urban and industrial growth, were investigated to assess their impact on future air travel demand. Statistical models of the total airline passenger series were developed and used to make forecasts. The important findings of the research include the following:

1. The predictive models predict reasonably accurate forecasts. By 1990, the annual airline passenger demand will be around 5.5 million.
2. The present site does not provide sufficient room for long-term expansion. A large expansion in the number of gate positions, terminal facilities, and automobile parking space will be required.
3. A decisive factor in the selection of any future site for the airport should be the availability of extensive areas for land use planning and control.

The Austin City Council has formed a task force that is extensively studying all available options for the future of the Robert Mueller Municipal Airport (8), keeping in view the projections of annual airline passengers.

ACKNOWLEDGMENT

The study presented in this paper was performed at the Center for Transportation Research, University of Texas, Austin. The authors are grateful to E.G. O'Rourke, Directorate of Aviation, city of Austin, for providing the data used in this paper. Appreciation is also extended to Roy E. Bayless for his interest in the results of this study.

REFERENCES

1. G.E.P. Box and G.M. Jenkins. Time Series Analysis, Forecasting and Control. Holden-Day, Inc., San Francisco, Calif., 1976.
2. A.I. McLeod, K.W. Hipel, and W.C. Lennox. Advances in Box-Jenkins Modeling; 2. Applications. Water Resources Research, Vol. 13, No. 3, June 1977.
3. E. Prazen. Forecasting and Whitening Filter Estimation. Vol. 12. TIMS Studies in the Management Sciences, North Holland Publishing Co., Amsterdam, Netherlands, 1979, pp. 149-165.
4. W. Uddin. A Study on Future Air Travel Demand and Space Needs at Austin Municipal Airport. Center for Transportation Research, University of Texas, Austin, March 1983.
5. Study Says Traffic To Swamp Airport. Austin American Statesman, May 16, 1983.
6. The Bergstrom West Plan. The City of Austin, Texas, Aug. 1981.
7. Aviation Demand and Airport Facility Requirement Forecasts for Medium Air Transportation Hub Through 1980. FAA, U.S. Department of Transportation, Jan. 1969.
8. Airport Expansion Plans Face Opposition. The Daily Texan, Austin, March 8, 1984.

Publication of this paper sponsored by Committee on Aviation Forecasting.

Determination of the Appropriate Number of Taxicabs to Serve an Airport

RAY A. MUNDY, C. JOHN LANGLEY, Jr., and LAURI STULBERG

ABSTRACT

Airport managers constantly receive complaints from airline passengers about the suspected overcharging, poor service, and uncleanliness of taxicabs that serve the airport. Unfortunately, many airport officials find it politically and practically difficult to adequately supervise the airport curb services being offered by taxicab companies and individuals. In addition, airport taxicab groundside access has been increasingly aggravated in many U.S. cities by the relatively recent deregulation of taxicab firms and their operations. Many of these problems are directly related to the total number of taxicabs permitted to serve the airport. In the short run the demand for airport taxicab service is relatively fixed, and thus allowing too many cabs encourages overcharging and deteriorating vehicles as operators find it difficult to maintain financial viability. On the other hand, permitting too few vehicles results in excessively attractive taxicab incomes and passenger inconvenience through long delays on busy holidays and peak travel periods. In the analysis that follows, actual operation statistics and data from the Detroit Metropolitan Airport

complex are used. It is demonstrated how a typical airport taxicab system can be simulated to provide a reasonable and practically defensible answer to the question of how many taxicabs are needed to serve the airport. The approach used involves a specially designed computer program entitled TAXISIM to simulate the capabilities of various cab fleet sizes to handle present and future taxicab demands. The optional number of cabs is then balanced with an economic business analysis of the cab fleet's earning potential, given past operational performance. Taken as a unit, this approach yields a simplistic method for determining an adequate size of taxicab fleet that can accommodate expected airport passenger demand and make a reasonable return on invested time and capital while paying the airport a fair concession fee. Results of this approach are easily transferable to other airports and even to cities in which a fixed number of taxicab permits is the preferred mode of operation.

Airport managers have become increasingly aware of the need to supervise and direct improved airport ground site access. Taxicab services have been the source of major complaints in terms of suspected overpricing, poor services, and unkempt, or unclean vehicles. Typically, a decision must be made to determine how many taxicab vehicles will be permitted to serve the airport in order to provide adequate service to airline traveling passengers, but yet limit the number of providers so that the total taxicab fleet can earn a reasonable return on its investment of time and capital.

The purpose of this paper is to provide a systematic approach to this managerial decision by using data from the Detroit Metropolitan Airport complex, which has been used in making recommendations concerning the appropriate taxicab fleet size for airport service. The following discussion includes a description of the airport taxicab situation at Detroit Metropolitan Airport and the analysis used to recommend the number of taxicabs required to serve the airport. The objectives of the study were to provide a number of taxicabs in service at Detroit Metropolitan Airport that would

1. Provide an adequate number so that airline passengers using taxicab service would have no delay or minimal delay,
2. Provide an adequate return on investment for time and capital used in taxicab services, and
3. Permit the airport authority to charge a reasonable concession fee to cab operators to defray the fixed and variable cost of assets used in the provision of taxicab ground site services.

