WATSONVILLE MUNICIPAL AIRPORT

# ECONOMIC BENEFIT ANALYSIS


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*For*

# WATSONVILLE MUNICIPAL AIRPORT

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# WATSONVILLE MUNICIPAL AIRPORT ECONOMIC BENEFIT ANALYSIS

## CONTENTS

# WATSONVILLE MUNICIPAL AIRPORT ECONOMIC BENEFIT ANALYSIS

## *INTRODUCTION*

This report provides an analysis of economic benefits created by Watsonville Municipal Airport (KWVI), a Regional General Aviation airport owned and operated by the City of Watsonville. The airport encompasses 330 acres and is three miles northwest of the central district of Watsonville, in Santa Cruz County, California. The latest available Federal Aviation Administration form 5010 lists 234 based aircraft on the airport, including 5 jets and 5 helicopters. The primary runway (north-south 2/20) is 4,501 feet in length and is capable of serving most turboprop aircraft and medium-weight private jets. The crosswind runway (east-west 9/27) is 3,998 feet long. The airport terminal was built in 1974 and houses the airport administrative offices, a UNICOM room, and a popular restaurant serving customers from the surrounding area.


Watsonville Municipal Airport offers a range of aviation services including fueling, inspections, maintenance, air charter, flight training, and aircraft sales and rentals. Business aircraft arriving at the airport bring travel parties supporting the local economy, such as corporate representatives meeting with local firms, or specialized medical personnel. In addition, the airport is home to several non-aviation businesses that produce goods and services for national and global markets while supporting jobs in the regional economy.

Watsonville Municipal Airport creates significant benefits that extend beyond the aviation community to impact economic growth and development as well as the quality of life of residents of Watsonville and Santa Cruz County. The availability of an airport with sufficient infrastructure to support corporate jets is invariably listed by business executives as a key criterion for business location and expansion. Public safety and national security objectives are supported by aviation operations of police officers and government agencies, including various branches of the U. S. military. Medical transport, aerial mapping, and air cargo shipments are all essential functions provided at the airport every day of the year.

## *MEASURING ECONOMIC BENEFITS*

Although qualitative advantages for quality of life and economic development created by an airport are important, they are also challenging to measure. In studying the economic benefits of airports and aviation, analysts have emphasized economic benefits that can be quantified and measured, as shown in **Figure A** below.

**Figure A: Measurable Economic Benefits of Airport Activity**


- **Employment** is the number of jobs supported by economic activity created by the presence of the airport.

- **Payrolls** include income to workers as employee compensation (the dollar value of payments received by workers as wages and benefits) and proprietor's income to business owners.

- **Output** is the value of the production of private firms and public agencies. For a private firm, output is equal to the annual value of revenue or gross sales at producer prices (before addition of further margins or transportation costs), including sales or excise taxes. Output, revenue, and sales are interchangeable synonymous terms used throughout this study and in turn, these are equal to spending or expenditures from the perspective of the buyer. For government units, the agency budget is used as the measure of output.

Economic benefit studies differ from cost-benefit analyses, which are often used to support a "go-no go" decision to undertake a proposed project. **Analysis of economic benefits is related to measurement of the economic contribution of an industry or a particular component of the economy such as an airport.** This methodology was standardized in the publication by the Federal Aviation Administration, *Estimating the Regional Economic Significance of Airports*, Washington DC, 1992, and has been closely followed in recent years by public and private sector aviation analysts.

Consistent with the FAA methodology, this study views Watsonville Municipal Airport as a source of measurable benefits that impact Watsonville and Santa Cruz County. Aviation activity creates revenues for firms and employment and income for workers on and off the airport.

On-airport activity by both private aviation related and non-aviation firms and government agencies located on the airport is a source of output, jobs, and worker payrolls. Business spending on the airport injects revenues into the community when firms and public sector agencies buy products from local and regional suppliers and again when employees of the airport spend for goods and services in their communities. Included in on-airport economic benefits are capital improvement projects that provide for growth and enhance air safety, as well as expenditures by tenants for modernization or expansion of existing space and facilities.

Off-airport spending by visitors that arrive by itinerant general aviation aircraft is a second source of economic benefits. Air visitor spending creates jobs, income, and revenues in the region's lodging, food service, ground transportation, retail, and recreation industries.

## DIRECT, SECONDARY, AND TOTAL ECONOMIC BENEFITS

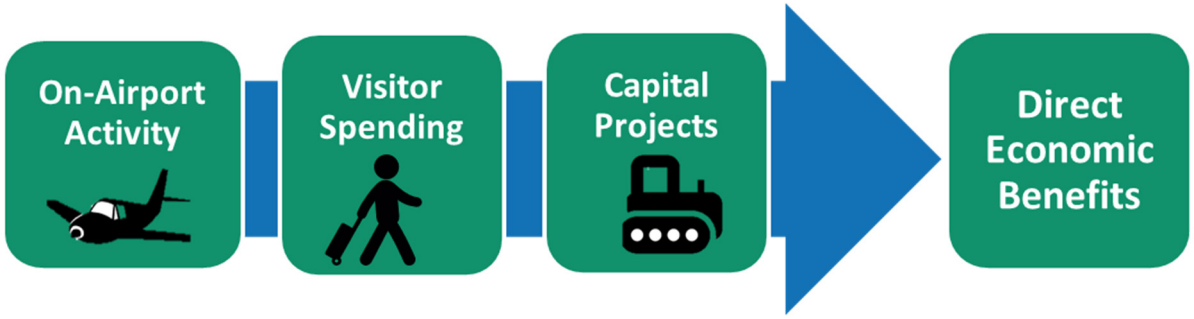
Economic activity (such as purchase of fuel by an aircraft pilot) creates an initial economic benefit or direct impact when the purchase is made. The spending by the pilot provides revenue to the seller (at KWVI fuel is sold by the City of Watsonville) and the initial spending is then used for payments to suppliers or to pay salaries to workers (who in turn spend their wages in their home communities). As payments are received by suppliers or spent by workers, the initial direct spending from the fuel purchase recirculates in the economy bringing secondary benefits known as multiplier or "ripple effects," illustrated in **Figure B**. These combined direct and secondary benefits summed together provide a measure of total economic benefits.

**Figure B: Direct, Secondary, and Total Economic Benefits**


The characteristics and components of direct and secondary benefits are explained below in further detail.

**Direct benefits** measure the initial output, employment, and payrolls when businesses and agencies on the airport generate sales and revenues, hire workers, and make payments to employees (see **Figure C)**. Visitor spending creates direct benefits off the airport when visitors that arrive by air pay for goods and services including lodging, restaurants, auto rental, retail items, or recreational activity. The on-airport direct benefits are tabulated by obtaining data on revenues received by airport employers, the number of workers, and compensation paid. Air visitor direct spending benefits are based on the number of visitors and their outlays for goods and services. Capital improvement projects are a third source of economic benefits, creating jobs, payrolls, and output. These initial direct benefit flows are the "inputs" to an input-output model to estimate secondary benefits.

**Figure C: Sources of Direct Economic Benefits**




**Secondary benefits** are created when the initial spending on the airport or by visitors circulates and recycles through the economy. There are two types of secondary benefits **(Figure D)**.

**Indirect benefits** include activity by suppliers and vendors who sell to airport or hospitality businesses, along with the jobs created and incomes paid to workers by these suppliers. For example, businesses and agencies on the airport purchase services such as insurance and hard goods such as tools or office furniture from off-airport providers.

**Figure D: Sources of Secondary Economic Benefits**


**Induced benefits** measure the consumer spending of workers who produced both the direct or indirect goods and services. For example, when an aircraft mechanic's salary is spent for consumer goods such

as groceries or medical services, this contributes to additional employment and income in the general economy for providers of these goods and services.

Economic benefit studies rely on multiplier factors from input-output models to estimate how direct spending on the goods and services of a particular industry or set of industries creates secondary indirect and induced benefits or multiplier effects. An input-output model incorporates inter-industry or "supply chain" relationships within the region that account for changes in employment, payroll, and output in related industries set off by a change in demand in an initial industry.

The input-output model used for this study was the IMPLAN model, based on data and coefficients for the Santa Cruz County economy from the U. S. Bureau of Economic Analysis. This model is frequently used for studying the economic benefits of airports and aviation across the nation, as well as economic impacts associated with changes in regional economies, such as closing of a military base or construction of a major sports venue. **Because the airport is an existing facility, the current IMPLAN application should be viewed as a contribution study, analyzing the benefits the airport creates annually for the local economy.** The time period studied is calendar year 2019 and figures are expressed in 2019 dollars.

## *ECONOMIC BENEFIT HIGHLIGHTS*

Watsonville Municipal Airport created 2019 economic benefits of 452 total jobs supported, total payrolls for workers of $27.2 million, and total output of $67.0 million (**Figure E**). The total benefits include both direct and secondary benefits, measuring the airport's overall contribution to the regional economy.

