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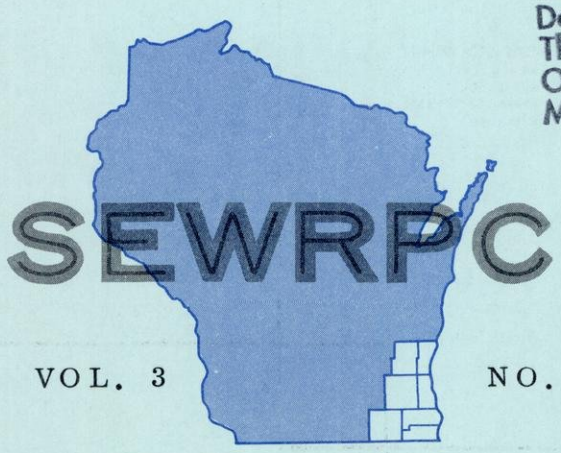

VOL. 3 NO. 4

September 1971

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THE TECHNICAL RECORD

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CHARACTERISTICS OF AIR AND GROUND TRAVEL GENERATED BY GENERAL MITCHELL FIELD AIRPORT TERMINAL—MAY 1968

by Sheldon W. Sullivan, Special Projects Planner

INTRODUCTION

In April 1968 the Southeastern Wisconsin Regional Planning Commission was requested by the Milwaukee County Department of Public Works to conduct an origin-destination study of air and ground travel generated by the airport terminal facilities at General Mitchell Field. This survey was to be carried out in conjunction with a week-long survey of vehicular and passenger traffic at the airport conducted by the Milwaukee County Department of Public Works and the Milwaukee County Airport Department to provide data required for the preparation of a passenger and air cargo master plan for this most important commercial airport. Accordingly, on May 16, 1968, the Southeastern Wisconsin Regional Planning Commission, with the cooperation of the Milwaukee County Department of Public Works and the Wisconsin Department of Transportation, conducted an origin-destination survey of air and ground travel at the General Mitchell Field airport terminal.

CONDUCT OF THE SURVEY

To obtain the necessary data, interviews were conducted with the drivers and passengers of vehicles as they entered or exited the airport terminal of General Mitchell Field during the 16-hour period between 6 a.m. and 10 p.m. on Thursday, May 16, 1968. During this 16-hour period, approximately 7,200 vehicles were stopped and approximately 11,100 persons interviewed. Twice during the morning peak traffic period, because of heavy rain, and on five other occasions when the number of vehicles waiting in the interviewing lanes became excessive, interviewing was halted; and the vehicles were permitted to pass unstopped through the interview stations. To account for vehicles and persons thus excluded from the survey, and for vehicles and persons entering or leaving the airport terminal during the eight hours of the day—12:00 a.m. to 6 a.m. and 10 p.m., to 12:00 a.m.—in which interviewing was not scheduled, adjustments were made to person-trip and vehicle-trip data within each one-hour period on the basis of observed vehicle counts, observed person counts, machine vehicle counts, and auto occupancy rates obtained at the terminal during the course of the survey.

Information obtained in the survey concerning persons and the ground trips which they made to and from the terminal included the sex and age of the tripmaker; the geographic location and the type of land use at the non-airport end of the trip; the purpose of the trip to the terminal and at the non-airport end of the trip; the mode of travel utilized; the number of occupants in the vehicle; and the times of arrival and departure. From enplaning or deplaning airline passengers only, information concerning the home address and the place of origin or the ultimate destination of the flight, as the case may be, was also obtained. Children under five years of age were not counted in the survey, nor were the trips that they made.

Information obtained in the survey concerning trucks entering or leaving the terminal included the truck type; the geographic location and the type of land use at the non-airport end of the trip; the purpose of the trip to the airport and at the non-airport end of the trip; the times of arrival and departure; the number of occupants in the truck; and the type of commodity picked up or delivered (see Figure 1).

Figure 1

INBOUND AND OUTBOUND AIRPORT SURVEY FORMS

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION
AIRPORT SURVEY
INBOUND

VEHICLE TYPE

1. AUTO-WISC.
2. AUTO-NOT WISC.
3. TAXI
4. LIMOUSINE
5. BUS
6. CYCLE
7. 2 AXLE SINGLE TIRE LIGHT
8. 2 AXLE SINGLE TIRE HEAVY
9. 2 AXLE DUAL TIRE
10. 3 AXLE SINGLE UNIT
11. 3 AXLE COMBINATION
12. 4 AXLE COMBINATION
13. 5 AXLE COMBINATION

VEHICLE OCCUPANCY ☐

DATE: _____
INTERVIEWER: _____

SAMPLE NUMBER ☐☐☐☐☐☐

STA. TIME: HOUR MIN. ORDER LINE

SHEET ___ OF ___ SHEETS

NO	AGE	SEX	TRIP PURPOSE AT AIRPORT	ORIGIN ADDRESS	LAND USE AT ORIGIN	TRIP PURPOSE AT ORIGIN	AIRLINE PASSENGER ONLY: ULTIMATE DESTINATION	AIRLINE PASSENGER ONLY: HOME ADDRESS	AUTO AVAIL.	COMMODITY
1		M F							Y N	
2		M F							Y N	
3		M F							Y N	
4		M F							Y N	
5		M F							Y N	
6		M F							Y N	

TRIP PURPOSE CODES

1. HOME
2. EMPLOYED AT AIRPORT
3. OTHER WORK CONNECTED BUSINESS
4. PERSONAL BUSINESS
5. MEDICAL-DENTAL
6. SCHOOL
7. SOCIAL-EAT MEAL
8. CHANGE TRAVEL MODE
9. SERVE PASSENGER
10. SHOPPING
11. RECREATION
12. RIDE
13. OVERNIGHT
14. PICK UP GOODS
15. DELIVER GOODS
16. PICK UP AND DELIVER GOODS
17. TO BASE OF OPERATIONS
18. SERVICE CALL

LAND USE CODES

1. RESIDENTIAL
2. HOTEL/MOTEL
3. COMMERCIAL
4. MANUFACTURING
5. TRANS, COMM. UTIL.
6. INSTITUTIONAL-GOV'T.
7. RECREATIONAL
8. AGRICULTURAL
9. OPEN LANDS & WATER AREAS

COMMODITY

1. TERMINAL SUPPORT
2. AIRLINE SUPPORT
3. MAIL
4. AIR FREIGHT-PERISHABLE
5. AIR FREIGHT-NONPERISHABLE
6. FUEL
7. OTHER
8. EMPTY

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION
AIRPORT SURVEY
OUTBOUND

VEHICLE TYPE

1. AUTO-WISC.
2. AUTO-NOT WISC.
3. TAXI
4. LIMOUSINE
5. BUS
6. CYCLE
7. 2 AXLE SINGLE TIRE LIGHT
8. 2 AXLE SINGLE TIRE HEAVY
9. 2 AXLE DUAL TIRE
10. 3 AXLE SINGLE UNIT
11. 3 AXLE COMBINATION
12. 4 AXLE COMBINATION
13. 5 AXLE COMBINATION

VEHICLE OCCUPANCY ☐

DATE: _____
INTERVIEWER: _____

SAMPLE NUMBER ☐☐☐☐☐☐

STA. TIME: HOUR MIN. ORDER LINE

SHEET ___ OF ___ SHEETS

NO	AGE	SEX	TRIP PURPOSE AT AIRPORT	DESTINATION ADDRESS	LAND USE AT DESTINATION	TRIP PURPOSE AT DESTINATION	AIRLINE PASSENGER ONLY: ORIGIN PLACE	AIRLINE PASSENGER ONLY: HOME ADDRESS	AUTO AVAIL.	COMMODITY
1		M F							Y N	
2		M F							Y N	
3		M F							Y N	
4		M F							Y N	
5		M F							Y N	
6		M F							Y N	

TRIP PURPOSE CODES

1. HOME
2. EMPLOYED AT AIRPORT
3. OTHER WORK CONNECTED BUSINESS
4. PERSONAL BUSINESS
5. MEDICAL-DENTAL
6. SCHOOL
7. SOCIAL-EAT MEAL
8. CHANGE TRAVEL MODE
9. SERVE PASSENGER
10. SHOPPING
11. RECREATION
12. RIDE
13. OVERNIGHT
14. PICK UP GOODS
15. DELIVER GOODS
16. PICK UP AND DELIVER GOODS
17. TO BASE OF OPERATIONS
18. SERVICE CALL

LAND USE CODES

1. RESIDENTIAL
2. HOTEL/MOTEL
3. COMMERCIAL
4. MANUFACTURING
5. TRANS, COMM. UTIL.
6. INSTITUTIONAL-GOV'T
7. RECREATIONAL
8. AGRICULTURAL
9. OPEN LANDS & WATER AREAS

COMMODITY

1. TERMINAL SUPPORT
2. AIRLINE SUPPORT
3. MAIL
4. AIR FREIGHT-PERISHABLE
5. AIR FREIGHT-NONPERISHABLE
6. FUEL
7. OTHER
8. EMPTY

Source: SEWRPC.

The survey data indicate that a total of approximately 8,900 vehicle trips[1] and approximately 14,200 person trips[2] were generated by the General Mitchell Field airport terminal on the date of the survey, approximately evenly divided in each instance by direction. The estimated 8,900 vehicle trips generated by the airport terminal as derived from survey data were found tc be approximately 4 percent below average weekday estimates of vehicle trips derived from machine count data recorded on the airport access roads just previous to the survey in the period April 30 through May 6, 1968, in a program conducted by the Milwaukee County Department of Public Works.

No independent estimate of person trip volumes generated by the airport terminal is known or is likely to exist for the general period of the survey. If the relationship of person trip volumes to vehicle trip volumes, however, was approximately similar in the period during which both the above-noted vehicle trip estimates were made, as might be commonly expected, it would indicate that the person trip volumes as derived from the survey data would also fall approximately 4 percent below the number of person trips made on any average weekday during this period.

The survey data indicate that there were approximately 4,100 airline enplanements and deplanements generated by the airport terminal on the date of the survey, excluding approximately 200 intra-airport transferees[3], the trips of which, having no true origins or destinations within this Region, cannot be said, therefore, to have been generated by the airport terminal. The estimated 4,100 airline passengers carried on the survey date, as derived from survey data, were found to be approximately 4.5 percent below estimates of such passengers on that date and about 6.7 percent below the weekday average for the week of the survey, as compiled from airline records at the terminal. Airline records included, however, intra-airport transferees which, at General Mitchell Field, were estimated to amount to approximately 5 percent of total airline passengers. If the number of intra-airport transferees is deducted from airline estimates of total daily airline passengers, the number of total daily airline passengers, as derived from survey data, which data do not include intra-airport passengers, would fall within 1 percent of total daily airline passengers and within 2 percent of estimated average weekday airline passengers for the week of the survey, as derived from airline data. The estimates of total person and total vehicle trips given here, it should be emphasized, relate to trips generated by the airport terminal only and do not, therefore, include an estimated 1,100 vehicle trips and an estimated 1,600 person trips generated by general aviation and corporate operations and by military installations located elsewhere within General Mitchell Field.

FORECASTS OF GROWTH IN AIRLINE PASSENGER VOLUMES

Table 1 and Figure 2 present a comparison of airline passenger volumes for 16 large and medium air traffic hubs throughout the United States for the year 1965, as well as of forecast volumes for these air traffic hubs for the years 1970, 1975, and 1980, as prepared by the Federal Aviation Administration (FAA). Standard Metropolitan Statistical Areas (SMSA's), generating more than 1.0 percent of the nation's scheduled air-carrier domestic passengers, are classified by the FAA as large air traffic hubs; and those generating between 0.25 percent and 0.99 percent are classified as medium hubs. The Milwaukee SMSA generated approximately 816,500 air-carrier enplaned domestic passengers, or 0.56 percent of the nation's total scheduled air-carrier enplaned domestic passengers in 1968 and is, by the established standards, therefore, classified as a medium traffic hub.

---

[1] *A vehicle trip is defined here as a one-way journey between the airport terminal and a point of origin or destination made by an automobile; motor bus, including school bus, taxi, airport limousine, or carryall; or a truck.*

[2] *A person trip is defined here as a one-way journey between the airport terminal and a point of origin or destination made as an automobile driver or as a passenger in an automobile or motor bus, including school bus, taxi, airport limousine, or carryall, or as a driver or passenger in a truck only when the trip by truck is made for personal use. Trips to and from the airport terminal by the driver of motor buses, including school buses, taxis, airport limousines, or carryalls, were not counted as person trips, nor were drivers of trucks in commerce at the airport terminal.*

[3] *The number of intra-airport transferees at General Mitchell Field on the date of the survey was calculated by applying rates of on-line and inter-line transferees, as estimated by the air carriers, to the total number of enplaning and deplaning passengers as recorded by the air carriers for the survey date. Such estimated rates ranged by carrier from about 3 to 14 percent.*

Table 1

ACTUAL AND FORECAST AIRLINE VOLUMES (PASSENGER ENPLANEMENTS AND DEPLANEMENTS) FOR SELECTED LARGE AND MEDIUM AIR TRAFFIC HUBS: 1965, 1970, 1975, AND 1980

SMSA	1970 POPULATION	SMSA 1970 RANK	AIRPORT TYPE[a]	AIRLINE PASSENGER VOLUMES (CCC'S)			
				ACTUAL	FORECAST		
				1965	1970	1975	1980
HOUSTON	1,985,000	13	L	2,430	4,489	7,680	12,962
MINNEAPOLIS	1,814,000	15	L	2,640	4,886	8,360	14,110
DALLAS/FT. WORTH	1,556,000	16	L	5,110	9,917	16,964	28,637
SEATTLE/TACOMA	1,422,000	17	L	2,250	4,360	7,850	13,234
MILWAUKEE	1,404,000	19	M	918	1,752	2,870	4,788
ATLANTA	1,390,000	20	L	6,694	13,874	23,736	40,066
CINCINNATI	1,385,000	21	L	1,580	3,318	5,676	9,581
SAN DIEGO	1,358,000	23	M	1,498	3,096	5,062	8,392
BUFFALO	1,349,000	24	M	1,308	2,532	3,966	6,328
MIAMI	1,268,000	25	L	5,558	10,564	18,072	30,510
KANSAS CITY (MO.-KANSAS)	1,257,000	26	L	2,412	4,434	7,586	12,804
DENVER	1,228,000	27	L	3,010	5,881	10,062	16,985
INDIANAPOLIS	1,110,000	29	M	1,112	2,272	3,704	6,020
NEW ORLEANS	1,046,000	31	L	2,236	4,180	7,152	12,073
TAMPA/ ST. PETERSBURG	1,013,000	32	M	1,658	3,346	5,378	8,814
PORTLAND	1,009,000	35	M	1,310	2,650	4,258	6,978

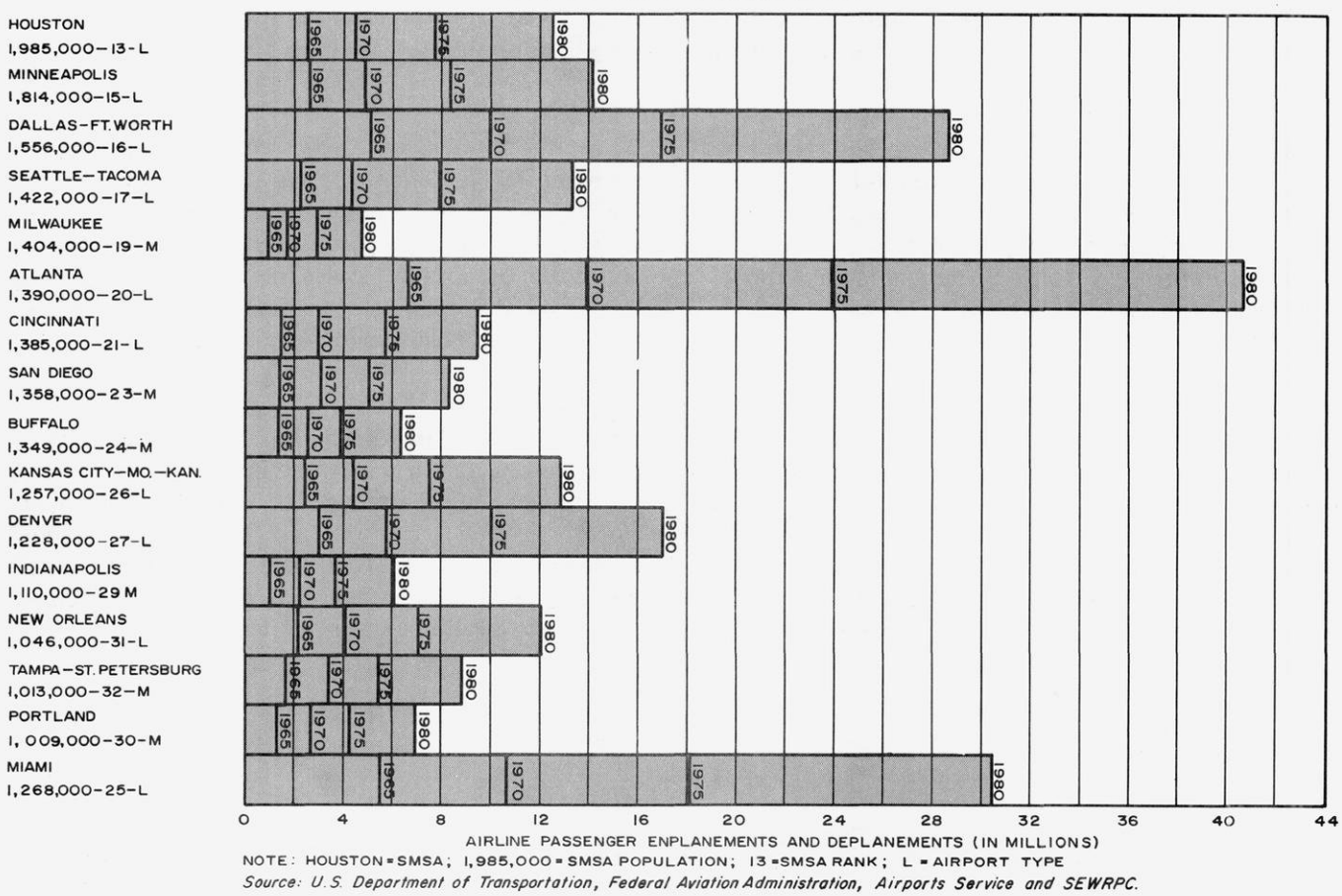
[a]L = LARGE AIR TRANSPORTATION HUB.
M = MEDIUM AIR TRANSPORTATION HUB.

SOURCE- AVIATION DEMAND AND AIRPORT FACILITY REQUIREMENT FORECASTS FOR LARGE AIR TRANSPORTATION HUBS THROUGH 1980 AND AVIATION DEMAND AND AIRPORT FACILITY REQUIREMENT FORECASTS FOR MEDIUM AIR TRANSPORTATION HUBS THROUGH 1980 BY THE U. S. DEPARTMENT OF TRANSPORTATION, FEDERAL AVIATION ADMINISTRATION AIRPORTS SERVICE. POPULATION DATA FOR 1970 WERE OBTAINED FROM COMMERCE NEWS, NEWS RELEASE CB71-46.

