The Impact of the Genesee County Airport on Genesee County

FRANCIS P. KULKA

ABSTRACT

In this study of the Genesee County Airport and its economic impact on the local economy, the costs and benefits of the airport to the city of Batavia and the remainder of the county are examined. The goal of this study was to demonstrate that general aviation airports provide an essential service in complementing an area's entire transportation system. As such, any airport development will incur its share of local costs (for development and operation), but at the same time it will generate a set of economic benefits directly because of its use and indirectly through the creation of additional income and purchases of goods and services in the local economy. The point to be made is that the key for any local decision making concerning airport development should reflect a balanced evaluation of an airport's costs and its benefits, placed in the context of how a community (or county) perceives the long-range need to provide public services to its residents, businesses, and other institutions. The conclusions drawn from this study provide some interesting perspectives on the behavior of general aviation in smaller urban areas and rural communities. A survey of airport operations in 1983 showed that 18 percent of all aircraft operations were for business purposes. Of the manufacturing firms that have 25 or more employees, 37.5 percent use the airport to some degree. Use of the airport ranges from a few trips to several hundred trips per year. What is interesting about the use of the airport by the manufacturing firms is that all the firms that use it have at least 100 employees. For small manufacturing firms, the airport does not appear to be essential for conducting business. This point was brought out by discussions relating to local business expansions. As a recruiting tool for manufacturing firms, it is safe to conclude that in seeking firms that may hire or employ 100 or more people, the presence of the airport could be an essential part of any presentation to a prospective new company. In 1983 local airport businesses were employing 16 full-time and 4 part-time individuals and a total payroll of $159,876. These businesses contributed directly and indirectly more than $861,000 in local economic expenditures. As a conservative estimate there was $3,654,999 in direct and indirect economic expenditures within the local economy. These expenditures in turn provided direct and indirect fiscal benefits that cannot be quantified, yet they exist. The range of these direct and indirect fiscal benefits reduces the county's average annual net operating cost of $37,400. Through a method of estimating the county's revenue capture rate, it appears that between 1978 and 1983 the county earned from $3,000 to $8,000 per year using the indirect revenue estimates to offset average annual operating costs.

Much has been written about airports and airport development and the costs and benefits to the communities they serve. In larger urban areas, the need for aviation is accepted and services are supplied to a variety of users. In smaller urban areas and rural counties the need for aviation sometimes becomes less clear and local critics ask: "Why do we need an airport and all its related costs?" Proponents highlight the benefits of aviation and other aviation-related groups to their business community.

This study provides background information on the Genesee County Airport and its economic impact on the local economy. The costs and benefits of the airport to the city of Batavia and the remainder of the county are examined. A profile of the airport's operational activity, which manufacturing firms (more than 25 employees) use it, the effect the airport has had in attracting new businesses, and the economic impact of the county's airport capital development program are presented in this paper. In addition, a discussion of the impacts of the businesses that derive their livelihoods from the airport is provided and the fiscal impacts of the airport on Genesee County are discussed.

Following the general conclusions of the study, other considerations are highlighted that need to be evaluated to provide a balanced perspective on the question of local airport development.

The goal of this study was to demonstrate that general aviation airports provide an essential service in complementing an area's entire transportation system. As such, airport development will incur its share of local costs (for development and operation), but at the same time it will generate a set of economic benefits directly because of its use and indirectly through the creation of additional income and purchases of goods and services in the local economy. The key for any local decision making concerning airport development should reflect a balanced evaluation of an airport's costs and its benefits, placed in the context of how a community (or county) perceives the long-range need to provide public

services to its residents, businesses, and other institutions.

Certain benefits that accrue to other units of government were not examined in this study. There was no attempt to quantify the contributions of the airport to federal and state income taxes, federal fuel and excise taxes, the state sales tax, and local and school property taxes. Instead, the effort concentrated on the fiscal impacts on the airport owner, Genesee County. These other benefits exist but it was believed that the effort in the study should, more appropriately, be concentrated on the county.

ECONOMIC ACTIVITY AND THE GENESEE COUNTY AIRPORT

Airport Activity and Use

The relationship of the county's economic activity and the need for air transportation can be demonstrated in a number of ways. A profile is given of aviation activity at the Genesee County Airport and the demands placed on it by the county's manufacturing firms.