**Figure E: Watsonville Municipal Airport Total Economic Benefits**

**Table 1**
**Direct, Secondary, and Total Economic Benefits**
**Watsonville Municipal Airport**

| SOURCE | EMPLOYMENT | PAYROLLS | OUTPUT |
|---|---|---|---|
| **Direct Economic Benefits** | | | |
| **On-Airport Benefits: Activity by Aviation & Non-Aviation Private Firms, Government Agencies, Capital Projects** | **242** | **$15,475,000** | **$36,340,000** |
| **Air Visitor Benefits: Activity by General Aviation Travelers** | **24** | **$909,000** | **$2,206,000** |
| ***Direct Benefits*** | ***266*** | ***$16,384,000*** | ***$38,546,000*** |
| **Secondary Economic Benefits** | | | |
| **Indirect Benefits: Activity by Suppliers & Vendors** | **63** | **$3,992,000** | **$10,336,000** |
| **Induced Benefits: Activity by Employees as Consumers** | **123** | **$6,864,000** | **$18,120,000** |
| ***Secondary Benefits*** | ***186*** | ***$10,856,000*** | ***$28,456,000*** |
| **Total Economic Benefits** | | | |
| ***Total Benefits*** | ***452*** | ***$27,240,000*** | ***$67,002,000*** |

*Sources: On-airport employment information obtained through on-site employer interviews and records of Watsonville Municipal Airport. Secondary benefits (indirect and induced) computed from the IMPLAN input-output model, with coefficients for Santa Cruz County. All values are in 2019 dollars.*

Economic benefits of Watsonville Municipal Airport by source are shown in **Table 1**. Highlights of the economic benefits of Watsonville Municipal Airport include the following:

- **The direct on-airport economic benefits resulted from the activity of 27 private tenants, 2 public agencies (see Appendix I), and various capital improvement projects during 2019. Direct on-airport output was $36.3 million, with payroll to 242 on-airport workers of $15.5 million.**
- **The direct economic benefit of air visitors to Watsonville Municipal Airport in 2019 brought an injection of $2.2 million of visitor spending into the economy, creating employment for 24 workers in the hospitality industry, with payroll of $909,000.**
- **The combined direct benefits of on-airport and visitor activity summed to output of $38.5 million, 266 direct jobs created, and payroll of $16.4 million. The combined secondary benefits, computed through IMPLAN, created an additional $28.5 million of revenues, jobs for 186 additional workers, and payroll of $10.9 million as the initial spending recycled through the region.**

Comparison of total benefits with the initial direct benefits provides insight into the multiplier process that causes benefits due to the presence of the airport to be distributed across the regional economy. For example, the 266 combined direct on-airport and air visitor jobs supported total employment of 452 total workers in the region, yielding a multiplier value of 1.7.

The economic interpretation is that, on average, each 100 direct jobs supported an additional 70 jobs in the general economy. Similarly, each million dollars of direct output is associated with additional secondary output of $700,000, derived from calculation of the ratio of total output ($67,002,000) to direct output ($38,546,000), again equal to 1.7. Multipliers vary by industry and geographical location. For this study, multipliers specific to Santa Cruz County industries from the IMPLAN model were applied.

## *A DAY AT WATSONVILLE MUNICIPAL AIRPORT*

Airports are available to serve the flying public and support the economy every day of the year. The Watsonville Municipal Airport is a consistent source of revenues, employment, and income for the service area economy. During an average day in 2019, the airport generated $183,600 of daily total economic benefits (including direct and secondary or multiplier benefits) and supported 452 area workers bringing home daily income of $74,600 for spending in their home communities (**Table 2**).

**Table 2**
**Economic Benefits for an Average Day**
**Watsonville Municipal Airport**

| Activity | Average Day |
|---|---|
| **All Aircraft Operations** | **164 Daily Aircraft Operations** |
| **On-Airport Employment** | **242 Workers on the Airport** |
| **On-Airport Payrolls** | **$42,400 Paid to Airport Workers** |
| **General Aviation Air Visitors** | **34 Air Visitors in the Area Daily*** |
| **Air Visitor Spending** | **$6,000 Daily Visitor Spending** |
| **Total Employment** | **452 Total Area Jobs Supported** |
| **Total Payrolls** | **$74,600 Paid to Area Workers** |
| **Total Economic Benefits** | **$183,600 Daily Economic Benefits** |

***Includes overnight visitors as well as those who remained for only part of a day**

On an average day at the airport, there are more than 160 operations by aircraft involved in local or itinerant activity including touch-and-go operations, corporate travel on business jets, or private general aviation flights bringing passengers visiting the area for personal travel or on business. In 2019 the airport provided on-site employment for 242 workers, bringing home $42,400 per day for spending in their home communities for consumer goods and services. On an average day in 2019 there were 34 air visitors in the area spending for lodging, food and drink, retail goods and services, recreation and ground transportation. Visitor spending injected $6,000 per day into the regional economy.

## *ON-AIRPORT ECONOMIC BENEFITS*

Economic benefits on the airport flow from the employment, payroll, and output created by the private firms and public agencies located on the airport, as well as capital improvement projects undertaken by private contractors that come onto the airport.

Information about employers and economic activity on the airport was obtained through surveys and interviews with tenants. Airport staff provided substantial data and collaboration in support of this study. Airport staff shared records, facilitated on-site interviews with business owners and managers, and provided specialized knowledge regarding airport operations. Survey participants were informed that the individual employer results were confidential and only aggregate totals would be published.

The 29 employers on the airport reported 242 employees in 2019 (**Table 3**). There were 14 aviation-related employers and 15 non-aviation employers. A listing on airport employers is provided in Appendix I to this report. Private sector employers made up 93 percent of employers on the airport (27/29) and accounted for 91 percent of all jobs on the airport (221/242) in 2019. Private aviation related employers on-site at Watsonville Municipal Airport included FBO firms providing FAA certified repair services, inspection, interiors, flight training for fixed wing aircraft and helicopters, aircraft rental and sales, aircraft charter, aerial photography, and skydiving operations, as well as medical transit.

The 13 private aviation tenants provided jobs for 65 workers, payrolls of $4.5 mill and created direct output of $9.0 million. Including staff of the Watsonville Municipal Airport and estimates of capital improvement projects, aviation related activity on the airport employed 80 workers with payrolls of $6.1 million and aviation-related direct output of $13.7 million in 2019.

There were 14 private non-aviation employers and one non-aviation public agency employing 162 workers on Watsonville Municipal Airport in 2019. Private non-aviation businesses included administrative offices for agricultural firms, auto rental, a clothing manufacturing firm serving national and global markets, high technology employers, various consumer businesses, and food service establishments. Combined private and public sector non-aviation payroll generated on Watsonville Municipal Airport was $9.4 million. Non-aviation employers created direct output of $22.6 million in 2019.

**Table 3**
**Direct, Secondary, and Total On-Airport Economic Benefits**
**Watsonville Municipal Airport**

| SOURCE | EMPLOYMENT | PAYROLLS | OUTPUT |
|---|---|---|---|
| **Direct On-Airport Economic Benefits** | | | |
| **Private Aviation Employers (13)** | **65** | **$4,461,000** | **$9,050,000** |
| **Public Aviation Employers (1)** | **10** | **$1,178,000** | **$3,536,000** |
| **Capital Improvement Projects*** | **5** | **$432,000** | **$1,132,000** |
| ***Aviation Benefits*** | ***80*** | ***$6,071,000*** | ***$13,718,000*** |
| **Private Non-Aviation Employers (14)** | **151** | **$8,202,000** | **$21,305,000** |
| **Public Non-Aviation Employers (1)** | **11** | **$1,202,000** | **$1,317,000** |
| ***Non-Aviation Benefits*** | ***162*** | ***$9,404,000*** | ***$22,622,000*** |
| ***Direct Benefits*** | **242** | **$15,475,000** | **$36,340,000** |
| **Secondary On-Airport Economic Benefits** | | | |
| **Indirect Benefits: *Activity by Suppliers & Vendors*** | **59** | **$3,769,000** | **$9,764,000** |
| **Induced Benefits: *Activity by Workers as Consumers*** | **115** | **$6,421,000** | **$16,992,000** |
| ***Secondary Benefits*** | **174** | **$10,190,000** | **$26,756,000** |
| **Total On-Airport Economic Benefits** | | | |
| ***Total Benefits*** | ***416*** | ***$25,565,000*** | ***$63,096,000*** |

*** Figures for Capital Improvement Projects are based on a 3-year average during 2017-2019.**
*Source: On-airport employment was obtained through on-site interviews and records maintained by Watsonville Municipal Airport administrative staff. Payroll figures based on Santa Cruz County wage and benefits data from U. S. Bureau Economic Analysis. Output estimates were computed from the IMPLAN input-output model, with coefficients for Santa Cruz County. Values are in 2019 dollars.*

The average compensation (including benefits) of aviation workers on the airport was $75,880. The U.S. Bureau of Economic Analysis reports the average compensation for all workers in Santa Cruz County was $68,200 (adjusted to 2019 by the Consumer Price Index of the U. S. Department of Labor). Aviation compensation was 11% greater than the average job in the area. Average compensation received by non-aviation workers was $69,150 (adjusted to full time equivalent workers to account for part time employees of food service and consumer service firms).

## CAPITAL IMPROVEMENT PROJECTS

Capital improvement projects are included as a source of airport economic benefits, since construction activity generates spending and employment both on and off the airport. Runway improvements, fencing, drainage projects, and building construction are all examples of capital improvements that enhance safety and provide for growth.

Large capital improvement projects that begin at a point in time can extend over more than one year and annual outlays can vary from year to year when larger projects are underway. To smooth out the annual variation in capital improvement spending, economic benefit studies typically average outlays over a multi-year period.

**Table 4**
**Capital Improvement Projects**
**Watsonville Municipal Airport**

| Year | Expenditures |
|---|---|
| 2017 | $302,000 |
| 2018 | $1,255,000 |
| 2019 | $1,841,000 |
| Total | $3,398,000 |
| 3 Year Average | $1,132,000 |

*Source: City of Watsonville budget documents and Watsonville Municipal Airport.*

For this study, figures on capital improvements were obtained from City of Watsonville and airport records and averaged over the most recent three-year period from 2017 through 2019. Activities at Watsonville Municipal Airport included runway rehabilitation and surface improvements, taxiway construction and maintenance, and signage. The total over the period was $3.4 million and the average annual outlay was $1.1 million **(Table 4)**. This expenditure value was used to obtain the employment estimate of 5 full time equivalent construction employment worker-years and $432,000 worker compensation.

## DIRECT, SECONDARY, AND TOTAL ON-AIRPORT BENEFITS

The capital improvement projects undertaken on the airport by private contract firms were incorporated into the computation of direct benefits of on-airport activity to provide a final sum of 242 direct jobs on the airport, with payroll of $15.5 million and direct output of $36.3 million.
Secondary benefits as estimated by the IMPLAN model added employment of 174 more jobs and additional output of $26.8 million as the initial direct spending recirculated within the regional economy. As noted earlier, secondary effects come from two sources. On-airport private firms and public agencies make purchases from suppliers and vendors, who in turn purchase inputs and hire employees to support production of goods and services for airport customers. This effect is known as the indirect benefit. Simultaneously, employees of airport firms and agencies and employees of their suppliers are also consumers who spend incomes in their home communities. This spending stimulates additional jobs and output in the sectors serving consumers, creating induced benefits across the area economy.