Thus, despite the very substantial increases in airline passenger travel at General Mitchell Field, particularly within the last decade, air passenger volumes generated by the Milwaukee SMSA fall far short of those generated by not only metropolitan areas of larger population size, such as, for example, Houston, Minneapolis, and Dallas, and those of similar size, such as, for example, Seattle—Tacoma, Atlanta, Cincinnati, San Diego, and Buffalo, but also those of considerably smaller population size, such as Denver, Indianapolis, New Orleans, or even Portland, Oregon. If, moreover, the FAA forecasts of airline passenger travel to the year 1980, as shown in Figure 2, are accurate or nearly so, the volumes generated by the Milwaukee SMSA will continue to lag behind those volumes generated by each of the other metropolitan

Figure 2

AIRLINE PASSENGER ENPLANEMENTS AND DEPLANEMENTS FOR SELECTED LARGE AND MEDUIM AIR TRAFFIC HUBS 1965, 1970, 1975, AND 1980



NOTE: HOUSTON = SMSA; 1,985,000 = SMSA POPULATION; 13 = SMSA RANK; L = AIRPORT TYPE

Source: U.S. Department of Transportation, Federal Aviation Administration, Airports Service and SEWRPC.

areas listed, although in relatively the same rank position. The major reason most often advanced in explanation of this phenomenon is that the early development of Chicago as the central hub and as the major point of interchange on the national airline system has tended to retard growth at General Mitchell Field both in the number of air carriers serving the Field and in the number of metropolitan areas to which direct service has been available from the Field. Another prominent reason advanced is that the very close proximity of the two great metropolitan areas of Milwaukee and Chicago, while certainly not limiting travel between them by any means, does decidedly limit airline passenger travel between them, with other modes of travel often being much more convenient. A third reason advanced, although somewhat related to the other two, is that the close proximity of Chicago's O'Hare Field to the Milwaukee SMSA, combined with the lack of direct service between General Mitchell Field and many important U. S. metropolitan areas, as well as the infrequent services between General Mitchell Field and other metropolitan areas, has induced many air travelers of this Region to travel to and/or from O'Hare Field by automobile rather than to make connecting flights to and/or from General Mitchell Field.

SURVEY FINDINGS

Mode of Travel

The almost complete dominance of the automobile as a means of ground access to and from the General Mitchell Field airport terminal is clearly evident in Figure 3. Of the total of approximately 14,200 person

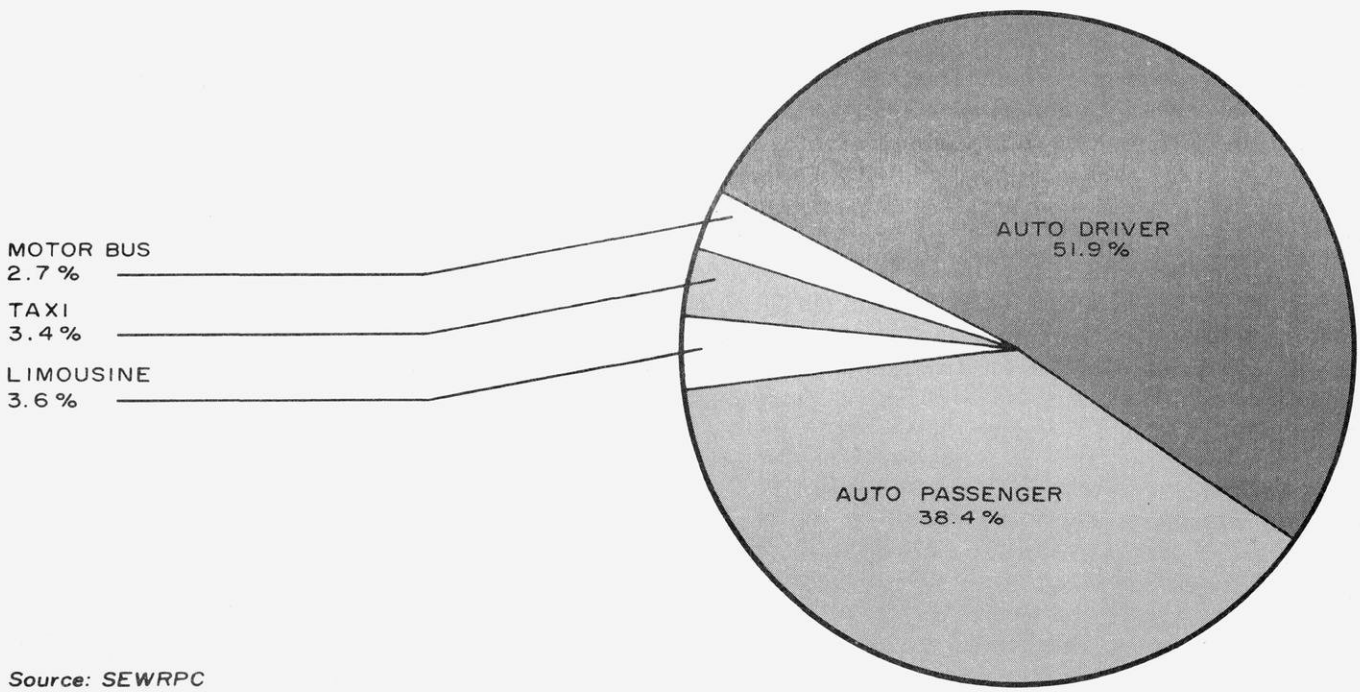
trips generated by the terminal, approximately 12,800, or about 90 percent, were found to have arrived at, or departed from, the airport terminal either as an auto driver or as an auto passenger. Approximately 7,400 trips, or about 52 percent, were made as an auto driver and approximately 5,400 trips, or about 38 percent, as an auto passenger. Of the remaining approximately 1,400 trips, approximately 500 trips each were made by airport limousine and by taxi, or a little less than 4 percent each, and approximately 400 trips, or less than 3 percent, were made by motor bus.

Considering the modal choices of ground travel utilized by airline passengers enroute to General Mitchell Field, it was found that approximately 78 percent were made by automobile, with 31 percent as auto drivers and 47 percent as auto passengers; approximately 11 percent were made by airport limousine or carryall; approximately 9 percent were made by taxi; and less than 3 percent were made by motor bus, as shown in Figure 4. Table 2 indicates that modal choices made by airline passengers enroute by ground to General Mitchell Field were not dissimilar in general to the modal choices of ground travel to airports in other metropolitan areas of similar population size where data for such travel were available.

Considering the modal choices of ground travel to General Mitchell Field from the Milwaukee CBD by enplaning airline passengers only, it was found that approximately 42 percent were made by automobile, with 17 percent as auto drivers and 25 percent as auto passengers; approximately 31 percent were made by airport limousine or carryall; approximately 26 percent were made by taxi; and less than 1 percent were made by motor bus, as shown in Figure 5. Table 3 indicates that Milwaukee's General Mitchell Field fell in the middle range among metropolitan areas in the percentage of enplaning airline passenger trips made to airports from central business districts by automobile, limousine, and taxi, and, like other metropolitan areas, made little use of the motor bus in such trips.

Figure 3

GROUND ACCESS MODAL CHOICES OF TOTAL PERSONS TRAVELING TO AND FROM GENERAL MITCHELL FIELD AIRPORT TERMINAL – 1968

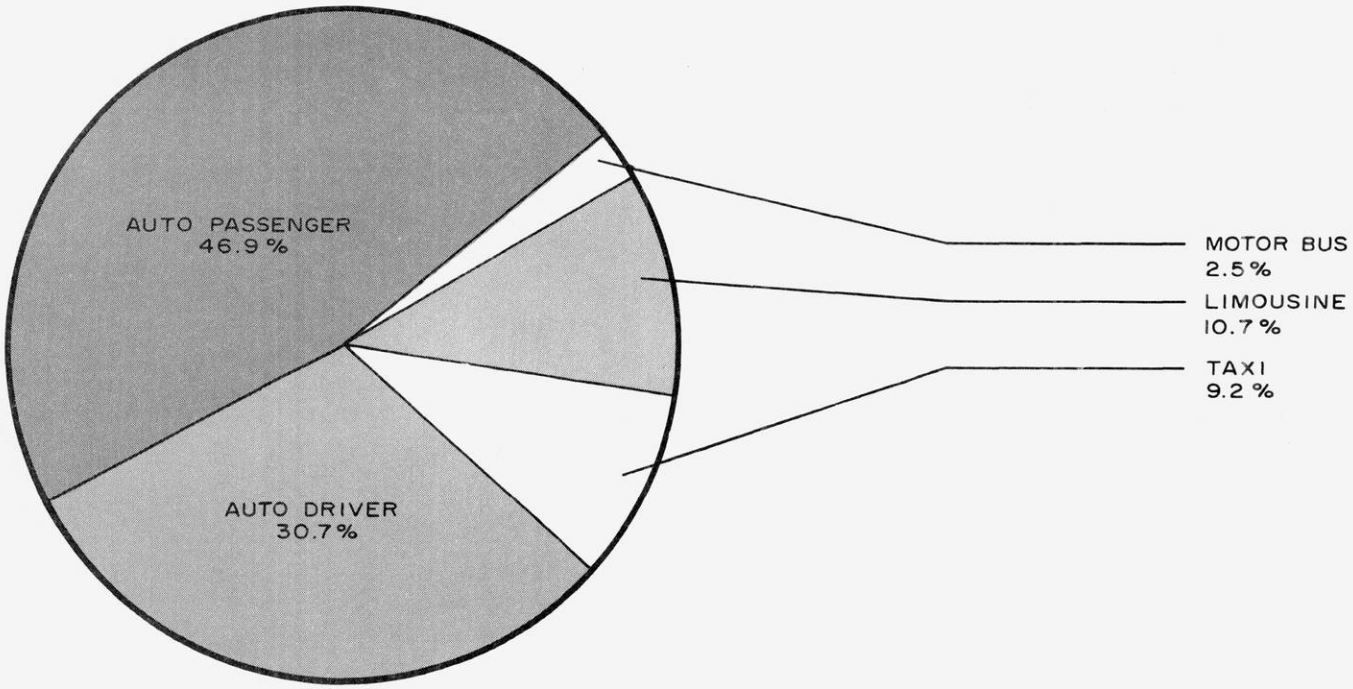


Source: SEWRPC

Public mass transportation services which were available at General Mitchell Field on an average weekday during the period of the survey was confined to scheduled express limousine service and scheduled local motor bus service. Express limousine service directly connecting the airport terminal with the Milwaukee central business district, a distance of approximately 6.5 miles, operated on an "on the hour and half-

Figure 4

GROUND ACCESS MODAL CHOICES OF AIRLINE PASSENGER TRIPS TO GENERAL MITCHELL FIELD AIRPORT TERMINAL - 1968



Source: SEWRPC

Table 2

GROUND TRAVEL MODAL CHOICES OF AIRLINE PASSENGERS BETWEEN AIRPORT TERMINALS AND ALL ORIGINS FOR SELECTED METROPOLITAN AREAS, AS A PERCENTAGE

METROPOLITAN AREA	YEAR	AUTOMOBILE	AIRPORT LIMOUSINE	TAXI	MOTOR BUS	OTHER	TOTAL
ATLANTA.....	1966-67	84.0	05.0	09.0	2.0	0.0	100.0
DENVER.....	1966-67	68.0	05.0	25.0	2.0	0.0	100.0
MIAMI.....	1966-67	65.3	10.4	24.3	0.0	0.0	100.0
SEATTLE/TACOMA..	1966-67	62.0	20.0	05.0	2.0	11.0[a]	100.0
PHOENIX.....	1966-67	76.0	09.0	11.0	4.0	0.0	100.0
MILWAUKEE.....	1968	77.6	10.7	09.2	2.5	0.0	100.0

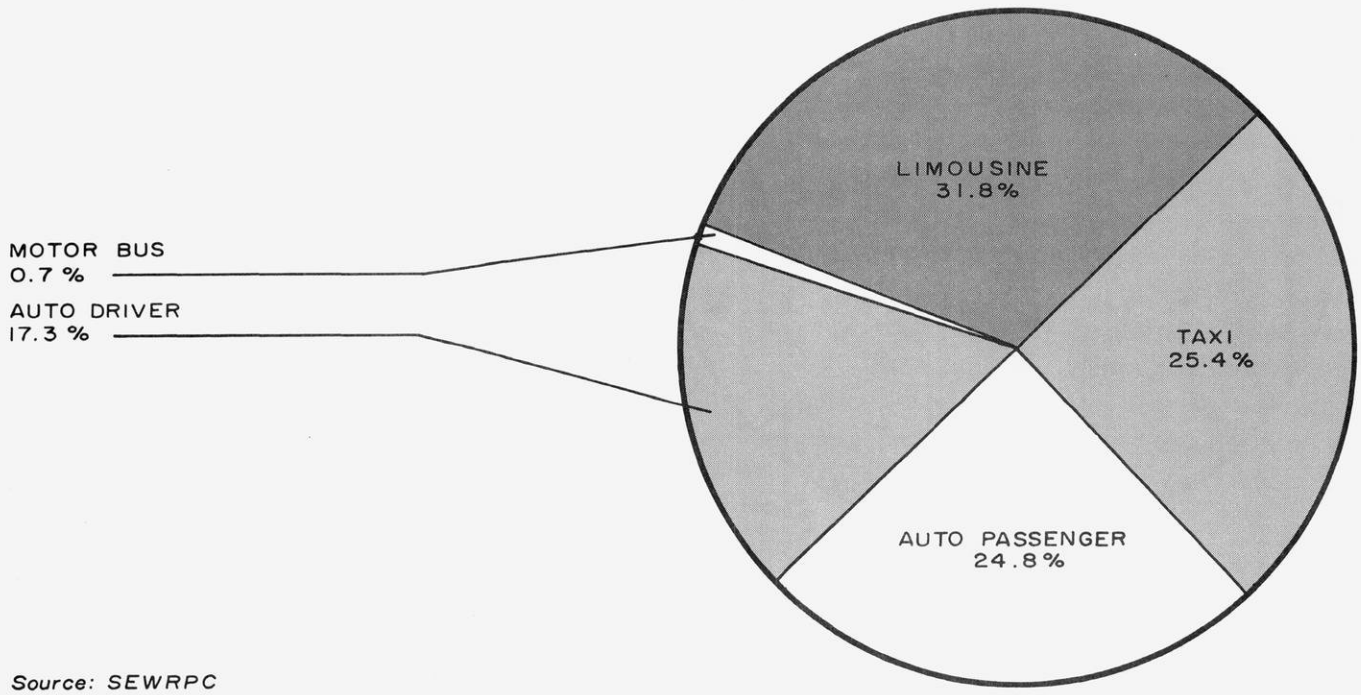
[a]INCLUDES SPECIAL MILITARY VEHICLES (10 PERCENT) AND HELICOPTERS (1 PERCENT).

SOURCE- DATA RELATING TO THE MILWAUKEE METROPOLITAN AREA WERE OBTAINED FROM SEWRPC 1968 SURVEY INFORMATION. DATA RELATING TO ALL OTHER METROPOLITAN AREAS WERE CITED IN TRANSPORTATION ENGINEERING JOURNAL OF ASCE, VOLUME 95, NO. TE1, FEBRUARY 1969.

hour" schedule from about 5:30 a.m. to midnight, making 38 trips in each direction each weekday. At the Milwaukee CBD end, limousines made stops to pick up or discharge passengers as direction would dictate at major hotels as required. Local motor bus service operating on a single route in a corridor approximately 12 miles in length connecting the airport terminal with the Milwaukee CBD and with other major points of transfer, provided service to and from the airport terminal on 15 runs in each direction each weekday between approximately 5:45 a.m. and midnight, with four morning runs operating between about 5:45 a.m. and 7:50 a.m., six afternoon and early evening runs between approximately 3:30 p.m. and 6:00 p.m., and five late night runs between approximately 11:00 p.m. and midnight.

Figure 5

GROUND ACCESS MODAL CHOICES OF AIRLINE PASSENGER TRIPS TO GENERAL MITCHELL FIELD AIRPORT TERMINAL ORIGINATING IN THE MILWAUKEE CENTRAL BUSINESS DISTRICT – 1968



Source: SEWRPC

Table 3

GROUND TRAVEL MODAL CHOICES OF AIRLINE PASSENGERS TO AIRPORT TERMINALS FROM CENTRAL BUSINESS DISTRICTS FOR SELECTED METROPOLITAN AREA, AS A PERCENTAGE

METROPOLITAN AREA	YEAR	AUTOMOBILE	AIRPORT LIMOUSINE	TAXI	MOTOR BUS	OTHER	TOTAL
ATLANTA.....	1966-67	83.0	6.0	10.0	1.0	0.0	100.0
DENVER.....	1966-67	49.0	15.0	35.0	1.0	0.0	100.0
SEATTLE/TACOMA..	1966-67	27.0	54.0	15.0	1.0	3.0	100.0
PHOENIX.....	1966-67	30.0	25.0	40.0	5.0	0.0	100.0
MILWAUKEE.....	1968	42.2	31.0	26.3	0.5	0.0	100.0

SOURCE- DATA RELATING TO THE MILWAUKEE METROPOLITAN AREA WERE OBTAINED FROM SEWRPC 1968 SURVEY INFORMATION. DATA RELATING TO ALL OTHER METROPOLITAN AREAS WERE CITED IN TRANSPORTATION ENGINEERING JOURNAL OF ASCE, VOLUME 95, NO. TE1, FEBRUARY 1969.

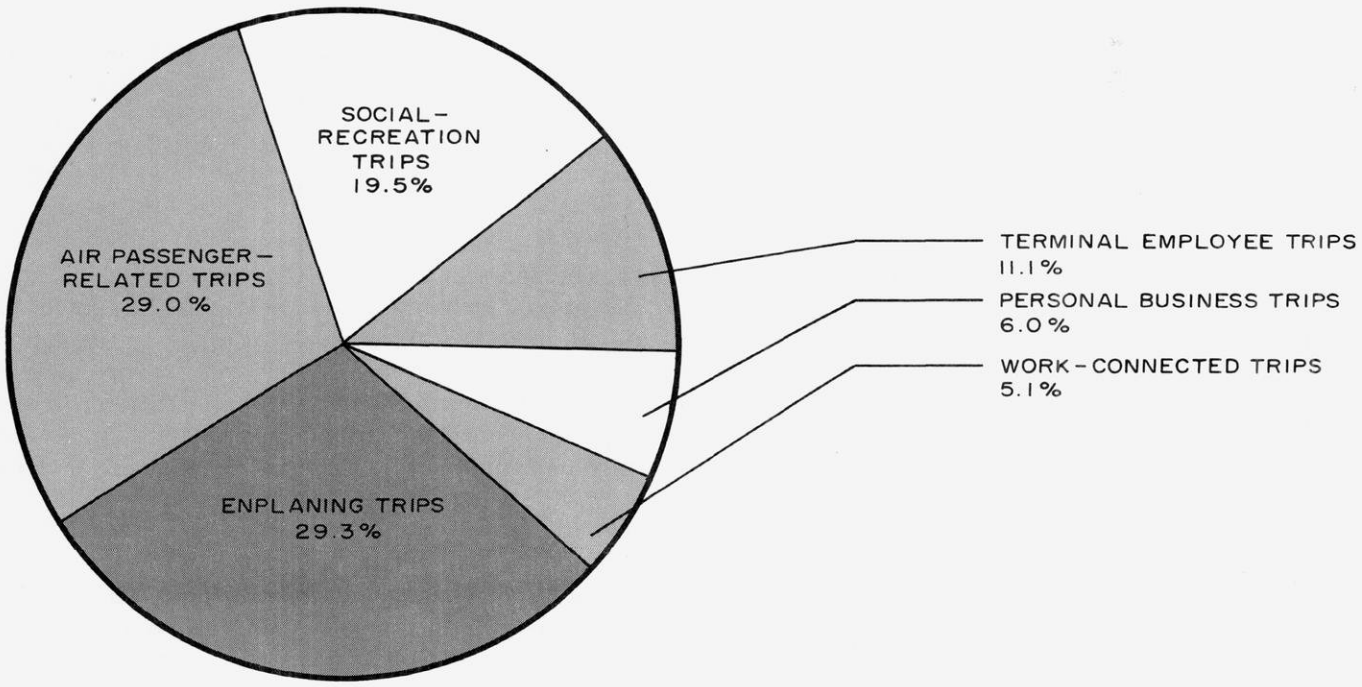
Trip Purposes of Ground Travel

Ground travel to the airport terminal at General Mitchell Field was found in the survey to consist of considerably more than the arrival of those who are about to enplane, along with the entourage of friends and relatives who are there to see them off. There are, for example, substantial numbers of persons who go to the airport terminal specifically for social-recreational activities, such as to sightsee or to dine; there are very considerable numbers of persons who are employed there not only in airline operations and maintenance and in airport staff positions, but also in the restaurants, gift shop, and car rental concessions; there are still others who, employed elsewhere, go to the airport on work-connected business, such as suppliers or repairmen; and there are those who go there on personal business.

