

Economic Impact of General Aviation in Florida: Suggested Method of Analysis

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ABSTRACT

The absence of a standard methodology to determine the regional economic impact of airports has caused difficulties in (a) evaluating economic impacts, (b) comparing economic impacts of airports in different regions, and (c) comparing the economic impact of airports with other economic activities. The input-output approach is generally regarded as the most appropriate method for determining regional impacts; however, the use of input-output analysis has been limited because of its high cost. The problem of high cost has recently been overcome by the Regional Input-Output Modeling System (RIMS II) developed by the U.S. Department of Commerce. The Florida Department of Transportation conducted a study of the economic impact of general aviation on Florida's economy. Using the RIMS II procedure, a method was developed to assess the impact of a specific general aviation airport on its community and the impact of statewide general aviation on the total Florida economy. The methodology was developed to minimize data requirements and hence survey costs. The Florida study indicated that in 1981 general aviation employed 9,752 and generated \$157 million in total earnings. The methodology and results presented in the Florida General Aviation Economic Assessment study are highlighted and an example of the use of the RIMS II tables is presented. The methodology is concluded to be applicable throughout the United States and it is recommended that the RIMS II approach be used as a standard to evaluate the regional economic impact of aviation and other transportation activities.

During the past two decades there has been tremendous growth in the number and variety of economic impact analyses being performed. This is true of impact studies in general and aviation activities in particular. Increasingly, the lack of a standardized methodology has made it difficult to compare the results of an impact study for one airport with the results of similar studies for airports in other regions, or even to compare impacts for one airport for different periods of time. Consequently, numerous recommendations have been made in the literature and at transportation research meetings to standardize methodologies for measuring the economic impact of aviation activities.

The most frequently criticized area of economic impact analysis has been the development of multipliers for measuring the effect of aviation activity on the community and region. Although input-output analysis is recognized as the most intellectually

rigorous method of developing multipliers, its use in economic impact studies has been limited by the high costs associated with developing the transactions matrix, the vast data requirements, and the inappropriateness of using the coefficients developed for one region to calculate the impacts of an activity in another region (1). Since the mid-1970s, all of these objections to using input-output analysis to obtain local or regional multipliers have been overcome by the Regional Industrial Multiplier System (RIMS) and the Regional Input-Output Modeling System (RIMS II) developed by the Regional Economic Analysis Division of the Bureau of Economic Analysis (BEA), U.S. Department of Commerce (2,3,4).

The RIMS II procedure provides regional-specific multipliers for a single county or group of counties and industry-specific multipliers for any of the 496 industrial sectors contained in the 1972 BEA national input-output table. These multipliers are obtained by a standard and consistent methodology at a reasonable cost. Such multipliers permit a comparison of the impact of aviation activities on different industries and a comparison of the impact of aviation expenditures for different categories of airports. RIMS II provides earnings multipliers, which may be used to estimate how aviation-related expenditures affect employment (4). The model also provides a table of direct coefficients and a table from which output multipliers can be calculated for each industry. However, for most public decision purposes, the effects on earnings and employment are the more appropriate indicators of economic activity.

Although RIMS II multipliers have been used in various parts of the United States to assess the regional economic impact of other industries, they have not been used previously to assess the impact of aviation-related economic activity. The RIMS II multipliers offer a technically sound, relatively easy to use, inexpensive, and regionally flexible methodology that may be used in conjunction with standardized data obtained from local areas and the U.S. Department of Commerce to conduct an aviation/airport economic study for any region of the country with a minimum of direct surveying.

In the summer of 1982, the Florida Department of Transportation (FDOT) let a contract to devise a methodology that would determine the economic impact of Florida's general aviation (GA) airports. The results were reported in the Florida General Aviation Economic Assessment (5). This paper highlights the methodology and results presented in that study, presents an example of the use of the RIMS II multipliers, and concludes that the methodology has excellent potential for use throughout the United States.

METHODOLOGY FOR ECONOMIC ASSESSMENT OF FLORIDA GENERAL AVIATION

The methodology encompassed three major phases: identifying airports to be studied, an economic

survey of those airports, and analysis of primary and secondary data.

Phase I: Identifying Airports

Surveying each business at each airport to obtain primary economic data was considered impractical. Consequently, a methodology was needed to reduce the number of airports surveyed while still retaining the diversity of airport categories represented in the total Florida GA system.

To identify a small, yet representative, group of airports, simple and multiple regressions were performed to establish influential relationships between the 17 FAA variables used to categorize airports and to determine which variables were most closely related to airport activity (6). The results of this analysis indicated that the strongest relationship existed between aircraft based at the airport and total annual operations. Therefore the mean and standard deviation of the these two elements was determined for each airport category. A similar analysis was performed for all Florida GA airports combined to obtain a ranking of GA airports on a statewide basis. The results produced a ranking of airports as they centered about the mean for each airport category. Those airports situated most closely to the mean became candidates for detailed economic analysis. Nine airports representing different classification categories were selected (5). Hereafter these airports will be referred to as target airports.