PRESENT SITUATION

Deplaning passenger taxicab services at the Detroit Metropolitan Airport are provided exclusively by taxicab operators that have applied for and have been issued a permit by the Detroit Metropolitan Airport Board to provide services. Currently, there is a moratorium on the number of permits issued, which is now 127. Taxicab operators are required to pay a total monthly fee of $40--recently reduced from $55 per month through rescheduling of the monthly fee to a quarterly fee. Thus, on an annual basis, the airport board has recently reduced charges to the 127 taxicab operators by $22,860. In addition, the board has also been asked and has been given permission to eliminate the age restriction on vehicles as long as they continue to pass taxicab vehicle inspection criteria.

The poor economic condition of the taxicab operations at Detroit Metropolitan Airport is obvious. In the short run, due to the lack of demand caused by a downturn in the number of airline passengers requiring taxicab services, taxicab vehicles and incomes of operators have deteriorated seriously. The Detroit Metropolitan Airport Board had little choice in the short term but to reduce its requirements for fees and to eliminate age requirements for vehicles.

Given these circumstances, the Detroit Metropolitan Airport administration requested that a much more in-depth, detailed analysis of the financial condition of the taxicab operation be conducted and that recommendations to improve the financial viability of this needed ground transportation service be made. Thus, detailed information was gathered on taxicab operations for the past 3 years. A single driver's log book, which was verified through observation and discussion with other taxicab operators, was used as a data base for the years 1981, 1982, and 1983. A summary of these data is given in Table 1 and Figures 1 through 5.

As shown, the average taxicab and its driver at the Detroit Metropolitan Airport work a very long day (nearly 14 1/2 hr), travel approximately 250 miles per day, and average $67.13 per day in fare income. It should be noted that the average revenue per day has declined by nearly 15 percent from the June 1981 average. On an hourly basis, the typical operator receives somewhat less than $5 per hour from fares and probably receives from $8 to $12 per day in tips. The 127 taxicabs operating at the airport average approximately 3.31 trips per day or a total of slightly more than five passengers per day.

As can be readily understood, such a condition cannot continue for any length of time. The average number of trips per day is simply insufficient to sustain operations other than on a marginal basis. Currently, taxicab operators have used the capital in their vehicles and are not replacing them, but are running the vehicles on used engines and deteriorating bodies. Their inability to replace vehicles results from a lack of capital. The situation, if allowed to continue, appears to be one that will deteriorate further.

NUMBER OF CABS NEEDED

In determining the most appropriate number of taxicabs to be authorized to pick up passengers at the Detroit Metropolitan Airport, two conflicting goals must be considered. First is the need to have an adequate supply of taxicabs available to meet the immediate transportation needs of deplaning passengers. Second is the need to limit the supply of taxicabs so that those operators servicing the airport's needs will be utilized adequately. Attempts to determine a single best number of taxicabs are frustrating, because raising the total will increase the extent to which the first goal is met, but doing so will also diminish achievement of the second goal. Conversely, lowering the total will have the opposite effect. In the end, it is necessary both to

TABLE 1 Taxi Summary of All Computations

1983 MONTH	DATE	TIME STARTED WORK	LENGTH WORKDAY	MILES TRAVEL	TOTAL DAILY REVENUE	REVENUE PER MILE	REVENUE PER HR	TIMES BETWEEN PICK-UP & DROP OFF (V-U) (F-E)	(J-I)	(N-M)	(R-Q)	PLUS ALL OTHERS	ROUND TRIP REV / TV HR	# PUP'S	# PASS
JAN AVG------)		9.40	14.60	178	66.97	0.37	4.59	0.51	0.41	0.45	0.37	0.40	23.78	3.23	4.83
MAR AVG------)		9.39	14.61	229	72.70	0.32	4.96	0.42	0.41	0.42	0.42	0.88	23.70	3.71	5.71
APR AVG------)		9.26	14.74	211	58.52	0.29	3.98	0.43	0.48	0.41	0.38	0.34	23.07	2.96	4.85
MAY AVG------)		9.17	14.83	234	70.33	0.31	4.76	0.47	0.41	0.42	0.42	1.01	24.19	3.34	4.79
AVG OF AVERAGES---)		9.30	14.70	213	67.13	0.32	4.57	0.45	0.43	0.42	0.40	0.66	23.68	3.31	5.05
1982 MAY AVG------)		9.26	14.74	181	74.63	0.40	5.06	0.54	0.42	0.43	0.56	0.48	22.34	3.69	5.59
AVG-JUNE 81--)		9.97	13.77	224	78.80	0.36	5.74	0.43	0.45	0.46	0.45	0.64	21.76	4.10	5.86
AVERAGE OF ALL AVG----)		9.41	14.54	215.73	71.00	0.34	4.90	0.46	0.43	0.43	0.45	0.67	23.01	3.56	5.36

