue Service) (Percent)	16.1								41.1	
Seat Load Factor (Scheduled Revenue Factor) (Percent)	51.7								36.5	

Performance Characteristics

Max. Crusing speed (MPH) 285
Econ. Cruising speed (MPH) 280
Range (Miles at econ. cruise) 530

Fuel consumption (MPG at econ. cruise) 2.2
Minimum field length (ft) 3700
Climb rate (fpm at S/L) 2090

Service ceiling (ft) 26300
Passenger capacity (seats) 15
Freight capacity (lbs) 1500

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT B-727-200 TYPE OF CARRIER TRUNK (UNITED)

Aircraft Operating Expenses
(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)	216.82		200.52		169.79		160.40		151.46	
Total Depreciation & Rentals	180.95		174.39		165.90		166.16		180.18	
Crew	291.27		258.15		217.60		200.81		192.85	
Fuel and Oil	346.82		280.61		171.80		161.27		154.66	
Insurance and Other	5.71		5.12		4.60		6.22		11.78	
Total Flying Operations	644.00		543.88		394.00		368.29		359.29	
Total Operating Expense	1041.77		918.79		729.69		694.85		690.93	
Per Airborne Hour ($)	1275.81		1109.08		881.56		838.78		846.99	
Per Revenue Passenger Mile (Scheduled Service)(¢)	4.076		3.583		2.936		2.898		3.200	
Per Available Seat Mile (Scheduled Service)(¢)	2.503		2.174		1.715		1.610		1.592	

Performance
(All revenue services unless noted otherwise)

Stage Length (Miles)	467		509		515		517		489	
Airborne Speed (MPH)	407		412		419		424		421	
Block to Block Speed (MPH)	336		343		349		356		352	
Fuel Consumed (All Services) (Gallons/Block Hour)	1278		1279		1300		1315		1297	
Ton Load Factor (Scheduled Revenue Service) (Percent)	48.0		48.1		48.8		48.7		44.0	
Seat Load Factor (Scheduled Revenue Factor) (Percent)	61.4		61.0		58.4		55.5		49.8	

Performance Characteristics

Max. Crusing speed (MPH) 592
Econ. Cruising speed (MPH) 570
Range (Miles at econ. cruise) 2645

Fuel consumption (MPG at econ. cruise) n/a
Minimum field length (ft) 6500
Climb rate (fpm at S/L) 2500

Service ceiling (ft) 33000
Passenger capacity (seats) 163
Freight capacity (lbs) 20000

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT B-737-200 TYPE OF CARRIER TRUNK (UNITED)

Aircraft Operating Expenses
(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)	263.13		210.22		152.58		136.05		129.13	
Total Depreciation & Rentals	122.68		113.20		102.69		106.98		113.56	
Crew	319.73		272.99		228.05		219.28		212.05	
Fuel and Oil	232.01		188.49		114.49		107.84		105.96	
Insurance and Other	5.13		1.24		3.65		4.86		9.05	
Total Flying Operations	556.19		465.72		346.18		331.99		327.06	
Total Operating Expense	942.72		789.14		601.44		575.01		569.76	
Per Airborne Hour ($)	1195.91		1004.39		759.26		725.75		723.49	
Per Revenue Passenger Mile (Scheduled Service)(¢)	5.984		4.930		4.049		3.859		3.939	
Per Available Seat Mile (Scheduled Service)(¢)	3.537		2.995		2.302		2.246		2.204	

Performance
(All revenue services unless noted otherwise)

Stage Length (Miles)	286		289		296		300		291	
Airborne Speed (MPH)	356		353		356		359		361	
Block to Block Speed (MPH)	286		283		286		290		290	
Fuel Consumed (All Services) (Gallons/Block Hour)	854		855		864		874		886	
Ton Load Factor (Scheduled Revenue Service) (Percent)	54.0		56.7		51.1		50.0		48.5	
Seat Load Factor (Scheduled Revenue Factor) (Percent)	59.1		61.1		56.8		58.2		56.0	

Performance Characteristics

Max. Crusing speed (MPH) 576
Econ. Cruising speed (MPH) 542
Range (Miles at econ. cruise) 2520

Fuel consumption (MPG at econ. cruise) N/A
Minimum field length (ft) 5000
Climb rate (fpm at S/L) 4200

Service ceiling (ft)
Passenger capacity (seats) 115-130
Freight capacity (lbs) 13135

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT BN-2A-20 TYPE OF CARRIER _____

Aircraft Operating Expenses
(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)										
Total Depreciation & Rentals										
Crew										
Fuel and Oil										
Insurance and Other										
Total Flying Operations										
Total Operating Expense										
Per Airborne Hour ($)										
Per Revenue Passenger Mile (Scheduled Service)(¢)										
Per Available Seat Mile (Scheduled Service)(¢)										

Performance
(All revenue services unless noted otherwise)

Stage Length (Miles)										
Airborne Speed (MPH)										
Block to Block Speed (MPH)										
Fuel Consumed (All Services) (Gallons/Block Hour)										
Ton Load Factor (Scheduled Revenue Service) (Percent)										
Seat Load Factor (Scheduled Revenue Factor) (Percent)										

Performance Characteristics

Max. Crusing speed (MPH) 180
Econ. Cruising speed (MPH) 151
Range (Miles at econ. cruise) 700

Fuel consumption (MPG at econ. cruise) 4.3
Minimum field length (ft) 1100
Climb rate (fpm at S/L) 1130

Service ceiling (ft) 18,000
Passenger capacity (seats) 9
Freight capacity (lbs) 1100

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT BN-2A MK III-2 TYPE OF CARRIER _____

Aircraft Operating Expenses
(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)										
Total Depreciation & Rentals										
Crew										
Fuel and Oil										
Insurance and Other										
Total Flying Operations										
Total Operating Expense										
Per Airborne Hour ($)										
Per Revenue Passenger Mile (Scheduled Service)(¢)										
Per Available Seat Mile (Scheduled Service)(¢)										

Performance
(All revenue services unless noted otherwise)

Stage Length (Miles)										
Airborne Speed (MPH)										
Block to Block Speed (MPH)										
Fuel Consumed (All Services) (Gallons/Block Hour)										
Ton Load Factor (Scheduled Revenue Service) (Percent)										
Seat Load Factor (Scheduled Revenue Factor) (Percent)										

Performance Characteristics

Max. Cruising speed (MPH) 180
Econ. Cruising speed (MPH) 150
Range (Miles at econ. cruise) 740

Fuel consumption (MPG at econ. cruise) 3.1
Minimum field length (ft) 1950
Climb rate (fpm at S/L) 1000

Service ceiling (ft) 12,400
Passenger capacity (seats) 17
Freight capacity (lbs) N/D

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT CANADAIR CL 600 TYPE OF CARRIER _____

Aircraft Operating Expenses

(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)										
Total Depreciation & Rentals										
Crew										
Fuel and Oil										
Insurance and Other										
Total Flying Operations										

Total Operating Expense										
Per Airborne Hour ($)										
Per Revenue Passenger Mile (Scheduled Service)(¢)										
Per Available Seat Mile (Scheduled Service)(¢)										

Performance

(All revenue services unless noted otherwise)

Stage Length (Miles)										
Airborne Speed (MPH)										
Block to Block Speed (MPH)										
Fuel Consumed (All Services) (Gallons/Block Hour)										
Ton Load Factor (Scheduled Revenue Service) (Percent)										
Seat Load Factor (Scheduled Revenue Factor) (Percent)										

Performance Characteristics

Max. Crusing speed (MPH) 345 Sea level
Econ. Cruising speed (MPH) 431 (39,000')
Range (Miles at econ. cruise) N/D

Fuel consumption (MPG at econ. cruise) N/D
Minimum field length (ft) N/D
Climb rate (fpm at S/L) N/D

Service ceiling (ft) 49,000
Passenger capacity (seats) 30
Freight capacity (lbs) 7500