Genesee County Airport serves general aviation and is located north of the city of Batavia (1980 population 16,703) and east of the New York State Thruway interchange on East Saile Drive. The airport was first opened as Batavia Airport in 1943 by Gilbert Chapell. The original facility was used primarily for flight instruction and consisted of sod landing strips located on the western portion of the present airport.

In 1963 Genesee County (1980 population 59,400) realized the need for public ownership of the facility and purchased the airport and 98 acres from Chapell. The facility included existing Runway 10-28, a short stub taxiway, an apron of 25,000 ft^2, medium intensity runway lights, a lighted wind cone, segmented circle, and rotary beacon. Shortly thereafter the airport was leased to Batavia Aviation, Incorporated.

In 1965 the airport experienced a major expansion of facilities. A new terminal building, aircraft maintenance and storage hangars, additional taxiways and apron areas, service roads, and fuel storage facilities were added. The automobile parking area was paved and additional lighting was installed. Another expansion period occurred in 1978 and ended in 1983. Improvement projects included land acquisition for a runway extension and parallel taxiway project, and work was completed on an apron expansion project in 1983. Genesee County Airport now has a 4,400 ft runway, parallel taxiway, and an Instrument Landing System (ILS).

The airport recorded its highest number of based aircraft (58) in 1975. In 1983, 43 aircraft were based at the airport. On the basis of the Genesee/Finger Lakes Regional Aviation System Plan forecasts for Genesee County, the airport will have between 88 and 110 based aircraft by the year 2000.

In May 1983 the Regional Planning Council conducted a 3-day survey of aircraft operations. According to this survey, the airport handled approximately 24,000 operations in 1983. The purpose of each operation included the following:

- Private, 19 percent
- Business, 18 percent
- Instruction and training, 60 percent
- Agricultural application, 3 percent

Eighty-seven percent of all operations were conducted by single engine aircraft and 52 percent of these operations were generated by aircraft based at the airport.

In November 1983 all manufacturing firms with 25 or more employees were surveyed. On the basis of the survey results, the following general conclusions can be drawn about the use of the Genesee County Airport by manufacturing firms.

1. More than one-third (37.5 percent) of the companies use the airport to some degree. This use ranges from a few trips to several hundred trips per year.
2. All the firms that use the airport have at least 100 employees.
3. There is a demand to haul (outbound) 75,600 lb of freight per year that is not being served from the Genesee County Airport.
4. Sixteen percent of all business trips originate from the Genesee County Airport.
5. The lack of scheduled air service is a deterrent to more companies using the airport.

As a follow-up to this survey, the Regional Planning Council met with the Genesee County Industrial Development Agency to obtain a complete picture of recent economic development activities in the county. Between 1978 and 1983, 16 new plants or business employing 10 or more people located or expanded their operations. These expansions and new locations accounted for 614 new jobs with a payroll of approximately $5.4 million and capital investment of more than $22 million. The airport had no significant role in any of the expansions or new locations. This result is not surprising given the survey results from the manufacturing firms.

In contrast to the more positive results of industrial expansion, during the same general period, more than 2,000 jobs were lost because of plant closings and major reductions in the work force. Three companies accounted for almost 1,300 lost jobs. The net result is that almost 1,800 manufacturing jobs have been lost during the last 5 years.

Direct Economic Benefits of the Genesee County Airport

During 1983 there were six companies actively engaged in operations at the Genesee County Airport. [Note that all the businesses are aviation related; the fixed-based operator (FBO) runs the airport. There is an air taxi service, a flight school and aircraft rental operation, a company that provides aerial application, a maintenance shop, and a shop that sells and repairs avionics equipment.] These companies had 16 full-time and 4 part-time employees and a total payroll of $159,876. They paid $10,297 in direct revenues to the county. In addition, they spent $296,694 buying goods and services in the county's economy. A total of $491,875 was generated and spent in Genesee County.

It is generally safe to conclude that without the presence of the airport, this mini-industry would not be located in the county. In interviews and follow-up telephone conversations with the fixed-based operator, the county Industrial Development Agency (IDA), and the Superintendent of Highways, it was learned that airport-related businesses have been relatively stable operations. Some companies have changed ownership and other short-term ventures are no longer located at the airport, but during the last 6 to 8 years the number of companies remained stable, and the level of activity has fluctuated with general economic conditions.