Still, those who went to the airport to enplane as airline passengers and those who went either to accompany them or to greet deplaning passengers, amounting to approximately 2,000 trips each, or 29 percent each of the total, together constitute a very solid majority of all arrivals. In addition, there were approximately 1,500 person trips to the terminal, or about 20 percent of the total trips made to the terminal, for social or recreational purposes; approximately 800 person trips to the terminal, or about 11 percent of the total, were made by persons employed at the terminal; approximately 450 person trips to the terminal, or about 6 percent of the total, were made for personal business reasons; and approximately 375 person trips to the terminal, or about 5 percent of the total, were made for work-connected purposes (see Figure 6).

Figure 6

GROUND ACCESS TRIP PURPOSES OF PERSONS TRAVELING TO GENERAL MITCHELL FIELD AIRPORT TERMINAL – 1968



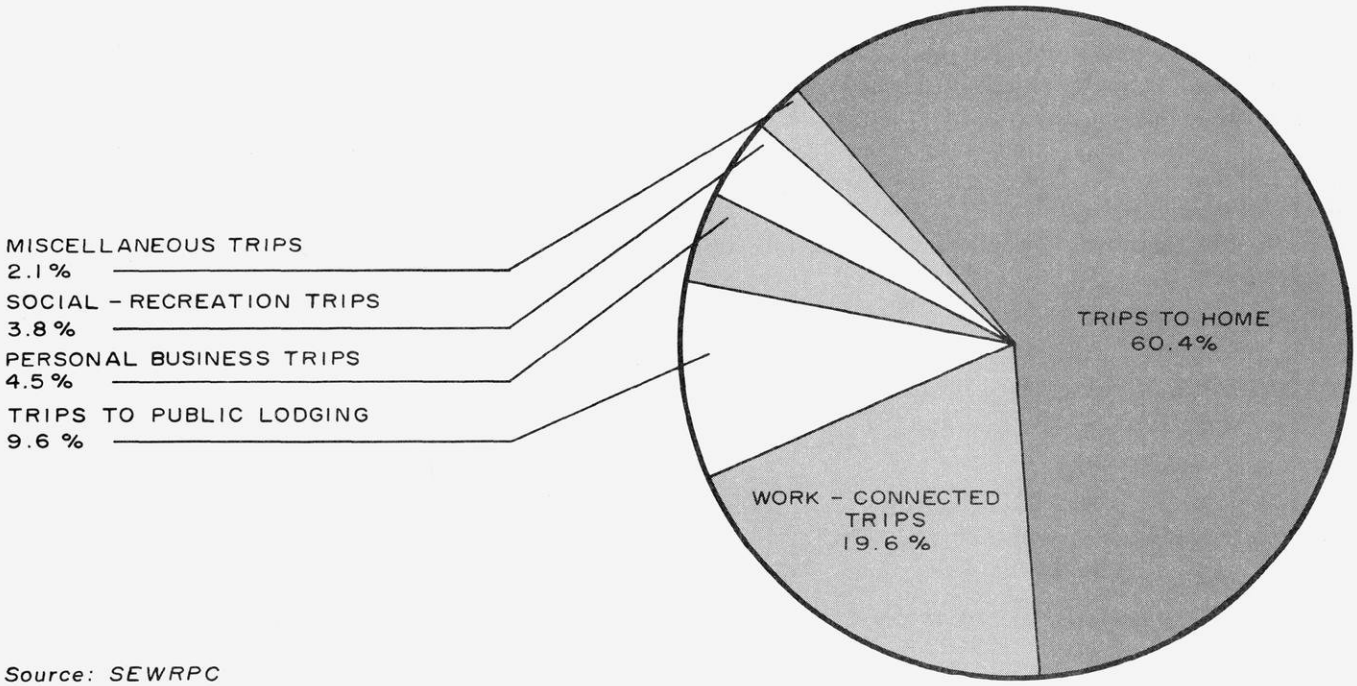
Source: SEWRPC

Ground travel from the airport terminal, as could be anticipated, consisted largely of persons returning to their homes, amounting to more than 4,200 trips, or about 60 percent of the total. Second in importance of trips leaving the airport terminal were those made for work-connected business, amounting to nearly 1,400 trips, or about 20 percent of the total. Trips from the airport terminal to places of public lodging, made mostly, of course, by nonresident deplaning airline passengers, amounted to nearly 700

trips or nearly 10 percent of the total, while trips leaving the terminal for personal business purposes and for social-recreational activities amounted to about 300 trips each, or about 4 percent each of the total; and trips made from the terminal for miscellaneous purposes amounted to about 150 trips, or about 2 percent of the total (see Figure 7).

Figure 7

GROUND ACCESS TRIP PURPOSES OF PERSONS TRAVELING FROM GENERAL MITCHELL FIELD AIRPORT TERMINAL – 1968



Source: SEWRPC

Considering only the ground travel by deplaned airline passengers leaving the airport terminal, it was found that trips made by residents of, or adjacent to, the Region returning to their homes amounted to approximately 800 trips, or about 41 percent of the total of about 2,000 ground trips made by deplaned airline passengers; trips to places of overnight accommodations made mostly by nonresident airline passengers, of course, were approximately 550 trips, or about 28 percent of the total; trips made for work-connected business totaled about 400 trips, or about 21 percent of the total; and trips made for personal business reasons or social-recreational purposes amounted to less than 100 trips each, or less than 5 percent each of the total (see Figure 8).

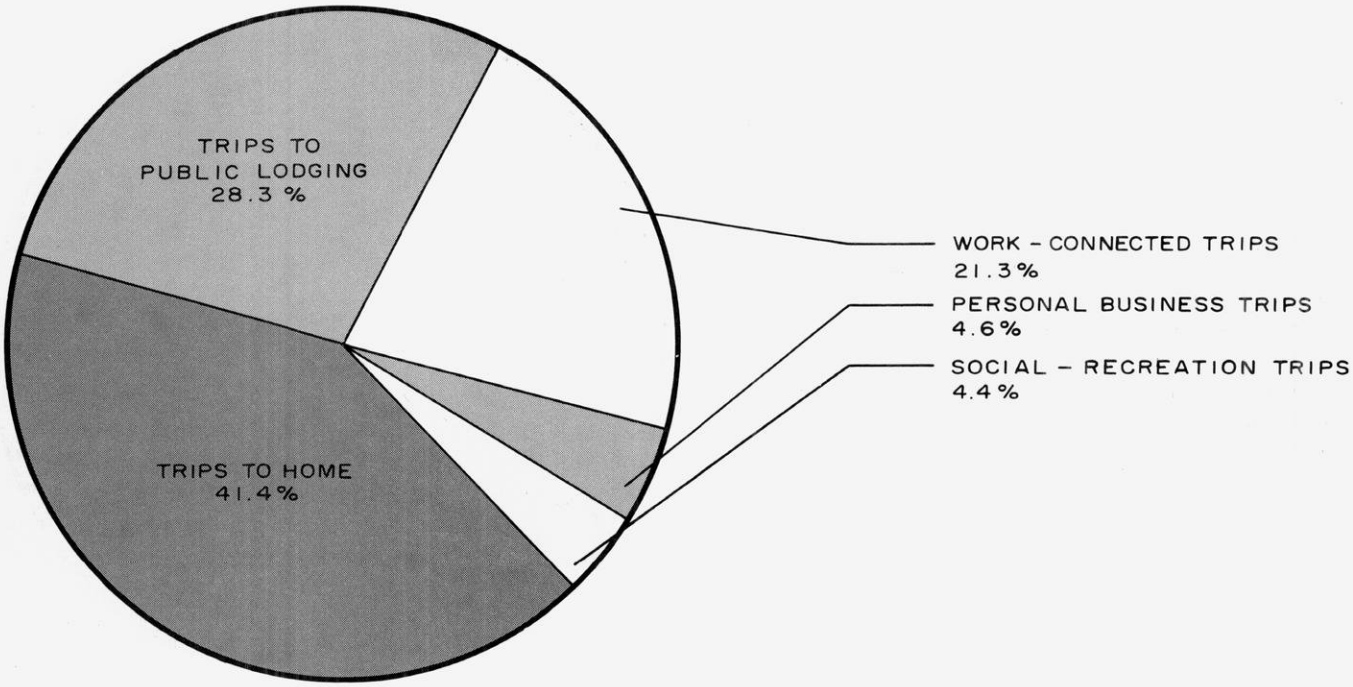
Land Use at Trip Ends

Ground travel generated by the airport terminal has a variety of land uses at the non-airport ends of the trips, including, among the most common, residences, public lodging accommodations, and an assortment of commercial establishments; among the less common land uses, manufacturing establishments, and governmental and institutional structures; and among the least common land uses, agricultural areas, recreational areas, and transportation, communication, and utility land uses, not including offices of the latter group, which are included in the retail and service land use category.

Trips made between residential land and the airport terminal, however, were by far the most common, amounting to approximately 8,400 person trips, or about 59 percent of the daily total of 14,200 person trips. Following in order of numerical importance are trips made to and from motels and hotels, amounting to approximately 2,000 trips, or about 14 percent of the total; trips made to and from other commercial establishments, amounting to approximately 1,900 trips, or about 13 percent of the total; trips made

Figure 8

GROUND ACCESS TRIP PURPOSES OF DEPLANING AIRLINE PASSENGERS LEAVING GENERAL MITCHELL FIELD AIRPORT TERMINAL - 1968



Source: SEWRPC

to and from manufacturing uses, amounting to approximately 800 trips, or about 6 percent of the total; trips made to and from governmental and institutional land uses, amounting to also approximately 800 trips, or also about 6 percent of the total; and the remaining miscellaneous land uses, amounting to approximately 300 trips, or about 2 percent of the total (see Figure 9).

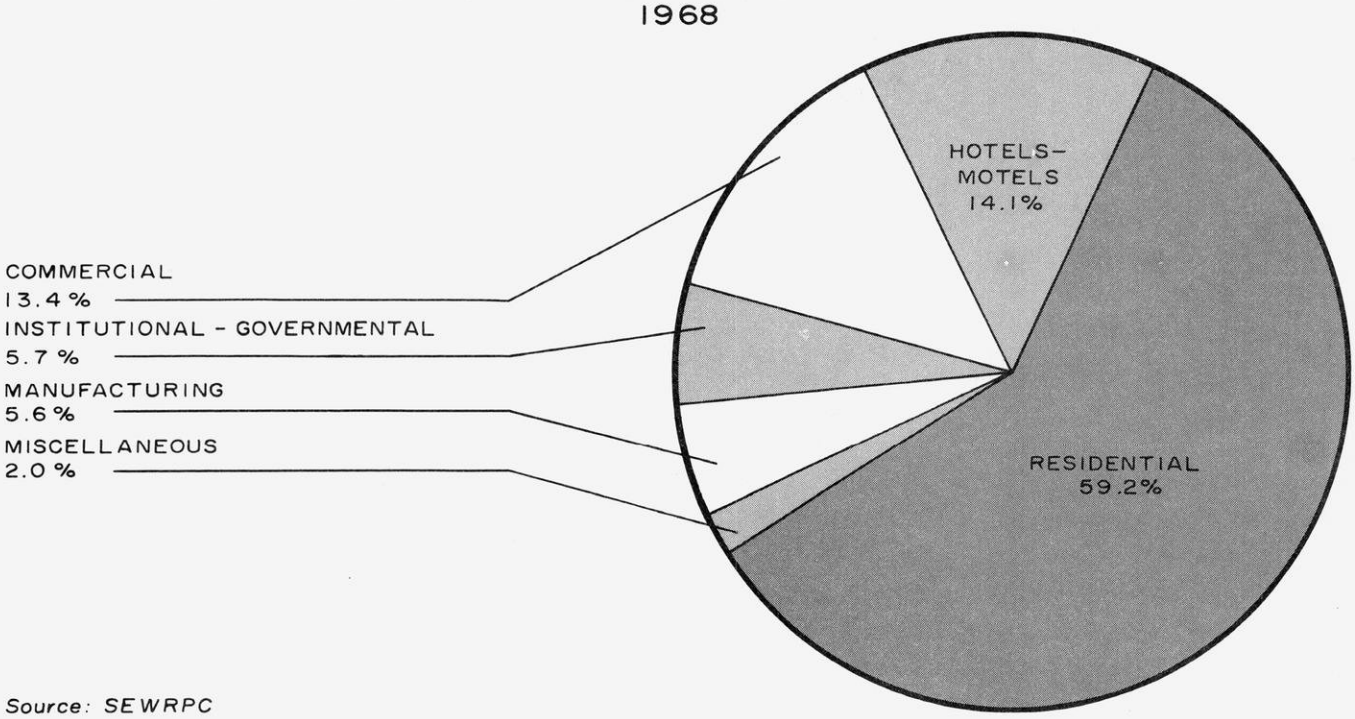
Considering the land uses at the origins of all ground trips to the airport terminal and at the destinations of all ground trips from the airport terminal, the following distributions were found:

Land Use	Percent of Trip Origins	Percent of Trip Destinations
Residential	54	64
Hotels-Motels	17	12
Commercial	14	12
Government and Institutional	7	4
Manufacturing	6	5
Miscellaneous	2	3
Total	100	100

Considering the land uses at the origins of ground trips to the airport terminal and at the destinations of ground trips from the airport terminal by airline passengers who reside outside the Region, the following distributions were found:

Figure 9

GROUND ACCESS TRIPS TO AND FROM GENERAL MITCHELL FIELD AIRPORT TERMINAL BY LAND USE AT THE NON - AIRPORT END OF TRIP 1968



Source: SEWRPC

Land Use	Percent of Trip Origins	Percent of Trip Destinations
Hotels-Motels	48	64
Commercial	22	18
Manufacturing	13	9
Residential	10	3
Governmental and Institutional	6	4
Miscellaneous	1	2
Total	100	100

Considering the land uses at the origins of ground trips to the airport terminal and the destinations of ground trips from the airport terminal by airline passengers who reside within the Region, the following distributions were found:

Land Use	Percent of Trip Origins	Percent of Trip Destinations
Residential	77	91
Governmental and Institutional	10	1
Commercial	6	3
Manufacturing	3	2
Hotels-Motels	3	2
Miscellaneous	1	1
Total	100	100

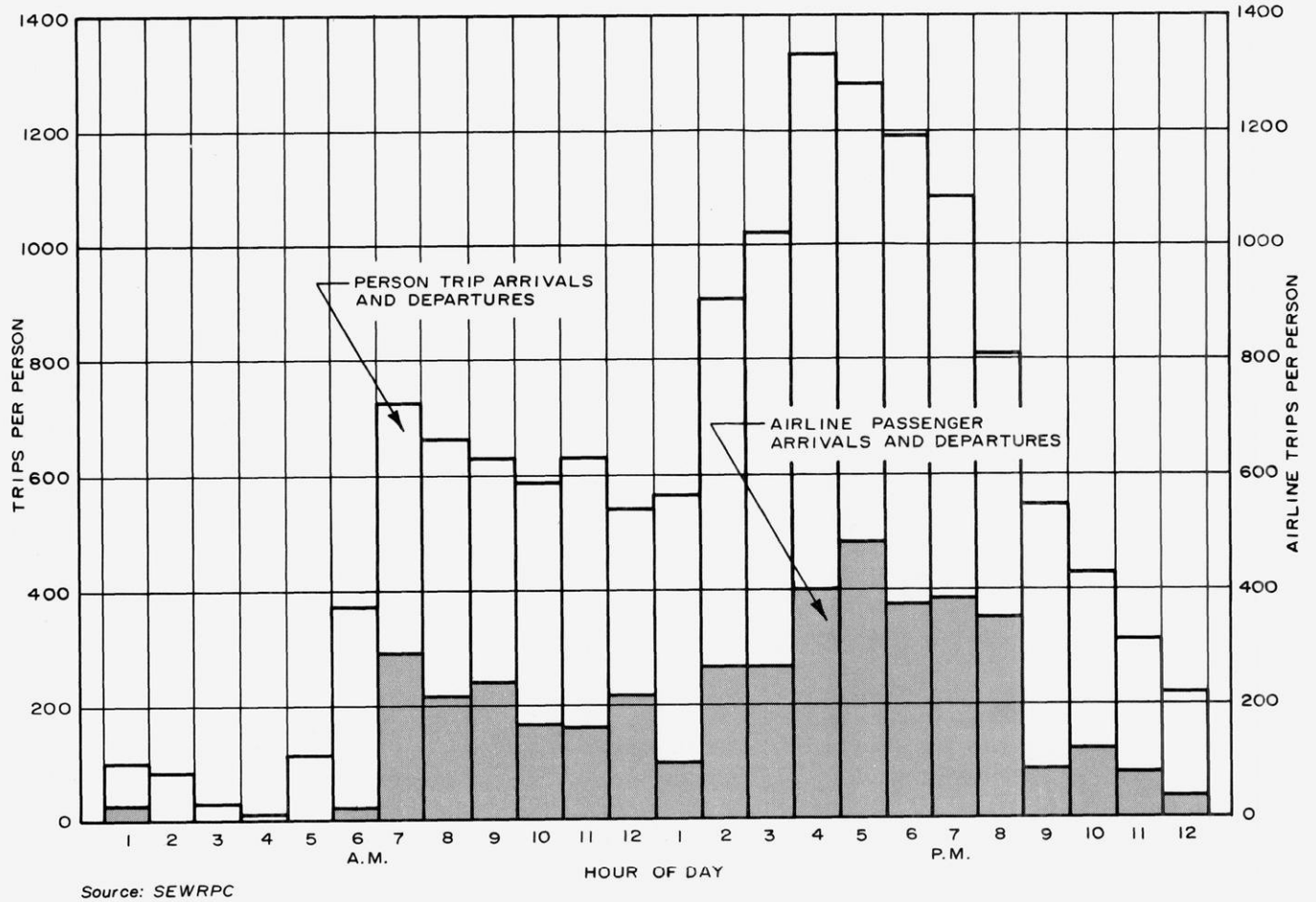
Hourly Distribution of Ground and Air Travel

Ground travel to and from the General Mitchell Field airport terminal was found to be divided into three fairly distinct time periods: 1) one of moderate activity, from about 6 a.m. until about 2 p.m., punctuated only by a relatively small peak in the hour beginning at 7 a.m. and coinciding with the morning peak both of enplaning airline passengers and of employees reporting to work at the terminal; 2) a period of considerably increased activity beginning at about 2 p.m., peaking between 4 p.m. and 6 p.m., and extending into the early evening; and 3) a period of rapidly decreasing activity beginning about 8 p.m. and ending at about 5 a.m. The morning peak, as noted above, occurs in the hour beginning at 7 a.m., when total arrivals and departures amount to about 700 trips, equal to approximately 5 percent of the daily total. In contrast, arrivals and departures in each hour between 2 p.m. and 8 p.m. total more than 1,000 trips and peak in the hour beginning at 4 p.m., when more than 1,300 trips are made, or more than 9 percent of the daily total.

As in the fact of the hourly distribution of total person trips, airline passenger arrivals and departures also peak in the morning in the hour beginning at 7 a.m., when about 275 enplanements and deplanements occur, equal to about 7 percent of the total airline passenger trips, and again in the period between 4 p.m. and 9 p.m., when arrivals and departures average approximately 380 trips, peaking within that period in the single hour beginning at 5 p.m., when approximately 460 enplanements and deplanements occur, or more than 11 percent of total airline trips. After 9 p.m., airline passenger activity decreases sharply (see Figure 10).