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT CESSNA 402B UTILINER TYPE OF CARRIER _____

Aircraft Operating Expenses

(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)										
Total Depreciation & Rentals										
Crew										
Fuel and Oil										
Insurance and Other										
Total Flying Operations										

Total Operating Expense										
Per Airborne Hour ($)										
Per Revenue Passenger Mile (Scheduled Service)(¢)										
Per Available Seat Mile (Scheduled Service)(¢)										

Performance

(All revenue services unless noted otherwise)

Stage Length (Miles)										
Airborne Speed (MPH)										
Block to Block Speed (MPH)										
Fuel Consumed (All Services) (Gallons/Block Hour)										
Ton Load Factor (Scheduled Revenue Service) (Percent)										
Seat Load Factor (Scheduled Revenue Factor) (Percent)										

Performance Characteristics

Max. Crusing speed (MPH) 261
Econ. Cruising speed (MPH) 219
Range (Miles at econ. cruise) 1365

Fuel consumption (MPG at econ. cruise) 5.5
Minimum field length (ft) 2220
Climb rate (fpm at S/L) 1610

Service ceiling (ft) 26190
Passenger capacity (seats) 10
Freight capacity (lbs) 2100

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT Dassault-Breguet Falcon 50 / TYPE OF CARRIER _____

Aircraft Operating Expenses

(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)										
Total Depreciation & Rentals										
Crew										
Fuel and Oil										
Insurance and Other										
Total Flying Operations										

Total Operating Expense										
Per Airborne Hour ($)										
Per Revenue Passenger Mile (Scheduled Service)(¢)										
Per Available Seat Mile (Scheduled Service)(¢)										

Performance

(All revenue services unless noted otherwise)

Stage Length (Miles)										
Airborne Speed (MPH)										
Block to Block Speed (MPH)										
Fuel Consumed (All Services) (Gallons/Block Hour)										
Ton Load Factor (Scheduled Revenue Service) (Percent)										
Seat Load Factor (Scheduled Revenue Factor) (Percent)										

Performance Characteristics

Max. Crusing speed (MPH) 608
Econ. Cruising speed (MPH) 557
Range (Miles at econ. cruise) 3625

Fuel consumption (MPG at econ. cruise) 1.6
Minimum field length (ft) 4920
Climb rate (fpm at S/L) 5000

Service ceiling (ft)
Passenger capacity (seats) 10-16
Freight capacity (lbs) N/A

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT DHC-6 TYPE OF CARRIER LOCAL SERVICE

Aircraft Operating Expenses
(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)	63.10	61.14 - 65.05	64.79		53.71		70.86	43.93 - 97.79	55.19	
Total Depreciation & Rentals	31.15	30.70 - 31.60	37.10		30.25		38.12	36.20 - 40.01	38.43	
Crew	54.38	32.28 - 77.47	70.56		64.79		46.09	45.50 - 46.68	44.14	
Fuel and Oil	30.06	26.62 - 33.49	22.76		12.99		11.49	11.10 - 11.88	11.99	
Insurance and Other	2.68	1.53 - 3.83	1.92		1.62		2.64	2.55 - 2.72	1.40	
Total Flying Operations	87.61	67.30 - 107.92	95.24		79.39		60.21	60.09 60.33	57.53	
Total Operating Expense	181.86	163.55 - 199.76	197.13		163.55		169.18	144.03 - 194.32	131.16	
Per Airborne Hour ($)	218.92	201.84 - 236.00	235.17		192.74		201.70	172.45 - 230.95	149.18	
Per Revenue Passenger Mile (Scheduled Service)(¢)	16.240	14.985 - 17.494	17.509		17.548		19.012	18.502 - 19.522	17.940	
Per Available Seat Mile (Scheduled Service)(¢)	7.497	7.483 - 7.510	7.768		6.063		7.485	7.415 - 7.552	6.331	

Performance
(All revenue services unless noted otherwise)

Stage Length (Miles)	78	67 - 89	89		90		134	93 - 175	93	
Airborne Speed (MPH)	155	143 - 166	167		159		158	155 - 161	157	
Block to Block Speed (MPH)	134	123 - 145	146		140		143	137 - 148	155	
Fuel Consumed (All Services) (Gallons/Block Hour)	79	77 - 80	78		76		75	70 - 80	75	
Ton Load Factor (Scheduled Revenue Service) (Percent)	43.6	44.0 - 43.1	43.9		43.1		42.2	38.8 - 45.5	34.6	
Seat Load Factor (Scheduled Revenue Factor) (Percent)	46.5	50.1 - 42.8	44.4		45.9		39.4	25.7 - 40.1	35.3	

Performance Characteristics

Max. Crusing speed (MPH) 210
Econ. Cruising speed (MPH) 170
Range (Miles at econ. cruise) 800

Fuel consumption (MPG at econ. cruise) 1.8
Minimum field length (ft) 1200 (STOL)
Climb rate (fpm at S/L) 1600

Service ceiling (ft) 26700
Passenger capacity (seats) 20
Freight capacity (lbs) 500

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT DHC-7 TYPE OF CARRIER Manufacturer's data

Aircraft Operating Expenses
(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)										
Total Depreciation & Rentals (12 yrs to 5%)										
Crew										
Fuel and Oil										
Insurance and Other										
Total Flying Operations										
Total Operating Expense										
Per Airborne Hour ($)										
Per Revenue Passenger Mile (Scheduled Service)(¢)										
Per Available Seat Mile (Scheduled Service)(¢) (based on 2500 block hours)	4.9									

Performance
(All revenue services unless noted otherwise)

Stage Length (Miles)	100									
Airborne Speed (MPH)										
Block to Block Speed (MPH)										
Fuel Consumed (All Services) (Gallons/Block Hour)										
Ton Load Factor (Scheduled Revenue Service) (Percent)										
Seat Load Factor (Scheduled Revenue Factor) (Percent)										

Performance Characteristics

Max. Crusing speed (MPH) 280
Econ. Cruising speed (MPH) 225
Range (Miles at econ. cruise) 455

Fuel consumption (MPG at econ. cruise) N/D
Minimum field length (ft) 2330
Climb rate (fpm at S/L) 1310

Service ceiling (ft) 22,200
Passenger capacity (seats) 50
Freight capacity (lbs) 12,550

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT CV-580 TYPE OF CARRIER Local

Aircraft Operating Expenses
(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)	184.91	154.60-215.21	164.17	141.15-187.19	[illegible]	124.30-172.67	[illegible]	117.00-142.80	[illegible]	119.98-136.86
Total Depreciation & Rentals	79.70	50.21-109.18	67.07	52.95-81.19	47.30	46.14-48.46	43.82	42.06-45.58	[illegible]	42.02-46.50
Crew	193.03	133.09-253.06	149.45	117.64-181.26	112.14	107.16-117.12	102.46	97.04-107.87	[illegible]	85.67-90.96
Fuel and Oil	103.90	103.04-104.76	74.28	70.53-78.03	49.05	46.89-51.20	[illegible]	44.33-49.22	[illegible]	47.45-48.06
Insurance and Other	6.29	4.14-8.43	4.72	3.20-6.23	[illegible]	3.67-4.40	[illegible]	3.75-4.17	5.67	5.44-5.89
Total Flying Operations	303.26	241.99-364.53	228.45	191.38-265.52	[illegible]	157.72-172.72	[illegible]	145.12-161.26	141.72	138.98-144.46
Total Operating Expense	567.86	446.80-688.92	459.69	385.48-533.90	[illegible]	330.48-391.53	[illegible]	307.70-346.13	[illegible]	305.46-373.34
Per Airborne Hour ($)	727.06	573.83-880.29	576.69	491.13-659.25	451.49	426.33-476.14	410.51	399.22-421.92	[illegible]	372.27-435.48
Per Revenue Passenger Mile (Scheduled Service)(¢)	11.992	10.429-13.547	9.083	8.671-9.454	7.771	7.687-7.852	7.144	7.084-7.204	[illegible]	7.035-7.660
Per Available Seat Mile (Scheduled Service)(¢)	6.454	5.209-7.698	5.113	4.486-5.740	[illegible]	3.873-4.036	3.616	3.616	[illegible]	3.790-4.546