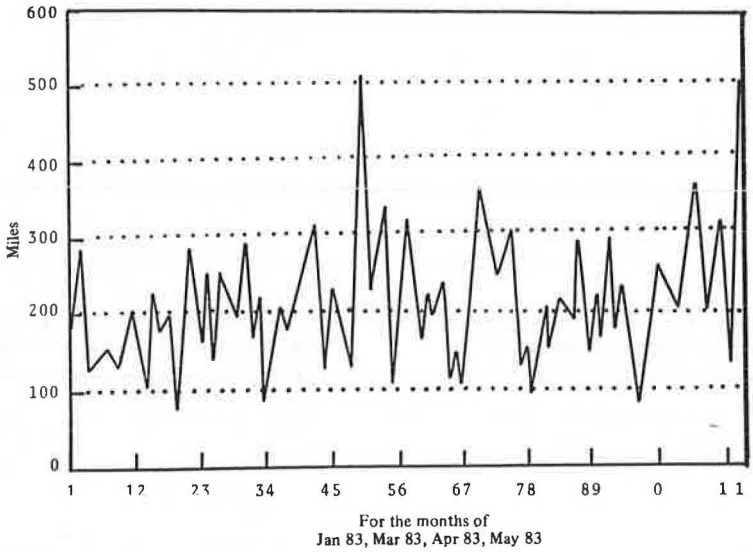

FIGURE 1 Number of miles traveled by day.

assure an adequate supply of taxicabs to meet passengers' needs and to make certain that the supply is limited sufficiently to enhance the chances of financial viability for individual taxicab operators.

Therefore, this study attempts to provide some insight into the number of taxicabs that are actually needed to meet the transportation needs of deplaning passengers. The approach used was to customize TAXISIM (a computer-based simulation model of taxicab operations) to the operating situation at the Detroit Metropolitan Airport and to simulate taxicab activity assuming several realistic levels of passenger demand for taxicab service. Given a particular level of demand, TAXISIM indicates the actual number of taxicabs that would be in service at any given time. Then, the maximum number of taxicabs needed can be determined by observing the magnitude of this figure over time. Finally, the application of an adjustment factor to this number for taxicabs to reflect a certain proportion that will be out-of-service at any given time will result in an estimate of the most appropriate number of taxicabs to be authorized to operate at the airport.

Four major steps were considered in this study:

1. Detailed physical description of taxicab operations at Detroit Metropolitan Airport,
2. Application of TAXISIM,
3. Interpretation of results, and
4. Analysis of policy implications.

Each step will be discussed separately.

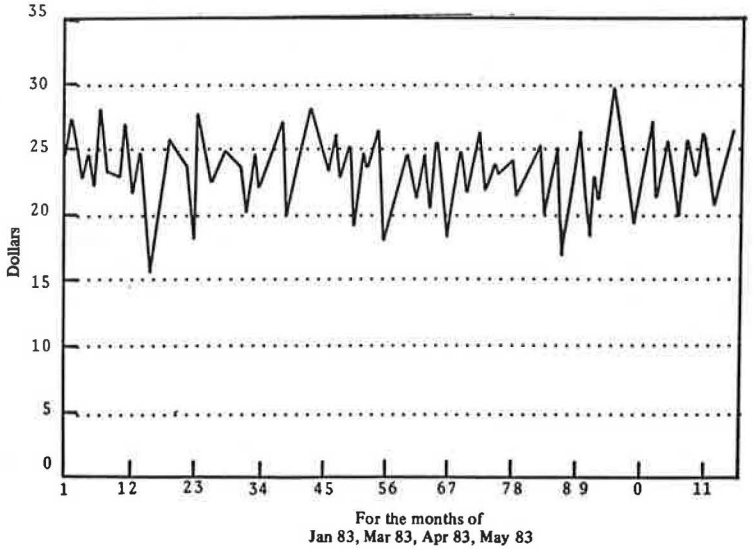

FIGURE 2 Revenue per travel-hour.

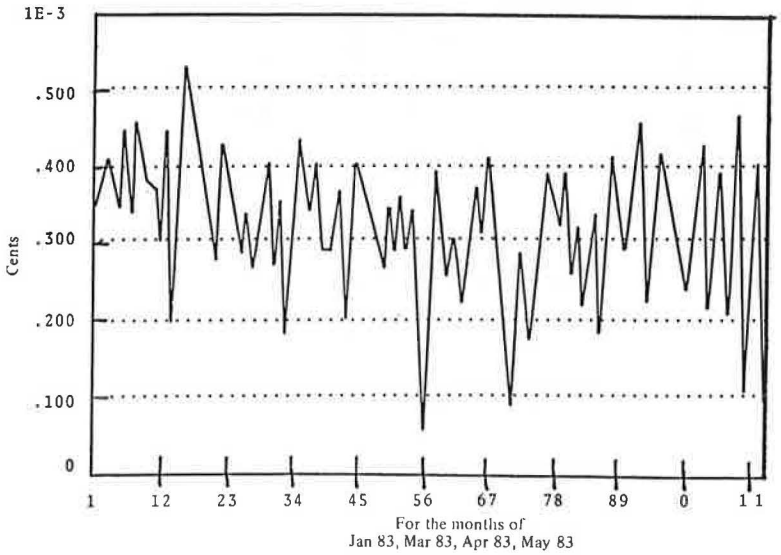

FIGURE 3 Revenue per mile.