Figure 10

PERSON TRIP ARRIVALS AND DEPARTURES AND AIRLINE PASSENGER ARRIVALS AND DEPARTURES AT GENERAL MITCHELL FIELD AIRPORT TERMINAL BY HOUR OF THE DAY 1968



Source: SEWRPC

It is important to observe that, because airline passengers and those who accompany or meet them constitute, as previously established, a majority of the total number of trips generated by the airport terminal and because both kinds of such trips are closely tied to airline flight scheduling, any substantial changes in the flight scheduling by time of day will bring about, therefore, corresponding shifts in the hourly distribution pattern of both air and ground travel at the airport terminal.

Trip Distribution by Age and Sex by Trip Purpose

Persons of all ages, as would be commonly expected, are among the approximately 7,200 persons attracted daily via ground access to the airport terminal of General Mitchell Field. Most of the very young come to sightsee or merely to ride along with their parents, who usually have more compelling reasons for coming, while most of those beyond middle age come to the airport terminal only to enplane as airline passengers or to accompany or meet other airline passengers.

Young people—that is, in the three age categories between ages 5 and 19—make relatively few trips to the airport terminal and relatively fewer trips to enplane, accounting for less than 8 percent of the total daily person trips to the terminal and for only a little more than 3 percent of the total enplaning passengers. As discussed earlier, children of less than five years of age are not included in the survey data.

Older people coming to the airport terminal—that is, those in the four age group categories beginning at age 55—also make comparatively few trips, accounting, as in the case of the young, for less than 8 percent of the total daily person trips but accounting for a somewhat larger portion than the young, or 9 percent, of total enplaning passengers.

Those in the remaining seven age group categories between the ages of 20 and 55 years account not only for approximately 85 percent of the total daily person trips made to the terminal and approximately 87 percent of the total enplaning passengers, therefore, but also for approximately 60 percent of the total daily social-recreational trips; approximately 93 percent of the total daily trips by employees; approximately 90 percent of the total airline passenger-related trips, such as those trips to accompany or to meet airline passengers, which trips are usually classified as personal business trips; approximately 88 percent of the total trips made for other personal business reasons; and approximately 94 percent of the trips made to the terminal on work-connected business by persons employed elsewhere. Table 4 indicates that approximately 56 percent of the total daily person trips made to the terminal and approximately 59 percent of the total daily enplaning passengers are made by persons within the four age groups between 30 and 50 years of age, with the single age group between 40 and 44 years of age accounting for more than 17 percent of the total daily person trips made to the airport terminal and for nearly 20 percent of the total daily enplaning airline passengers.

Survey results show that trips made to the airport terminal by males outnumbered those made by females not only in the context of total daily trips but also within all major trip purpose categories, with the exception of one major trip purpose category. In total daily trips to the airport terminal, the ratio was almost precisely two males to one female; and, in enplaning airline passenger trips, the ratio was slightly higher than three to one, favoring males. Males also outnumbered females in trips made to the terminal by employees, about four to one; in trips made for personal business, about three to one; in trips made for work-connected business, about 12 to 1; and in airline passenger-related trips, about one and one-half to one. Only in trips made for social-recreational purposes were females in the majority, outnumbering males in this instance by a ratio of a little more than one and one-half to one (see Table 5).

Comparisons between the age and sex distribution of airport users, as derived from survey data, and the regional population, as estimated in the 1970 decennial federal census, as shown in Table 6, provide further evidence that both the older and younger residents of the Region do not make trips to the airport commensurate with their numbers. For example, those persons ages 5 through 19 years, although amounting to about one-third of the Region's population, accounted for only 8 percent of total airport users, and those persons ages 55 years and over, amounting to about 20 percent of the Region's population, accounted also for less than 8 percent of total airport users. On the other hand, persons ages 25 through 44 years, while amounting to approximately 26 percent of the Region's population, accounted for 54 percent of air-

Table 4

GROUND TRAVEL TO GENERAL MITCHELL FIELD AIRPORT TERMINAL BY TRIP PURPOSE AND AGE GROUP, AS A PERCENTAGE: 1968

AGE GROUP	TRIP PURPOSE						
	EMPLOYED AT AIRPORT	WORK-CONNECTED BUSINESS	PERSONAL BUSINESS	SOCIAL-RECREATION	ENPLANING AIRLINE PASSENGER	AIRLINE PASSENGER-RELATED TRIP	TOTAL PERSON TRIP
5-9	--	--	0.4	10.7	0.6	0.7	2.2
10-14	--	--	1.2	7.8	0.3	0.7	1.6
15-19	3.1	2.0	4.2	10.8	2.4	2.1	3.8
20-24	11.8	8.9	18.6	15.0	11.4	6.6	10.8
25-29	14.9	11.3	12.4	6.5	7.8	10.6	9.6
30-34	15.3	21.8	12.8	8.0	10.1	14.7	12.4
35-39	22.2	19.8	14.7	7.5	14.3	15.9	14.7
40-44	18.4	15.3	10.5	10.2	19.5	19.8	17.4
45-49	6.2	11.7	9.7	6.8	14.7	12.5	11.5
50-54	4.4	5.6	8.9	6.2	9.5	9.5	8.2
55-59	2.6	2.8	3.1	3.9	3.8	3.0	3.4
60-64	0.7	0.4	2.7	4.5	3.8	2.7	3.1
65-69	--	0.4	0.8	1.2	1.2	0.9	0.9
70 AND OVER	0.4	--	--	0.9	0.6	0.3	0.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE- SEWRPC.

port users, and persons in the age group 35 through 44 years, while amounting to about 13 percent of the Region's population, accounted for about 32 percent of total airport users according to survey data. It may also be observed in Table 6 that females, although amounting to nearly 52 percent of the Region's population, accounted for only 33 percent of total airport users on the survey date.

Table 5

GROUND TRAVEL TO GENERAL MITCHELL FIELD AIRPORT TERMINAL BY TRIP PURPOSE AND SEX OF TRIPMAKER, AS A PERCENTAGE: 1968

SEX	TRIP PURPOSE						
	EMPLOYED AT AIRPORT	WORK-CONNECTED BUSINESS	PERSONAL BUSINESS	SOCIAL-RECREATION	ENPLANING AIRLINE PASSENGER	AIRLINE PASSENGER-RELATED TRIP	TOTAL PERSON TRIP
MALE	81.6	92.3	76.5	37.1	75.4	63.9	67.0
FEMALE	18.4	7.7	23.5	62.9	24.6	36.1	33.0
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE- SEWRPC.

Total Population at the Airport Terminal

The total population of the airport terminal on the survey date—that is, the total number of different persons at the airport on that date—is estimated to have been 9,400 persons, consisting of approximately 4,300 persons who arrived at the terminal as enplaning or deplaning airline passengers, including approximately 200 intra-airport transferees, and who each are assumed to have made but a single trip, either to or from the terminal; and of approximately 5,100 others who arrived at the terminal for a variety of other purposes and who each are assumed, because of the nature of their trips, to have made two trips—one to, and one from, the airport terminal.

Table 7 indicates that the size of the average weekday population at the General Mitchell Field airport terminal was found to be approximately similar to the average population size of the Kansas City Municipal and the San Diego Airports, both classified as large air hubs, and of the Phoenix Sky Harbor Airport, which, like Milwaukee, is classified as a medium air hub. The average weekday population of the Denver Stapleton, Seattle-Tacoma, and the Atlanta Airports, all classified as large air hubs, was each found to be substantially higher than that of General Mitchell Field.

Because of the nature of most trips to the airport terminal, it is important to point out that the population of the terminal at any given time during the day or night is usually only a small percentage of the total number of persons attracted daily. This is due mainly to the fact that the majority of those who come to the airport pass through, or come and go relatively quickly, as discussed in the ensuing paragraphs.

Table 6

AGE AND SEX PERCENTAGE DISTRIBUTION OF GENERAL MITCHELL FIELD AIRPORT TERMINAL USERS AND REGIONAL POPULATION

AGE GROUP[a]	GENERAL MITCHELL FIELD AIRPORT TERMINAL USERS[b]			POPULATION OF SOUTHEASTERN WISCONSIN REGION[c]		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
5-9	0.8	1.2	2.0	5.8	5.6	11.4
10-14	0.8	0.8	1.6	5.9	5.7	11.6
15-19	1.9	1.9	3.8	5.1	5.1	10.2
20-24	6.5	4.5	11.0	3.8	4.5	8.3
25-34	13.9	8.0	21.9	6.4	6.8	13.2
35-44	23.2	8.7	31.9	6.2	6.3	12.5
45-54	15.1	4.9	20.0	6.0	6.3	12.3
55-64	4.2	2.3	6.5	4.7	5.2	9.9
65 +	0.6	0.7	1.3	4.4	6.2	10.6
TOTAL	67.0	33.0	100.0	48.3	51.7	100.0

[a]CHILDREN UNDER 5 YEARS OF AGE ARE NOT INCLUDED EITHER IN THE AIRPORT USER OR THE REGIONAL POPULATION ESTIMATES.

[b]SURVEY DATA, GENERAL MITCHELL FIELD AIRPORT TERMINAL, MAY 1968.

[c]U. S. CENSUS OF POPULATION, APRIL 1970.

SOURCE- SEWRPC.

Table 7

ESTIMATED TOTAL AIRPORT POPULATION ON AN AVERAGE DAY
FOR SELECTED METROPOLITAN AREAS

AIRPORT	YEAR	AIRLINE PASSENGERS[a]	EMPLOYEES	VISITORS[b]	TOTAL
ATLANTA.....	1966-67	29,600	12,000	36,700	78,300
DENVER (STAPLETON).....	1966-67	5,500	5,500	8,500	19,500
KANSAS CITY (MUNICIPAL).....	1966-67	6,700	1,100	1,500	9,300
PHOENIX (SKY HARBOR).....	1966-67	6,000	300	8,400	14,700
SAN DIEGO.....	1966-67	3,000	1,600	3,200	7,800
SEATTLE/TACOMA.....	1966-67	10,000	4,000	4,700	18,700
MILWAUKEE (MITCHELL).....	1968	4,300	800	4,300	9,400

[a]TOTAL INCLUDES ENPLANEMENTS AND DEPLANEMENTS AND INTRA-AIRPORT TRANSFEREES.

[b]VISITORS INCLUDE ALL PERSONS VISITING THE AIRPORT, OTHER THAN AIRLINE PASSENGERS AND EMPLOYEES OF THE AIRPORT AND AIRLINES.

SOURCE- DATA RELATING TO MILWAUKEE-GENERAL MITCHELL FIELD WERE OBTAINED FROM SEWRPC 1968 SURVEY INFORMATION. DATA RELATING TO ALL OTHER AIRPORTS WERE CITED IN TRANSPORTATION ENGINEERING JOURNAL OF ASCE, VOLUME 95, NO. TE1, FEBRUARY 1969.

Hourly Accumulation of Persons

Except for those employed there, the rather large majority of persons who arrive at the airport terminal may be expected to remain there for a relatively short length of time. This is particularly true, of course, of enplaning and deplaning airline passengers and of their entourage who, as previously shown, together account for approximately 60 percent of total daily trips to the terminal and whose stay at the terminal commonly does not exceed an hour. Those who arrive at the airport terminal for social-recreational purposes or to conduct personal business or work-connected business, moreover, can scarcely be regarded as likely to remain much longer than an additional hour or two, generally leaving only employees of the diverse operations and establishments of the terminal as those who can be expected to consist of the large majority of those who remain at the terminal for more than three or four hours.

Of the approximately 9,400 persons who visited the airport terminal on the survey date, it is estimated that the maximum accumulation of persons at the terminal throughout the day was approximately 1,000 persons, occurring within the hour beginning at 3 p.m., as shown in Figure 11.

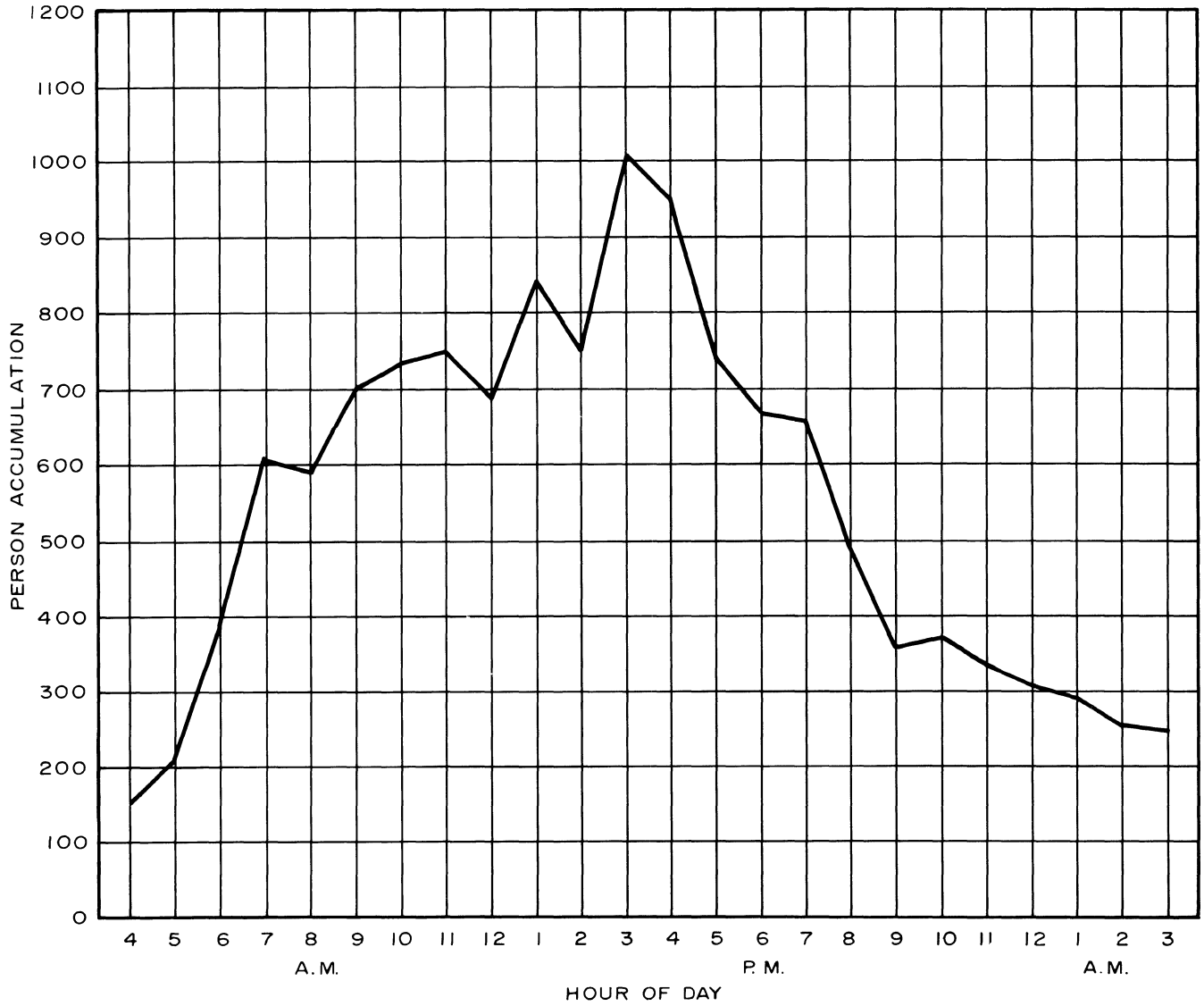
Spatial Distribution of Ground Travel

The attraction of General Mitchell Field airport terminal was found to extend into virtually every part of the Region, blanketing the highly urbanized areas of the Region and reaching into the less urbanized areas of the Region, as well as beyond these areas.

Large concentrations of attraction, however, were found to be relatively few in number in that trip interchanges with the airport terminal, amounting to 100 daily trips or more, were found to be in only 12 or 619 traffic analysis zones and amounting to 200 daily trips or more in only three zones. One of these three latter zones represents the very heart of the Milwaukee central business district (CBD); and the other two

Figure 11

ACCUMULATION OF PERSONS AT GENERAL MITCHELL FIELD AIRPORT TERMINAL BY HOUR OF DAY, MAY 16, 1968



Source: SEWRPC

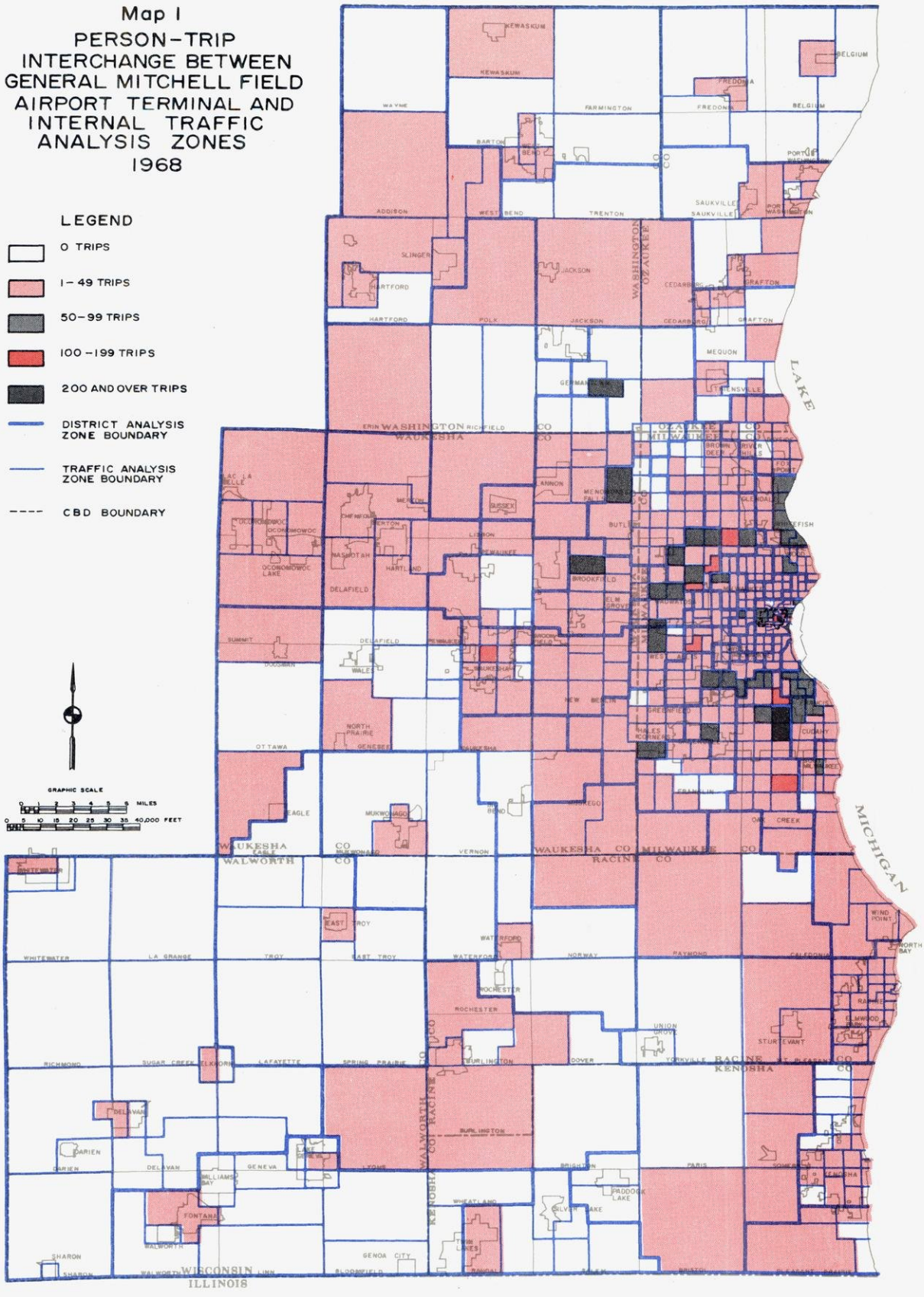
zones are located immediately adjacent on the west to General Mitchell Field, each containing accommodations, including meeting rooms designed especially to attract air travelers entering the Region who need not or prefer not to find accommodations in the city center or elsewhere (see Map 1).