Of the 174 secondary jobs associated with the presence of the airport, 59 were indirect jobs in supplier industries to on-airport activity, such as finance and insurance, business services, providers of parts, supplies and materials, transportation and warehousing, information and communication systems. There also were 115 additional jobs in the region induced by household spending by airport and supplier

employees across a broad spectrum of consumer industries including health care, food service, retail trade, and personal services.

The total benefits of on-airport operations are the sum of the combined direct and secondary benefits. The total benefits of on-airport operations include:

- **416 total jobs supported**
- **$25.6 million total payroll created**
- **$63.1 million of output contributed to the area economy**

Direct on-airport employment benefits of 242 jobs accounted for 58 percent of total employment benefits, while the secondary (or multiplier) component of 174 jobs accounted for 42 percent.

## *GENERAL AVIATION VISITOR ECONOMIC BENEFITS*

Visitors travel on general aviation aircraft to Watsonville Municipal Airport for business, as vacationers, to reunite with friends and relatives, or for various personal or professional reasons. Although general aviation travel is sometimes viewed as a luxury mode of transport, the efficiencies and flexibility of general aviation are highly desirable, especially to corporate travelers.

Studies of companies that use business aviation find that these firms outperform others on key financial measures such as earnings and share price growth. While these visitors are in the Watsonville area, they contribute to the regional economy with expenditures on lodging, food and drink, and other goods and services. Moreover, air travel can provide a way for high time-value decision makers to review investment opportunities in the Watsonville area or conduct business discussions and return to their home airport during the same day.

Watsonville Municipal Airport officials estimate there were 59,860 operations in 2019, with a distribution of 66 percent local operations and 34 percent itinerant operations. Operations are defined as a departure (take off) or arrival (landing). Local flights are those that take off from the Watsonville Municipal Airport and remain in the airport traffic pattern for pilot training or testing. Local operations predominantly involve based aircraft. Itinerant operations occur when aircraft depart to another airport or arrive at Watsonville on a flight originating at another airport.

There were an estimated 20,352 itinerant general aviation operations at Watsonville Municipal Airport in 2019 **(Table 5**). Itinerant operations can involve based or non-based aircraft traveling to or from airports other than Watsonville Municipal Airport. Those itinerant arriving aircraft that are not based at Watsonville Municipal Airport are identified as "true transient" arrivals in airport economic studies. To determine the number of true transient arrivals, a sample of 3,600 operations from the FlightAware Flight Tracker database for Watsonville Municipal Airport was analyzed. This source includes arrival and departure data for aircraft identified by N numbers, on an hourly basis. Based aircraft arrivals were removed by matching arriving N numbers with known N numbers of Watsonville based aircraft. It was found that 21 percent of arriving itinerant aircraft were based at Watsonville Municipal Airport, while 79 percent were true transients based elsewhere, and therefore properly identified as visitors.

**Table 5**
**General Aviation Itinerant Aircraft**
**Watsonville Municipal Airport**

| Category | Activity |
|---|---|
| **Itinerant GA Operations** | **20,352** |
| **Itinerant GA Arrivals** | **10,176** |
| **Itinerant Based Arrivals** | **2,137** |
| **True Transient Arrivals** | **8,039** |
| **Overnight Stay Aircraft** | **1,206** |
| **One Day Stay Aircraft** | **6,833** |
| **One Day Stay > 3 hours** | **1,447** |
| ***One Day Stay < 3 hours*** | ***5,386*** |

*Source: Derived from records for Watsonville Municipal Airport as compiled by the FlightAware Flight Tracker system, 2019.*

There were 10,176 itinerant arrivals in 2019. Applying the ratios from the sampling analysis, estimates of 2,137 based itinerant arrivals and 8,039 true transient arrivals were obtained for Watsonville Municipal Airport for 2019. By matching pairs of arrivals and departures in the sample of 3,600 operations, it was found that 15 percent of all arriving transient aircraft (1,206) remained overnight, while 85 percent (6,833) stayed for a portion of a day but not overnight.

Some one-day aircraft remain on the airport for only a short period, such as to buy fuel or visit the on-site restaurant. Other travel parties may stay longer to visit a corporate site, conduct a business meeting, or purchase goods and services off the airport. These latter activities generate off-airport benefits in the form of expenditures that support jobs and payroll in the local area. Detailed arrival and departure records indicated that 67 percent of arriving transient aircraft (5,386) remained on the airport for less than three hours while 18 percent of arriving aircraft (1,447) remained parked at the airport for three hours or longer, enough time for passengers to leave the airport and make expenditures in the surrounding area.

Those aircraft travel parties that remained overnight stayed in the Watsonville area for an average of 2.5 days, according to an analysis of the FlightAware arrival and departure data. Aircraft that remained on the airport for three hours or longer stayed in the area for an average of 4.9 hours. The greatest percentage of aircraft remained at the airport for less than three hours. The average length of stay for one day transient aircraft remaining on the airport for less than three hours was 1.1 hours.

## GENERAL AVIATION VISITOR SPENDING

Overall visitor spending depends on the number of visitors, their length of stay, and the types of expenditures made. The number of visitors is a function of the number of arriving aircraft and average passengers per aircraft. While appealing in concept, attempts to survey pilots and passengers of arriving or departing general aviation aircraft often result in response rates that fall well below acceptable levels of statistical significance.

Studies by the National Business Aviation Association and Harris Interactive found average travel party size across business aviation flights of 3.0 persons. This estimate may be influenced by increasing utilization of larger corporate jets, as the Aircraft Owners and Pilots Association reported an average of 2.5 passengers some years ago. A recent study by the FAA ("The Economic Impact of Civil Aviation on the U. S. Economy: The Economic Impact of Civil Aviation by State," 2017) determined average number of passengers on itinerant general aviation flights to be 2.84. For this study, an average of these three estimates, 2.8 passengers per aircraft, was used.

Estimates for visitor spending per aircraft travel party per trip are set out in **Table 6**. Travel party calculations are for 2.8 passengers. Overnight travel parties stayed an average of 2.5 days, according to analysis of the FlightAware sample of 3,600 arrivals and departures. Figures for spending by category were based on the "Santa Cruz County Visitor Profile" prepared by Campbell Rinker Marketing Research, 2014, and updated to 2019 through adjustment by the Consumer Price index. Entries were validated by contacting lodging establishments, rental car agencies and local restaurants. Lodging and food expenditures were also compared with per diem spending allowances for Santa Cruz County for federal travel by the U. S. General Services Administration. These methodologies for computing visitor spending are typically used in airport studies by research firms and government agencies (see for example "Contribution of General Aviation to the US Economy in 2018," prepared by PricewaterhouseCoopers LLP for the NBAA and other sponsors, released in February, 2020).

Visitor spending per aircraft per trip for overnight visitors was $1,602. The largest component was lodging at $828, which accounted for 52 percent of the total. The next largest category for overnight visitors was food and drink, at $427 per aircraft travel party, 27 percent of the total.

**Table 6**
**General Aviation Visitor Spending per Aircraft per Trip**
**Watsonville Municipal Airport**

| Category | Overnight Aircraft | One Day Aircraft |
|---|---|---|
| **Lodging** | **$828** | **N/A** |
| **Food & Drink** | **$427** | **$68** |
| **Retail Goods & Services** | **$133** | **$53** |
| **Entertainment** | **$77** | **$12** |
| **Ground Transportation** | **$137** | **$55** |
| ***Spending per Trip*** | ***$1,602*** | ***$189*** |
| **Number of Aircraft** | **1,206** | **1,447** |
| ***Direct Visitor Spending*** | **$1,932,000** | ***$274,000*** |
| ***Direct Visitor Benefits*** | **$2,206,000** | |

*Source: Spending from Visit Santa Cruz County, adjusted to 2019 values by Consumer Price Index, U. S. Bureau of Labor statistics. Day visitor spending for each category is 40% of one full day spending. Some figures are rounded and may not compute exactly.*

Visiting travel parties who were only in the area for a day had no expenses for lodging and therefore total spending per aircraft was lower than for overnight visitors, at $189. Since one-day visitors were often in the area for only a portion of a full day, each spending category was adjusted to 40 percent of the full day/overnight values.

The economic value of an arriving overnight aircraft of $1,602, multiplied over 1,206 aircraft arrivals yields direct visitor spending of $1.9 million for 2019. The economic value of an aircraft that remains on the airport from three hours or more of $189, multiplied over 1,447 one-day aircraft, results in direct spending of $274,000. The combined general aviation visitor direct spending at Watsonville Municipal Airport by overnight and one-day aircraft was $2.2 million for 2019.

## DIRECT, SECONDARY, AND TOTAL VISITOR BENEFITS

Annual 2019 direct, secondary, and total air visitor benefits are shown in **Table 7**. Benefits are shown for overnight, one day, and combined general aviation visitors. The largest direct spending category by aviation visitors was overnight expenditures for hotel or other accommodation, with outlays of $998,000. The level of lodging employment associated with this spending level was 9 jobs and payroll of $399,000. The second greatest spending category was food and drink, with combined overnight and one day visitor outlays of $614,000, creating 8 jobs with payroll of $259,000. Summed over all spending categories for combined overnight and one day travel parties, direct visitor benefits included output of $2.2 million, 24 annual-equivalent jobs supported, and payroll of $909,000.

The indirect benefits created by purchase of intermediate goods and services from suppliers to the hospitality industry were output of $572,000 and 4 additional jobs across the regional economy. The induced spending by workers as consumers created benefits of $1.1 million revenues and 8 jobs. The secondary benefits flowing from the direct air visitor spending summed to $1.7 million of output, 12 jobs, and $666,000 of payrolls.