Indirect Economic Benefits to the Genesee County Airport

Any industry or business that generates a substantial payroll provides indirect benefits to the local

economy in which it conducts its operations. The same holds true for airport-related businesses. In addition, there are indirect benefits that accrue to an economy because of the nature of capital development for a publicly owned airport.

In this section an attempt is made to measure the value of these indirect benefits and show their magnitude in the local economy. This includes demonstrating the indirect impacts of airport construction projects and the impact of those businesses that operate at the airport. This involves applying the concept of an economic multiplier.

In examining the indirect benefits, airport development projects were examined over the last 6 years. This included three projects that involved an apron extension, runway extension, and construction of a parallel taxiway. The total costs of the projects and the year in which they were constructed are given in Table 1. Direct and indirect expenditures total $2,818,272 (see Table 2).

For the airport businesses the direct expenditures and indirect expenditures are given in Table 3. Indirect expenditures for taxes and charitable donations were not calculated. The total direct and indirect benefits of the airport-related businesses amounted to $861,735.

Fiscal Impacts of Genesee County Airport

Along with the benefits of airport development comes the responsibility of paying certain costs. For Genesee County, these costs include providing the local match for airport development projects as well as annual maintenance and operation costs.

During the last 6 years (1978-1983) the county's capital development program for the airport totaled $1,484,083. The county's local share of these costs totaled $52,123. This results in an average development cost of $8,688 per year since 1978.

During the same period, the county's average yearly operating expenses were $47,614. The county's average annual revenue from the airport was $10,214. [Note that the county's two sources of revenue are a $0.03/gallon fuel flowage fee and 15 percent of the fixed-based operator's total rental income.] The rental income could have been higher but there were short-term gaps when a full-time fixed-based operator was not at the airport. The net operating cost to the county on the average between 1978 and 1983 was $37,400. The county has no outstanding bond debts for the airport. The county's total annual average cost over the 6-year period then is $46,088 ($37,400 average net operating costs plus $8,688 development costs).

Because averages tend to smooth over actual year-to-year expenditures, and sometimes distort patterns or levels of expenditure, one specific year of the airport's operation was examined more closely and an effort was made to incorporate other revenue generated by the airport but not directly received by the county.

In 1983 the county's share of direct airport development costs was $586. This represents its 2.5 percent local share. Its total operating cost was $40,289. Thus, the county's total costs for 1983 were $40,875. It received revenues of $10,297 directly from the airport and $7,240 from the county's share of sales taxes derived from airport businesses. This results in a net operating cost of $23,328 for the county in 1983. The 1983 cost is $33,186 less than the average for the 6-year period.

Between the county's direct revenues and sales taxes generated by local airport businesses, the airport appears to be an apparent "money loser" from a fiscal point of view, but its net operating cost is within the county's ability to cover as a needed public service.

There is another source of revenue to the county that can be explained but is extremely difficult to quantify. As a general statement, most people accept the concept of the economic multiplier when evaluating the impact of a new injection of money into the local economy. This is particularly true of airport development and its related businesses. The airport improvement program of the Federal Aviation Administration (FAA) is based on a user's fee program and the monies raised through it are used exclusively for airport development. These funds cannot, under current federal legislation, be used for any other purpose. As a corollary, without the airport, airport-related businesses would not be located at the Genesee County Airport. If the economic multiplier concept of direct and indirect economic benefits is accepted, then another point to realize is that there are also direct and indirect fiscal benefits.

Between 1978 and 1983, the direct expenditures of airport development projects were $1,484,083; the indirect expenditures were $1,334,189 for a total of $2,818,272. In 1983 local airport businesses generated $456,570 in direct expenditures (this excludes $35,305 paid in rental fees and other taxes). This in turn generated $380,157 in indirect expenditures for a total of $836,727. For both capital development and airport-related businesses total direct and indirect expenses were $3,654,999. It is important to note that information was obtained on airport-related businesses for 1983 only. In this time period (1977-1983) there were obviously additional direct and indirect expenditures by these businesses. The $3,654,999 total is a conservative estimate.

Given this total, how much additional revenue was secured by the county? Between the wages and salaries paid and goods and services obtained, airport-related projects have generated additional revenues for the county by way of real property and local sales taxes. By exactly how much is difficult to determine but it is safe to conclude that the county's average operating cost is much lower than $37,400. Depending on the revenue capture rate of these direct and indirect expenditures the airport could be "making money."