Although the attraction of the airport terminal is, as shown in Map 1, far-reaching, the very large majority of travel was found to have originated from within a radius of approximately 18 airline miles of the terminal, or within an area extending roughly from a point on Lake Michigan just north of Milwaukee County and following an arc-shaped course through the western edge of the City of Waukesha and through the southern part of the City of Racine to a point on Lake Michigan (see Map 2 and Table 8).

Within this area, there were originated approximately 85 percent each of the total of person trips; airline passenger-related trips; work-connected trips; and the "other" trip category, which is comprised almost entirely of trips for social-recreational and for personal business purposes. Trips to the airport terminal made by persons employed there amounted to 94 percent from within the 18 airline mile distance and, not surprisingly, to as much as approximately 83 percent from within nine airline miles.

Map 1

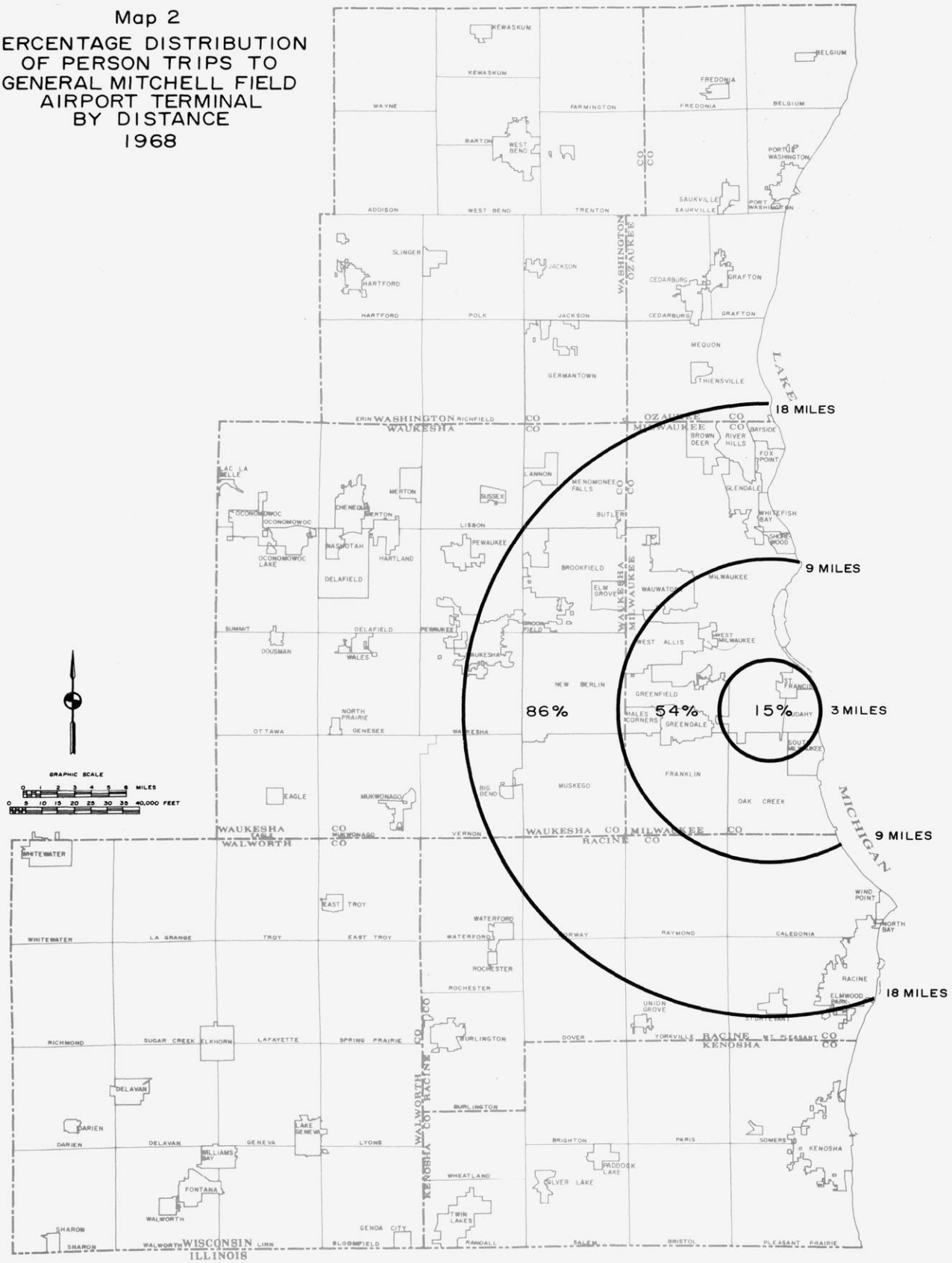
PERSON-TRIP INTERCHANGE BETWEEN GENERAL MITCHELL FIELD AIRPORT TERMINAL AND INTERNAL TRAFFIC ANALYSIS ZONES 1968



Source: SEWRPC.

Map 2

PERCENTAGE DISTRIBUTION OF PERSON TRIPS TO GENERAL MITCHELL FIELD AIRPORT TERMINAL BY DISTANCE 1968



Source: SEWRPC

Table 8

PERSON TRIPS TO GENERAL MITCHELL FIELD AIRPORT TERMINAL BY DISTANCE FROM THE TERMINAL FOR SELECTED TRIP PURPOSES, AS A PERCENTAGE: 1968

TRIP PURPOSE	AVERAGE AIRLINE DISTANCE FROM AIRPORT TERMINAL		
	3 MILES	9 MILES	18 MILES
ENPLANING AND DEPLANING AIRLINE PASSENGER TRIPS	8	51	85
AIR PASSENGER-RELATED TRIPS	15	50	86
AIR TERMINAL EMPLOYEE TRIPS (INCLUDING FLIGHT PERSONNEL)	38	83	94
WORK-CONNECTED TRIPS	23	67	86
OTHER PERSON TRIPS	13	47	83
ALL PERSON TRIPS	15	54	86

SOURCE- SEWRPC.

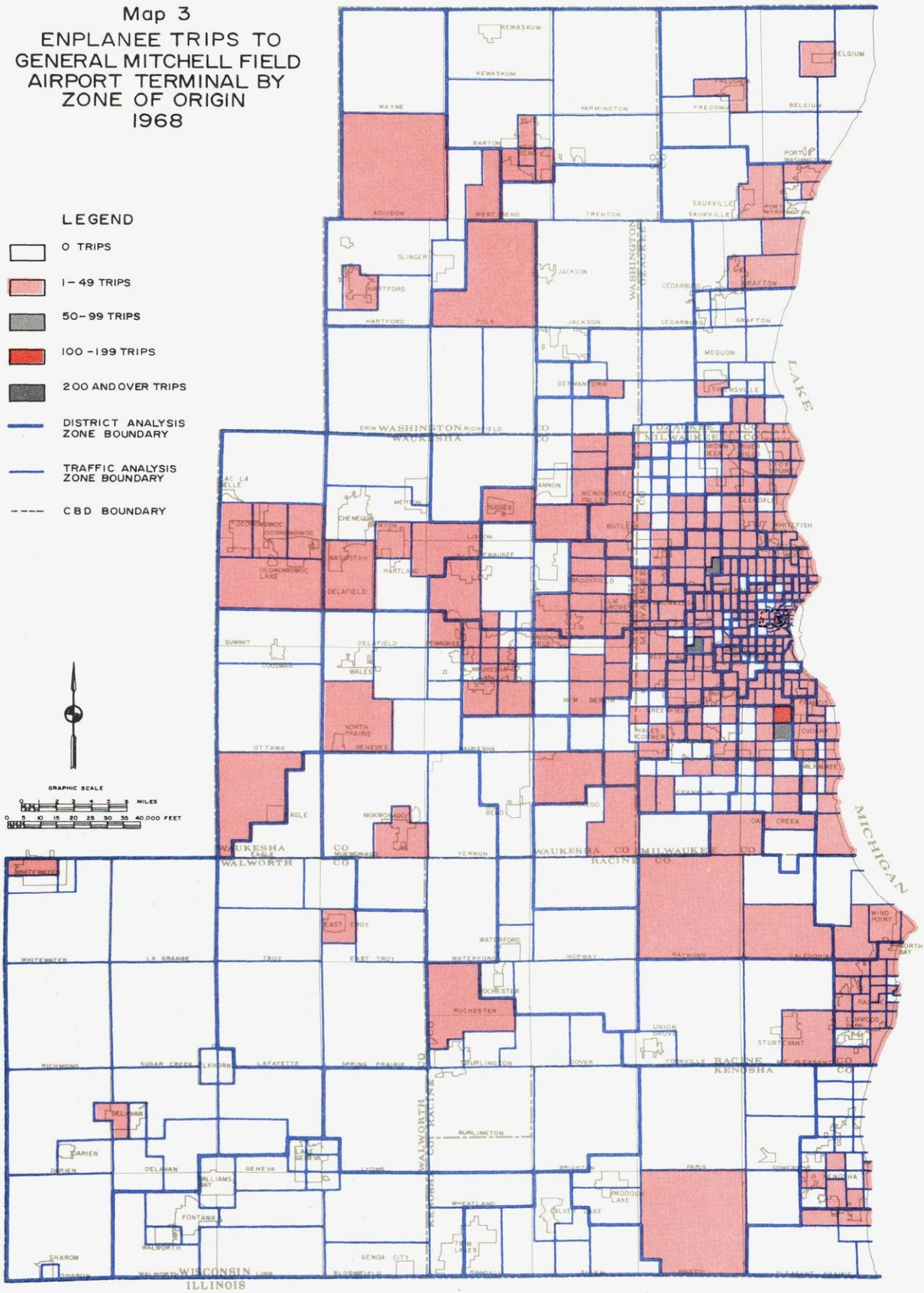
Ground travel of airline passengers to and from the airport terminal forms a pattern quite similar to that of total person travel generated by the terminal except for scale. As in total person travel, the attraction of ground travel of airline passengers encompassed not only most of the urbanized area but also a substantial part of the less urbanized areas of the Region and even beyond. As in total person travel also, large concentrations of airline passenger trip interchanges with the terminal were found to be limited to a very few zones, four zones only having as many as 100 daily trip interchanges with the terminal and one zone only having as many as 200 such trips (see Map 3).

Ground travel between the Milwaukee CBD and the airport terminal is estimated at approximately 1,400 person trips daily, or about 10 percent of the total person travel generated by the terminal. Of the total person trips between those two areas, nearly 68 percent were made by automobile, approximately 18 percent, by airport limousine; approximately 14 percent, by taxi; and less than 1 percent, by motor bus.

Ground travel by airline passengers between these two locations is estimated at approximately 660 daily trips, or about 16 percent of total daily airline passengers generated by the terminal. Table 9 indicates that the percentage of total airline passenger travel at the terminal generated within the Milwaukee CBD falls within the lower range among central business districts in other metropolitan areas having population sizes between 1 and 2 million, for which such data are available.

Ground travel between the airport terminal and points beyond the boundary of the Region is estimated at approximately 1,000 trips daily, or about 7 percent of total person travel generated by the terminal. Nearly all of this travel, 92 percent, was made by automobile, with about 6 percent by motor bus and about 1 percent each by limousine or taxi. Of the approximately 1,000 person trips generated from outside the Region, approximately 78 percent of the total was found to have been generated from points within Wisconsin; 18 percent of the total, from points in Illinois; and the remaining 4 percent, for the most part, from the neighboring states of Iowa, Michigan, and Minnesota. Within Wisconsin there were approximately 760 person trips made to and from the airport terminal which were generated in 29 of the total of 65 counties in Wisconsin outside the Region. Although ground travel to and from the terminal was recorded from such distant points within the state as Door County in the northeast; Iron County in the north, and Eau Claire and LaCrosse Counties in the west, the large majority of such travel from within Wisconsin was

Map 3
ENPLANEE TRIPS TO GENERAL MITCHELL FIELD AIRPORT TERMINAL BY ZONE OF ORIGIN 1968



Source: SEWRPC.

Table 9

TOTAL AIRLINE PASSENGERS ORIGINATING WITHIN CENTRAL BUSINESS DISTRICTS FOR SELECTED METROPOLITAN AIRPORTS, AS A PERCENTAGE

AIRPORT	AIRLINE PASSENGERS ORIGINATING WITHIN CBD (PERCENT)
DENVER (STAPLETON)	30.0
KANSAS CITY (MUNICIPAL)	40.0
PHOENIX (SKY HARBOR)	24.0
SAN DIEGO	10.0
SEATTLE-TACOMA	16.5
MILWAUKEE (MITCHELL)	16.0

SOURCE- DATA RELATING TO MILWAUKEE-GENERAL MITCHELL WERE OBTAINED FROM SEWRPC 1968 SURVEY INFORMATION. DATA RELATING TO ALL OTHER AIRPORTS WERE CITED IN TRANSPORTATION ENGINEERING JOURNAL OF ASCE, VOLUME 95, NO. TE1, FEBRUARY 1969.

found to be attracted from counties lying closer to the terminal and particularly from the five counties of Sheboygan, Dodge, Manitowoc, Fond du Lac, and Dane, in that order, which together constitute approximately 60 percent of such trips.

Average Distances of Ground Travel

The average distance of ground travel between the airport terminal and all points of origin or destination was found in the survey to be approximately 13.8 airline miles for person trips, approximately 11.9 airline miles for vehicle trips, and approximately 16.8 airline miles for ground trips made by airline passengers.

The average distance of ground travel between the airport terminal and points of origin or destination within the Region only was found to be approximately 8.8 airline miles for person trips, amounting to about 93 percent of the total number of person trips; approximately 8.0 airline miles for vehicle trips, amounting to nearly 95 percent of the total number of vehicle trips; and approximately 9.6 airline miles for ground trips made by airline passengers, amounting to about 91 percent of the number of total airline passenger ground trips.

The average distance of ground travel between the airport terminal and points of origin or destination outside the Region only was found to be approximately 82.8 airline miles for person trips, amounting to nearly 7 percent of the total number of person trips; approximately 80.5 airline miles for vehicle trips, amounting to a little more than 5 percent of the total number of vehicle trips; and approximately 88.3 airline miles for airline passenger ground trips, amounting to about 9 percent of the total number of airline passenger trips (see Table 10).

Spatial Distribution of Air Travel

An interesting finding in the survey was that points of origin and/or ultimate destinations of airline passenger travel generated by General Mitchell Field were recorded for each of 45 states of the Union and the District of Columbia, with the States of Idaho, Maine, Utah, Vermont, and Wyoming being the only exceptions (see Map 4). In addition, 181 airline passenger flights to and/or from the airport terminal originated

Table 10

AVERAGE DISTANCE OF PERSON, VEHICLE, AND AIRLINE PASSENGER GROUND TRAVEL GENERATED BY GENERAL MITCHELL FIELD, IN AIRLINE MILES: 1968

TRIP LOCATION	PERSON TRIPS		VEHICLE TRIPS		AIRLINE PASSENGER TRIPS	
	AVERAGE AIRLINE DISTANCE	PERCENT OF TOTAL	AVERAGE AIRLINE DISTANCE	PERCENT OF TOTAL	AVERAGE AIRLINE DISTANCE	PERCENT OF TOTAL
ALL TRIPS	13.8	100.0	11.9	100.0	16.8	100.0
IN-REGION TRIPS	8.8	93.2	8.0	94.6	9.6	90.9
OUT-OF-REGION TRIPS	82.8	6.8	80.5	5.4	88.3	9.1

SOURCE- SEWRPC.

Map 4

ORIGINS AND DESTINATIONS OF AIRLINE PASSENGERS GENERATED BY GENERAL MITCHELL FIELD AIRPORT TERMINAL MAY 16, 1968

Source: SEWRPC

or ultimately terminated in foreign countries. Of the latter, approximately one-half, or 89, were transatlantic flights; nearly one-fourth, or 41, were to or from points in Canada; approximately one-eighth, or 26, were transpacific flights; and approximately one-eighth, or 25, were trips to Mexico or Central and South American countries.

Trip interchanges with Michigan, Minnesota, and New York, in that order, were the most common among the states recorded at the terminal, with the first two named each totaling approximately 500 and the latter, approximately 400 interchanges. Other states having more than 200 airline passenger interchanges with the terminal were California, Pennsylvania, Florida, Illinois, and Ohio, in that order.

Vehicle Trips Generated by the Airport Terminal

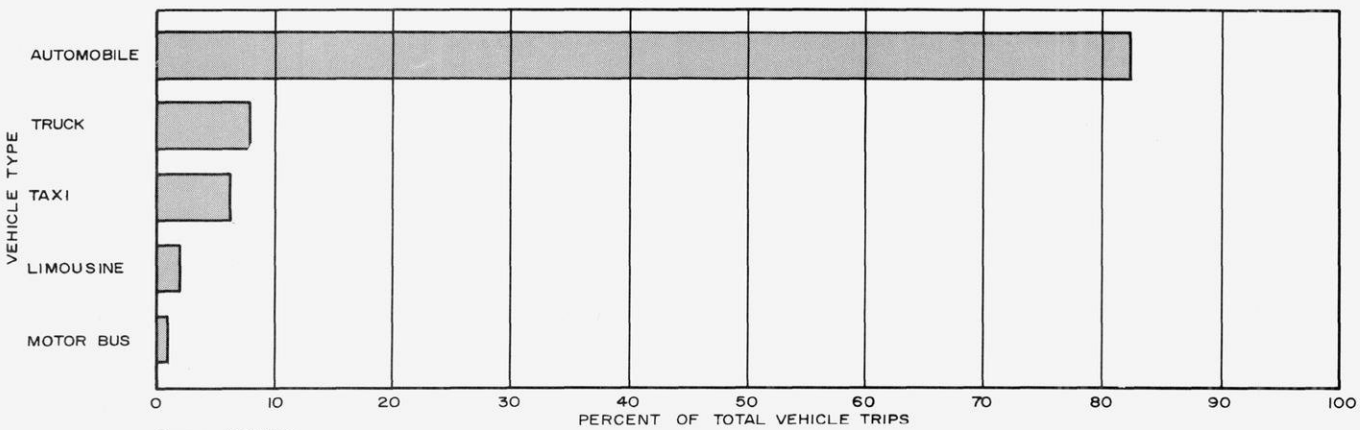
Survey data indicate that a total of approximately 8,900 vehicle trips were made to and from the airport terminal on the survey date, nearly evenly divided, as should be expected, by direction. Of the total vehicle trips, 7,400 of these vehicle trips, or about 83 percent, were made by automobiles; approximately 700 trips, or about 8 percent, were made by trucks; approximately 650 trips, or about 7 percent, were made by taxis; approximately 200 trips, or about 2 percent, were made by airport limousines and carryalls; and less than 50 trips, or less than 1 percent, were made by motor buses (see Figure 12).

Vehicle trips generated by the airport terminal, very much like person trips, extended into all parts of the Region and beyond, such trips having been recorded for 484 of the total 619 internal traffic analysis zones, as well as for a substantial number of municipalities located in neighboring counties, including the northeastern counties of Illinois. Vehicle trip interchanges in the magnitude of 100 or more daily trips were found in only seven traffic analysis zones, including three Milwaukee CBD zones, two zones adjacent to the west of General Mitchell Field, one Racine CBD zone, and one zone containing several large manufacturing establishments, including Allis Chalmers.