Performance
(All revenue services unless noted otherwise)

Stage Length (Miles)	113	98-127	120	98-141	124	100-147	122	100-143	120	97-141
Airborne Speed (MPH)	229	229-229	229	229-230	233	230-236	232	230-233	235	231-238
Block to Block Speed (MPH)	185	182-188	187	182-192	190	181-198	187	181-196	191	182-199
Fuel Consumed (All Services) (Gallons/Block Hour)	341	330-351	340	333-347	[illegible]	338-358	352	339-365	355	347-362
Ton Load Factor (Scheduled Revenue Service) (Percent)	45.1	41.7-48.4	47.7	43.6-51.7	[illegible]	42.2-45.5	43.4	43.1-43.7	[illegible]	43.2-44.9
Seat Load Factor (Scheduled Revenue Factor) (Percent)	53.4	49.9-56.8	56.2	51.7-60.7	50.3	48.1-52.5	49.0	47.7-50.2	[illegible]	46.5-46.3

Performance Characteristics

Max. Crusing speed (MPH) 342
Econ. Cruising speed (MPH)
Range (Miles at econ. cruise) 1605

Fuel consumption (MPG at econ. cruise)
Minimum field length (ft) 4240
Climb rate (fpm at S/L) N/D

Service ceiling (ft)
Passenger capacity (seats) 48
Freight capacity (lbs)

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT CV 600 TYPE OF CARRIER LOCAL

Aircraft Operating Expenses
(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)	166.23		148.24		150.89		134.12		103.10	
Total Depreciation & Rentals	150.92		79.82		39.52		41.99		39.62	
Crew	135.73		103.60		88.51		87.98		75.92	
Fuel and Oil	80.97		58.54		41.31		37.95		39.92	
Insurance and Other	3.83		4.70		4.36		5.27		4.62	
Total Flying Operations	220.53		166.84		134.18		133.21		120.42	
Total Operating Expense	537.67		395.50		324.5		309.33		268.13	
Per Airborne Hour ($)	655.17		468.41		346.27		373.61		316.84	
Per Revenue Passenger Mile (Scheduled Service)(¢)	17.845		10.539		9.562		8.998		7.769	
Per Available Seat Mile (Scheduled Service)(¢)	7.967		5.583		4.471		4.845		3.635	

Performance
(All revenue services unless noted otherwise)

Stage Length (Miles)	118		120		131		117		120	
Airborne Speed (MPH)	208		210		216		215		217	
Block to Block Speed (MPH)	175		180		184		181		184	
Fuel Consumed (All Services) (Gallons/Block Hour)	378		285		273		259		266	
Ton Load Factor (Scheduled Revenue Service) (Percent)	43.8		43.0		38.9		51.9		42.0	
Seat Load Factor (Scheduled Revenue Factor) (Percent)	44.1		53.0		46.8		48.3		46.8	

Performance Characteristics

Max. Crusing speed (MPH) 309
Econ. Cruising speed (MPH) 309
Range (Miles at econ. cruise) 1900 (long range tanks)

Fuel consumption (MPG at econ. cruise) _____
Minimum field length (ft) _____
Climb rate (fpm at S/L) 1400

Service ceiling (ft) 24,000
Passenger capacity (seats) 56
Freight capacity (lbs) _____

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT DC-9-30 TYPE OF CARRIER LOCAL

Aircraft Operating Expenses
(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)	191.48	183.01 - 199.94	176.02	169.11 - 182.93	127.68	122.82 - 132.53	134.58	120.64 - 148.52	120.80	107.78 - 133.83
Total Depreciation & Rentals	118.95	112.48 - 125.41	120.12	116.79 - 123.44	107.61	102.12 - 113.09	109.16	108.15 - 110.16	109.69	106.16 - 113.23
Crew	188.88	177.84 - 199.91	158.39	149.97 - 166.81	137.35	128.53 - 146.16	128.37	120.50 - 136.23	118.91	112.38 - 125.44
Fuel and Oil	274.69	260.13 - 289.25	195.49	183.18 - 207.79	125.23	119.35 - 131.11	120.80	115.39 - 126.21	123.41	121.71 - 125.10
Insurance and Other	13.18	9.94 - 16.41	9.75	7.35 - 12.15	11.54	7.54 - 15.53	12.58	10.59 - 14.57	18.36	17.30 - 19.43
Total Flying Operations	476.75	469.99 - 483.51	363.63	345.30 - 381.95	274.11	263.41 - 284.81	261.75	250.45 - 273.04	260.69	267.85 - 253.52
Total Operating Expense	787.17	778.40 - 795.93	659.76	631.20 - 688.32	509.39	488.95 - 530.43	505.49	503.84 - 507.12	491.19	481.79 - 500.58
Per Airborne Hour ($)	975.37	950.88 - 1000.86	813.46	797.65 - 829.26	633.95	624.56 - 643.34	625.26	610.32 - 640.19	610.21	586.57 - 633.86
Per Revenue Passenger Mile (Scheduled Service)(¢)	5.800	5.367 - 6.232	4.800	4.741 - 4.859	3.930	3.912 - 3.947	3.665	3.651 - 3.679	4.100	3.810 - 4.389
Per Available Seat Mile (Scheduled Service)(¢)	2.820	2.726 - 2.914	2.343	2.323 - 2.363	1.785	1.772 - 1.798	1.774	1.725 - 1.822	1.738	1.654 - 1.821

Performance
(All revenue services unless noted otherwise)

Stage Length (Miles)	229	202 - 256	241	206 - 275	255	214 - 295	253	223 - 282	249	218 - 279
Airborne Speed (MPH)	348	347 - 349	349	347 - 351	357	351 - 363	356	354 - 357	355	355
Block to Block Speed (MPH)	282	277 - 287	285	276 - 293	291	279 - 303	292	287 - 296	290	285 - 294
Fuel Consumed (All Services) (Gallons/Block Hour)	922	902 - 941	917	892 - 941	931	816 - 965	943	916 - 969	834	899 - 968
Ton Load Factor (Scheduled Revenue Service) (Percent)	42.5	40.1 - 44.2	43.1	41.9 - 44.2	41.0	40.5 - 41.5	430	42.5 - 43.4	37.6	36.5 - 38.6
Seat Load Factor (Scheduled Revenue Factor) (Percent)	42.9	46.8 - 50.8	43.8	47.8 - 49.8	45.4	45.3 - 45.5	48.4	47.2 - 49.5	42.5	41.5 - 43.4

Performance Characteristics

Max. Cruising speed (MPH) 526
Econ. Cruising speed (MPH) 364
Range (Miles at econ. cruise) 1925
(80 pass. + baggage)

Fuel consumption (MPG at econ. cruise)
Minimum field length (ft) 5530
Climb rate (fpm at S/L) 2900

Service ceiling (ft)
Passenger capacity (seats) 115
Freight capacity (lbs) 13,425

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT DC-9-50 TYPE OF CARRIER _____

Aircraft Operating Expenses

(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)										
Total Depreciation & Rentals										
Crew										
Fuel and Oil										
Insurance and Other										
Total Flying Operations										
Total Operating Expense										
Per Airborne Hour ($)										
Per Revenue Passenger Mile (Scheduled Service)(¢)										
Per Available Seat Mile (Scheduled Service)(¢)										

Performance

(All revenue services unless noted otherwise)

Stage Length (Miles)										
Airborne Speed (MPH)										
Block to Block Speed (MPH)										
Fuel Consumed (All Services) (Gallons/Block Hour)										
Ton Load Factor (Scheduled Revenue Service) (Percent)										
Seat Load Factor (Scheduled Revenue Factor) (Percent)										