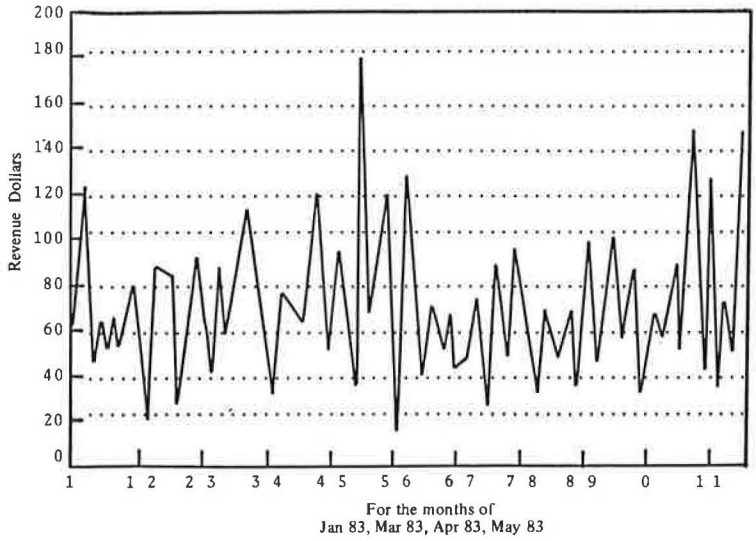

FIGURE 4 Total daily revenue.

TAXICAB OPERATIONS AT DETROIT METROPOLITAN AIRPORT

Figure 6 is a schematic of the principal components of the taxicab operating system at Detroit Metropolitan Airport. Passenger demand for taxicab service occurs either at the north terminal pickup point (PU) or at the south terminal pickup point. The need to provide such service for deplaning passengers at the international terminal was considered, but was not included in this analysis because of the low volume of such demand and because demand occurs at relatively discrete points in time (in contrast to being continuous).

When a passenger is in need of a taxicab service, the taxicab moves forward from a short dispatch line in the vicinity of each terminal area. The dispatch line at the south terminal accommodates approximately three vehicles at a time, while the dispatch line at the north terminal is somewhat longer and accommodates seven to nine vehicles. The supply of taxicabs in each of the short dispatch lines is replenished directly from the supply of taxicabs in the holding area by the use of a dispatcher at both the north and south terminals.

After each taxicab picks up its passenger(s) at the terminal area, the passenger is transported to his destination, and the taxicab then returns to the holding area. Although in actual practice a taxicab may not always return directly to the airport for a number of possible reasons, this assumption simpli-

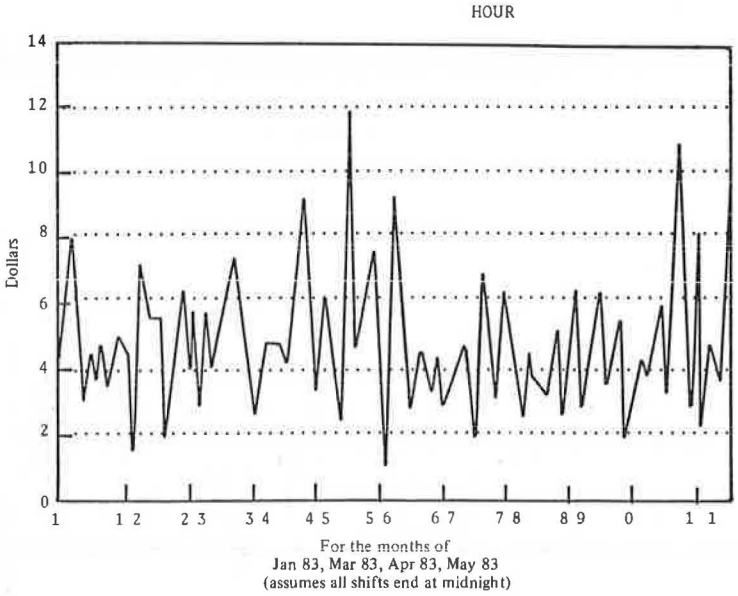

FIGURE 5 Revenue per shift hour.