Combining direct and secondary benefits, the total economic benefits from air visitor spending were:

- **36 total jobs supported,**
- **$1.6 million total payroll created, and**
- **$3.9 million of output contributed to the area economy.**

**TABLE 7**
**Direct, Secondary, and Total Economic Benefits from General Aviation Visitors**
**Watsonville Municipal Airport**

| Category | Overnight GA Visitor Expenditures | One Day GA Visitor Expenditures | Output (Expenditures) | Payrolls | Employment |
|---|---|---|---|---|---|
| **Direct Visitor Economic Benefits** | | | | | |
| Lodging | $998,000 | N/A | $998,000 | $399,000 | 9 |
| Food/Drink | $515,000 | $99,000 | $614,000 | $259,000 | 8 |
| Retail Sales | $160,000 | $77,000 | $237,000 | $140,000 | 3 |
| Entertainment | $93,000 | $18,000 | $111,000 | $57,000 | 2 |
| Ground Transport | $166,000 | $80,000 | $246,000 | $54,000 | 2 |
| *Direct Benefits* | *$1,932,000* | *$274,000* | *$2,206,000* | *$909,000* | *24* |
| **Secondary Visitor Economic Benefits** | | | | | |
| Indirect Benefits | $500,000 | $72,000 | $572,000 | $223,000 | 4 |
| Induced Benefits | $982,000 | $146,000 | $1,128,000 | $443,000 | 8 |
| *Secondary Benefits* | *$1,482,000* | *$218,000* | *$1,700,000* | *$666,000* | *12* |
| **Total Visitor Economic Benefits** | | | | | |
| *Total Benefits* | *$3,414,000* | *$492,000* | *$3,906,000* | *$1,575,000* | *36* |

*Source: Spending estimates based on figures from Visit Santa Cruz County applied to general aviation aircraft activity at Watsonville Municipal Airport compiled by the FlightAware Flight Tracker System. Employment and payroll estimated by the IMPLAN input-output* model. Values are in 2019 dollars.

## *GOVERNMENTAL REVENUE BENEFITS*

Because of the output, jobs, and income created by the presence of Watsonville Municipal Airport, the facility is an important source of public revenues. Estimated tax revenues for 2019 are shown in **Table 8**. The tax revenues in the table are derived from the IMPLAN model, based on current rates for California, Santa Cruz County, and federal taxes. The IMPLAN model estimates tax revenues related to employment, worker compensation and output components as reported by the U. S. Bureau of Economic Analysis. No break-out is available in the BEA data for individual cities, as city and county data are combined and reported at the county level.

The table is constructed to identify the taxes from direct on-airport activity, direct visitor spending in the region, secondary tax collections created by supplier (indirect) and worker (induced) activity and total combined tax collections from direct and secondary sources due to the presence of the airport.

**Table 8**
**Government Revenue Benefits**
**Watsonville Municipal Airport**

| Source | Direct Taxes On-Airport | Direct Taxes Visitors | Secondary Taxes | Total Taxes |
|---|---|---|---|---|
| **Federal Taxes** | | | | |
| Corporate Profits Tax | $47,000 | $4,000 | $63,000 | $114,000 |
| Personal Income Tax | $1,256,000 | $74,000 | $887,000 | $2,217,000 |
| Social Security Tax | $1,643,000 | $93,000 | $1,089,000 | $2,825,000 |
| All Other Federal Taxes | $102,000 | $18,000 | $163,000 | $283,000 |
| Total Federal Taxes | $3,048,000 | $189,000 | $2,203,000 | $5,440,000 |
| **State and Local Taxes** | | | | |
| Corporate Profits Tax | $27,000 | $2,000 | $34,000 | $63,000 |
| Sales Tax | $369,000 | $64,000 | $587,000 | $1,020,000 |
| Property Tax | $364,000 | $63,000 | $580,000 | $1,007,000 |
| Aircraft Property Tax | $280,000 | N/A | N/A | $280,000 |
| Personal Income Tax | $447,000 | $28,000 | $338,000 | $843,000 |
| All Other State & Local | $237,000 | $23,000 | $231,000 | $491,000 |
| Total State & Local Taxes | $1,754,000 | $180,000 | $1,770,000 | $3,704,000 |
| **Total Federal, State, and Local Taxes** | | | | |
| Total Taxes | $4,802,000 | $369,000 | $3,973,000 | $9,144,000 |

*Source: Calculations from the IMPLAN input-output model based on Santa Cruz County, California, and federal tax collections at current rates. All figures are in 2019 dollars.*

Watsonville Municipal Airport was the source of the following public revenues in 2019:

**$9.1 million total combined federal, state and local tax revenues**
**$5.4 million total federal tax revenues**
**$3.7 million total state and local tax revenues**
**$4.8 million federal, state and local tax revenues from direct on-airport activity**

## FEDERAL TAXES

The largest federal component was the social security tax, with contributions from employers and workers of $2.8 million in 2019. Direct social security contributions on the airport of $1.6 million accounted for 57 percent of the total social security taxes. The second largest federal tax revenues came from total personal income taxes of $2.2 million, with $1.3 million paid by the 242 on-airport workers. Overall, direct on-airport economic activity accounted for $3.0 million of federal tax revenues, or 56 percent of the total federal collections of $5.4 million.

## STATE AND LOCAL TAXES

The largest components of total state and local tax revenues were sales and property taxes of $1.0 million for each. Personal income taxes of $447,000 were the largest single revenue source from direct on-airport activity. Direct on-airport activity contributed $1.7 million in revenues or 47 percent of the total state and local collections.

## AIRCRAFT PROPERTY TAXES

Under California law, aircraft are subject to annual appraisal and are taxable as tangible personal property. The Santa Cruz County assessor receives aircraft ownership information from the Watsonville Airport, the State Board of Equalization, and the FAA. Aircraft owners must file an Aircraft Property Statement that includes the purchase price, model and manufacturing year of the aircraft, and information about operating hours, condition, and avionics equipment. For tax purposes, the assessed value is set at current market value of the aircraft. Historic aircraft are typically exempt from property tax.

Aircraft based at Watsonville Municipal Airport had an adjusted (after exemptions) assessed value of $24,066,495 in 2019, according to figures provided by the Auditor-Controller office of the County of Santa Cruz. The airport is located in tax area 02-078 and personal property in that area is subject to the general 0.01 percent tax rate plus an additional 0.00164018 percent tax rate for various school district bonds and other voter-approved charges. The resulting property taxes received from based aircraft at Watsonville Municipal Airport include the following:

- **$280,000 aircraft property total tax revenues**

- **$241,000 general tax revenues at .01 percent tax rate**
- **$39,000 Watsonville city tax revenues at voter-approved .00164018 tax rate**

Aircraft property taxes of $280,000 accounted for 16 percent of the $1.7 million state and local tax revenues resulting from direct economic activity on-site at Watsonville Municipal Airport in 2019.

## *CATALYTIC ECONOMIC BENEFITS*

One of the most familiar quotes within the aviation community is shown in the accompany photo of a popular poster: "A mile of road will take you one mile, a mile of runway will take you anywhere." The quotation is a reminder for officials who must weigh competing uses for scarce dollars as they allocate public money for infrastructure construction and maintenance. Highways serve a large number of citizens, but airports offer a much broader reach with greater economic potential, dollar for dollar.


John Kasarda, originator of the aerotropolis concept that links economic development to expanded aviation use, has demonstrated that aviation is becoming increasingly important for global, national, and regional economic growth. He has compared expanded commercial service and general aviation in the 21st century to the development of the interstate highway system in the 20th century and railroads in the 19th century (see *Aerotropolis: The Way We'll Live Next*, 2011, Farrar, Straus and Giroux).

Modern airport impact methodology recognizes the "catalytic" influence an airport has on the entire economy, supporting supply chains and providing rapid, efficient transport for goods and passengers. A study by the Air Transport Action Group, an international air travel organization, notes that "Air transport's most far-reaching economic contribution is via its contribution to the performance of other industries and as a facilitator of their growth. These 'catalytic' or 'spin-off' benefits of aviation affect industries across the whole spectrum of economic activity." (See *Benefits Beyond Borders*, ATAG, 2018, Pg. 11).

The catalytic role of California airports in economic development was highlighted in *Aviation in California: Benefits to our Economy and Way of Life*, prepared for the California Division of Aeronautics by Economics Research Associates (June,2003). In a section titled "Catalyst for Economic Development" (pg. 26) the report points out that "As California corporations continue to decentralize their operations

to escape the high cost of major metropolitan areas, the state's system of 250 airports is becoming increasingly important. These airports allow smaller California communities to complete with lower cost locations in other states." The report also emphasizes several features of aviation that are important to business, including increased security and "less hassle," privacy, convenience, time saving, and cost saving. Examples of aviation users - firms particularly dependent on general aviation - include high technology employers, wholesale distributors, real estate companies, and agricultural producers. Meanwhile, airports whose employers that provide aviation services – aviation suppliers - also create benefits in the local economy when they purchase goods and services as intermediate inputs, across the regional supply chain. Catalytic effects of aviation suppliers and users are analyzed in more detail below.

## CATALYTIC BENEFITS: NON-AVIATION VENDORS AND SUPPLIERS TO AVIATION

Aviation activity at Watsonville Municipal Airport requires intermediate inputs of goods and services in order to produce sales to the users of aviation services, defined as "output." Output is one of three measures of direct economic benefits, along with jobs created and payrolls received by workers and proprietors. In order to produce output and support jobs, aviation employers make purchases, ranging from aviation and jet fuel for resale, office furniture, shop tools, and services such as insurance and banking. The direct output of Watsonville Municipal Airport aviation employers in 2019 was $13.7 million, as shown in **Table 9**. This direct output required intermediate inputs of $4.6 million, identified in the table as "Indirect Benefits," or purchases from suppliers in the regional economy. (It is likely that additional inputs were purchased from outside the region, but those outlays are not included in the table, since they do not create jobs and output for the regional economy.)