Performance Characteristics

Max. Crusing speed (MPH) 576
Econ. Cruising speed (MPH) 553
Range (Miles at econ. cruise) 2550

Fuel consumption (MPG at econ. cruise) _____
Minimum field length (ft) 7750
Climb rate (fpm at S/L) 2500

Service ceiling (ft) _____
Passenger capacity (seats) 139
Freight capacity (lbs) 15,370

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT Piper PA-23-250 Turbo Aztec E TYPE OF CARRIER _____

Aircraft Operating Expenses

(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)										
Total Depreciation & Rentals										
Crew										
Fuel and Oil										
Insurance and Other										
Total Flying Operations										

Total Operating Expense										
Per Airborne Hour ($)										
Per Revenue Passenger Mile (Scheduled Service)(¢)										
Per Available Seat Mile (Scheduled Service)(¢)										

Performance

(All revenue services unless noted otherwise)

Stage Length (Miles)										
Airborne Speed (MPH)										
Block to Block Speed (MPH)										
Fuel Consumed (All Services) (Gallons/Block Hour)										
Ton Load Factor (Scheduled Revenue Service) (Percent)										
Seat Load Factor (Scheduled Revenue Factor) (Percent)										

Performance Characteristics

Max. Crusing speed (MPH) 248
Econ. Cruising speed (MPH) 230
Range (Miles at econ. cruise) 1175

Fuel consumption (MPG at econ. cruise) 6.1
Minimum field length (ft) 1690
Climb rate (fpm at S/L) 1470

Service ceiling (ft) 30,000
Passenger capacity (seats) 5
Freight capacity (lbs) 1500

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT Piper PA-31-350 TYPE OF CARRIER Navajo Chieftain

Aircraft Operating Expenses

(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)										
Total Depreciation & Rentals										
Crew										
Fuel and Oil										
Insurance and Other										
Total Flying Operations										

Total Operating Expense										
Per Airborne Hour ($)										
Per Revenue Passenger Mile (Scheduled Service)(¢)										
Per Available Seat Mile (Scheduled Service)(¢)										

Performance

(All revenue services unless noted otherwise)

Stage Length (Miles)										
Airborne Speed (MPH)										
Block to Block Speed (MPH)										
Fuel Consumed (All Services) (Gallons/Block Hour)										
Ton Load Factor (Scheduled Revenue Service) (Percent)										
Seat Load Factor (Scheduled Revenue Factor) (Percent)										

Performance Characteristics

Max. Crusing speed (MPH) 254
Econ. Cruising speed (MPH) 246
Range (Miles at econ. cruise) 1020

Fuel consumption (MPG at econ. cruise) 4.5
Minimum field length (ft) 1730
Climb rate (fpm at S/L) 1390

Service ceiling (ft) 27,700
Passenger capacity (seats) 5-9
Freight capacity (lbs) 2470

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT SHORT SD3-30 TYPE OF CARRIER _____

Aircraft Operating Expenses

(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)										
Total Depreciation & Rentals										
Crew										
Fuel and Oil										
Insurance and Other										
Total Flying Operations										
Total Operating Expense										
Per Airborne Hour ($)										
Per Revenue Passenger Mile (Scheduled Service)(¢)										
Per Available Seat Mile (Scheduled Service)(¢)										

Performance

(All revenue services unless noted otherwise)

Stage Length (Miles)										
Airborne Speed (MPH)										
Block to Block Speed (MPH)										
Fuel Consumed (All Services) (Gallons/Block Hour)										
Ton Load Factor (Scheduled Revenue Service) (Percent)										
Seat Load Factor (Scheduled Revenue Factor) (Percent)										

Performance Characteristics

Max. Crusing speed (MPH) 228
Econ. Cruising speed (MPH) 184
Range (Miles at econ. cruise) 500
max payload, 10,000#

Fuel consumption (MPG at econ. cruise) 1.4
Minimum field length (ft) 3470
Climb rate (fpm at S/L) 1210

Service ceiling (ft) 18,500
Passenger capacity (seats) 30
Freight capacity (lbs) 1002
7500 (freighter)

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT SWEARINGEN METRO II TYPE OF CARRIER _____

Aircraft Operating Expenses

(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)										
Total Depreciation & Rentals										
Crew										
Fuel and Oil										
Insurance and Other										
Total Flying Operations										

Total Operating Expense										
Per Airborne Hour ($)										
Per Revenue Passenger Mile (Scheduled Service)(¢)										
Per Available Seat Mile (Scheduled Service)(¢)										

Performance

(All revenue services unless noted otherwise)

Stage Length (Miles)										
Airborne Speed (MPH)										
Block to Block Speed (MPH)										
Fuel Consumed (All Services) (Gallons/Block Hour)										
Ton Load Factor (Scheduled Revenue Service) (Percent)										
Seat Load Factor (Scheduled Revenue Factor) (Percent)										

Performance Characteristics

Max. Crusing speed (MPH) 300
Econ. Cruising speed (MPH) 241
Range (Miles at econ. cruise) 2460

Fuel consumption (MPG at econ. cruise) 2.9
Minimum field length (ft) 3550
Climb rate (fpm at S/L) 2400

Service ceiling (ft) 27,000
Passenger capacity (seats) 20
Freight capacity (lbs) 4600

AIRCRAFT OPERATING EXPENSES AND PERFORMANCE

AIRCRAFT VFW-FOKKER 614 TYPE OF CARRIER _____

Aircraft Operating Expenses

(All services per block hour in dollars unless noted otherwise)

	1975		1974		1973		1972		1971	
	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range
Total Maintenance (Including Maintenance Burden)										
Total Depreciation & Rentals										
Crew										
Fuel and Oil										
Insurance and Other										
Total Flying Operations										
Total Operating Expense										
Per Airborne Hour ($)										
Per Revenue Passenger Mile (Scheduled Service)(¢)										
Per Available Seat Mile (Scheduled Service)(¢)										

Performance

(All revenue services unless noted otherwise)

Stage Length (Miles)										
Airborne Speed (MPH)										
Block to Block Speed (MPH)										
Fuel Consumed (All Services) (Gallons/Block Hour)										
Ton Load Factor (Scheduled Revenue Service) (Percent)										
Seat Load Factor (Scheduled Revenue Factor) (Percent)										

Performance Characteristics

Max. Crusing speed (MPH) 443
Econ. Cruising speed (MPH) _____
Range (Miles at econ. cruise) _____

Fuel consumption (MPG at econ. cruise) _____
Minimum field length (ft) 4350
Climb rate (fpm at S/L) 3100

Service ceiling (ft) 25,000
Passenger capacity (seats) 40
Freight capacity (lbs) _____

APPENDIX C

ATTITUDINAL SURVEY FORMS

TRAVEL AGENTS

Respondent _____ Phone _____

Title and Affiliation _____

Address _____

Interviewer _____ Date _____ Time _____

Nearest Airport _____

_____

1. Do you ever book airline passengers on flights departing from some airport other than the one nearest their homes? (If no, skip to #4.)

2. Why? (May select more than one)

   a) No appropriate service is provided locally.

   b) Service from the more distant airport involves:

      1) greater seat availability
      2) fewer connections
      3) shorter layovers
      4) more frequent schedules
      5) more popular airlines
      6) a better airport
      7) some other reason. Please describe _____

      _____

3. How many air passengers, excluding charters, did you book last year?

   _____

4. What percentage of your air customers were booked from the following airports last year? _____

	name	%
a)	local _____	_____
	next nearest _____	_____
	next nearest _____	_____
	other _____	_____

b) Can you give specific reasons (i.e., schedules, frequency, direct service, etc.) why airports other than the local one were used?

5. Please identify those cities to which your customers travel most frequently by any means of transportation and, for those which you feel are particularly poorly served by air, indicate what additional services or service alterations are required.

6. Since individual responses to this survey will be kept confidential, please name your major commercial and institutional clients so that we can contact them directly for their comments on air service.