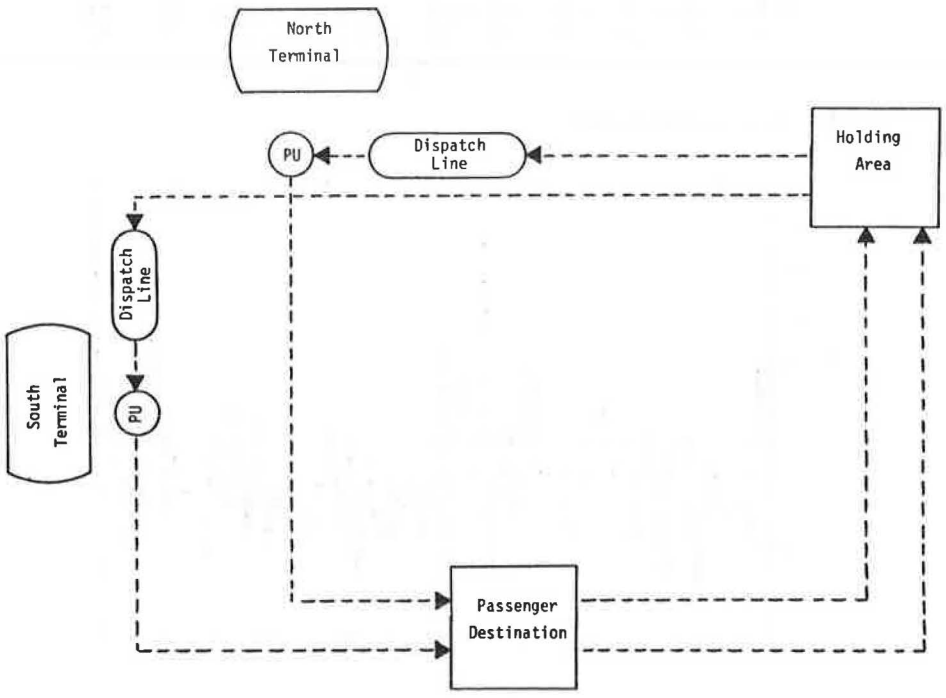

FIGURE 6 Taxicab system: schematic.

fies, but does not compromise, the validity of the simulation approach.

The data in Table 2 indicate the magnitudes of various time factors that must be considered in the attempt to understand the time sequence of various taxicab operations at Detroit Metropolitan Airport. The data in Table 2 were developed following a visual observation of taxicab operations at the airport at several different times and from a comprehensive set of log-book entries made by one of the taxicab drivers.

Activity 1, as identified in Table 2, is that of deplaning passengers requesting taxicab service. An analysis of available records suggested that it would be useful to consider four levels of demand for service, which were expressed in terms of passenger interarrival times, or the times between successive passenger requests for service. The most intense level of demand is that indicated by interarrival times that average 48 sec and that may vary by ± 15 sec. An interarrival time of 48 ± 15 sec translates to a demand per hour equal to 75 requests and a demand per 14-hr day of 1,050. In order of declining intensity, the other demand levels measured in terms of interarrival times are 60 ± 20 sec (60 requests per hour; 840 per day), 80 ± 30 sec (45 requests per hour; 630 per day), and 200 ± 50 sec (18 requests per hour; 252 per day).

Actually the analysis of passenger demand patterns for any individual day would conclude that demand fluctuates somewhat over various time periods. Thus, it is highly unlikely that any single demand rate would be maintained in a continuous fashion over a lengthy period of time. Also, it should be noted that with regard to the four levels of demand identified here, the 60 ± 20 sec interarrival time is representative of currently existing peak demand times, and the 200 ± 50 sec interarrival time is representative of exceptionally slow periods. The 80 ± 30 sec interarrival time is somewhat of an average or typical figure, and the 48 ± 15 sec interarrival time represents a super-peak level that is experienced only rarely. If passenger request activity were to increase significantly, however, it is possible that the peak level of interarrival times could be represented accurately by 48 ± sec.

Activity 2 is that of taxicabs moving from the holding area to the respective terminal areas, and the times concerned in this activity are approximately 120 ± 20 sec to the north terminal and 150 ± 20 sec to the south terminal. The time spent in the short dispatch lines (Activity 3) will depend on the location of the line (i.e., north versus south terminal) and the passenger interarrival times (demand rate) taking place. Thus, for each terminal, the data in Table 2 identify four estimates of time spent in the dispatch line.

Next, Activity 4 is that of advancing from the dispatch line to the passenger pickup point, and this is accomplished in approximately 10 sec, irrespective of terminal. Activity 5 is that of actually picking up the passenger(s), and the time factor for either terminal is 20 ± 10 sec.

Finally, Activity 6 consists of leaving the airport property, taking the passenger(s) to the destination, and then returning to the holding area. Logbook studies indicated that the average time elapsing from passenger pickup to return to the holding area was 51 min; thus a time factor of 3,060 ± 900 sec was used for this activity.

Although the actual time necessary to accomplish any of the foregoing activities may vary considerably from the average or expected value, the time factors given in Table 2 should provide an adequate representation of the system under study.