**Table 9**
**Direct, Secondary, and Total Aviation Economic Benefits**
**Watsonville Municipal Airport**

| SOURCE | EMPLOYMENT | PAYROLLS | OUTPUT |
|---|---|---|---|
| **Direct Aviation Economic Benefits** | | | |
| **Private Aviation Employers (13)** | **65** | **$4,461,000** | **$9,050,000** |
| **Public Aviation Employers (1)** | **10** | **$1,178,000** | **$3,536,000** |
| **Capital Improvement Projects** | **5** | **$432,000** | **$1,132,000** |
| ***Direct Aviation Benefits*** | ***80*** | ***$6,071,000*** | ***$13,718,000*** |
| **Secondary Aviation Economic Benefits** | | | |
| **Indirect Benefits: *Activity by Suppliers & Vendors*** | **28** | **$1,752,000** | **$4,602,000** |
| **Induced Benefits: *Activity by Workers as Consumers*** | **44** | **$2,411,000** | **$6,541,000** |
| ***Secondary Aviation Benefits*** | ***72*** | ***$4,163,000*** | ***$11,143,000*** |
| **Total Aviation Economic Benefits** | | | |
| ***Total Benefits*** | ***152*** | ***$10,234,000*** | ***$24,861,000*** |

*Source: On-airport employment was obtained through on-site interviews and records maintained by Watsonville Municipal Airport administrative staff. Payroll figures based on Santa Cruz County wage and benefits data from U. S. Bureau Economic Analysis. Output, indirect benefits and induced benefits estimates were computed from the IMPLAN input-output model, with coefficients for Santa Cruz County. Values are in 2019 dollars.*

Suppliers to aviation make up what is known as the "upstream" portion of the aviation supply chain. Detail from the IMPLAN input-output model provides for analysis of the various industries supplying inputs for aviation activity at Watsonville Municipal Airport, as shown in **Table 10**. The entries illustrate the upstream supply chain that supports aviation at Watsonville Municipal Airport. Industries in the table are ranked according to dollar volume of inputs provided to airport firms and the City of Watsonville during 2019.

**Table 10**
**Aviation Upstream Supply Chain**
**Watsonville Municipal Airport**

| Industry | Inputs |
|---|---|
| Transportation & Warehousing | $1,075,000 |
| Construction, Maintenance | $543,000 |
| Real Estate, Rentals, Leasing | $506,000 |
| Financial Services | $445,000 |
| Business Support Services | $441,000 |
| Professional, Technical Services | $387,000 |
| Wholesale Trade | $227,000 |
| Retail Trade | $146,000 |
| Information, Communication | $140,000 |
| Mining & Petroleum Refining | $127,000 |
| Accommodations, Food Services | $89,000 |
| Personal Services | $86,000 |
| Equipment Repair, Maintenance | $78,000 |
| Manufacturing | $55,000 |
| Utilities | $21,000 |
| All Other Suppliers | *$236,000* |
| Total Inputs | *$4,602,000* |

*Source: Calculated from the IMPLAN input-output model, Santa Cruz County, 2019*

The greatest inputs to aviation were from the broader transportation and warehousing industry, including trucking, delivery services, warehouse storage, and related businesses. To produce $13.7 million of output, the on-airport aviation community requires $1.1 million of inputs from transport and warehouse firms.

The second largest source of inputs is the construction industry, including maintenance. This entry is separate from the Capital Improvement category and represents work done for private firms as well as the airport administration, valued at $543,000. The real estate industry, including rentals and leasing, receives $506,000 from airport employers. Firms and the airport administration purchased financial services totaling $445,000 and required additional general business services (such as janitorial or security) of $441,000.

To recap, the aviation output produced was valued at $13.7 million, equivalent to revenues received by private firms plus the budget of the airport administration. The dollar value of inputs required to produce aviation output on the airport in 2019 summed to $4.6 million. From **Table 9**, it can be seen that the $4.6 million of goods and services provided by the upstream suppliers and vendors of inputs to aviation was associated with creation and support of 28 jobs in the regional economy. The average wage for input supplier firms was $62,570.

The analysis here relates to upstream suppliers to aviation producers. However, non-aviation firms on the airport also require inputs from regional suppliers. The total purchases of inputs by non-aviation firms on the airport was $5.1 million in 2019, supporting 31 jobs across various industries. Combined, aviation and non-aviation producers at Watsonville Municipal Airport purchased inputs from regional suppliers and vendors valued at $9.7 million, creating 59 jobs (see **Table 3**).

## CATALYTIC BENEFITS: NON-AVIATION USERS OF AVIATION SERVICES

The previous section identified the businesses and industries that make up the upstream portion of the aviation supply chain that provides the essential inputs required to produce aviation output. Utilizing inputs from the upstream supply chain, aviation output is then produced for users, customers, or clients of the Watsonville Municipal Airport aviation community. The customer component is known as the "downstream" portion of the supply chain. The downstream users of aviation are those businesses, public agencies, and individuals who depend on and purchase aviation output.

Output produced by the aviation providers can be sold as inputs to further production or sold to what regional analysts refer to as "final demand." For example, when an agricultural firm requires crop dusting service, the crop dusting is an intermediate input to agricultural output. In contrast, an individual who charters a flight to travel from Watsonville to a medical appointment in Southern California is the final purchaser of the charter service. Goods and services sold to final demand are not intended to be resold or used for further production. In general, final demand consists of sales to consumers, governments, or sales made outside the local region (these are referred to as "institutional" demand also).

Through input-output analysis, sales to businesses who use aviation as intermediate inputs and household or government purchases for final demand can be identified. Within the IMPLAN model there are over 500 industries represented. Each industry has a set of requirements from other industries in order to produce output and each institutional component of the economy (households, government, capital investment, out-of-region exports) has a similar listing of purchases. The final demand and intermediate demands by purchasers of aviation services from Watsonville Municipal Airport are set out in **Table 11**. As before, output of private aviation employers is $9.0 million. Private businesses within the region that require aviation services in the production of their own output purchased $5.1 million of aviation services as intermediate inputs. An additional $4.0 million of private aviation output was purchased directly by consumers or government as final demand. Note that the output of the airport administration (equal to the budget of $3.5 million) is included as final demand, along with capital improvement projects. Within the framework of input-output analysis, both are recorded as components of final demand.

**Table 11**
**Components of Demand for Aviation Services**
**Watsonville Municipal Airport**

| Category | Sales as Final Demand | Sales as Intermediate Inputs | Output |
|---|---|---|---|
| **Private Aviation Employers** | **$3,986,000** | **$5,064,000** | **$9,050,000** |
| **Public Aviation Employers** | **$3,536,000** | **N/A** | **$3,536,000** |
| **Capital Improvement Projects** | **$1,132,000** | **N/A** | **$1,132,000** |
| ***Sales to Purchasers*** | ***$8,654,000*** | ***$5,064,000*** | ***$13,718,000*** |

*Source: Calculated from the IMPLAN input-output model, Santa Cruz County, 2019.*

The private business customers that make up the downstream supply chain of the Watsonville Municipal Airport aviation community are shown in detail in **Table 12**. It can be seen that several significant purchasers of aviation services also appear **in Table 10** as suppliers to aviation. Examples are transportation and warehousing, wholesale and retail trade, manufacturing, utilities, and business support services. While each of these appears as a supplier to aviation, each is also a customer, illustrating the interconnectedness of the market economy.

**Table 12**
**Aviation Downstream Supply Chain**
**Watsonville Municipal Airport**

| Industry | Purchases |
|---|---|
| Transportation & Warehousing | $2,703,000 |
| Wholesale Trade | $840,000 |
| Health Care | $359,000 |
| Business Support Services | $287,000 |
| Utilities | $250,000 |
| Retail Trade | $208,000 |
| Manufacturing | $133,000 |
| Information, Communication | $40,000 |
| Non-Profits | $7,000 |
| All Other Industries | $237,000 |
| *Total Inputs* | *$5,064,000* |

*Source: Calculated from the IMPLAN input-output model, Santa Cruz County, 2019.*

Total purchases of aviation services by businesses were $5.0 million in 2019. The largest volume of sales was within the transportation and warehousing industry, again dominated by trucking, showing that aviation producers depend on the trucking industry to receive necessary supplies, while the trucking industry also depends on aviation to expedite deliveries of cargo. The regional health care industry paid out $359,000 for aviation services, most likely for delivery of critical shipments and for medical transport. Aviation firms require manufactured products, particularly avionics and aircraft parts, and in turn the manufacturing industry transports cargo by air and pays for executive travel on general aviation flights.

## CATALYTIC BENEFITS OF BASED AIRCRAFT

Although details on aircraft usage are not publicly available from the Aircraft Property Statements filed with the assessor's office, it is possible to draw some conclusions based on ownership and aircraft value data in the public record. The average assessed value of the 234 aircraft based at Watsonville Municipal Airport is $98,000. The total assessed value of all aircraft is $24 million and the median value (one half are higher valued, and one half are lower valued) is $27,000. Aircraft are assessed at market value when first placed on the assessor's rolls but are not adjusted thereafter. Over time, market value and assessed value diverge. The large difference between average value and median value suggests that there are several high-value aircraft that boost the average value; analysis shows the average assessed value of the top ten aircraft is $1.3 million. This figure includes the 5 corporate jets based at the airport.

Driscoll's is among the businesses that own Watsonville based corporate aircraft. The firm is a major grower and supplier of strawberries and other berry products, accounting for over one third of the entire U.S. berry market. The company is noted for initiating California agricultural trade with China, implementation of modern water policy, and support for global worker welfare standards. Driscoll's has a staff of some 30 scientists, many based in Watsonville, as well as Florida, Mexico, Spain and other global

sites. The company aircraft based at Watsonville Municipal Airport provide support for shipping as well as executive travel across the nation and around the globe. While Watsonville's climate is ideal for agricultural products, the supporting economic infrastructure (including Watsonville Municipal Airport) facilitates production and keeps Watsonville at the forefront of the global berry market.

Based aircraft at the airport also support safety and quality of life for the region. Starting in September of 2018, CALSTAR Air Medical Services established an emergency air medical transport base at KWVI to provide service to Santa Cruz County and surrounding communities. The base is staffed by a flight crew made up of pilots, clinicians, and on-site aircraft maintenance technicians. Helicopters operating from the base are equipped with IFR and GPS equipment that allow operation in limited visibility situations common along the coastal region.

An example of the value of the airport to the greater Watsonville-Santa Cruz area is the response of based aircraft owners after the magnitude 6.9 Loma Prieta Earthquake in 1989. Millions of Americans watching the beginning of the 1989 World Series witnessed the initial shock on national broadcast television, giving rise to the name the "World Series Earthquake." The shock was centered approximately 10 miles northeast of Santa Cruz on the San Andreas Fault. The aftershock zone extended 25 miles, from north of Los Gatos to south of Watsonville near Highway 101. Records showed 63 people killed, more than 3,700 injured and an additional 12,000 displaced. Authorities estimate up to 4,000 landslides may have occurred during the quake, closing Highway 17 between Scotts Valley and Los Gatos.