7. Is the air service provided at (the local airport) better or worse now than in the past? When was it better or worse and why?

AIRLINE AND AIRPORT PERSONNEL

Respondent_____ Phone_____

Title and Affiliation_____

Address_____

Interviewer_____ Date_____ Time_____

Nearest Airport_____

_____

1. Do you often hear complaints from passengers about inadequate passenger or cargo service from this airport to other cities?

2. If yes, what are those cities and what complaints were made?

3. From your experience, what new or additional services from this airport might be well-received by the public? Please explain why?

4. What major local businesses or institutions frequently use the passenger and cargo service provided here and where do they go?

5. Is the air service provided here today better or worse than it was in the past? When was it better or worse and why?

CHAMBERS OF COMMERCE AND REGIONAL PLAN AGENCIES

Respondent_____ Phone_____

Title and Affiliation_____

Address_____

Interviewer_____ Date_____ Time_____

Nearest Airport_____

1. Are you aware of any specific additional air passenger or air cargo services that would be helpful to businesses or institutions in this area? If yes, what, why, and by whom?

2. Are there any other specific services that, although not presently needed, would promote growth in this area?

3. Do you know if people or freight from this area frequently depart from some airport other than the local one? Do you know why?

4. What local businesses and institutions are major users of air service?

5. Is the air service provided at (the local airport) better or worse now than in the past? When was it better or worse and why?

INSTITUTIONS AND BUSINESSES

Respondent _____ Phone _____

Title and Affiliation _____

Address _____

Interviewer _____ Date _____ Time _____

Nearest Airport _____

1. Please identify those cities to which your employees or freight travel most frequently (by any means) and for those which you feel are poorly served by air. Indicate what additional services or service alterations are required.

2. Do your employees and freight depart through the local airport or a more distant one? If more distant, which ones and why?

3. Are there new or additional air services that would benefit your organization? If so, what?

4. From the viewpoint of your organization, is the air service provided at (the local airport) better or worse now than in the past? When was it better or worse and why?

APPENDIX D

BEFORE AND AFTER ANALYSIS

MICHIGAN SCHEDULED AIR SERVICE STUDY
BEFORE AND AFTER ANALYSIS

City-Pair (To) - (From)	Origin-Destination Passengers 1965	1975	75 as a percentage of 65	Service Quality 1965	1975	Steps Better or (Worse)
Alpena - Milwaukee	30	320	1067	20.45	8.45	12
Lansing - Flint	10	20	200	20.80	5.02	16
Escanaba - Benton Harbor	20	90	450	25.00	10.75	14
Escanaba - Flint	20	50	250	25.74	13.00	13
- Hancock	10	130	1300	21.90	4.65	17
Flint - Lansing	10	20	200	18.50	5.03	13
Hancock - Escanaba	10	130	1300	15.15	4.65	11
- Menominee	10	60	600	15.00	6.00	9
Ironwood - Oshkosh	30	60	200	21.55	10.30	11
Jackson - Pellston	10	20	200	29.60	17.60	12
Kalamazoo - Wausau	30	300	1000	15.15	6.15	9
Menominee - Hancock	10	60	600	14.25	3.00	11
Alpena - Indianapolis	10	320	3200	13.75	5.52	8
Benton Harbor - Escanaba	20	90	450	16.75	9.25	8
Flint - Muskegon	90	260	289	12.10	4.60	8
Ironwood - Muskegon	10	50	500	17.95	9.70	8
Jackson - Beloit	30	40	133	11.55	4.05	8
- Des Moines	70	300	429	13.35	5.11	8
Detroit - Pellston	2840	6370	224	8.55	2.00	7
Jackson - St. Louis	80	370	463	12.30	5.55	7
Pellston - Dallas	140	890	636	11.80	5.00	7
Alpena - Cleveland	190	920	484	8.40	2.50	6
- Muskegon	20	40	200	20.80	14.80	6
Lansing - Escanaba	810	3510	433	10.50	4.05	6
Traverse City - Cincinnati	430	1590	370	13.00	7.00	6
- Minneapolis	310	1750	565	13.85	7.85	6
Benton Harbor - Iron Mountain	10	30	300	15.15	9.15	6
Flint - Lincoln	110	220	200	8.55	3.00	6
Grand Rapids - Columbus	1670	3880	232	12.30	6.24	6
Hancock - Saginaw	120	70	58	20.10	14.10	6
Ironwood - Grand Rapids	60	480	800	17.00	11.00	6
Kalamazoo - Milwaukee	760	2310	304	12.10	6.10	6
Pellston - Washington, D.C.	380	1150	303	11.25	5.50	6
Muskegon - Alpena	20	40	200	22.30	16.30	6
Marquette - Flint	10	130	1300	20.20	14.20	6
Median			429			8.6
Alpena - New York	160	580	363	9.90	4.50	5
- Washington, D.C.	60	500	833	9.30	4.50	5
Lansing - Menominee	480	900	188	8.65	4.15	5
Traverse City - Cleveland	1110	2930	264	12.00	7.50	5
- Detroit	6260	18020	288	8.70	3.45	5
Sault Ste. Marie - Cleveland	630	990	157	13.15	8.65	5
Detroit - Sault Ste. Marie	2600	4200	162	9.78	4.29	5
Flint - Escanaba	20	50	250	17.50	13.00	5
- Hancock	60	90	150	18.40	13.65	5
- Marquette	10	130	1300	19.45	14.95	5

MICHIGAN SCHEDULED AIR SERVICE STUDY
BEFORE AND AFTER ANALYSIS

City-Pair (To) - (From)	Origin-Destination Passengers 1965	1975	75 as a percentage of 65	Service Quality 1965	1975	Steps Better or (Worse)
Grand Rapids - Escanaba	760	1380	182	8.70	4.20	5
Hancock - Cincinnati	50	270	540	11.30	6.00	5
Iron Mountain - Flint	10	50	500	18.80	13.55	5
Ironwood - Detroit	280	1570	561	14.90	10.30	5
- Kalamazoo	20	90	450	16.80	12.30	5
- Milwaukee	750	1930	257	10.60	6.10	5
- Minneapolis	180	530	294	14.40	9.90	5
- New York	310	630	203	13.40	8.00	5
Jackson - Milwaukee	220	430	195	9.60	5.10	5
Kalamazoo - Detroit	2910	9430	324	3.15	-1.50	5
- La Crosse	10	150	1500	12.70	7.45	5
- Saginaw	90	130	144	15.90	9.90	5
Pellston - Cincinnati	1110	1110	100	13.50	8.25	5
- Detroit	2840	6370	224	8.55	4.05	5
- Minneapolis	20	750	3750	15.95	9.95	5
Marquette - Sioux Falls	20	40	200	18.55	14.05	5
Median			261			5
Saginaw - Atlanta	1030	4190	407	6.50	2.50	4
- San Diego	1080	3290	305	6.00	2.50	4
- W. Palm Beach	100	1660	1660	9.00	5.00	4
Lansing - Milwaukee	6210	10020	161	3.65	0.15	4
Traverse City - Houston	140	2020	1443	11.00	7.00	4
- St. Louis	680	1510	222	8.10	4.50	4
- Washington, D.C.	590	2430	412	9.05	5.00	4
Sault Ste. Marie - Detroit	2600	4200	162	10.55	6.80	4
- Pittsburgh	180	370	206	13.65	9.65	4
- Los Angeles	440	430	98	11.50	7.50	4
Detroit - Menominee	1160	1590	137	9.28	5.01	4
Escanaba - Detroit	1650	3370	204	9.73	5.93	4
Benton Harbor - Cleveland	470	460	98	10.75	7.00	4
- Marquette	50	100	200	14.95	10.90	4
- Tampa	410	1160	283	8.00	4.50	4
Flint - Kalamazoo	20	50	250	13.73	9.25	4
Hancock - Benton Harbor	10	40	400	13.20	9.45	4
Iron Mountain - Cincinnati	30	140	467	8.75	5.00	4
- Saginaw	20	70	350	19.00	15.25	4
Ironwood - Los Angeles	180	470	261	13.00	9.50	4
- Madison	190	760	400	10.05	6.55	4
Jackson - Madison	50	280	560	11.45	7.70	4
- Minneapolis	170	550	324	9.60	5.12	4
Kalamazoo - St. Louis	1510	363	24	8.00	4.25	4
Pellston - Indianapolis	310	780	252	10.70	6.95	4
- New York	1170	1990	170	9.55	5.50	4
Muskegon - Cleveland	1420	2950	208	6.95	2.50	4
- Detroit	2980	6150	206	3.65	0.15	4
Median			251			4