It was extremely difficult to find an application to reasonably calculate an indirect capture rate for the purchase of economic goods and services and to apply to fiscal (revenue) benefits. No usable

TABLE 1 Airport Development Projects[a] (1983 dollars)

Project	1978	1979	1980	1981	1982	1983	Total
Parallel taxiway	139,483	517,864	88,254				745,601
Runway extension		56,073	470,388	74,376			600,837
Apron extension			47,722	22,965	43,523	23,435	137,645
Total	139,483	573,937	606,364	97,341	43,523	23,435	1,484,083

Source : Genesee County Department of Highways.

[a]The county's share of the apron extension and parallel taxiway project was 2.5 percent; and its share for the runway extension project was 5 percent.

TABLE 2 Airport Development Projects: Direct and Indirect Economic Expenditures (1983 dollars)

Year	Direct Expenditures ($)	Indirect Expenditures[a] ($)	Total ($)
1978	139,483	125,395	264,878
1979	573,937	515,969	1,089,906
1980	606,364	545,121	1,151,485
1981	97,341	87,509	184,850
1982	43,523	39,127	82,650
1983	23,435	21,068	44,503
Total	1,484,083	1,334,189	2,818,272

[a]The indirect expenditure is determined by multiplying the direct expenditure by the industry-specific earnings multiplier given in Table A-1 in the Appendix for the general construction industry (0.899).

literature was found. There are, however, intuitive and inductive applications that appear reasonable, and a range of estimates can be suggested for indirect fiscal benefits based on the total airport-related expenditures in Genesee County.

1. To begin the analysis, estimates of the direct and indirect expenditures of the airport's capital projects and airport businesses are developed. The estimates are identified as conservative, middle, and optimistic. The conservative estimate reflects the total direct and indirect expenditures presented in the earlier discussion (6 years of capital spending and 1 year of airport business expenditures).

The middle estimate takes into account that the airport businesses were in operation between 1978 and 1983. For the period 1978-1982 the assumption is made that this rate of expenditure on the average is 50 percent less per year than for the surveyed year 1983: $418,363 x 5 (1978-1982) = $2,091,815 + $836,727 (1983 estimate) = $2,928,542. The optimistic estimate assumes that the rate of expenditures for the airport businesses on the average per year is 75 percent of the 1983 total for the period 1978-1982 (see Table 4).

The middle and optimistic estimates were developed for one basic purpose: to find the boundaries or limits of reasonable expectations for airport sales in this time period. The estimates are provided as a demonstration of reasonableness for acceptance rather than accuracy for verification. The information developed in the study suggests that actual sales from 1978 to 1982 may be higher than the optimistic estimates. Both estimates, however, provide a more realistic picture, albeit a conservative one, of the economic activity generated by airport-related businesses.

2. The next step was to outline a range of the indirect revenue capture rate for the expenditures identified in Table 4. On the basis of the level of expenditures, the data in Table 5 show the estimates of revenue the county obtains from these expenditures by type: conservative, middle, or optimistic. The capture rates range from 1 to 5 percent and serve as a surrogate for the county property tax and its share of the state sales tax.

3. After the calculation of the indirect revenue estimates, an average operating cost reduction was determined for each expenditure level by capture rate estimate. For example, the capture rate of 1 percent for the conservative estimate of $3,654,999 is $36,549 over the 6-year period. The average operating cost reduction per year is determined by $36,549 divided by 6 = $6,091 (see Table 6).

4. Next, a method was needed to incorporate and consider the direct sales tax revenue generated by the airport businesses for the period 1978-1982. In 1983 the airport businesses contributed $7,240 to the county through the state sales tax. This contribution was based on expenditures of $296,012 or 2.445 percent of the businesses' total spending for goods and services. Assuming that business spending patterns change slowly over time, the proportion of 1983 expenditures for goods and services was held constant for previous years. Thus 50 percent and 75 percent of these expenditures were used to determine previous sales tax contributions at the rate of 2.445 percent for the middle and optimistic expenditure estimates.

The yearly sales tax estimate for 5 years was

TABLE 3 Airport Businesses: Direct and Indirect Economic Expenditures, 1983

	Direct Expenditures ($)	Indirect Expenditures[a] ($)	Total Expenditures ($)
Payroll	159,876	122,784	282,660
Taxes	25,008	NA	25,008
Fuel, supplies and equipment	233,051	189,936	422,987
Advertising	1,947	2,153	4,100
Services (repair)	61,014	65,284	126,298
Charitable donations	682	NA	682
Total	481,578	380,157	861,735

Note: NA = not applicable.