Phase II: Economic Survey of Target Airports

The RIMS II analytical model allows the analyst to devote a larger share of his resources to the phase of the study that is most critical: collecting primary economic data by means of a survey. The accuracy of the survey data is of utmost importance for sound conclusions to be drawn. Consequently, a great deal of attention was given to designing the survey, data reliability, and formulating analysis techniques. Because of this effort, approximately 90 percent of the on site businesses and organizations and 100 percent of the direct suppliers answered the surveys. Approximately 90 percent of the answered surveys were of sufficient quality to be used in the economic analysis. Thus, the total success rate of the surveys was more than 80 percent. An extensive description of this phase of the study is contained in the Florida General Aviation Economic Assessment (5).

Phase III: Economic Analysis

The State of Florida was divided into six metropolitan regions, three rural regions, and a region representing the entire state. FDOT purchased a complete set of RIMS II multipliers for each of the identified regions.

To determine the economic impact on the community or region of each target airport, the individual firms surveyed were assigned to a Standard Industrial Classification (SIC) category based on principal products or services. Firms listed in the 1982 Directory of Florida Industries (8) were assigned the SIC code identified by that reference. Those firms not listed in the directory were assigned SIC codes from the Standard Industrial Classification Manual (9) based on knowledge of each firm's principal product and the judgment of the researchers. To aid in administration of the survey, firms were then

assigned to one of four categories: airport management, field-based operation (FBO), aviation-related businesses, and nonaviation-related businesses. Most activities including airport management, FBO categories, and a number of aviation-related firms were assigned to SIC 45 (air transportation). However, a number of firms were assigned to other categories, such as SIC 76 (avionics repair).

Sales figures were not available for the airport management category. Consequently, total payroll plus total purchases were used as a proxy for sales in that category. The total sales attributed to airport management, FBO, and aviation-related businesses located at each target airport were aggregated by SIC code and used as the measure of aviation-related final demand at that airport. Because sales activity attributed to nonaviation-related firms was not dependent on general aviation, the impact from these firms on total earnings and employment was excluded from this analysis.

The appropriate RIMS II regional multiplier was then applied to the sales of each aviation-related firm to estimate total earnings. However, the multipliers are based on the six-digit numbering system of the 1972 national input-output model (10) and must be translated to appropriate SIC categories. For example, SIC 45 (air transportation) corresponds to RIMS II code no. 650500. Using BEA personal income data provided by the Florida Department of Commerce, effects on employment were then estimated by dividing the total earnings from general aviation activities by the average annual earnings per employee for each SIC category (7). The total earnings and employment for each target airport are reported in the Florida General Aviation Economic Assessment (5).

ECONOMIC IMPACTS OF FLORIDA GENERAL AVIATION

The use of input-output multipliers to estimate statewide economic impacts of general aviation airports required the development of statewide general aviation airport sales figures. Sales data from the nine target airports were regressed against several airport characteristics. Results from these experiments were much better than had been initially expected. The coefficient of determination (r^2) was 0.81, meaning that approximately 81 percent of the variation in airport sales was explained by the total number of civilian aircraft based there. The "y" intercept was -\$630,221, and the slope of the curve was 37,189. This suggests a strong relationship between the number of civilian aircraft based at a general aviation airport and the dollar volume of sales generated at that airport. In 1981 there were 6,720 civilian aircraft based at the state's general aviation airports. A confidence test was conducted for the slope coefficient, which was found to be successful at the 0.0005 level. Standard error of the slope was $\pm 1,382$. The resultant regression relationship estimated statewide sales to be \$249,281,400 among the 82 general aviation airports offering no known scheduled commercial service. This figure did not include the sales by nonaviation businesses located on airport property.

Total estimated earnings from general aviation for each Florida industry are given in Table 1. Table 1 is derived by applying the statewide earnings multiplier coefficient (not shown in Table 1) for each industry times estimated statewide sales (\$249,281,400). Because most activities associated with general aviation can be assigned to SIC 45 (air transportation), only one comparable set of RIMS II multipliers (air transportation, code no. 650500)

TABLE 1 Statewide Impacts by Industry from General Aviation Airport Sales of \$249,281,400 (1981 Dollars) and Pensacola Earnings Multipliers