MICHIGAN SCHEDULED AIR SERVICE STUDY
BEFORE AND AFTER ANALYSIS

City-Pair (To) - (From)	Origin-Destination Passengers			Service Quality		
	1965	1975	75 as a percentage of 65	1965	1975	Steps Better or (Worse)
Alpena - Philadelphia	30	240	800	8.45	5.00	3
Saginaw - Kalamazoo	90	130	144	15.90	12.90	3
- New York	16990	22610	133	5.00	2.50	3
- Moline	500	880	176	5.90	2.50	3
Detroit - Alpena	1190	4840	407	5.04	2.04	3
- Escanaba	1650	3370	204	9.98	7.48	3
- Kalamazoo	2910	9430	324	2.39	-1.00	3
- Traverse City	6260	18020	288	3.04	0.00	3
Escanaba - Lansing	810	3510	433	7.05	4.16	3
- Washington, D.C.	170	480	282	10.79	7.79	3
Benton Harbor - St. Louis	520	920	177	7.45	4.45	3
- Traverse City	80	60	75	10.30	7.30	3
- Sault Ste. Marie	30	10	33	14.15	11.15	3
Flint - Boston	740	3270	442	5.50	3.00	3
Hancock - Minneapolis	320	900	281	15.10	12.10	3
Jackson - Kansas City	230	370	161	7.60	5.00	3
- La Crosse	10	30	300	13.95	10.95	3
Kalamazoo - Boston	1440	3800	264	9.00	6.50	3
- Washington, D.C.	1440	5560	386	7.25	4.00	3
Pellston - Jackson	10	20	200	19.10	16.10	3
- Kalamazoo	10	80	800	19.85	16.85	3
- St. Louis	590	1040	176	9.25	6.25	3
Muskegon - Escanaba	20	150	750	14.85	11.85	3
- Sault Ste. Marie	10	20	200	23.50	20.50	3
Menominee - Benton Harbor	20	10	50	13.15	10.17	3
- Houston	30	160	533	10.50	8.00	3
- Minneapolis	390	610	156	8.40	5.40	3
Median			234			3
Alpena - Boston	20	270	1350	9.45	7.23	2
- Detroit	1190	4840	407	5.05	2.79	2
Saginaw - Houston	3650	6370	175	6.50	5.00	2
- Iron Mountain	20	70	350	18.75	16.75	2
Lansing - Benton Harbor	20	60	300	7.75	6.25	2
- Detroit	3940	7750	197	- 0.40	- 1.90	2
- Green Bay	2400	3620	151	2.70	1.00	2
- Hancock	1440	3780	263	8.70	7.20	2
Sault Ste. Marie - Battle Creek	10	10	100	19.05	17.30	2
- New York	330	660	200	13.15	10.95	2
- Kalamazoo	10	70	700	18.75	16.50	2
Battle Creek - Iron Mountain	30	10	33	14.35	12.85	2
Detroit - Hancock	3840	8050	210	9.88	8.38	2
- Ironwood	280	1570	561	11.90	9.65	2
- Saginaw	5470	7560	138	0.52	- 0.98	2
Escanaba - Cleveland	310	420	135	10.77	8.52	2
- Grand Rapids	760	1380	182	5.70	3.45	2
- Minneapolis	680	950	140	9.73	7.98	2

MICHIGAN SCHEDULED AIR SERVICE STUDY
BEFORE AND AFTER ANALYSIS

City-Pair (To) - (From)	Origin-Destination Passengers 1965	1975	75 as a percentage of 65	Service Quality 1965	1975	Steps Better or (Worse)
Benton Harbor - Hancock	10	40	400	16.20	13.95	2
- Lansing	20	60	300	6.25	4.00	2
- Manistee	10	30	300	7.50	6.00	2
- Miami	620	920	148	7.50	5.50	2
- Pellston	10	50	500	12.25	10.00	2
- Washington, D.C.	490	1190	243	7.85	5.50	2
Flint - Atlanta	350	2330	666	4.50	2.50	2
- Cleveland	4560	8100	178	2.28	0.00	2
- Los Angeles	3820	6160	161	6.00	4.50	2
- Menominee	10	10	100	18.30	16.78	2
- Tampa	700	7050	1007	6.00	4.00	2
Grand Rapids - Cleveland	11010	21900	199	3.40	1.50	2
- Green Bay	3870	6250	161	1.50	0.00	2
- Menominee	610	840	138	5.80	4.30	2
- Minneapolis	6120	15820	258	4.00	2.50	2
- Washington, D.C.	5480	15770	288	4.50	2.50	2
Hancock - Chicago	2900	6030	208	6.40	4.15	2
- Green Bay	770	1220	158	4.30	2.80	2
- Lansing	1440	3780	263	10.20	8.00	2
- Traverse City	10	30	300	22.15	20.65	2
Iron Mountain - Battle Creek	30	10	33	15.10	13.60	2
- Benton Harbor	10	30	300	10.65	8.40	2
- New York	530	1210	228	7.50	5.50	2
Ironwood - Chicago	1630	3800	233	8.75	7.25	2
- Lansing	150	760	507	14.55	12.30	2
- Wausau	80	80	100	7.60	6.10	2
Kalamazoo - Beloit	10	100	1000	5.10	2.85	2
- Madison	390	1250	321	6.25	4.25	2
- Philadelphia	1700	4420	260	6.90	5.00	2
- Sault Ste. Marie	10	70	700	18.00	15.78	2
- South Bend	160	80	50	1.98	0.23	2
Pellston - Battle Creek	-	10	-	19.10	17.60	2
- Chicago	5710	8560	150	6.75	4.50	2
- Los Angeles	440	710	161	11.00	9.50	2
Muskegon - Lansing	180	190	106	3.31	1.81	2
- Tampa	660	3190	483	6.50	4.50	2
Marquette - Chicago	5120	8470	165	7.40	5.90	2
- Dayton	200	820	410	12.55	10.30	2
- Minneapolis	1050	2680	255	12.75	10.50	2
- Rochester, MN.	110	250	227	20.25	18.75	2
- Washington, D.C.	370	1050	284	8.85	7.00	2
Menominee - Chicago	2750	4100	149	5.65	3.40	2
- Detroit	1160	1590	137	8.25	6.00	2
Median			228			2
Alpena - Chicago	580	980	169	6.70	5.95	1
Saginaw - Cleveland	9210	14100	153	3.55	2.50	1