[a]The direct expenditures were calculated by using the following multipliers from Table A-1 in the Appendix by industrial sectors: payroll - 53 - 0.768; fuel, supplies and equipment - 51 - 0.815; advertising - 54 - 1.06; and services - 56 - 1.07.

TABLE 4 Estimates of Direct and Indirect Airport-Related Expenditures (1983 dollars)

	Conservative ($)	Middle ($)	Optimistic ($)
Direct and indirect expenditures (capital projects)	2,818,272	2,818,272	2,818,272
Direct and indirect expenditures (airport operations)	836,727	2,928,542	3,974,452
Total expenditures	3,654,999	5,746,814	6,792,724

TABLE 5 Indirect Revenue Capture Rate (1978-1983) (1983 dollars)

Capture Rate (%)	Conservative ($)	Middle ($)	Optimistic ($)
1	36,549	57,468	67,927
2	73,099	114,936	135,854
3	109,649	172,404	203,781
4	146,199	229,872	271,708
5	182,749	287,340	339,636

TABLE 6 Average Operating Cost Reduction Per Year (1978-1983) (1983 dollars)

Capture Rate (%)	Conservative ($)	Middle ($)	Optimistic ($)
1	6,091	9,578	11,321
2	12,183	19,516	22,642
3	18,274	28,734	33,963
4	24,366	38,328	45,284
5	30,458	47,890	56,606

then added to the 1983 total to develop an average direct sales tax contribution, given in Table 7. This revenue source was then deducted from the average annual operating costs to develop net operating cost for each expenditure estimate category.

5. The final step, given in Table 8, presents the average annual net operating cost for each expenditure category by the capture rates of indirect revenue contributions taken from Table 6. For example, in the conservative estimate at a capture rate of 1 percent, the final cost of operating the airport is ($30,160) - $6,091 = ($24,069). If the conservative estimate and the 1 percent capture rate are considered reasonable, then between 1979 and 1983 the county was paying on the average $24,069 to operate the airport.

Given the assumptions and the scenarios presented, the difficult question becomes one of determining which expenditure category, conservative, middle, or optimistic, and indirect revenue capture rate(s) present the most reasonable range of county costs or profit. For discussion purposes, the capture rates of 1 percent and 5 percent can be eliminated from any additional consideration. As direct and indirect expenses occur, the county would likely capture more than 1 percent but nothing as large as 5 percent. Removing these estimates from consideration leaves the county examining a range of estimates from losing $17,977 to earning $13,615 per year.

TABLE 7 Estimate of New Operating Cost (1983 dollars)

	Conservative ($)	Middle ($)	Optimistic ($)
Average annual operating cost	(37,400)	(37,400)	(37,400)
Direct sales tax contribution	7,240	4,223	5,731
Net operating cost (loss)	(30,160)	(33,177)	(31,669)

TABLE 8 Average Annual Operating Profit (Loss) with Indirect Revenues

Capture Rate (%)	Conservative ($)	Middle ($)	Optimistic ($)
1	(24,069)	(23,599)	(20,348)
2	(17,977)	(14,021)	(9,027)
3	(11,886)	(4,443)	2,294
4	(5,794)	5,150	13,615
5	298	14,713	24,937

Examination of the expenditure categories leads to another range of estimates that should not be considered. The conservative estimate includes only 1 year of expenditures for airport-related businesses. On the basis of the history of the airport it is reasonable to assume that, in the years 1978-1982, there were direct and indirect expenditures by these establishments. Consequently, it appears appropriate to discount the conservative expenditure category. This leaves the county examining a range of estimates from losing $14,021 to earning $13,615 per year.

Between the two remaining expense categories, the question becomes which one represents the actual or realistic pattern between 1978 and 1983. In conversations with the fixed-based operator, the county Industrial Development Agency, and the county Highway Superintendent, the businesses at the airport have historically been stable entities. Over the past 6 years, the same number of businesses plus occasional short-term ventures have been located at the airport. The pattern of expenditures has fluctuated; 1978-1980 were relatively strong years, 1981 and 1982 were weak years, and 1983 was a recovery year. This suggests that the optimistic category of expenditures is reasonable and the 75 percent of expenditures for 1978-1982 more closely reflects actual business spending habits.