APPLICATION OF TAXISIM

TAXISIM is a generally applicable, computer-based simulation model of taxicab operations. It is sufficiently flexible to be helpful in analyzing a wide range of fixed-base ground transportation systems. As a result, it proved to be quite capable in terms of its ability to gain insight into taxicab operations at Detroit Metropolitan Airport.

The initial step in the use of TAXISIM was to incorporate all of the operating characteristics and time factors discussed in the preceding section. Once this was accomplished, a number of computer simulations were conducted, each with a differing level of passenger demand, as measured in terms of interarrival times. In a realistic sense, the taxicab operating system responds directly to individual passenger demands for service, and the TAXISIM simulation is driven entirely by the occurrence of passenger demands. It should be noted that the various levels of passenger demand listed in Table 2 are for both terminals combined and that TAXISIM assumes that approximately one-half of the demand occurs at the north terminal and the other half occurs at the south terminal. However, this could vary substantially and produce no significantly different results.

TABLE 2 Taxicab System: Time Factors (in seconds)

Activity	North[a] Terminal	South[a] Terminal
Passenger interarrival times (times in seconds between successive requests for service)		
Four levels of demand (both terminals combined)		
48 ± 15		
60 ± 20		
80 ± 30		
200 ± 50		
Advance taxicab from holding area to terminal area	120 ± 20	150 ± 20
Wait in (short) dispatch line at terminal area (depends on passenger interarrival times)		
48 ± 15	384 ± 60	96 ± 20
60 ± 20	480 ± 80	120 ± 30
80 ± 30	640 ± 120	160 ± 45
200 ± 50	1,600 ± 200	400 ± 75
Advance to passenger(s) pickup point	10	10
Pick up passenger(s)	20 ± 10	20 ± 10
Leave airport; take passenger(s) to destination; return to holding area	3,060 ± 900	3,060 ± 900

[a]Approximately one-half of the passenger demand occurs at the north terminal; the other half occurs at the south terminal.

INTERPRETATION OF RESULTS

Table 3 gives a summary of the principal results from the application of TAXISIM to the taxicab operating system at Detroit Metropolitan Airport. The first line of the table indicates that when passengers were arriving at a rate of 48 ± 15 sec apart (i.e., equivalent to 75 passengers per hour, or 1,050 passengers per 14-hr day), the maximum number of taxis in use at any given time was 82, and the average number was 63. "In use" status refers to the time that elapses between the time a taxicab exits the holding area to the time it returns to the holding area subsequent to providing transportation for a passenger. The last figure given in the average time column indicates that the average "in use" time per taxicab was 3,539 sec, or 58.98 min. The remaining lines in Table 3 can be interpreted similarly. Figure 7 shows an interesting comparison of the maximum number of taxicabs in use as related to the levels of passenger demand measured on a per hour basis.

The single most important figure in Table 3 is the 82 taxicabs, which was the maximum number in use at any time when demand was at the very intense level indicated by the first line of data. Although this demand rate was characterized earlier as the super-peak level, it is interesting to compare the TAXISIM result of a maximum of 82 taxicabs in use with the existing 127 taxicabs authorized to service the airport's needs. Even if an additional adjustment factor of, for example, 20 percent is added to the 82, the resulting 97 taxicabs (1.20 times 82) falls far short of 127. The implication is that the number of taxicabs could be reduced from 127 to 97 with no loss in the ability to meet super-peak levels of demand. Thus, a reduction of 24 percent (127 to 97) in fleet size would not compromise the ability of the taxicab fleet to meet the transportation needs of deplaning passengers.

TABLE 3 Taxicab System: Results of Study

Demand per Day	Demand per Hour	Interarrival[a] Time	Maximum Taxis in Use	Average Taxis in Use	Average Time[a]
1,050	75	48 ± 15	82	63	3,539
840	60	60 ± 20	64	51	3,521
630	45	80 ± 30	53	41	3,628
252	18	200 ± 50	26	21	4,295

[a]All times shown above are in seconds.

ANALYSIS OF POLICY IMPLICATIONS

As shown by the analysis, there is an oversupply of permitted taxicabs servicing the Detroit Metropolitan Airport. This has resulted in loss of revenue not only to the Detroit Metropolitan Airport, but also to the 127 permittees currently providing service. During the past 2 years, the capital equipment of the taxicab fleet and the incomes of those operators currently in the system have seriously deteriorated. Increasing taxicab rates would be one solution, but rates are already comparable to the higher ranges of taxicab rates for other major cities, and an increase in rates would only appear to be "gouging" airline traveling passengers.