MICHIGAN SCHEDULED AIR SERVICE STUDY
BEFORE AND AFTER ANALYSIS

City-Pair (To) - (From)	Origin-Destination Passengers 1965	1975	75 as a percentage of 65	Service Quality 1965	1975	Steps Better or (Worse)
Saginaw - Los Angeles	5720	8770	153	4.50	4.00	1
- Philadelphia	4880	6640	136	5.65	4.50	1
- San Francisco	4090	7300	178	4.50	4.00	1
- Washington, D.C.	4750	10640	224	5.85	4.50	1
Lansing - Boston	1090	5360	492	4.50	4.00	1
- Chicago	25270	41170	163	0.00	- 1.00	1
- Denver	2010	4950	246	5.00	4.50	1
- Los Angeles	5330	8070	151	5.50	5.00	1
- Marquette	1750	4770	273	7.50	6.75	1
- Minneapolis	4150	8980	216	4.50	4.00	1
- Muskegon	180	190	106	1.50	0.05	1
- San Francisco	3820	5260	138	5.00	4.00	1
- Washington, D.C.	8200	15300	187	4.50	4.00	1
Traverse City - Chicago	10730	18590	173	3.35	2.60	1
- Los Angeles	810	1970	243	8.50	7.50	1
Sault Ste. Marie - San Francisco	360	460	128	11.50	10.50	1
Battle Creek - St. Louis	900	610	68	7.90	6.42	1
- San Francisco	1120	560	50	6.50	6.00	1
Detroit - Benton Harbor	140	670	479	6.65	5.91	1
- Lansing	3940	7750	197	- 0.90	- 1.89	1
- Marquette	4150	9200	222	8.69	7.69	1
- Muskegon	2980	6150	206	2.90	2.16	1
Escanaba - Green Bay	330	490	148	4.00	2.52	1
- Los Angeles	270	490	181	8.00	7.00	1
Benton Harbor - Atlanta	110	990	900	5.50	4.50	1
- Detroit	140	670	479	5.90	5.16	1
Flint - Iron Mountain	10	50	500	15.30	13.84	1
- New York	7630	13170	173	3.00	2.50	1
- Philadelphia	2670	5120	192	4.50	4.00	1
- South Bend	60	240	400	8.21	7.42	1
Grand Rapids - Benton Harbor	90	130	144	0.90	0.15	1
- Chicago	51770	71720	139	- 1.00	- 2.00	1
- Dayton	1650	2680	162	9.40	7.92	1
- Lansing	370	190	51	0.28	- 0.72	1
- Milwaukee	11450	16020	140	2.40	1.00	1
- New York	22000	37990	173	3.00	2.50	1
- Philadelphia	5250	10570	201	5.00	4.00	1
- Tampa	2230	12890	578	5.00	4.50	1
Hancock - Detroit	3840	8050	210	10.60	9.85	1
- Flint	60	90	150	20.65	19.90	1
- Los Angeles	240	590	246	10.50	9.50	1
- Milwaukee	800	2280	285	5.30	4.55	1
- Muskegon	60	200	333	12.00	11.25	1
Iron Mountain - Green Bay	600	350	58	2.54	1.80	1
- Hancock	260	120	46	4.02	2.53	1
Jackson - Chicago	3660	4960	136	2.90	2.15	1
- Los Angeles	510	320	63	7.00	6.50	1
- New York	120	430	358	9.20	8.50	1
Kalamazoo - Chicago	15820	28120	178	- 1.00	- 2.00	1
- Cleveland	2060	5920	287	7.25	6.50	1

MICHIGAN SCHEDULED AIR SERVICE STUDY
BEFORE AND AFTER ANALYSIS

City-Pair (To) - (From)	Origin-Destination Passengers 1965	1975	75 as a percentage of 65	Service Quality 1965	1975	Steps Better or (Worse)
Kalamazoo - Los Angeles	3730	5090	136	5.00	4.50	1
- Minneapolis	1850	4530	245	5.35	4.00	1
- New York	5190	13000	250	6.00	5.00	1
Muskegon - Milwaukee	9160	12140	133	0.57	- 0.92	1
- St. Louis	990	2360	238	5.65	4.90	1
- Washington, D.C.	1320	2200	167	5.00	4.50	1
Marquette - Detroit	4150	9200	222	9.45	8.70	1
- Kalamazoo	50	270	540	14.20	13.45	1
- Lansing	1750	4770	273	8.25	7.50	1
- Milwaukee	2300	3670	160	8.50	7.75	1
- New York	820	2080	254	8.05	7.00	1
Menominee - Cleveland	230	280	122	8.55	7.80	1
- Green Bay	240	300	125	2.75	2.00	1
- Philadelphia	380	440	116	7.60	6.50	1
- Washington, D.C.	330	420	127	6.50	5.50	1
Median			178			1
Alpena - Sault Ste. Marie	40	10	25	9.00	9.25	-
Saginaw - Flint	180	20	11	2.03	2.05	-
- Tampa	910	7530	827	5.00	5.00	-
- Traverse City	200	550	275	4.70	4.70	-
Lansing - Grand Rapids	370	190	51	- 1.00	- 1.00	-
- Ironwood	150	760	507	12.30	12.30	-
- Philadelphia	3300	7020	213	4.00	4.00	-
Traverse City - Pellston	80	160	200	1.90	1.90	-
- Saginaw	200	550	275	6.20	6.20	-
- Sault Ste. Marie	170	220	129	3.10	3.10	-
Sault Ste. Marie - Alpena	40	10	25	9.25	9.25	-
- Chicago	3800	3490	92	7.95	7.95	-
Detroit - Grand Rapids	9550	22550	236	0.37	0.63	-
- Manistee	550	550	100	7.95	7.72	-
Escanaba - Marquette	10	50	500	1.95	1.95	-
- Milwaukee	990	1590	161	6.53	6.53	-
Benton Harbor - Chicago	6620	8370	126	- 0.50	- 0.85	-
Flint - Alpena	100	100	100	3.02	3.50	-
- Chicago	15150	28860	190	- 0.50	- 0.50	-
- Washington, D.C.	2500	6010	240	4.00	4.00	-
Grand Rapids - Detroit	9550	22550	236	- 1.00	- 1.00	-
- Flint	360	60	17	9.30	9.30	-
- Hancock	710	1770	249	5.85	5.85	-
- Miami	4210	7880	187	4.50	4.50	-
- Saginaw	530	500	94	6.30	6.30	-
- Traverse City	870	1160	133	1.60	1.60	-
Hancock - Iron Mountain	260	120	46	2.52	2.52	-
- Washington, D.C.	160	640	400	10.20	10.20	-
Iron Mountain - Chicago	3570	5420	152	3.15	3.15	-
- Milwaukee	1550	2780	179	2.75	2.75	-

MICHIGAN SCHEDULED AIR SERVICE STUDY
BEFORE AND AFTER ANALYSIS

City-Pair (To) - (From)	Origin-Destination Passengers			Service Quality		
	1965	1975	75% as a percentage of 65	1965	1975	Steps Better or (Worse)
Iron Mountain - Oshkosh	60	10	17	6.15	6.15	-
Jackson - Detroit	340	560	165	1.90	1.90	-
Kalamazoo - Duluth	130	330	254	10.45	10.45	-
Muskegon - Boston	1140	2290	201	4.50	4.50	-
- Chicago	19430	22640	117	0.00	0.40	-
- Flint	90	260	289	4.60	4.60	-
- New York	5510	6840	122	5.00	5.00	-
Marquette - Benton Harbor	50	100	200	11.95	11.95	-
- Escanaba	10	50	500	2.70	2.70	-
- Green Bay	1340	2240	167	3.55	3.80	-
Menominee - Grand Rapids	610	840	138	2.80	2.80	-
- Lansing	480	900	188	5.65	5.65	-
Median			170			-
Saginaw - Grand Rapids	530	500	94	4.80	5.30	(1)
Traverse City - New York	2410	4260	177	5.50	6.00	(1)
Sault Ste. Marie - Pellston	90	60	67	2.67	3.40	(1)
- Lansing	230	180	78	12.70	13.70	(1)
- Milwaukee	280	500	179	14.25	15.00	(1)
Detroit - Flint	2920	2980	102	- 0.76	0.24	(1)
- Iron Mountain	2900	3990	138	5.78	7.23	(1)
- Jackson	340	560	165	0.67	1.92	(1)
Escanaba - Chicago	2430	4260	175	4.67	5.42	(1)
Benton Harbor - Denver	260	950	365	4.50	5.00	(1)
- Los Angeles	1030	1430	139	4.50	5.00	(1)
- Minneapolis	1280	3910	305	4.80	5.55	(1)
- Phoenix	270	1120	415	6.00	6.50	(1)
- San Francisco	770	1010	131	4.50	5.00	(1)
Flint - Grand Rapids	360	60	17	9.30	10.05	(1)
- Milwaukee	1060	4180	394	8.20	9.45	(1)
- Minneapolis	1140	3870	339	4.00	5.00	(1)
- San Francisco	2090	3440	165	5.50	6.00	(1)
Grand Rapids - Pellston	540	480	89	3.55	4.30	(1)
Iron Mountain - Cleveland	650	450	69	7.55	8.30	(1)
- Denver	90	450	500	6.50	7.00	(1)
- Lansing	1730	2300	133	6.15	6.90	(1)
- Los Angeles	230	690	300	8.00	8.50	(1)
Ironwood - Green Bay	160	490	306	5.85	6.60	(1)
Kalamazoo - Marquette	50	270	540	11.20	11.95	(1)
Manistee - Cleveland	110	120	109	10.50	11.25	(1)
- Lansing	20	20	100	6.85	8.10	(1)
Pellston - Sault Ste. Marie	90	60	67	1.90	2.60	(1)
- Traverse City	80	160	200	2.65	3.40	(1)
Muskegon - Saginaw	130	30	23	18.20	18.95	(1)
- San Francisco	1680	2380	142	4.50	5.50	(1)
Marquette - Cleveland	1140	1330	117	9.75	10.50	(1)
- Grand Rapids	1090	2840	168	6.15	6.90	(1)