Given these observations and the fact that the indirect revenue capture rates represent the obtainment of revenue from the county real property and state sales tax (7 percent), of which 3 percent is shared with the county, it is reasonable to conclude that the county's capture rate for airport capital projects and its related businesses is between 3 and 3.5 percent and is probably closer to the upper range. Therefore, it is estimated that the county earned between $3,000 and $8,000 per year between 1978 and 1983.

This conclusion is based on one critical consideration. First, the 1983 survey data are a good representation of the average amount expended by the airport businesses. Even under difficult economic conditions, companies usually do not have fluctuations in expenditures by amounts of 50 percent from one year to the next. Furthermore, the optimistic expenditure level probably underestimates actual purchases of goods and services.

GENERAL CONCLUSIONS

The conclusions from this study provide some interesting perspectives on the behavior of general aviation in smaller urban areas and rural communities. The general aviation airport does provide a variety of services and uses for an area's business and aviation community. Because of the nature of this study, the economic and business aspects of the airport received more attention than other uses that are equally important, yet the economic and business aspects are the most criticized portions on the total general aviation industry.

1. A survey of airport operations in 1983 showed that 18 percent of all aircraft operations were for business purposes. Almost one out of every five operations is conducted by local companies within the county.

2. Of the manufacturing firms with 25 or more employees, more than one-third (37.5 percent) use the airport to some degree. Its use ranges from a few trips to several hundred trips per year. What is

interesting about the use of the airport by the manufacturing firms is that all the firms that use it have at least 100 employees. For small manufacturing firms, the airport does not appear to be essential for conducting business. This point was brought out by discussions relating to local business expansions. As a recruiting tool for manufacturing firms, it is safe to conclude that in seeking firms that may hire or employ 100 or more people, the presence of the airport could be an essential part of any presentation to a prospective new company.

3. In 1983, local airport businesses were employing 16 full-time and 4 part-time individuals and had a total payroll of $159,876. These same businesses contributed directly and indirectly more than $861,000 in local economic expenditures.

4. The county, through its capital development program between 1978 and 1983, generated directly and indirectly $2,818,272 of local economic expenditures. This economic benefit cost the county, through the local match for the projects, $52,123.

5. The average net annual operating cost for maintaining the airport between 1978 and 1983 was $37,400. The average annual development cost to the county for the airport was $8,688 for the same period. The total direct average cost was $46,088.

6. As a conservative estimate, there was $3,654,999 in direct and indirect economic expenditures within the local economy between 1978 and 1983. These expenditures in turn provided direct and indirect fiscal benefits than cannot be quantified, yet they do exist.

7. Through a method of estimating the county's revenue capture, it appears reasonable to suggest that the county, between 1978 and 1983, earned $3,000 to $8,000 per year using the indirect revenue estimates to offset average annual operating cost.

GENERAL OBSERVATIONS

During the time this study was undertaken, different perceptions, thoughts, and opinions were generated by people being interviewed, the Regional Planning Council, staff, and other interested parties. Because of the scope of the study, some relevant aspects of it did not receive a great deal of attention yet they should be mentioned in some manner. These observations help to bridge some of the points considered about the economic impact of the Genesee County Airport but not discussed in their entirety.

1. Studies of this type are needed to help justify general aviation. Unlike other modes of transportation in which the projects or services provided serve a basic public purpose and all are generally accepted as such, general aviation airport development continues to be misunderstood and misrepresented. Better communication needs to be developed, particularly at the state and local levels, by both public and private interests if general aviation is to make a long-term and stable contribution in meeting a community's total transportation requirements.

2. It is encouraging to know that a public airport with as few as 40 to 45 based aircraft is making a positive economic and fiscal contribution. Within the time period studied, the county has been rocked by some major plant closings, which has resulted in the net lost of almost 1,800 jobs despite an active and aggressive industrial development program.

3. The method used to suggest the profitability for the county was basically an indirect one. The assumptions used in its formulation and the conclusions that came out of it appear reasonable and sound. A more definite process would have been preferred but one was not found. However, the concept of the indirect revenue capture rate is extremely useful and could have other applications.