Industry	Statewide Total Earnings (\$)	Statewide Total Employment	Pensacola Earnings Multiplier ^a
1. Agriculture	1,221,500	114	0.0011
2. Forestry and fishing	74,800	5	0.0002
3. Coal mining	—	—	0.0000
4. Crude petroleum and natural gas	—	—	0.0001
5. Other mining	49,900	3	0.0001
6. New construction	—	—	0.0000
7. Maintenance and repair construction	2,218,600	148	0.0069
8. Food and kindred products and tobacco	1,884,700	125	0.0022
9. Textile mill products	99,700	9	0.0006
10. Apparel	872,500	96	0.0022
11. Paper and allied products	598,300	28	0.0006
12. Printing and publishing	2,044,100	141	0.0039
13. Chemical and refined petroleum	473,600	23	0.0006
14. Rubber and leather products	324,100	28	0.0001
15. Lumber and furniture products	299,100	23	0.0002
16. Stone, clay, and glass products	124,600	7	0.0001
17. Primary metals	24,900	1	0.0000
18. Fabricated metals	324,100	20	0.0001
19. Nonelectrical machinery	199,400	11	0.0002
20. Electrical machinery	897,400	50	0.0009
21. Motor vehicles	49,900	4	0.0000
22. Other transportation equipment	2,517,700	116	0.0028
23. Instruments	99,700	7	0.0001
24. Miscellaneous manufacturing	249,300	21	0.0006
25. Transportation, local government and transit	91,785,400	4,657	0.3408
26. Communications	2,916,600	140	0.0089
27. Utilities	772,800	34	0.0022
28. Wholesale trade	6,257,000	347	0.0103
29. Retail trade	8,675,000	816	0.0282
30. Eating and drinking establishments	4,761,300	676	0.0159
31. Finance	4,013,400	264	0.0102
32. Insurance	2,941,500	181	0.0045
33. Real estate	872,500	69	0.0025
34. Lodging and amusements	1,171,600	122	0.0034
35. Personal service	1,969,300	188	0.0056
36. Business services	8,749,800	589	0.0246
37. Health services	3,041,200	192	0.0104
38. Other services	4,287,600	422	0.0140
39. Households	598,300	75	0.0020
Total	157,461,200	9,752	0.5064

^aRIMS II earnings multiplier for code no. 650500 (air transportation) for the Pensacola metropolitan area.

was used to derive impacts statewide. As might be expected the largest earnings are by transportation, local government, and transit industries, which accrue \$91,785,000 in total earnings annually. The next-largest earnings sector is the business service sector, generated by airport operations, which reaches \$8,749,800. Following that is retail trade with earnings of \$8,675,000. Wholesale trade is next with earnings of \$6,257,000, followed by eating and drinking establishments, other services, finance, and health services. The total statewide earnings from general aviation are \$157,461,200.

The effects on statewide employment were estimated by dividing the earnings of each industry from general aviation by the average annual earnings per employee for that industry. The transportation, local government, and transit sector also have the largest number of employees associated with general aviation. The second largest impact on employment was on the retail trade sector with 816 employees, followed by the eating and drinking establishments with 676 employees, the business service sector with 589 employees, other services with 422 employees, and wholesale trade with 347 employees. In total the \$249 million in sales at general aviation airports resulted in employment for 9,572 persons.

Because this is a study of the economics of general aviation in Florida, nonaviation-related businesses were not included in the statewide impact estimates. Among target airports all classifications except the smallest had nonaviation businesses present. The impact of the nonaviation businesses is

potentially far greater than that of aviation businesses.

RIMS II TABLES--USE AND SAMPLE CALCULATIONS

The RIMS II tables are described in this section, which explains how they are used, and a sample set of calculations for determining impacts on earnings is presented.

Two levels of industry aggregation tables are available: a 39-row by 39-column set and a 39-row by 476-column set. In this study the 39-by-476 tables were used. The industrial identity of each row is described by a two-digit number and an industry description. These codes and industry descriptions were used to describe the impact of air transportation on the employment of specific industries shown in Table 1. Each column in the table is described by a six-digit code which corresponds with the numbering system of the 1972 national input-output model (10). In this sample set of calculations code no. 650500 (air transportation) was used.

The RIMS II earnings multiplier table for each region of Florida is used to determine the total impact of a given change in final demand on earnings. Also the multiplier table can be used to determine how a change in demand for any one of the 476 industries affects the earnings of any one of the industries represented in the 39 rows.

The final demand figure for a target airport was used as the entry to the appropriate regional RIMS

II multiplier table. The fourth column of Table 1 gives the air transportation column extracted from the earnings multiplier table for the Pensacola metropolitan area. Sales from aviation-related businesses at Destin Airport, which is in the Pensacola metropolitan area, amounted to \$1,897,348 in 1981. The total impact on earnings is calculated by multiplying these aviation-related sales by the total of the earnings multiplier column: $\$1,897,348 \times 0.5064 = \$960,817$.

If the impact of aviation activity on a particular industry is desired, it may be obtained by multiplying the aviation-related sales demand by the appropriate industry's multiplier coefficient. For example, suppose the impact of aviation activity at Destin Airport on the printing and publishing industry in the Pensacola metropolitan area is desired. The earnings multiplier coefficient is 0.0039 for this industry (10). Therefore, aviation-related sales of \$1,897,348 at Destin Airport result in total earnings of \$7,400 ($\$1,897,348 \times 0.0039$) by the printing and publishing sector.

CONCLUSION

The study design developed for the Florida General Aviation Economic Assessment Study provides a practical alternative to the disparate approaches currently employed in estimating the economic impact of aviation activities. The study design employs a recognized input-output approach, RIMS II, for generating multipliers, which ensures that multipliers derived from a common methodology are available for any region of the United States at a modest cost. The field work required to collect primary economic data is minimized because the primary economic variables specified by the RIMS II model, sales and payroll, are easily and reliably collected.

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