Clearly the cause of the problem is underutilization of taxicabs that are in service for less than 4 hr out of a 15-hr work day for an approximate utilization factor of 25 percent. Comparing this utilization factor with taxicab operations in general, such utilization is appallingly low. This explains the low incomes and deteriorating equipment. Were it not

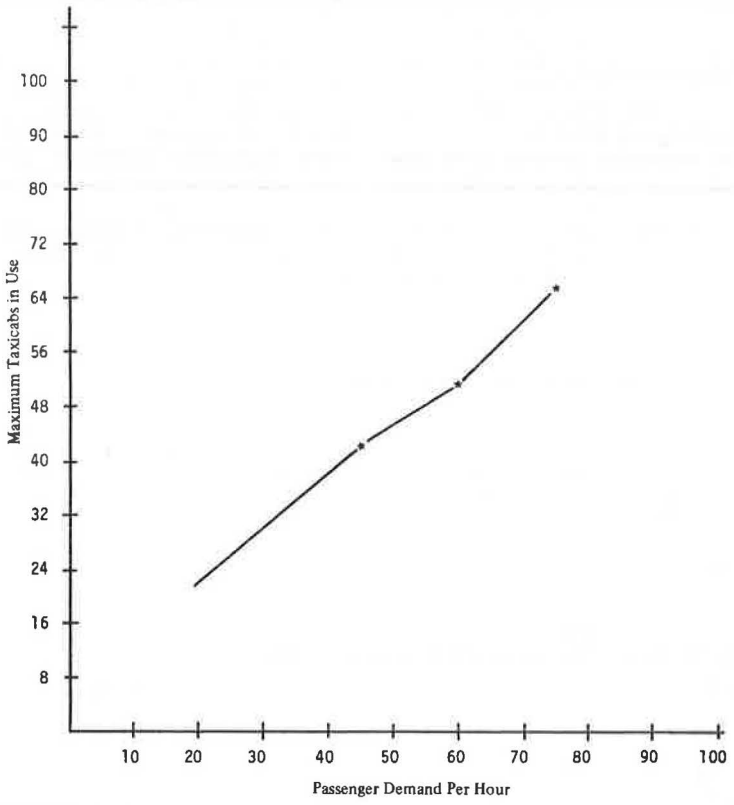

FIGURE 7 Taxicab system: maximum taxicabs in use versus passenger demand per hour.

for the very high unemployment rate experienced by the Detroit metropolitan area over the past 2 years, it is suspected that there would have been a natural decline in the number of taxicab operators at the airport. It appears that most operators are simply "hanging on" with a hope that an upturn in passenger activity will again bring profitability to their operations. As shown by the foregoing analysis, even with a steady increase in airline passenger traffic, it would be a long time before a sufficient volume of taxi demand was generated to fully use 127 permits. Thus, in order to restore profitability to the taxicab operation and to provide a financial framework so that taxicabs can pay their fair share for use of airport facilities, the total number of permits needs to be reduced.

TAXICAB FLEET REDUCTION OPTIONS

As stated earlier, a reduction of approximately 24 percent in the number of permits allocated to taxicab operations at Detroit Metropolitan Airport would not be detrimental to the level of service provided by the taxicab fleet. By decreasing the number of taxicabs and increasing the profitability of remaining taxicabs, new equipment could be purchased and thus increased utilization of the taxicab fleet could be effected.

Several mechanisms could be used to reduce the number of taxicab permits to the recommended level of 97: (a) refuse to grant the right of transferal of permits from one operator to another; (b) refuse to reissue permits as they expire; and (c) coordinate the purchase of 30 permits by the Detroit Metropolitan Area Taxicab Association. Each of these will be discussed in more detail.

The initial mechanism of refusing to grant transferal of permit operating authority would be a passive way of allowing the number of permits to be gradually reduced to the recommended level of 97 or lower, if such were desired. It would, however, place a hardship on those operators seeking to cease business operations and recover whatever investment they had made in their taxicab or purchase of the taxicab and permit if such had been the case. It has been common practice among permit holders to effectively sell their permit by selling their operating license and vehicle to a prospective buyer. It is estimated that the "street" value of a taxicab permit at the Detroit Metropolitan Airport is $4,000. This includes the taxicab, which, in essence, is what legally is being sold to the prospective buyer. Even at these rates, there appears to be a lack of interest in purchasing such operating authority. Thus, inability to sell a permit and a desire to discontinue daily operations would, over time, force a number of operators from the current group of 127.

The second alternative, that of refusing to renew permits as they expire at the 6-year limit, has the added benefit of probably being a faster method to reduce the number of taxicabs and to restore financial health to the entire system. However, this alternative would be somewhat discriminatory in that those operators who had originally purchased taxicab permits and had been in service the longest would be the first to be eliminated from the proposed system.

Purchase of approximately 30 permits by the Detroit Metropolitan Area Taxicab Association would probably be the most equitable and financially sound proposition to restore financial health to the overall taxicab operation. As previously mentioned, the street value of a current Detroit Metropolitan Airport taxicab permit is somewhere between $4,000 and $5,000. Thus, the purchase price of approximately 30 permits would result in a capital investment of as much as $150,000. As indicated in Table 4, the reduction of 30 taxicab permits would permit the remaining operators to achieve on the average one more pickup per day or an additional $20.73 per day in revenue.