4. Many benefits derived from the airport, especially fiscal benefits, are not estimated. The amount of time needed for research of the county's various construction contracts to determine expenses for labor, equipment purchasing or renting, and supplies would have involved a considerable effort. Nevertheless, the benefits credited to federal and state income taxes, the state's sales tax, federal excise taxes, and municipal and school property taxes exist. The New York State Department of Transportation or the Federal Aviation Administration may want to consider a study designed to track exactly how a specific construction project's monies are distributed and spent in a local economy.

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APPENDIX: INDUSTRY-SPECIFIC MULTIPLIERS

This Appendix contains an explanation of the calculation of the industry-specific earnings multipliers (1) used in this study. Industry-specific earnings multipliers estimate the regional total-earnings impact from an initial change in final demand originating from a particular industry sector. Consider the following example: a $100,000 increase in final demand for transportation equipment (sector 51) in the Buffalo, New York, area. According to the industry-specific earnings multipliers given in Table A-1, the increase in final demand would result in a regional total-earnings increase of $81,500 ($100,000 x 0.815).

Calculation of the industry-specific earnings multipliers follows the methods reported by the Regional Economic Analysis Division of the Bureau of Economic Analysis, U.S. Department of Commerce, in its publication, Industry-Specific Gross Output Multipliers for BEA Economic Areas (2). This publication provides (where available) industry-specific

TABLE A-1 Industry-Specific Earnings/Gross Output Ratios and Industry-Specific Earnings Multipliers

Sector No.	Industry-General Earnings/Gross Output Ratio (E_j)	Earnings/Gross Output Ratio (e_j)	Industry-Specific Earnings Multiplier
18	0.289	0.296	0.899
50	0.308	0.303	0.943
51	0.267	0.288	0.815
53	0.311	0.304	0.768
54	0.513	0.376	1.06
55	0.160	0.234	0.496
56	0.487	0.364	1.07

TABLE A-2 Industry-Specific Gross Output Multipliers: Buffalo Area[a] *(2)*

Sector No.	Industrial Sector Definitions	Gross Output Multiplier (M_j)
18	General building contractor, heavy construction contractor, special trade contractors	3.027
50	Electrical equipment and supplies	3.111
51	Transportation equipment	2.822
53	Transportation, communication, and utilities	2.52
54	Wholesale and retail trade	2.812
55	Finance, insurance, and real estate	2.12
56	Services	2.939

[a]Genesee County is considered part of the Buffalo economic area.

gross output multipliers (M_j; see Table A-2) and the following method of calculating industry-specific earnings multipliers: given M_j, the industry-specific gross output multiplier for industry j and earnings/gross output ratio (e_j) is calculated as follows:

$$e_j = (1/M_j)\ (E_j) + (1 - 1/M_j)$$

where e_j is the industry j's earnings/gross output ratio and E is the national earnings/gross output ratio (0.3008). Having computed e_j for each of the regional industries, then $(M_j e_j)$ represents the industry-specific earnings multiplier for industry j. The industry-specific earnings multipliers reported in Table A-1 were applied to the payroll expenditure categories as well as to the expenditure categories of goods and services.

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The contents of this paper do not necessarily reflect the official views or policies of the Federal Aviation Administration or the New York State Department of Transportation. Acceptance of this paper by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein, nor does it indicate that the proposed development is environmentally acceptable in accordance with Public Laws 91-190, 91-258, and/or 90-459.

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Methodology for Forecasting Air Travel and Airport Expansion Needs

WAHEED UDDIN, B. FRANK McCULLOUGH, and MELBA M. CRAWFORD

ABSTRACT

Forecasting to assess future needs for a business or facility has become an indispensable part of the planning process. The air travel market appears to be very sensitive to the prevailing business cycles, and it demands frequent updating of forecasts. A methodology is presented for statistically forecasting airline passenger traffic and for assessing the future needs for expansion of airport facilities. Two basic approaches to develop models based on statistical fit of the historical time series data are described. The total airline passenger data collected at the Robert Mueller Municipal Airport in Austin, Texas, were used in the analyses. Several regression models developed by using annual airline passenger data show sales tax revenue as a strong predictor. The same data collected on a monthly basis are analyzed by using Box-Jenkins univariate time series models. The best fitting Box-Jenkins seasonal ARIMA model is later used to forecast airline passenger traffic for specified lead times. Forecasts for longer lead times are also made by using the selected regression equations, which indicate that around 5.5 million total airline passengers are projected for 1990. Finally, the impact of the projected air travel demand in 1990 on existing aviation and terminal facilities is examined.