Based aircraft owners at Watsonville Municipal Airport and other general aviation flyers volunteered for thousands of flights to bring in food and relief supplies as both Santa Cruz and Watsonville were cut off by land. The airlift was regarded as highly successful and laid the foundation for planning for future disaster relief efforts, recognizing another earthquake causing similar extensive damage is very much in the realm of possibility. The Watsonville Emergency Airlift Command Team (WEACT) was established in 2014 as a non-profit organization offering training, drills, and simulations to improve the response to disasters. In the event of a disaster, airlift, and other response activities by WEACT are coordinated by the KWVI airport manager and delegated staff.

As illustrated above, based aircraft support private business, public agencies, and public service missions for the entire Watsonville-Santa Cruz area. In addition, owners of aircraft have freedom of movement that is not hampered by commercial service restrictions. Commercial service options are limited by set schedules and route destinations that can accommodate larger aircraft, but general aviation aircraft can fly to many more airports in California or across the nation. Analysis of departure data from the FlightAware sample showed 72 different destinations for all aircraft based at the airport. Out-of-state destinations included Arizona, Idaho, Kansas, Nevada, New Mexico, Oregon, and Washington. There were undoubtedly other destinations, but it has become common practice for larger business aircraft pilots to block identification information from private flight tracking systems. Overall, it was estimated that based aircraft at Watsonville Municipal Airport made 2,137 flights to various destinations in 2019 (an average of 9 flights per year) for business or personal travel.

## CATALYTIC BENEFITS OF ITINERANT AIRCRAFT

In the same way that the infrastructure of Watsonville Municipal Airport provides support for outward bound travel for based aircraft, the airport also allows visitors from across the nation to come to the area for business, recreation, or personal reasons. There were an estimated 8,309 arrivals at Watsonville Municipal Airport by itinerant aircraft in 2019. In a detailed sample of 2,500 arrivals, visitors to Watsonville originated at 113 airports, including in Arizona, Idaho, Colorado, Florida, Montana, Nevada, New Mexico, and Utah.

Analysis of itinerant aircraft arrivals at Watsonville Municipal Airport indicated that a key linkage provided by the airport is between Santa Cruz County and the dynamic Silicon Valley area. Silicon Valley includes the San Jose metro area, communities further north on the peninsula such as Sunnyvale and Mountain View, and the southern portion of the East Bay toward Fremont. Silicon Valley originations account for more than 25 percent of itinerant (non-based) arrivals at the airport. Driving time from San Jose to Watsonville is typically about one hour, and much slower during rush hours. The flight-line distance between Watsonville and San Jose is approximately 30 miles.

**Table 13**
**Origin of Arriving Itinerant Aircraft**
**Watsonville Municipal Airport**

| Rank | Origin | Percent |
|---|---|---|
| 1 | San Jose, CA | 15.4 |
| 2 | Palo Alto, CA | 11.1 |
| 3 | Salinas, CA | 5.5 |
| 4 | Monterey, CA | 5.4 |
| 5 | Marina, CA | 5.2 |
| 6 | Hollister, CA | 4.3 |
| 7 | San Carlos, CA | 4.3 |
| 8 | Sacramento, CA | 3.9 |
| 9 | Hayward, CA | 2.7 |
| 10 | Concord, CA | 2.3 |

*Source: Derived from records for Watsonville Airport as compiled by the FlightAware Flight Tracker system, 2019. Transient aircraft only, Watsonville based aircraft arrivals have been excluded.*

Major employers in Silicon Valley include Apple, Facebook, Google, Oracle, Hewlett Packard, Intel, and many others with a global presence. According to the Bureau of Economic Analysis, the average compensation per job in Silicon Valley is $152,000. Similarly, costs of doing business and home prices are much higher than in Santa Cruz County. Itinerant flight activity indicates strong linkages between the Watsonville area and Silicon Valley, with significant potential for further growth.

## *AIRPORT INFLUENCE ON HOME PRICES*

There has been flight activity in the area of Watsonville Municipal Airport since the 1940's when the airfield was used by the U.S. Navy for training and staging of flight crews. Over time, operations and activity at the airport have increased, as has residential construction in Watsonville and near the airport. Concern about aircraft noise is important to the general public, and especially to those homeowners near airport flight patterns. As a result, airport authorities are careful to log and respond to reports of excessive noise.

In addition to sporadic noise complaints, officials work with homeowners, real estate firms, land use planners, and aviation consultants to monitor the perception (or the actual reality) that home values in communities may be jeopardized by airport proximity, primarily due to aircraft noise. This topic has been studied extensively by analysts, primarily with respect to large metropolitan area commercial service airports. Because of the existence of residential housing near Watsonville Municipal airport and a desire to quantify the relationship between airport activity and home values, a study of the effect of airport noise levels on home prices was included in this economic benefit study.

The report was prepared by an Arizona State University economist who specializes in econometric studies, working with business students who assisted in data collection. The statistical noise analysis is included as Appendix II.

The highlights of the study are set out below:

- **National studies find that property values decrease in the range .5% to 1.0% for each one unit increase in airport noise exposure.**

- **The Watsonville Municipal Airport noise study was based on analysis of data for 234 houses outside the 55 CNEL level, 59 houses inside the 55-60 CNEL contour, and 18 houses inside the 60-65 CNEL contour. The CNEL contour, unique to California, combines and weights decibels (db) of noise in daytime, evening, and nighttime.**

- **Houses outside the 55 CNEL level had the highest value, $591,099. Houses in the 55-60 contour had an average value of $581,218. Houses nearest the airport, in the 60-65 CNEL contour had the lowest value, $557,653. However, a proper statistical analysis would adjust these figures for differences in housing features such as number of bedrooms, number of bathrooms, and lot size.**

- **An econometric regression analysis, holding housing features constant but allowing for noise variation, found a reduction in home value of 0.8% for a one unit increase in decibels across all noise contours, a result similar to the noise effect found in many recent studies for other airports.**

## *DATA SOURCES AND REFERENCES*

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# APPENDIX I
## WATSONVILLE MUNICIPAL AIRPORT EMPLOYERS

**Aviation Employers**

- **Belardi's Interiors**
- **CALSTAR**
- **City of Watsonville**
- **CK Restoration**
- **Gary Air**
- **GoJump Santa Cruz**
- **Hoversurf**
- **NorCal Avionics**
- **Pacific Air Care**
- **Santa Cruz Pilot**
- **SC Flying Club**
- **Specialized Helicopter**
- **Strawberry Aviation**
- **United Flight Services**

**Non-Aviation Employers**

- **Beer Mule**
- **California Conservation Corps**
- **Ella's at the Airport**
- **Expo Imaging**
- **Head'n Home**
- **Hertz**
- **Knowlton Construction**
- **Mid Valley Supply**
- **Pacific AgPak**
- **Pied Piper**
- **Precision Dynamic Machining**
- **Sage Instruments**
- **Sundance Berry Farms**
- **Tin Can Alley**
- **Watsonville Diesel**

# APPENDIX II
## WATSONVILLE MUNICIPAL AIRPORT
## NOISE ANALYSIS

**Stefan Ruediger, PhD**
**Department of Economics**
**Arizona State University**

Outside noise above basic ambient levels can disturb basic life in and around a house, leisure activities, or sleep and work in the home office. Furthermore medical research shows that noise exposure can cause increased risk of hearing impairment and poor school performance (Passchier-Vermeer and Passchier 2000), hypertension (Rosenlund et al. 2001), cardiovascular disease (Meecham and Shaw, 1993; Correia et al. 2013), increases in suicide rates (Meecham and Shaw, 1993), and sleep disturbance and psychological stress (Stone, et al 1972).

However, airspace is a common property resource, where there is little or no delineation of use rights for private parties. Airport noise is an example of a negative externality which is defined as a by-product of production or consumption activities that adversely affects third parties not directly involved in the associated market transactions (Nelson, 2008). There is no established market for quietness where people could be compensated for their suffering, but a complementary system exists wherein individuals reveal their *willingness-to-pay* to avoid different levels of aircraft noise exposure. This willingness-to-pay is revealed through the difference in house values based on noise levels.

Most commonly the differential property value is estimated through the Noise Depreciation Index (NDI), which is defined as the percentage depreciation of property values due to a one unit increase in noise exposure, typically measured in decibels (dB). The first such studies were carried out at the beginning of the 1970s which involved airports in Canada, the US, and Australia. Nelson (1980) provides an overview of 12 of these studies ranging from 1960 to 1976. He finds the average NDI to be 0.4% to 1.1%. These findings are supported through analyses of individual airports by Collins and Evans (1994); Feitelson, Hurd, and Mudge (1996); Kaufman and Espey (1997), Levesque (1994); O'Byrne, Nelson, and Seneca (1985); and Pennington, Topham and Ward (1990).

In more recent extensions of the work by Nelson (1980), Schipper, Nijkamp and Rietveld (1998) covering 19 HD noise studies and 30 NDI estimates find an average NDI of 0.83%. Further support comes from Nelson (2004) covering 33 airport studies in the US and Canada from 1969 to 1997 finding that values of properties decline between 0.51 to 0.67% per dB.

Work on the negative effects of noise on house values at Chicago O'hare airport (McMillen, 2004) and Atlanta Hartsfield-Jackson Airport (Cohen and Coughlin, 2005, 2008) put the NDI above 1%. McMillen finds an NDI of about 1% for Chicago O'hare and Cohen and Coughlin find an NDI of about 2% for Atlanta Hartsfield. The most recent meta-analysis (Wadud, 2010) confirms that the NDI is likely below 1%. Including 53 NDI estimates, Wadud (2010) shows that the NDI is between 0.45% and 0.64%. The findings for the US, Canada, and Australia are supported by studies for Switzerland and Poland. Salvi (2003) finds

and NDI of 0.74% per dB for Zurich Airport, Baranzini and Ramirez (2005 ) find an NDI of 0.7% for apartments located in the vicinity of Geneva airport, and Trojanek, R. et al (2017) find an NDI of 0.87% for single-family houses, and 0.57% for apartments in the vicinity of Poznan Airport

However, airports also have positive effects on surrounding communities. A portion of the population might value close proximity to airports because access for convenience of transportation and travel time for employment (Tompkins et al, 1998; Lipscomb ,2003).