MICHIGAN SCHEDULED AIR SERVICE STUDY
BEFORE AND AFTER ANALYSIS

City-Pair (To) - (From)	Origin-Destination Passengers 1965	1975	75 as a percentage of 65	Service Quality 1965	1975	Steps Better or (Worse)
Marquette - Oshkosh	60	140	233	8.15	8.90	(1)
Menominee - Milwaukee	400	740	185	5.25	6.00	(1)
- New York	680	550	81	6.00	6.50	(1)
Median			154			(1)
Alpena - Miami	70	240	343	7.50	9.00	(2)
Saginaw - Chicago	34800	43810	126	- 1.25	.50	(2)
Lansing - Cleveland	4920	11830	240	0.00	2.00	(2)
- Iron Mountain	1730	2300	133	4.65	6.90	(2)
- New York	9870	23840	242	2.00	4.00	(2)
Traverse City - Grand Rapids	870	1160	133	4.60	6.10	(2)
Sault Ste. Marie - Traverse City	170	220	129	3.85	5.35	(2)
Battle Creek - Atlanta	360	540	150	5.50	7.50	(2)
- Cincinnati	340	430	126	7.60	9.35	(2)
- Memphis	220	620	282	6.95	8.45	(2)
- Minneapolis	730	420	58	5.30	6.81	(2)
- Philadelphia	1690	670	40	4.00	6.00	(2)
- Sault Ste. Marie	10	10	100	18.05	20.03	(2)
Benton Harbor - Grand Rapids	90	130	144	0.00	1.90	(2)
Flint - Detroit	2920	2980	102	- 0.76	1.50	(2)
Grand Rapids - Ironwood	60	480	800	11.00	12.50	(2)
- Marquette	1690	2840	168	3.15	5.40	(2)
Hancock - Grand Rapids	710	1770	249	7.35	9.60	(2)
Iron Mountain - Detroit	2900	3990	138	5.75	8.00	(2)
- Grand Rapids	1030	1550	150	3.30	5.55	(2)
- Rochester, MN.	30	60	200	14.50	16.00	(2)
Kalamazoo - Pellston	10	80	800	13.10	14.60	(2)
Manistee - Detroit	550	550	100	7.20	8.70	(2)
- Grand Rapids	280	190	68	4.75	6.25	(2)
Muskegon - Los Angeles	2910	4860	167	4.50	6.00	(2)
- Marquette	30	190	633	13.05	14.55	(2)
- Minneapolis	1630	4200	258	4.90	6.40	(2)
Marquette - Manistee	10	10	100	23.15	25.40	(2)
- Muskegon	30	190	633	12.80	14.30	(2)
Median			150			(2)
Saginaw - Sault Ste. Marie	170	30	18	7.25	10.25	(3)
Traverse City - Iron Mountain	10	20	200	24.80	27.80	(3)
- Lansing	290	210	72	8.05	11.30	(3)
Escanaba - Muskegon	20	150	750	11.85	15.10	(3)
Grand Rapids - Iron Mountain	1030	1550	150	2.00	4.80	(3)
Kalamazoo - Traverse City	20	40	200	10.40	13.40	(3)
Manistee - Benton Harbor	10	30	300	4.50	7.50	(3)
Saginaw - Detroit	5470	7560	138	- 1.00	3.25	(4)

MICHIGAN SCHEDULED AIR SERVICE STUDY
BEFORE AND AFTER ANALYSIS

City-Pair (To) - (From)	Origin-Destination Passengers 1965	1975	75 as a percentage of 65	Service Quality 1965	1975	Steps Better or (Worse)
Traverse City - Flint	270	40	15	7.50	11.25	(4)
Benton Harbor - Menominee	20	10	50	12.40	16.17	(4)
Grand Rapids - Sault Ste. Marie	670	660	99	3.95	7.70	(4)
Iron Mountain- Marquette	150	40	27	1.22	4.97	(4)
Jackson - Cleveland	800	310	39	6.00	10.00	(4)
Manistee - Chicago	1770	1250	71	6.60	10.35	(4)
- New York	330	180	55	5.50	9.40	(4)
- St. Louis	180	230	128	9.80	13.55	(4)
- Washington, D.C.	120	120	100	7.52	11.25	(4)
Marquette - Iron Mountain	150	40	27	2.72	6.45	(4)
- Menominee	80	30	38	4.00	7.75	(4)
Alpena - Saginaw	190	200	105	1.70	6.20	(5)
Saginaw - Pellston	40	30	75	6.00	10.50	(5)
Lansing - Sault Ste. Marie	230	180	78	12.95	17.50	(5)
- Traverse City	290	210	72	8.30	12.80	(5)
Traverse City - Hancock	10	30	300	16.15	20.65	(5)
Sault Ste. Marie - Benton Harbor	30	10	33	14.90	9.65	(5)
- Flint	180	10	6	10.00	14.50	(5)
- Muskegon	10	20	200	13.75	18.25	(5)
Manistee - Baltimore	10	150	1500	9.70	14.25	(5)
- San Francisco	100	110	110	9.50	14.50	(5)
Pellston - Lansing	100	50	50	9.55	14.05	(5)
Alpena - Flint	100	100	100	3.00	9.00	(6)
Saginaw - Alpena	190	200	105	1.70	15.95	(14)
- Muskegon	130	30	23	6.20	15.20	(9)
Lansing - Manistee	20	20	100	6.85	18.10	(11)
- Pellston	100	50	50	10.30	16.30	(6)
Traverse City - Benton Harbor	80	60	75	5.80	11.80	(6)
Sault Ste. Marie - Philadelphia	240	500	208	17.00	9.50	(8)
- Saginaw	170	30	18	11.75	22.25	(11)
- Grand Rapids	670	660	99	5.45	12.95	(8)
Flint - Saginaw	180	20	11	0.29	6.55	(6)
Iron Mountain - Traverse City	10	20	200	23.30	30.05	(7)
Ironwood - Duluth	230	130	57	0.58	6.35	(6)
Manistee - Houston	10	170	1700	16.20	8.50	(8)
- Marquette	10	10	100	20.15	26.90	(7)
Pellston - Benton Harbor	10	50	500	7.75	13.75	(6)
- Grand Rapids	540	480	89	5.05	11.80	(7)
- Saginaw	40	30	75	7.50	15.00	(8)
Menominee - Marquette	80	30	38	3.25	16.75	(14)
Median			84			(5.67)