Vehicle trips made directly between the airport terminal and the Milwaukee central business district amounted to approximately 880 trips, or nearly 10 percent of the total daily vehicle trips. Of these 880 trips, approximately 550 were automobile trips; approximately 190 were taxi trips; approximately 80 were truck trips; and approximately 70 were limousine trips. To place these trips in proper prospective, it should be noted that if all of the 880 vehicle trips between the Milwaukee CBD and the General Mitchell Field airport terminal were assumed to have been made over the major route connecting these points, the North-South Freeway, which was only partially completed at the time of the survey, such vehicle trips would have amounted to only 4 to 5 percent of total average daily volumes on that route, estimated in 1968 in the range of 18,000 to 22,000 vehicles per weekday. Although approximately 30 vehicle trips were made to and from the airport terminal by motor buses, there was no direct service between

Figure 12

PERCENT OF TOTAL VEHICLE TRIPS GENERATED BY GENERAL MITCHELL FIELD AIRPORT TERMINAL, BY VEHICLE TYPE—1968



Source: SEWRPC.

the air terminal and the Milwaukee CBD. Table 11 shows the ratios of vehicles inbound to the air terminal to airline passengers enplaning at the terminals for a number of major airports throughout the United States. At General Mitchell Field, there were approximately 2.15 inbound vehicles per enplaning passenger, approximately midway in the range among the airports listed from 1.68 at the Phoenix Airport to 2.76 vehicles per enplaning passenger at Seattle-Tacoma.

Truck Trips Generated by the Airport Terminal

Of a total of nearly 700 trips by trucks made to and from the airport terminal, approximately 51.0 percent were made by two-axle, single-tire trucks; approximately 39.0 percent were made by single, dual-tire trucks; approximately 8.5 percent were made by three-, four-, and five-axle truck-trailer combinations; and about 1.5 percent were made by three-axle, single-unit trucks (see Figure 13).

Truck trips were also found to have a relatively wide distribution within the Region, such trips having been recorded for 159 of the total of 619 internal traffic analysis zones, as well as for a few municipalities located in neighboring counties. Truck trips between the air terminal and the Milwaukee CBD amounted to a little more than 80 trips, or about 12 percent of total truck trips generated by the air terminal, nearly

Table 11

DAILY INBOUND VEHICLES PER AVERAGE DAILY ENPLANED PASSENGER FOR SELECTED METROPOLITAN AIRPORTS

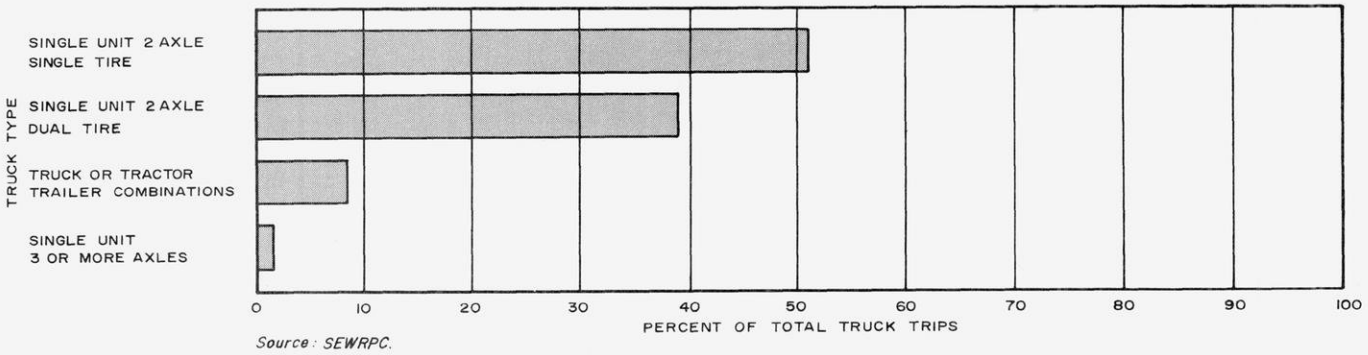
AIRPORT	1966 ENPLANED PASSENGERS (DAILY)	INBOUND TRAFFIC VOLUME ESTIMATES (VEHICLES DAILY)	INBOUND VEHICLES PER ENPLANED PASSENGER (DAILY)
LOS ANGELES	16,481	42,000	2.55
WASHINGTON D. C. (NATIONAL)	10,211	15,980	1.56
BOSTON	8,001	15,000	1.88
PHILADELPHIA	5,420	9,925	1.83
PITTSBURGH	5,360	9,900	1.85
DENVER	5,193	12,500	2.41
ST. LOUIS	4,914	11,400	2.32
MINNEAPOLIS/ST. PAUL	4,375	10,400	2.38
SEATTLE/TACOMA	3,524	9,725	2.76
BALTIMORE (FRIENDSHIP)	2,852	5,020	1.76
PHOENIX	2,438	4,100	1.68
WASHINGTON D. C. (DULLES)	1,334	2,690	2.01
MILWAUKEE[a]	2,100	4,517	2.15

[a]INFORMATION FOR GENERAL MITCHELL FIELD IS FOR THE YEAR 1968.

SOURCE- IMPACT OF PROJECTED AIR TRAVEL DEMAND ON AIRPORT ACRESS BY SALVATORE G. LARDIERE, FEDERAL AVIATION ADMINISTRATION, AND FRANK E. JAREMA, FEDERAL HIGHWAY ADMINISTRATION, JANUARY 1969; AND SEWRPC.

Figure 13

PERCENT OF TOTAL TRUCK TRIPS GENERATED BY GENERAL MITCHELL FIELD AIRPORT TERMINAL, BY TYPE OF TRUCK - 1968



Source: SEWRPC.

all of them two-axle, single-tire and two-axle, dual-tire trucks. Truck trip interchanges in the magnitude of 50 or more daily trips were to be found in only one zone, and that zone was located adjacent to the airport on the west.

Truck Trip Purposes

Of the total number of truck trips made to and from the terminal, trips for the purpose of picking up goods, delivering goods, and both picking up and delivering goods accounted for nearly 90 percent. Of the other purposes, trips made on service calls accounted for approximately 10 percent of the total number of trips, while trips made by trucks returning to their respective bases accounted for somewhat less than 1 percent.

Truck Trips by Type of Commodity Carried

Drivers of trucks were requested in the survey to provide information concerning the principal type of commodity picked up or delivered at the airport terminal. Approximately 46 percent of truck drivers responding reported handling air freight, with 32 percent of the trucks handling nonperishable, and 14 percent handling perishable, air freight. Approximately 10 percent of the trucks were involved in terminal support; about 9 percent carried mail; 3 percent were involved in airline support; and 1 percent carried fuel. Approximately 18 percent of the trucks were not carrying goods, and about 13 percent were not able to classify their cargos (see Figure 14).

SUMMARY AND CONCLUSIONS

More than 14,000 person ground trips were made to and from the General Mitchell Field airport terminal on the survey date, approximately 4,100 of which were ground trips made by enplaning and deplaning airline passengers.

The estimates of growth in airline travel at General Mitchell Field indicate that total volumes will reach nearly 5 million passengers carried annually by 1980, or approximately three times the number carried in 1968, the year of the survey. Despite this growth, the Federal Aviation Administration predicts, however, that Milwaukee, classified as a medium air traffic hub, will continue as such for the ensuing decade, at least, and will probably drop relatively further behind other metropolitan areas of approximately the same population size in volumes of airline passengers served, although remaining in about the same rank position.

Approximately 60 percent of ground travel to and from the air terminal was made, and in approximately equal volumes, by those who came to enplane or deplane and by those who came to accompany or meet them. Social-recreational trips and trips made by persons employed at the airport, including flight personnel, accounted for most of the balance of trips to and from the air terminal.

The majority of total ground travel to and from the air terminal originated on, or was destined for, residential land. The ground travel of airline passengers who reside outside the Region was found to occur, for the most part, between the airport and both places of lodging accommodations and places of commercial or industrial activities.

Ground travel at General Mitchell Field airport terminal experienced a relatively light morning peak in the hour beginning at 7 a.m. and a much heavier and longer peak in the period between 4 p.m. and 6 p.m. Airline passenger volumes served at the air terminal peaked in the morning in the hour beginning at 7 a.m., equal to 7 percent, and peaked in the afternoon in the hour beginning at 5 p.m., equal to 11 percent, of the total daily enplanements and deplanements. Any substantial shift in flight schedules is, however, apt to have correspondingly substantial changes in the hourly distribution of both air and ground travel at the airport terminal.

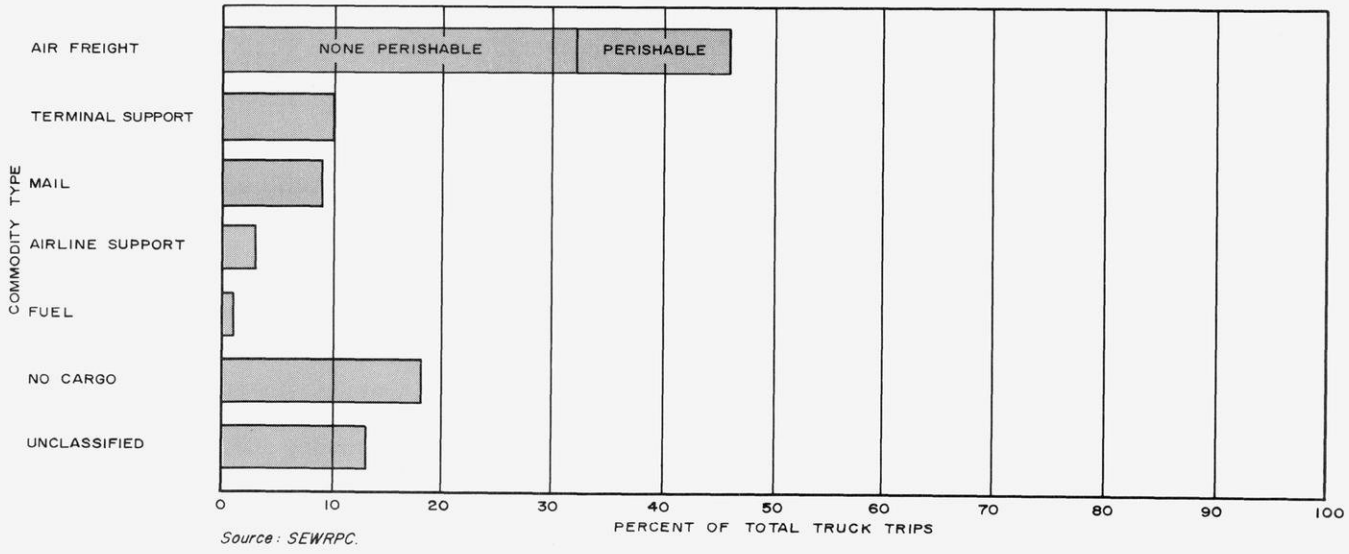
Persons within the age group categories from 20 years to 55 years comprised approximately 85 percent of the total ground travel to the airport terminal and accounted for about 87 percent of the enplaning airline passengers. Males outnumbered females two to one in daily trips to the airport and three to one in the number of enplaning airline passengers.

Although the attraction of the airport terminal was found to cover a wide area extending throughout the Region and beyond, the very large majority of both ground and airline passenger travel was found to have originated or to have been destined for an area the boundary of which lies within 18 airline miles of the airport terminal. It was found also that large concentrations of trip interchanges with the air terminal were very few both in the volumes of total ground travel and of airline passenger ground travel to and from the Field.

The exclusive airport highway facility directly linking General Mitchell Field with the regional freeway system will, when completed, afford greatly increased accessibility between the airport and all parts of the Region and beyond. The increased accessibility gained may prompt some air travelers of this Region to switch from Chicago's O'Hare Field to General Mitchell Field in air travel beginning or ending in southeastern Wisconsin.

Figure 14

PERCENT OF TOTAL TRUCK TRIPS GENERATED BY GENERAL MITCHELL FIELD AIRPORT TERMINAL BY PRINCIPAL TYPE OF COMMODITY PICKED UP OR DELIVERED AT THE TERMINAL—1968



Source: SEWRPC.

SHIFTS IN CENTERS OF POPULATION WITHIN THE REGION: 1960-1970

by Wayne H. Faust, Associate Planner

INTRODUCTION

In order to assist in monitoring residential population shifts within the seven-county Southeastern Wisconsin Region, the Southeastern Wisconsin Regional Planning Commission undertook the task of computing the 1960 and 1970 centers of population for each county in the Region, as well as for the Region itself. A center of population is defined as that point for a particular geographic area which minimizes the sum of the air line distances from that location to the distributed location of the entire resident population. The location of centers of population are, therefore, useful in analytical and quantitative studies made by both public and private agencies wherein knowledge of service or market areas or of shifts in residential population is required.

COMPUTING THE CENTER OF POPULATION

For a discussion of the computational methodology used to derive the 1960 and 1970 centers of population within the Region, see "Computing the Center of Population and the Geographic Center," SEWRPC Technical Record, Vol. 3, No. 2, 1969. This Technical Record article not only presented the techniques utilized to locate centers of population and geographic centers by conventional and electronic data processing methods but also set forth the specific locations of each of the geographic centers which are shown herein on Map 1 and described in Table 1. It should be noted that the geographic boundaries of the counties and the Region have remained constant since 1960; and, therefore, no changes occurred in the locations of the geographic centers. The location of the geographic center of the City of Milwaukee, however, did change between 1960 and 1970 due to substantial changes in the corporate limits of that city.[1]

The 1960 centers of population were computed utilizing a combination of the conventional and computer techniques, with the 1960 resident populations by civil division[2] being allocated based upon the best available measure of housing unit dispersion within the Region—the SEWRPC map, entitled "Existing Land Use, March 1963." The location of the observed population center of each civil division was coded for electronic computer application, and the resultant county and regional centers of population were computed. Data from the U. S. Bureau of the Census, 1970 Census of Population, and the SEWRPC 1970 land use map overlay served as inputs to compute by the conventional method the 1970 centers of population. Census tracts or enumeration districts[3] rather than civil divisions were the elemental geographic units for which individual 1970 centers of population were selected.

SHIFTS IN THE CENTERS OF POPULATION: 1960-1970

It is important to note that the population changes for the civil divisions within the Region and each of the counties described herein provide only indications of the changes in overall dispersion of resident population which effects the shifts in the centers of population. It is only through the application of center of

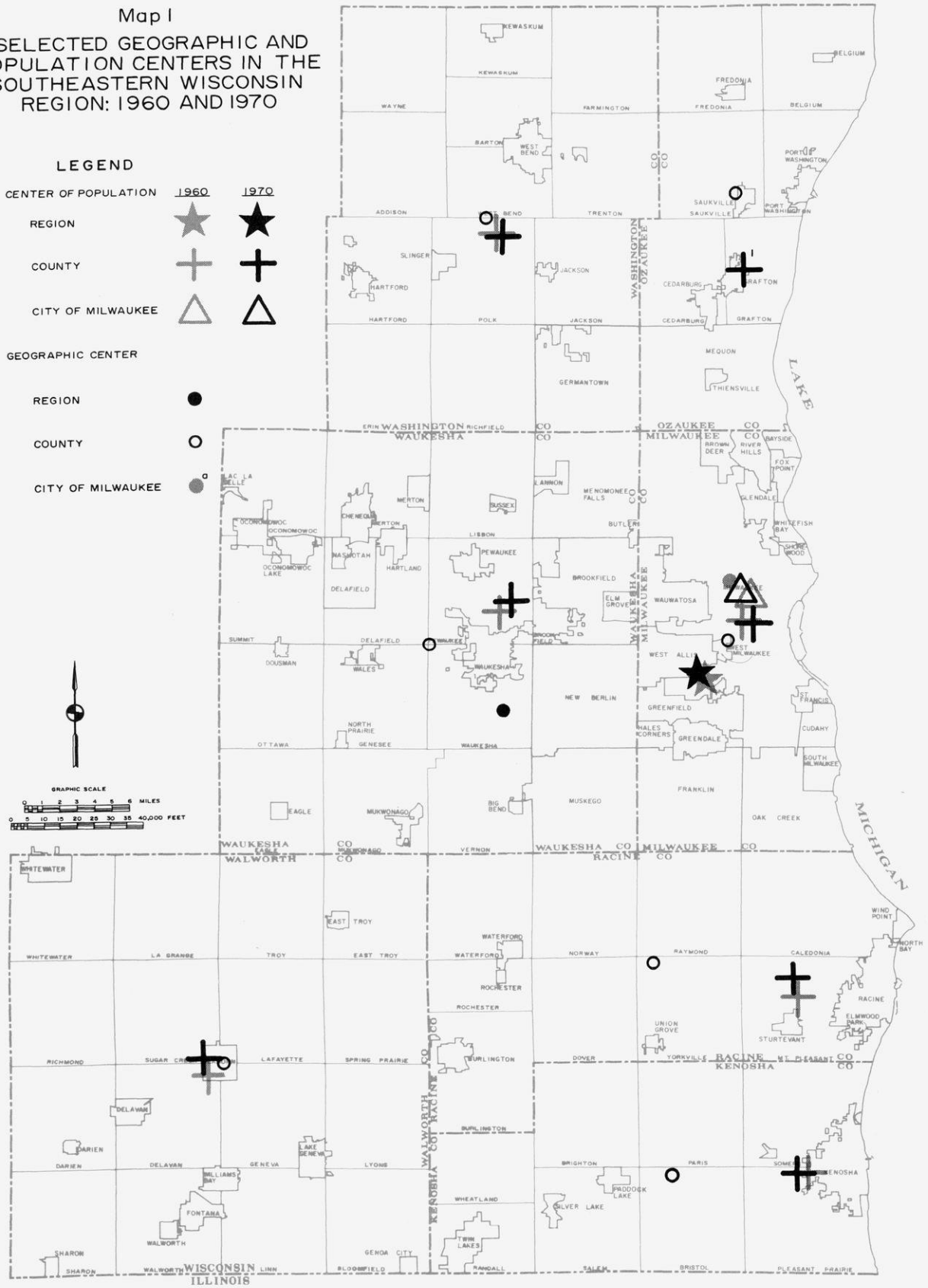
[1] *In 1960 the Village of Brown Deer included an approximately 16-square mile area which, upon litigation, was awarded to the City of Milwaukee in 1962 by the Wisconsin Supreme Court. The geographic center of the City of Milwaukee is, therefore, based on the jurisdictional area of the City applicable following the 1962 Court decision.*

[2] *See 1960 Census of Population, U. S. Bureau of the Census.*

[3] *As defined by the U. S. Bureau of the Census in the 1970 Census User's Guide, Part 1, October 1970, "Census tracts are small, relatively permanent areas into which large cities and adjacent areas are divided for the purpose of providing comparable small-area statistics...." Enumeration districts are subareas of census tracts utilized for administrative purposes, and "These small population areas average about 250 housing units...."*

Map 1

SELECTED GEOGRAPHIC AND POPULATION CENTERS IN THE SOUTHEASTERN WISCONSIN REGION: 1960 AND 1970



[a] Based on the jurisdictional area of the City as it existed since 1963.

[1] 1960 and 1970 locations are the same.

Source: SEWRPC.