**Data for Watsonville Municipal Airport**

This study reports on a model of the house prices as a function of attributes. The attributes are the number of bedrooms, bathrooms, and other features. House price data were current as of April 2020 from Zillow. The dataset contains information on 312 houses in Freedom and Watsonville, California. In addition to the house data from Zillow the model uses noise contour information provided by the City of Watsonville. The noise contour maps were created in August 2018.

Noise is measured using the Community Noise Equivalent Level (CNEL). CNEL is a single number that expresses the average sound level over a 24-hour period. The CNEL is measured in dB but includes an additional fivefold weight for aircraft movements between 7 pm and 10 pm (roughly a 5dB penalty) and an additional tenfold weight for aircraft movements during the nighttime hours of 10 pm to 7 am (roughly a 10dB penalty). The CNEL approach to measure noise exposure is unique to California. CNEL is measured in common dB units (Wyle Laboratories, 1971). Normal background noise in urban areas is approximately 50-60 decibels during daytime hours and 40 decibels during nighttime (Nelson, 2004). An indoor CNEL value of 45dB is mandated by the California Code of Regulations (CCR, Title 24, Part 6, Section T25-28) for single-family dwellings, multiple family dwellings, hotel and motel rooms which translates to about an outside noise exposure of 65-75 dB CNEL with closed windows.

The model is based on data for 234 houses located outside the 55 CNEL contour, 59 houses inside the 55 to 60 CNEL contour, and 18 houses inside the 60 to 65 CNEL contour. Table A-1 contains the descriptive statistics for the sale prices and the characteristics of the houses for 2020. The average house in Freedom (n=214) is valued at $568,037.47 and the average house in Watsonville (n=98) is valued at $641,495.68. The average house in the sample, valued at $591,099.60, had 3 bedrooms, 1.5 bathrooms, and was located on a 0.25 acre lot. The houses outside the 55 CNEL contour are valued at $596,082.27, the houses inside the 55 to 60 CNEL contour are valued at $581,218.73, and houses inside the 60 to 65 CNEL contour are valued at $557,653.67. A review of the data shows a small decrease in home values as the noise level increases, but since we are not holding all other housing characteristics constant, it is possible houses in the noisier area might be smaller, have fewer bathrooms, or fewer bedrooms than houses in quieter areas. Figure A shows an overview of all the houses and their respective CNEL values included in this study.

**The Model**

The analysis uses a standard hedonic price model. The model can be written as

$$Y = X\beta + \varepsilon$$

where $\varepsilon$ is a residual term assumed to be normally distributed with a zero mean and constant variance. The dependent variable ($Y$) is the natural log of housing price values, and $X$ includes all house characteristics such as the number of bedrooms, the number of bathrooms, the number of fireplaces, the number of stories, lot size, and distance from the airport in miles. Included in $X$ are also a dummy variable for the neighborhood and most importantly a dummy variable for the noise contour. Table A-2 includes a list of the variables and their definitions.

The goal of the regression analysis is to isolate the effect of noise on house values. Simply comparing the average values of houses in each noise contour does not provide conclusive evidence about the effect of noise on house values because houses on different sides of noise contour boundaries might differ by more characteristics than just the noise level. Regression analysis keeps everything else constant while just focusing on the difference in noise levels.

**Results**

Table A-3 provides results for the OLS regression analysis. The results are within the range of the main findings of similar studies reviewed earlier. Overall, the estimated model explains about 60% of the variation in log housing values. The individual variables for housing characteristics performed as expected. Houses with more bathrooms, more bedrooms, larger lot sizes, and a fireplace have higher values. Dummy variables for the number of bathrooms and number of bedrooms are positive and significant (at the 1% level) determinants of house values. It is interesting to note that the number of stories or the presence of a fireplace do not have an effect on the value of houses in this sample. While keeping the noise value constant, the house value increases as the distance from the airport increases. For each additional mile from the airport, the value of houses is about 9% higher. Furthermore, each additional acre of property adds about 21% to the value of a house. The city, Freedom or Watsonville has no significant effect on the value of houses.

The value of a house located inside the 65 CNEL noise contour is about 4% lower (95% CI: -9% to 0.8%, p-value 0.1%) than otherwise, holding everything else constant. Per db, housing prices are .043/5 =.08% lower. The effect of a location inside the 60 CNEL contour is statistically insignificant (95% CI: -2.4% to 3.8%). The finding for the 65 CNEL contour is in line with many other noise studies that find about a 0.4 to 2% reduction in house value per dB.

The summary finding of the model is that properties near the Watsonville Municipal Airport show a 0.8% reduction in housing value for a one unit increase in decibels, holding constant all other factors that influence price, such as lot size or number of bedrooms. The result is similar to that most frequently found in other airport noise studies for the United States.

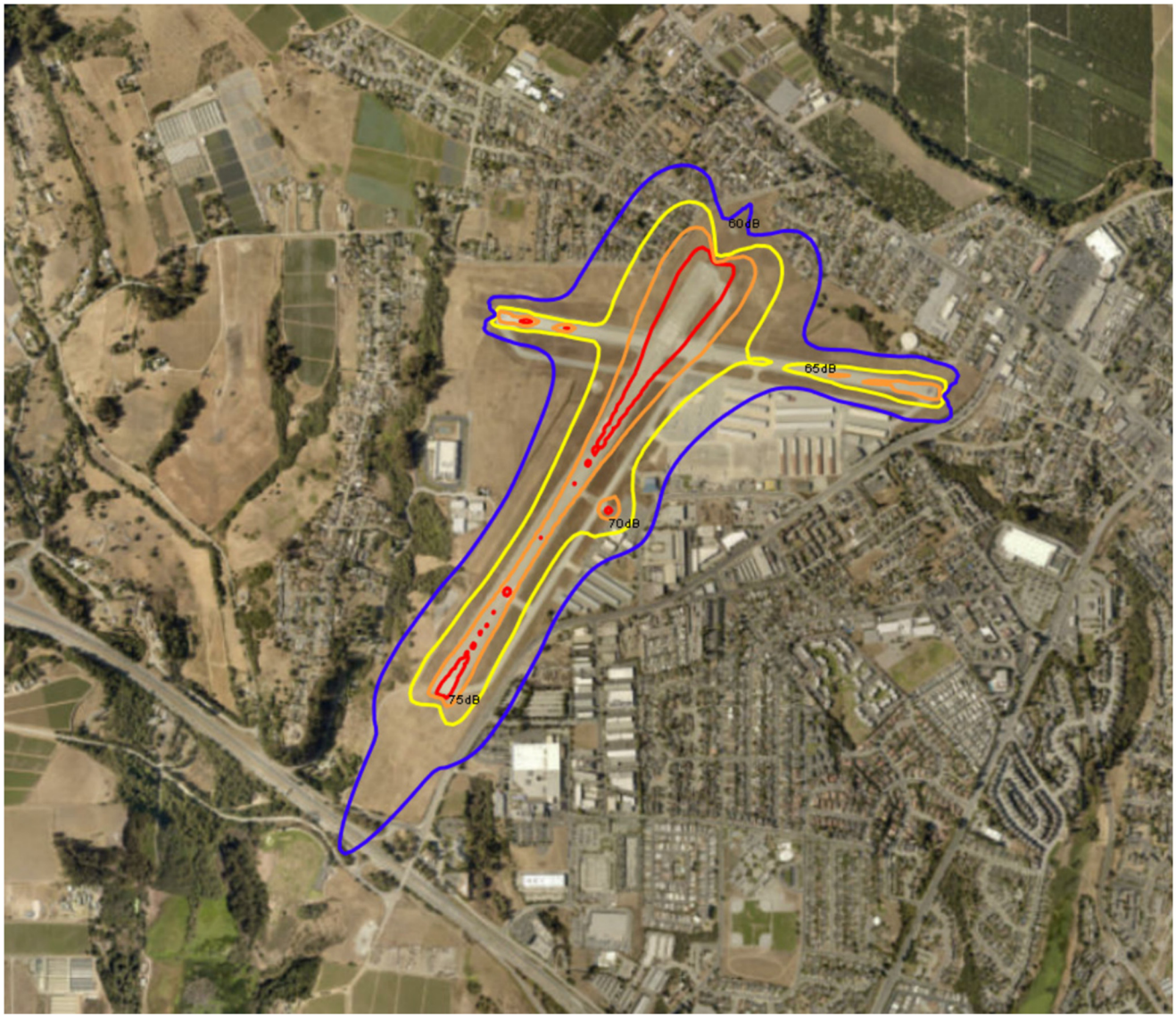


Figure A: Noise Contours for Watsonville Municipal Airport


Figure B: Residential Properties and Noise Levels, Watsonville Municipal Airport

**TABLE A-1. SUMMARY STATISTICS, FULL SAMPLE—219 OBSERVATIONS**

| | Count | Percentage | Mean |
|---|---|---|---|
| Houses outside CNEL 55 contour | 234 | 75.24 | $596,082.27 |
| Houses inside CNEL 55-60 contour | 59 | 18.97 | $581,218.73 |
| Houses inside CNEL 60-65 contour | 18 | 5.78 | $557,653.67 |
| | | | |
| Freedom | 214 | 68.59 | $568,037.47 |
| Watsonville | 98 | 31.41 | $641,459.68 |
| | | | |
| 1-bedroom | 7 | 2.25 | $438,971.14 |
| 2-bedrooms | 90 | 28.94 | $532,134.97 |
| 3-bedrooms | 164 | 52.73 | $600,597.33 |
| 4-bedrooms | 48 | 15.43 | $686,990.33 |
| 5-bedrooms | 1 | 0.32 | $638,029 |
| 6 bedrooms | 1 | 0.32 | $770,146 |
| | | | |
| 1-bathroom | 122 | 39.1 | $522,983.49 |
| 2-bathroom | 161 | 51.6 | $619,599.45 |
| 3-bathrooms | 27 | 8.65 | $702,559.93 |
| 4-bathrooms | 2 | 0.64 | $947,226.00 |
| | | | |
| 0 fireplaces | 76 | 24.36 | $598,234.45 |
| 1 fireplace | 236 | 75.64 | $588,801.91 |
| | | | |
| 1-story | 297 | 95.19 | $583,666.96 |
| 2-stories | 15 | 4.81 | $738,265.40 |
| | | **Range** | **Mean** |
| Zillow Value | 312 | $276,000-$1,117,840 | $591,099.60 |
| Travel Distance (miles) from Airport | 312 | 0.71 – 2.02 | 1.47 |
| Lot Size Sq acres | 312 | 0.046 - 1.9 | 0.231 |
| Bedrooms | 311 | 1 - 6 | 2.84 |
| Bathrooms | 312 | 1 - 4 | 1.71 |