Subtracting an estimated marginal cost of providing this additional service would mean an added income of $10.88 per day per vehicle. If $5.00 per taxicab per day were used in a loan repayment fund, $485 per day would be generated by the 97 participating taxicabs. Multiplied by 365 days per year, the fund would generate $177,025, which is more than enough to pay off a $150,000 short-term loan at 15 percent interest. Also the $5.88 additional daily income over expenses received by the taxicab operators would generate a $2,146 marginal increase in revenue per taxicab. Thus, it is further recommended that, after the first year and after the loan repayment has been completed, the $15 per month administrative charge by the Detroit Metropolitan Airport be reinstituted along with the requirement on vehicle age.

It is only through such a reduction in the number of taxicabs serving the airport that a sound financial program for the remaining vehicles can be developed. By reducing the number of taxicabs by approximately 24 percent, financial health will be restored to the taxicab system and the taxicabs will once more be able to pay a fair share for their use of the airport facility.

In the second and subsequent years, it is recommended that additional charges be assessed for upgrading the main holding area for taxicab operations. Currently, the small building that houses restroom facilities in the holding area appears to be inadequate for the number of individuals who use it. Consideration in future years should be given to levying special assessments on the taxicabs for the construction of a new facility that would house a limited number of vending machines and provide a minimum amount of space so that drivers could gather while they were not on call or waiting in line. Self-assessment financing by the taxicab owner-driver themselves should guarantee the nondestructive use of these facilities.

TABLE 4 Financial Analysis of Association Buy Out of 30 Vehicles

Average	Current Taxicab System (127 taxicabs)	Proposed Taxicab System (97 taxicabs)	Changes Under Proposed System
Number of trips per day	3.31	4.33	+1.02
Mileage per day	213.00	278.64	+65.64
Revenue per day ($)	67.18	87.91	+20.73
Variable cost per day (@ $.15/mile)	31.95	41.80	+9.85
Contribution to overhead and average profit per day (exclusive of gratuities) ($)	35.23	46.11	+10.88

SUMMARY

The foregoing analysis has shown how computer simulation in taxicab fleet operation serving major U.S. airports can assist airport policy officials in setting the appropriate number of taxicabs to serve their airport. Airport officials have the responsibility to ensure safe, economical, and dependable taxicab service and should manage this service. Concession agreements that limit the number of taxicabs to those that are economically viable to serve adequate airport passenger demand are simply an extension of good managerial practice on the part of the airport authority.

Through such mechanisms the actual taxicab fare or rate is secondary when the productivity factor of the taxicab fleet is taken into consideration. Objectives of a fair taxicab driver income, good quality service, and adequate compensation to the airport facilities dedicated to taxicab services can be met through operational simulation of the fleet by simple computer programs such as TAXISIM and straightforward business cost analysis. The tools are simple and other airport managers are encouraged to consider their use.

Publication of this paper sponsored by Committee on Airport Landside Operations.

Comments on Airport Survey Methods Using Schiphol Airport in Amsterdam as an Example

WOLFGANG BLECHINGER, WERNER BRÖG, and H. W. B. MESSELINK

ABSTRACT

Airport surveys are necessary to collect the data needed to analyze and forecast air travel. In this paper Schiphol Airport in The Netherlands is used as an example to demonstrate that it is important to occasionally study and review both the methods used to conduct such surveys and the execution of the surveys themselves. The Schiphol Airport study showed that sampling procedures can cause considerable misrepresentations in the results of a survey. If the so-called last minute passengers are not adequately represented in the sample, for example, the number of persons making private trips is automatically overrepresented. Although it is difficult to interview these last minute passengers, this study shows that it is possible. If the proper methods are used, last minute passengers can be correctly represented in the sample and it is also possible to get them to answer the questions that are most important to the survey. Furthermore, the Schiphol Airport study proved that for normal airport surveys, self-administered questionnaires are not only less expensive than personal interviews, but that passengers also prefer this method of data collection and the results are more accurate.

The growth of air traffic in the late 1960s and early 1970s made the thorough investigation of the need for, and the impact of, a second national airport a matter of vital concern to the Dutch Civil Aviation Authority. It appeared that the Schiphol Airport would soon no longer be able to handle existing volumes of traffic. One of the major problems for researchers working on the project was the lack of adequate data.

Consequently, in 1972 surveys of flight passengers at Schiphol Airport were commenced to collect data on airline passengers. These surveys were conducted under the auspices of a steering group that represented KLM (the national airline), the airport authority, and the civil aviation authority.

These surveys were conducted over the long term; five surveys were conducted every 2 years. Each survey covered a period of 1 week; 20 percent of all departing passengers were interviewed.

At first, all of the groups concerned were satisfied with the results of the surveys. As time passed, however, and it became possible to compare the Schiphol Airport data with other data sources (e.g., household surveys on vacation trips made by plane), the validity of the results of the Schiphol surveys was viewed with growing skepticism.

Increasing computerization, which allowed a much more detailed analysis of the data, reinforced these doubts. It was decided, therefore, that a thorough examination of the existing survey methods was nec-