TABLE I

SELECTED GEOGRAPHIC AND POPULATION CENTERS
IN THE SOUTHEASTERN WISCONSIN REGION- 1960 AND 1970

GEOGRAPHIC UNIT	GEOGRAPHIC CENTER	CENTER OF POPULATION	
		1960	1970
SOUTHEASTERN WISCONSIN REGION	0.2 MILE EAST AND 0.3 MILE SOUTH OF THE INTERSECTION OF CTH I AND CTH F IN SECTION 26 IN THE TOWN OF WAUKESHA	S.67TH STREET BETWEEN W.EUCLID AND W. OKLAHOMA AVENUES IN THE CITY OF MILWAUKEE	S.71ST STREET AND W. OKLAHOMA AVENUE IN THE CITY OF MILWAUKEE
KENOSHA COUNTY	CENTER OF SECTION 5, T1N, R22E, IN THE TOWN OF BRISTOL	IN THE NE 1/4 OF SECTION 3, T1N, R22E, IN THE TOWN OF PLEASANT PRAIRIE	IN THE NW 1/4 OF SECTION 3, T1N R22E, IN THE TOWN OF PLEASANT PRAIRIE
MILWAUKEE COUNTY	IN THE SW 1/4 OF SECTION 1, T6N, R21E, IN THE VILLAGE OF WEST MILWAUKEE	BETWEEN N. 30TH AND N.31ST STREETS AND BETWEEN W. KILBOURN AVENUE AND W. WELLS STREET IN THE CITY OF MILWAUKEE	N.22ND STREET AND W. WELLS STREET IN THE CITY OF MILWAUKEE
OZAUKEE COUNTY	IN THE SE 1/4 OF SECTION 26, T11N, R21E, IN THE VILLAGE OF SAUKVILLE	IN THE SW 1/4 OF SECTION 18, T10N, R21E, IN THE TOWN OF GRAFTON	IN THE SW 1/4 OF SECTION 18, T10N, R21E, IN THE TOWN OF GRAFTON
RACINE COUNTY	IN THE SE 1/4 OF SECTION 6, T3N, R21E, IN THE TOWN OF YORKVILLE	IN THE NW 1/4 OF SECTION 15, T3N, R22E, IN THE TOWN OF MOUNT PLEASANT	IN THE SW 1/4 OF SECTION 10, T3N, R22E, IN THE TOWN OF MOUNT PLEASANT
WALWORTH COUNTY	NE CORNER OF SECTION 1, T2N, R16E, IN THE VILLAGE OF ELKHORN	IN THE SW 1/4 OF SECTION 1, T2N, R16E IN THE TOWN OF DELAVAN	IN THE SW 1/4 OF SECTION 35, T3N, R16E, IN THE TOWN OF SUGAR CREEK
WASHINGTON COUNTY	NW CORNER OF THE NE 1/4 OF SECTION 3, T10N, R19E, IN THE TOWN OF POLK	IN THE NE 1/4 OF SECTION 3, T10N, R19E, IN THE TOWN OF POLK	IN THE SW 1/4 OF SECTION 2, T10N, R19E, IN THE TOWN OF POLK
WAUKESHA COUNTY	SE CORNER OF SECTION 36, T7N, R18E, IN THE TOWN OF DELAFIELD	IN THE NW 1/4 OF SECTION 26, T7N, R19E, IN THE TOWN OF PEWAUKEE	IN THE SE 1/4 OF SECTION 23, T7N, R19E, IN THE TOWN OF PEWAUKEE
CITY OF MILWAUKEE	INTERSECTION OF N.42ND STREET AND W. NORTH AVENUE IN THE CITY OF MILWAUKEE[a, b]	BETWEEN N.27TH AND N.28TH STREETS AND SLIGHTLY NORTH OF W. VLIET STREET IN THE CITY OF MILWAUKEE[a]	N.31ST STREET AND W. WALNUT STREET IN THE CITY OF MILWAUKEE[a]

[a]THE LOCATIONS OF THESE CENTERS WERE PROVIDED BY THE CITY OF MILWAUKEE, DEPARTMENT OF CITY DEVELOPMENT.

[b]THE GEOGRAPHIC CENTER OF THE CITY OF MILWAUKEE IS BASED ON THE JURISDICTIONAL AREA OF THE CITY AS IT HAS EXISTED SINCE 1963.

SOURCE- CITY OF MILWAUKEE, DEPARTMENT OF CITY DEVELOPMENT, AND SEWRPC.

population computational methods that aggregate, dispersed populations can be precisely weighed to locate centers of population and subsequently permit the measurement of any shifts in their locations at different points in time.

The Region

The shift in the location of the population center of the Region between 1960 and 1970, although having moved only slightly to the northwest, is indicative of the fact that, during this decade, the three counties located north and west of the 1960 population center had the greatest percentage increases in population of all the counties in the Region—Waukesha, 46.20 percent; Ozaukee, 41.57 percent; and Washington, 38.42 percent—and had gained 106,816 persons of the 182,267 person population increase in the Region.

The geographic center of the Region is located near the intersection of CTH I and CTH F in the Town of Waukesha. This geographic center, being approximately 11.5 miles west and slightly south of the 1960 and 1970 centers of population of the Region (see Table 1), which were found to be within five blocks of one another within the City of Milwaukee, at S. 67th Street and W. Oklahoma Avenue (1960) and S. 71st Street and W. Oklahoma Avenue (1970), suggests that the large proportion of the total population of the Region residing in Milwaukee County—65.8 percent in 1960 and 60.1 percent in 1970—has significantly restrained the impact of the 1960-1970 population growth in the other counties of the Region on the shift of the Region's center of population.

Kenosha County

The geographic center of Kenosha County is located approximately one-half mile northeast of the intersection of USH 45 and STH 50. Between 1960 and 1970, the center of population of the County shifted to the west approximately one-half mile from the 1960 location at the intersection of Green Bay Road and 64th Street in the Town of Pleasant Prairie. This one-half mile shift occurred even though the population in the City of Kenosha increased during the decade by 10,906 persons compared to the increase in the county population of 17,302 persons. Contributing factors to the westward movement of this center of population were the large percentage increases in the populations of the three far-western civil divisions

in the County—the Village of Twin Lakes, 52.0 percent; the Town of Randall, 56.2 percent; and the Town of Wheatland, 36.2 percent—which exceed the population increase of the next most rapidly growing civil division in the County by more than 9 percent.

Milwaukee County

The Milwaukee County center of population, considering that the City of Milwaukee's center of population was reported to have shifted approximately 0.38 mile in a northwestwardly direction, surprisingly was found to have moved eastward approximately three-quarters of a mile within the City of Milwaukee from its 1960 location between N. 30th and N. 31st Streets and between W. Kilbourn Avenue and W. Wells Street to its 1970 location at N. 22nd Street and W. Wells Street. This movement is largely the result of the 16,721 person net increase in population of those civil divisions located wholly to the east of a north-south line drawn through the 1960 center of population, because the growth of those civil divisions comprises 92.8 percent of the 18,016 person net increase between 1960 and 1970 in the entire population of Milwaukee County. The geographic center of the County is located south of the 1960 center of population at a point approximately one-quarter mile north of the intersection of W. Lincoln Avenue and S. 43rd Street in the Village of West Milwaukee.

Ozaukee County

Interestingly, the center of population of Ozaukee County—located in the Village of Grafton on STH 57 approximately one-half mile northeast of the intersection of Washington Street and 16th Avenue—like the geographic center of the County—located approximately at the western corporate limit of the Village of Saukville on STH 33—did not shift between 1960 and 1970. Although the population of the County increased by 15,980 persons, or 41.6 percent, during the decade, the dispersion of this population growth throughout the County was such that the 1970 center of population was found to be located at the same place it had been in 1960.

Racine County

In Racine County the geographic center is located approximately one-half mile northeast of the intersection of USH 45 and STH 20 in the Town of Yorkville. The County's 1970 center of population is located in the Town of Mount Pleasant on CTH C approximately three-quarters of a mile west of the intersection of CTH C and Stuart Road, having shifted northward approximately three-quarters of a mile from the 1960 location, which location was approximately three-quarters of a mile southwest of the intersection of CTH C and Stuart Road. This northward shift in the center of population of the County between 1960 and 1970 was probably due in part to the effect of residential development adjacent to Milwaukee County. In addition, the shift was strongly influenced by the fact that 40.5 percent of the 29,057 person increase in the county population occurred in the northern one-half of the County, including the Villages of North Bay, Waterford, and Wind Point and the Towns of Caledonia, Norway, Raymond, and Waterford.

Walworth County

Coincidentally, in Walworth County, the 1960 and 1970 centers of population were found to be within two miles of the geographic center. The geographic center of Walworth County is located approximately at the intersection of E. Rockwell Street and S. Washington Street in the City of Elkhorn. From its 1960 location at a point approximately three-eighths of a mile northeast of the intersection of Devendorf Street and the 1960 southern corporate limit of the City of Elkhorn, the center of population shifted northwesterly almost one-half mile to a point located approximately one-quarter mile south of W. Court Street on West Street in the City of Elkhorn. As might be expected from the center of population having moved northwestwardly between 1960 and 1970, the population of the civil divisions exclusively in the northwest quadrant of the County increased 44.2 percent, more than their proportionate, one-quarter share of the land area of the County. In addition, the civil division in the northwest quadrant furthest from the 1960 center of population, the City of Whitewater, experienced a substantial rise in population in absolute and relative terms of 3,749 persons, which represents 33.8 percent of the 1960-1970 county population increment.

Washington County

Washington County's geographic center is located approximately 0.6 mile west of the intersection of Lake Drive and Hillside Drive in the Town of West Bend. The shift in the locations of the 1960 and 1970 centers

of population of Washington County of slightly more than one-half mile within the Town of Polk was measured between the 1960 location of the center of population, which was found to be one-quarter mile south of S. Town Line Road on CTH Z, and the 1970 center location, approximately one-quarter mile northeast of the intersection of Pleasant Valley Road and CTH Z.

An important factor in the southeastern shift of the center of population in Washington County was the development of residential subdivisions in the Town and Village of Germantown. A combined town-village population of 4,606 persons in 1960 increased by 62.3 percent to 7,390 persons in 1970. It should be noted that, even though the population of the City of West Bend increased 5,017 persons, or 43.5 percent, during the decade, the growth of the City had a lesser effect on the center's movement because of the City's proximity to the center and because its rate of population increase was less than that of the combined population increment of the Town and Village of Germantown.

Waukesha County

The geographic center of Waukesha County is located approximately one-quarter mile west of the intersection of CTH DT and CTH T in the Town of Delafield. In 1960 the center of population of the County was located in the Town of Pewaukee on Nuttingham Drive halfway between Archery Road and Busse Road, and by 1970 the center had moved northeast approximately 0.6 mile to a point located approximately one-quarter mile north of the intersection of IH 94 and STH 164 in the Town of Pewaukee. The population growth which occurred in the civil divisions in the eastern tier of townships is the apparent underlying reason for the northeastward movement of the center of population in Waukesha County. Of a total gain in population of 73,116 persons in the County, 43,699 persons were added in total to the populations of the Cities of Brookfield, Muskego,[4] and New Berlin; the Villages of Butler, Elm Grove, Lannon, and Menomonee Falls; and the Town of Brookfield.

SUMMARY

In order to assist in monitoring residential population shifts within the seven-county Southeastern Wisconsin Region, the Southeastern Wisconsin Regional Planning Commission undertook the task of computing the 1960 and 1970 centers of population for each county in the Region, as well as for the Region as a whole. The stability between 1960 and 1970 of the centers of population computed for the Region and its constituent counties is significant in that no center shifted more than a distance of about one mile, even though there was an 11.58 percent increase in the population of the Region and the population increases of the counties ranged between 1.74 percent and 46.20 percent.

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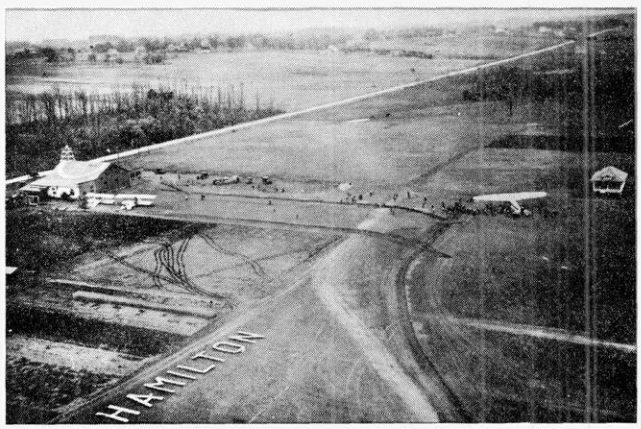
[4] *The Town of Muskego incorporated as a city of the fourth class in 1964.*

A BACKWARD GLANCE

by Sheldon W. Sullivan, Special Projects Planner

THE DEVELOPMENT OF GENERAL MITCHELL FIELD

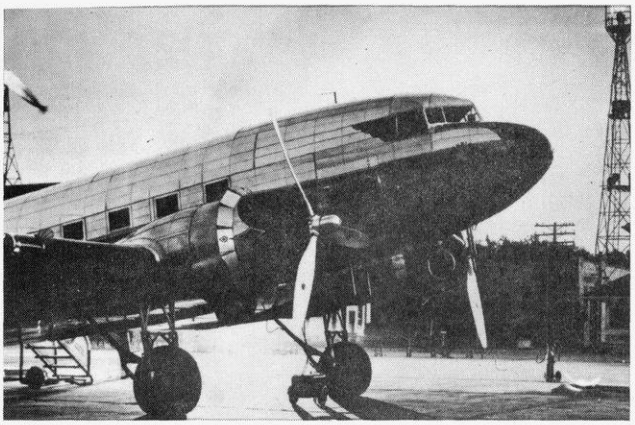
The development of General Mitchell Field as the major air carrier airport in southeastern Wisconsin began late in 1926 when the County of Milwaukee transferred airport operations from a site first acquired and improved in 1919 and located in what is now James Currie Park to a newly purchased 163-acre tract located about six miles south of downtown Milwaukee, which included Hamilton Airport, the nucleus of present day General Mitchell Field. Upon acquisition, the airfield was a relatively level, sod-surfaced, "T"-shaped area with the base of the "T" extending one mile north and south between E. Layton Avenue and E. Grange Avenue, and the leg of the "T" extending approximately three-quarters of a mile westerly to S. Howell Avenue. The main building on the airfield, a rambling wooden hangar which had been moved to Hamilton Airport some years earlier from another private airfield, served during the first year of county ownership both as a hangar and an administrative building. A rotating beacon atop the hangar and a drum-type lighting device invented by Hamilton which cast a flat beam onto the landing strips were the only aids to air navigation at the airport. The total cost of the airfield, its equipment, and the adjoining farm land was $135,000. Shortly after acquisition, the airport was renamed the "Milwaukee County Airport." The following year, additional adjoining farm land, including a farmhouse, was purchased. The farmhouse, remodeled to house the weather bureau, an administrative office, a snack bar, and the office of Northwest Airways, Inc., (known as Northwest Airlines, Inc., since 1934) which operated the mail service, became the new administrative building.



This photograph of Hamilton Airport was taken about the time the airport was purchased by Milwaukee County. The large aircraft at right, which attracted such interest, was one in which it is said that the first polar flight was made. In that 1926 flight over the North Pole, Lt. Commander Richard E. Byrd was the navigator, and Floyd Bennett, a famous aviator of the period, the pilot.

Photo courtesy of The Toepfer Collection, Milwaukee County Historical Society.

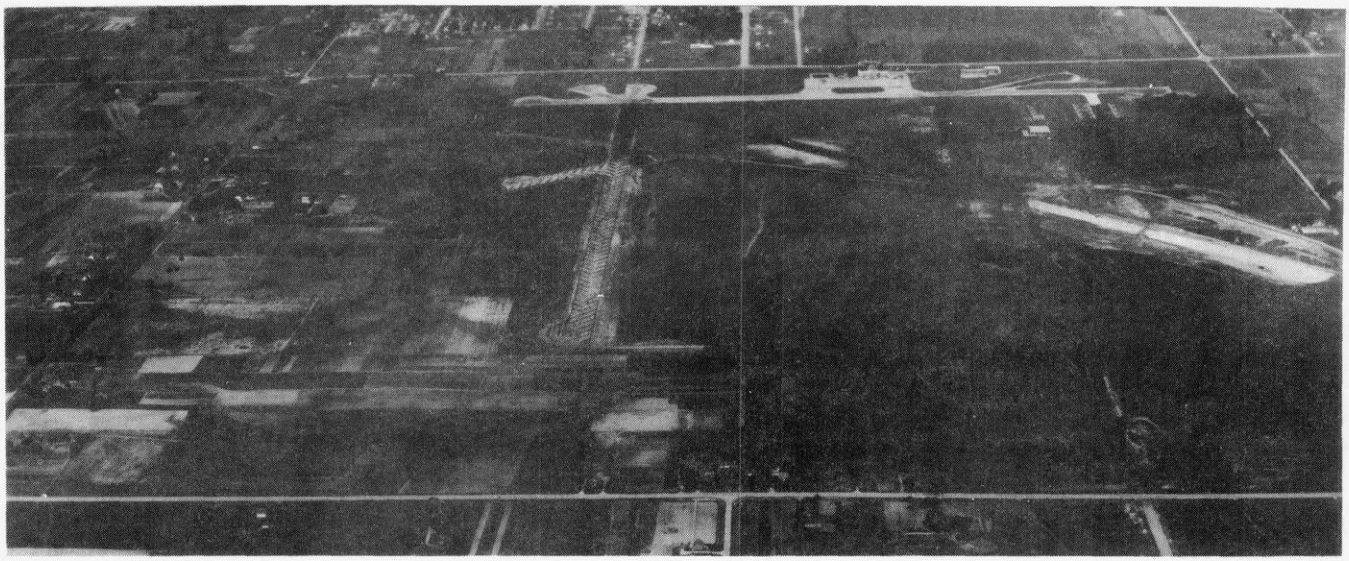
Growth in air travel during the formative years of the new Milwaukee County Airport and in the depression years soon to follow was slow. At first the airport operations consisted largely of airmail service on the Chicago to Milwaukee to Minneapolis-St. Paul route, but on July 1, 1927, the first regularly scheduled passenger service in the Region began when Northwest Airways, Inc., provided service connecting these four cities. Early airport records show that by 1930, the number of airline passengers carried annually, i.e., the number of airline enplanements and deplanements at the Milwaukee County Airport, totaled about 3,000. By 1930, with the development of larger and heavier aircraft, sod surface had been replaced at the airport by a cinder surface which, for the sake of economy, was laid in strips, these strips effectively becoming the first runways at the airport. Commercial air travel, however, was beset by major problems in those early years. For one thing, flying was expensive and beyond the means of the average citizen. Flying, too, was still subject to the vagaries of weather, and the relatively small and seemingly fragile aircraft of the late 1920's and the early 1930's did not engender a great amount of confidence on the part of the public. It was not until 1936 that an aircraft, the Douglas DC-3, was designed which provided the performance, reliability, safety, and economy of travel which would satisfy public desires.



The Douglas DC-3 (to the left) first provided the performance, the reliability, the safety, and the economy in travel which would satisfy public desires.

Photo courtesy of The Milwaukee Journal.

By 1937 the site of the Milwaukee County Airport had been expanded from about 163 acres at the time of purchase to 378 acres. The number of airline passengers totaled about 12,000 that year, and the need for a new air terminal to meet the anticipated demand was recognized and planned for. From 1938 through 1941, as the dimensions and weight of aircraft continued to increase, cinder runways were replaced with 100-foot wide runways having a 6- to 7-inch waterbound stone base topped with a double surface treatment of hot tar. The east-west runway was constructed in 1938 and extended in 1941 to a length of 4,800 feet; the northeast-southwest runway was also constructed in 1938 and in 1941 was extended to a length of 5,000 feet; the north-south runway was constructed in 1939 and lengthened by 1943 to 4,800 feet; and the northwest-southeast runway, 4,600 feet in length, was constructed in 1940. A taxiway, 2,650 feet long and 75 feet wide, was constructed in 1943 connecting the recently extended east-west and northeast-southwest runways. Other improvements completed at the airport by 1938 included the construction of a radio range station near the Rawson Avenue approach to the airport; the installation of a weather station at the airport which provided radio and teletype weather reports; the installation of a cone wind indicator; the marking of runways with coded range lights; and the installation of floodlights which provided illumination for the airport runways.



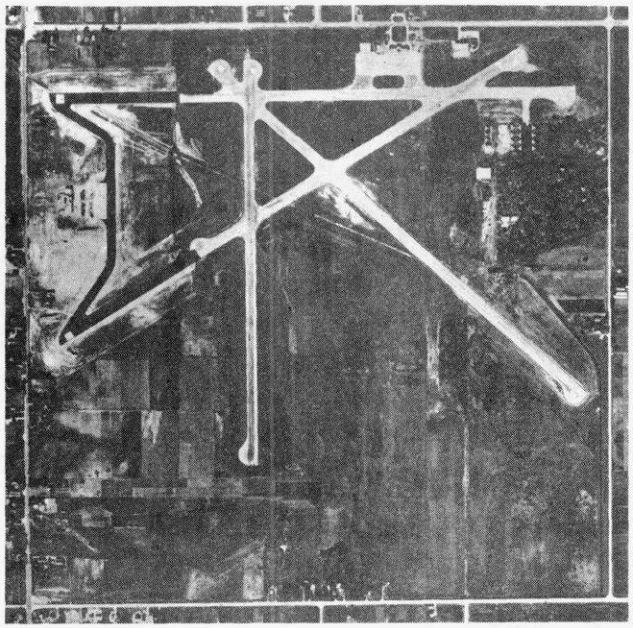
This photograph of General Mitchell Field was taken in 1939 and shows the construction in progress of waterbound stone base runways which were to replace existing cinder surfaced runways.

Photo courtesy of the Milwaukee County Airport Department.

In the early 1940's, a new terminal building constructed under a WPA project, containing a control tower operated by the Civil Aeronautics Administration and located on E. Layton Avenue along the north side of the field, was placed in operation, replacing the old farmhouse in use as a terminal building since 1927. Airline service was now being provided to both the Atlantic and Pacific coasts, and the number of airline passengers had increased in 1940 to more than 31,000 per year. The upward trend in air passenger travel, however, was interrupted during the war years, decreasing to approximately 23,000 passengers in 1943. Within this period, in 1941, the airport was officially renamed General Mitchell Field in honor of Brigadier General William Mitchell, famous for his advocacy of air power supremacy, a strong supporter of civil aviation, a one-time resident of the Region, and often a visitor in Milwaukee County in the early years of aviation.

This photograph of the Milwaukee County Airport administration building and tower was taken shortly after it was completed in 1940. The Northwest Airlines, Inc., and the Pennsylvania Central Airlines (later to become Capitol Airlines and now United Airlines) moved into the building in August 1940. The Pennsylvania Central Airlines aircraft standing on the apron was a Douglas DC-3.

Photo courtesy of the Milwaukee County Airport Department.



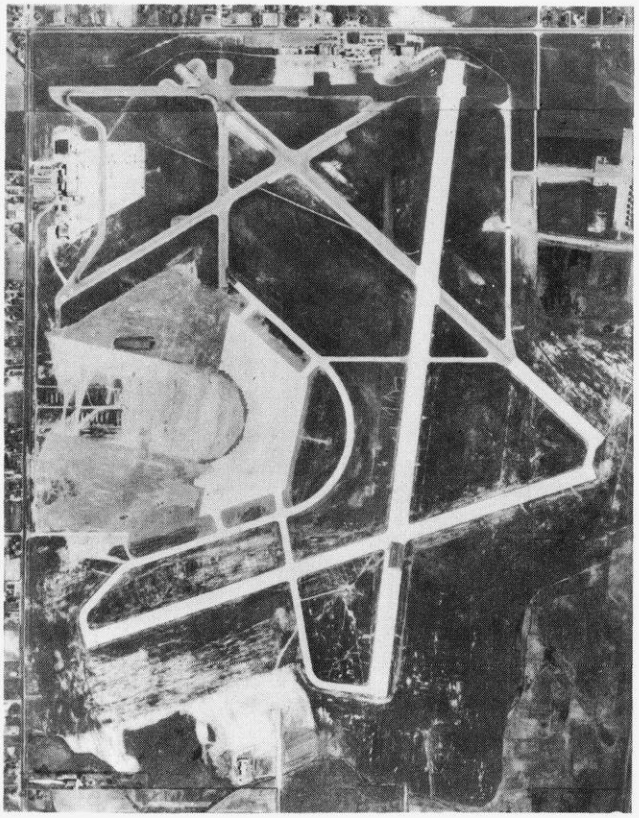
This photograph of General Mitchell Field taken in 1941 shows the nearly completed system of stone base runways. After the stone base runways were completed, they were topped with a double surface treatment of hot tar. The building shown at the west end of the airport was the recently completed Army National Guard headquarters building.

Photo courtesy of the Milwaukee County Airport Department.

By the end of the war in 1945, General Mitchell Field had grown in area to 649 acres, air travel had climbed sharply to a total of more than 105,000 passengers annually, and plans for the expansion of the airport and for the construction of another new air terminal building were underway. Larger and faster aircraft, designed before and during World War II and thoroughly tested during that war, were now adapted for commercial aviation use in time for the large increases in air travel which almost without interruption have continued both nationally and within the Region to this date. The first all-concrete runway to be constructed at General Mitchell Field, the north-northeast—south-southwest runway, was completed by

1948. The new runway, built to specifications which required 12 inches of concrete over 12 inches of granular fill, extended approximately 6,700 feet in length and 200 feet in width. An Instrument Landing System (ILS) was installed in 1948 and commissioned at the airport in 1949.

During the period of construction of the new airport terminal facility from 1948 to 1955, certain significant changes in the airport runway system were made. The north-south and east-west runways were dropped from the runway system; a 1,270-foot concrete extension to the existing bituminous surface northwest-southwest runway brought the total length of the runway to 5,870 feet; and a new concrete runway 5,610 feet long and 150 feet wide, the more southerly of two runways referred to as southwest-northeast runways, was constructed. Within this period, in 1950, an Airport Surveillance Radar (ASR) system was installed at General Mitchell Field.



This photograph of General Mitchell Field was taken in 1951 and shows construction in progress of a new administration and air terminal building which was to be completed in 1955. The remains of a part of the Army cantonment buildings can be observed in the excavated area. German prisoners of war were held in the cantonment area during the last years of World War II.

Photo courtesy of the Milwaukee County Airport Department.

By 1955 a new air terminal facility on S. Howell Avenue had been put in operation along the west side of the expanded runway system, and the area of General Mitchell Field had been expanded to approximately 1,531 acres, an increase of approximately 882 acres over the area of the Field in 1945. Airline travel during this period increased very sharply from approximately 105,000 passengers in the last year of World War II in 1945 to approximately 522,000 passengers in 1955.

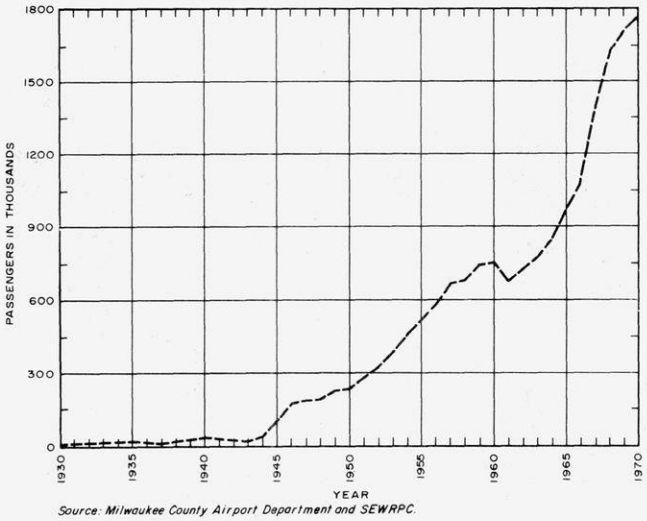
Since 1955 airline travel at General Mitchell Field has continued to record very substantial gains, increasing from approximately 522,000 passengers in 1955 to about 752,000 in 1960, and from 966,000 in 1965 to approximately 1,767,000 passengers in 1970 (see Figure 1). During this period, the area of General Mitchell Field was also substantially increased from approximately 1,500 acres in 1955 to nearly 2,000 acres in 1970.

Since 1955 there have been continued improvements at General Mitchell Field including the installation of an air conditioning system in the air terminal building; the extension of the southwest-northeast concrete runway from 5,610 feet to 8,011 feet in length; the extension of the north-northeast—south-southwest

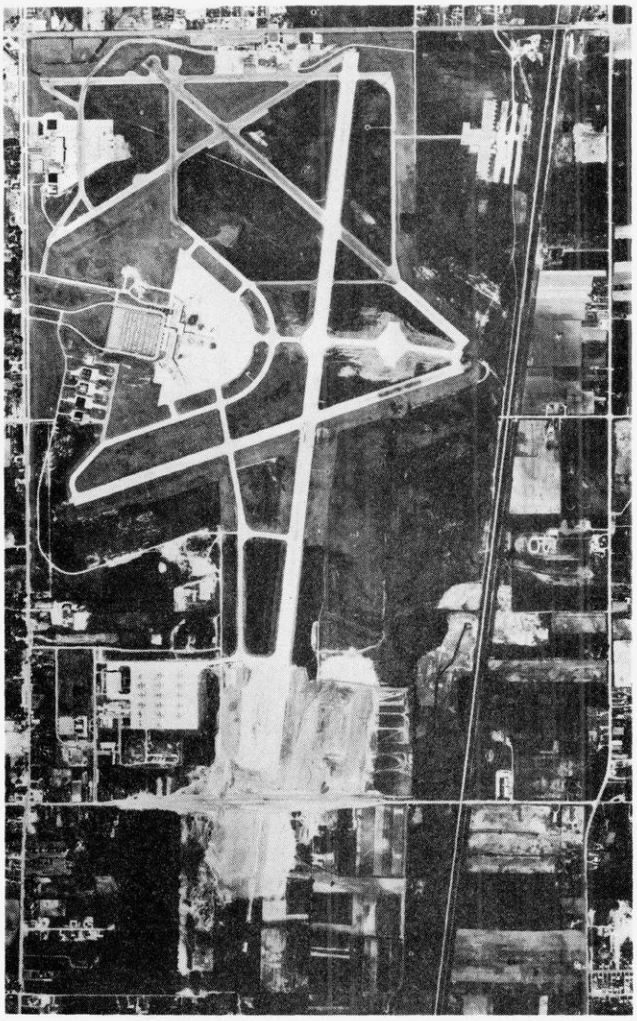
runway (renamed the north-south runway since 1961 or earlier) from 6,730 to 9,916 feet in length; the construction and extension of taxiways; the lighting and marking of runways and taxiways; and the draining, grading, and fencing of the airport grounds.

Figure 1

ESTIMATES OF AIRLINE PASSENGERS AT GENERAL MITCHELL FIELD AIRPORT TERMINAL: 1930 - 1970



Source: Milwaukee County Airport Department and SEWRPC.



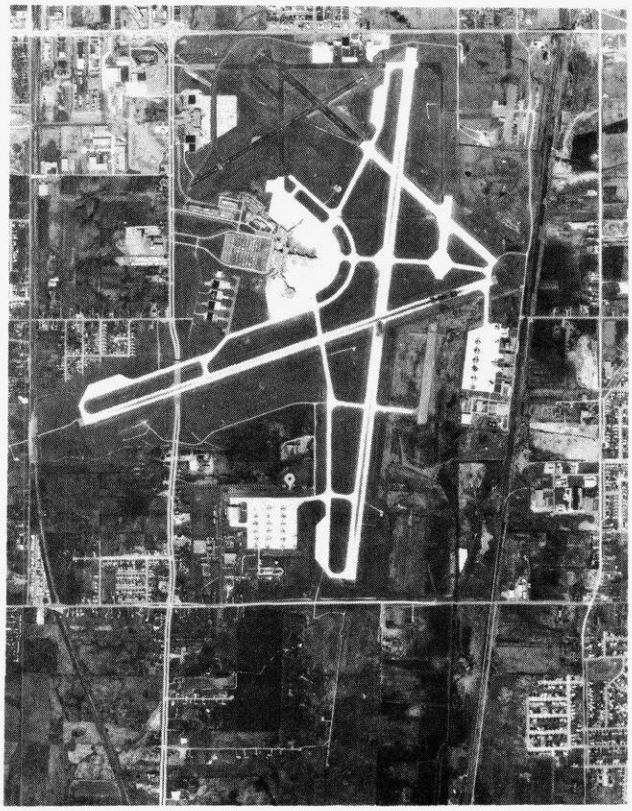
This photograph of General Mitchell Field was taken in 1960 approximately 5 years after the opening of the present airport terminal. The hangars shown just southwest of the main parking area of the terminal house corporate aircraft, the hangars in the northeast corner of the airport house private aircraft, and the installation in the southwest corner of the airport houses the U. S. Air Force Reserve Training Center.

Photo courtesy of the Milwaukee County Airport Department.

In 1969 the Milwaukee County Board of Supervisors adopted a master plan for the continued development of General Mitchell Field. The remodeling of the south pier of the air terminal into an eight-gate circular concourse was the first major construction project under the new master plan. The plan calls for a new and larger air terminal incorporating existing terminal facilities to the degree possible; a new cargo center; the acquisition of additional lands north and south of the airport for safe approach zones; improved parking facilities, some of which may be included in the expanded air terminal structure; and a new exclusive airport highway facility scheduled for completion in 1973, directly linking General Mitchell Field with the regional freeway system, thereby affording greatly increased accessibility to all parts of the Region and beyond.

It would be improper not to acknowledge the importance of the fixed base and corporate operations and the military installations in the development and history of General Mitchell Field. In the early history of the airport, for example, fixed base operations virtually sustained the airport by providing such services as flight instruction, air taxi service, and service, repair, rental and sometimes the sale, of aircraft. During World War II, the installation of military units at the airport sharply accelerated the pace of its development in order to meet the need for new and improved runways which would accommodate newly

developed military aircraft larger and faster than had been known at the airport. The influence of corporate operations at General Mitchell Field has been more subtle, but exceedingly healthy, not only for development of the airport but also for the economy of the entire Southeastern Wisconsin Region through important air commerce with business and industry throughout the nation and world.



This photograph of General Mitchell Field was taken in 1970 and shows the airport very much as it looks today. On the eastern edge of the airport just south of center can be seen the new training center of the Wisconsin Air National Guard. Also to be seen in this photograph is the eight-gate south concourse of the airport terminal, which was opened for service late in 1969.

Photo courtesy of the Milwaukee County Airport Department.

During the 45-year history of the airport under Milwaukee County ownership, more than twenty fixed base operations have served it. Of these, two remain. They are Midwest Airways, Inc., founded in 1925 and now located on the northwest corner of the airport on S. Howell Street; and Mitchell Aero, founded in 1961 and located on Layton Avenue on the north side of the Field. Other fixed base operations many persons will remember are Elling O. Weeks Aircraft Corporation, founded in the early 1930's; Harold C. (Tiny) Westfahl Airways, also begun in the early 1930's; Holterhoff Flying Service, founded in the mid-1930's; Anderson Air Activities, begun in the late 1930's; and, more recently, Thomas Aviation.

The operations of Midwest Airways, Inc., founded by three brothers, James, Edward, and Ray Knaup, deserve special attention, especially for their early years of operation. In those first years, in addition to instructing students in the arts of air navigation and flight and the repair and building of aircraft, the Knaup brothers were engaged in commercial air photography, gave glider instructions, provided air taxi service, provided fueling and repair services to visiting aircraft, took sightseers aloft, and even barnstormed as stunt flyers at celebrations such as county fairs in the hinterlands of Wisconsin, Illinois, and Iowa. In the first years of flight instruction during the 1920's, in the absence of ground to air communications, the Knaups devised an extraordinary and novel aid to air navigation. Signals of caution or emergency due to changing weather conditions were given to aviators aloft by intentionally leaving open a certain single hangar door to denote caution or two other hangar doors to denote emergency. Among other interesting incidents at Midwest Airways in those pioneer aviation years were the transporting of about 100 football fans by air to the Notre Dame-University of Wisconsin game in Madison as early as 1928; the gamble of buying 10 sister aircraft of the "Spirit of St. Louis" in 1928 and fortunately selling them all; installing a completely assembled airplane in 1929 in Gimbels Department Store; lighting Milwaukee's

official Christmas tree at Wisconsin Avenue and 10th Street on Christmas night, 1930, by remote control from an aircraft above; training six Chinese nationals as pilots in 1931 so that they might serve in the Chino-Japanese war then in progress; and transporting a case of a Milwaukee-brewed 3.2 beer to the White House in 1933 applauding President Roosevelt's support of legislation for the return of the product.

During World War II, the almost total effort of Midwest Airways was directed toward training pilots for the U. S. Armed Forces. Midwest Airways also claims an unusual "first" in aviation annals—that of having the first American aircraft hijacked to Cuba, an incident in 1961 in which the hijacker rented the plane and piloted it to Cuba. It was never returned. As Ed Knaup, the only living member of the original firm, who is now retired, said recently, "It was not just a way of making a living; it was a way of life—but what a life!" In 1966 the controlling interest in Midwest Airways, Inc., was purchased by Edward L. Stowe, now president of the firm, and Edward Pietrzak.

World War II had a permanent as well as temporary impact on the development of General Mitchell Field. The needs of the military brought about: 1) the construction of a headquarters building for the Army National Guard; 2) the acquisition of additional lands resulting in enlarging the airport area to nearly 650 acres; 3) the construction of new runways and the improvement of others; and 4) the construction of a cantonment area including administration buildings, barracks, and a hospital. The guard building was to be converted to other use and the cantonment buildings were later to be demolished, but the expansion of the airport area and improvement of airport facilities during the war were to remain and set the stage for the postwar development of General Mitchell Field.

The first military unit to be installed at the Field was the 126th Observation Squadron, an air arm of the Army National Guard. The Squadron arrived at the Field late in 1940 and departed on active duty in May 1941. After the U. S. Army leased the use of the Field from the county, the 10th Troop Carrier Group was based there for several months followed by the 10th Ferrying Squadron of the Air Transport Command. Toward the close of the war, German prisoners of war were held for a time in the cantonment barracks at the Field. Following the war, virtually all military flights had ceased, headquarters and cantonment buildings were demolished and the county had unrestricted use of the airport again.

Upon establishment of the Wisconsin Air National Guard in 1947, however, military flights at Mitchell Field were resumed when the 126th Fighter Squadron and support units were assigned to the Field. In 1950, the 128th Air Defense Wing and the 128th Air Defense Group, its arm, were collocated at General Mitchell Field, and the 126th Fighter Squadron was redesignated the 126th Fighter-Interceptor Squadron under the Wing Command. The Squadron was called to active duty in the spring of 1951 and returned to the Field in December 1952. In 1961 the 128th Air Defense Group was redesignated the 128th Air Refueling Group, the 126th Fighter-Interceptor Squadron was redesignated the 128th Air Refueling Squadron. Both remain as such at the Field today, with the Wing headquarters moved in the interim to Truax Field in Madison, Wisconsin.

U. S. Air Force Reserve flying activities at General Mitchell Field began in 1952 with the assignment of the 924th Reserve Training Wing, which a few months later was redesignated the 438th Fighter Bomber Wing. In November 1957 it was redesignated with the change of mission and became the 440th Troop Carrier Wing. In July 1967 the Wing was redesignated again and became the 440th Tactical Airlift Wing, and as such remains at the Field today. Collocated with the Wing is the 933rd Tactical Airlift Group, an arm of the Wing, and its support units.

The number of aircraft movements made by both internally and externally based corporate aircraft represents a very small part of the total aircraft movements made by all aircraft at Mitchell Field. The number of corporate aircraft based at the Field in 1970, for example, was approximately 35, and the total number of arrivals and departures made by such aircraft on an average day is estimated at less than 100, with a sizable number not making a single operation. The arrivals and departures made by non-home-based

corporate aircraft at General Mitchell Field on an average weekday are estimated to be somewhat lower, and if only the arrivals and departures made by corporate aircraft based outside of the Region are considered, a still lower number would be expected.

The economic importance of corporate aircraft activity to General Mitchell Field, measured only in terms of the dollar income derived from landing fees, hangar rentals, fuel sales, and services to aircraft, for example, would be substantial, but would represent only a small fraction of total revenues of the Field.

The real economic importance of corporate air activity to the Field and more particularly to the entire Region could be found in an inventory of the value and volume of sales affecting this Region which result from corporate aircraft movements.

ACKNOWLEDGEMENTS

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OLD COURT HOUSE
P.O. BOX 769
WAUKESHA, WISCONSIN
53186
PHONE 547-6721