**TABLE A-2. VARIABLES IN HEDONIC REGRESSIONS**

| Variable Name | Variable Definition |
|---|---|
| lzestimate | Log value of the nominal housing value as determined by Zillow |
| cnel2 | Dummy variable equal to one for houses inside the 60 CNEL noise contour; zero otherwise. |
| cnel3 | Dummy variable equal to one for houses within the 65 CNEL noise contour; zero otherwise. |
| bedroom2 | Dummy variable equal to one for houses with two bedrooms; zero otherwise. |
| bedroom3 | Dummy variable equal to one for houses with three bedrooms; zero otherwise. |
| bedroom4 | Dummy variable equal to one for houses with four bedrooms; zero otherwise. |
| bedroom5 | Dummy variable equal to one for houses with five bedrooms; zero otherwise. |
| bedroom6 | Dummy variable equal to one for houses with six bedrooms; zero otherwise. |
| bathroom2 | Dummy variable equal to one for houses with 2 bathrooms; zero otherwise. |
| bathroom3 | Dummy variable equal to one for houses with 3 bathrooms; zero otherwise. |
| bathroom4 | Dummy variable equal to one for houses with 4 bathrooms; zero otherwise. |
| lotsizeacre | Lot size in acres. |
| stories2 | Dummy variable equal to one for houses with more than one story; zero otherwise. |
| fireplace2 | Dummy variable equal to one for houses with one fireplace; zero otherwise. |
| dist | Travel distance in miles from house to airport. |
| citydummy2 | Dummy variable equal to one for houses Watsonville, using Freedom as the base City |
| age | Age of house in years in 2020 |

**TABLE A-3. REGRESSION ANALYSIS RESULTS**

| | Semi-Log Function | |
|---|---|---|
| **Dep Var: Log(house value)** | **Coefficient** | **Standard Error** |
| cnel2 | 0.007 | (0.016) |
| cnel3 | -0.043 | (0.026) |
| bedroom2 | 0.175*** | (0.040) |
| bedroom3 | 0.233*** | (0.042) |
| bedroom4 | 0.306*** | (0.045) |
| bedroom5 | 0.402*** | (0.114) |
| bedroom6 | 0.386*** | (0.114) |
| bathroom2 | 0.082*** | (0.017) |
| bathroom3 | 0.109*** | (0.032) |
| bathroom4 | 0.437*** | (0.076) |
| lotsizeacre | 0.194*** | (0.036) |
| stories2 | 0.050 | (0.040) |
| fireplace2 | -0.019 | (0.014) |
| dist | 0.086*** | (0.024) |
| citydummy2 | 0.008 | (0.017) |
| age | -0.001 | (0.000) |
| Constant | 12.876*** | (0.064) |
| adj R-squared | 0.597 | |
| N | 309 | |
| * p<0.05, ** p<0.01, *** p<0.001 | | |

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# APPENDIX III
## WATSONVILLE MUNICIPAL AIRPORT
## AMBAG AIRPORTS ECONOMIC IMPACT STUDY
**August 13, 2003**

**Prepared by**
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**Arizona State University**
**June 15, 2020**

In 2003, the Association of Monterey Bay Area Governments (AMBAG) released an economic analysis of the regional importance of six publicly owned airports serving the AMBAG region The airports were Hollister Municipal Airport, Marina Municipal Airport, Mesa Del Rey (King City) Airport, Monterey Peninsula Airport, Salinas Municipal Airport, and Watsonville Municipal Airport. Watsonville Municipal Airport economic impacts as presented in Table 13 of the AMBAG report are shown below.

AMBAG Airports Economic Impact Study –Final Draft

**TABLE 13 - WATSONVILLE MUNICIPAL AIRPORT ECONOMIC IMPACTS**

| Source | Jobs | Economic Impact |
|---|---|---|
| Airport Tenants | | |
| Aviation Related Tenants - Direct Impacts | 37 | $ 3,408,667 |
| - Induced Impacts | 55 | $ 3,783,225 |
| Non-Aviation Tenants - Direct Impacts | 163 | $ 8,839,461 |
| - Induced Impacts | 211 | $ 10,114,363 |
| Combined Tenant Capital Spending | 7 | $ 73,920 |
| Total Airport Tenant Impacts | 473 | $ 26,219,636 |
| Visitor Spending | | |
| Direct Impacts | 83 | $ 4,178,618 |
| Induced Impacts | 64 | $ 4,680,052 |
| Total Visitor Spending Impacts | 147 | $ 8,858,670 |
| Indirect Impacts | 1,030 | $ 627,353,000 |
| Total Impacts | 1,650 | $ 662,431,306 |

The findings for Watsonville Municipal Airport included on airport aviation-related direct impacts of $3.4 million, on-airport non-aviation direct impacts of $8.8 million, and direct visitor spending impacts of $4.2 million, summing to direct economic impacts of $16.4 million. Induced impacts (secondary spending by employees as consumers in their home communities) summed to $18.6 million. Combined direct and induced impacts were $35.1 million.

**Indirect Impacts**

In addition to direct and induced impacts, the AMBAG study included an additional component labeled indirect impacts, defined as "the perception that the business community has on the airports' impact on local business operations" (AMBAG, page 7).

The economic impact of the indirect impact component for Watsonville Municipal Airport was $627.3 million. Adding direct, induced and "indirect" impacts gives a calculated total economic impact of $662.4 million for 2003. The indirect impact component of $662.4 million accounted for 95% of the total economic impact of $662.4 million in the table.

The indirect impact component was intended as a measure of business reliance on the airport. Data for indirect impacts was taken from a survey mailed out to "businesses that may have an airport connection" (AMBAG, page 8). The business impacts included were those that responded they would lose revenues or relocate out of the area if the airport were closed.

The survey question as worded is shown below.

**Local Business Survey**

1) Zip code of business location? _____

2) Type of business?

Agricultural _____ Manufacturing _____ Service/Commercial _____
Government _____ Retail/Commercial _____ Tourism Related _____
Other (Please Specify) _____

3) What would be the effect on your business if the airport should close? (Complete as many responses as applicable.)

a) Lay off _____ employees. (Please combine part-time and full-time employees.)

b) Lose $ _____ in gross revenues.

c) _____ Business would relocate.

d) _____ No effect on business.

e) _____ Other. _____

4) Estimated annual gross revenues? (At this location only.) (For fiscal year ending _____)

a) Either indicate amount if you can release it: _____

b) Or, mark appropriate range on scale below. (If necessary fill in your own range.)

0 | 50 | 100 | 200 | 300 | 400 | 500 | | |
(thousand $)

A - 4

The indirect impact figure was the sum of the annual gross revenues of all those businesses that reported they would be affected in some way by closure of the airport. According to the AMBAG report, this approach was a feature of the CALTRANS Airport Impact Model developed in the 1980s. The CALTRANS model was discontinued in the 1990s.

A review of airport impact studies from the period 1980 – 2000 shows this methodological approach of "indirect impacts" incorporating employment and revenue of local businesses was used in some reports, but not endorsed by the FAA. Since about 2000, the methodology for airport economic impact no longer includes this broad definition of indirect impact as a component of the economic impact of an airport.

**Input-Output is Standard Methodology**

Airport economic impact analysis has become less reliant on business surveys and now employs statistical and econometric techniques, due to the introduction of computerized input-output models as the main tool for airport economic impact analysis. Analysts began using the Regional Input Output System (RIMS model) from the U. S Bureau of Economic Analysis around 2000, and since 2010 the IMPLAN (Impact Analysis for Planning) model has come into wide use as the "gold standard" for airport economic impact studies.

An important feature of input output models is that they quantify local purchases of goods and services by airport businesses. Input-output models now allow much more detail on how local businesses are related to the airport. The modern definition of "indirect impact" for airport economic impact analysis is the value of goods and services purchased locally by airport businesses, such as fuel, tools, insurance, or office furniture. If a desk is purchased by an FBO, for example, only the cost of the desk is included, not the total annual revenue of the office furniture supply store. The indirect impact is a measure of business to business purchases within the regional supply chain by airport employers.

This approach was initially set out in the FAA white paper *Estimating the Regional Economic Significance of Airports*, which laid the groundwork for a now-standardized approach to impact analysis. That white paper recommended the main off-site impacts to be included are "airport expenditures for materials, equipment, fuel, and utilities" (page 30). There is no mention of surveying businesses that are either airport suppliers or airport users to add in their employment or revenues as an impact component. The impacts of local businesses on the airport are defined by the input-output model as the exact amount of local supplier sales to businesses and public agencies on the airport.

While it is useful to know the size and number of businesses that might leave the area if the airport were to close, it is now recognized that those revenues cannot be counted as part of the airport economic impact, since public utilities such as water or electricity could make the same claim. The economic impact of the water department is the jobs within the department, the purchases the department makes from local suppliers, and the value of output (water fees) produced. Although the strawberry industry, for example, depends on water, the output and employment created by the strawberry industry is the economic impact of the strawberry industry, and is not part of the impact of the water utility, although certainly the importance of water to a multi-billion dollar industry should be noted and protected.

**Summary**

When the AMBAG study was prepared in 2003, there were no well-established guidelines for airport economic impact studies. The CALTRANS model included a component labeled "indirect impact" which relied on surveys of off-site business related to the airport and represented the summation of the revenues of those businesses as part of the airport impact. For Watsonville Municipal Airport in 2003, the indirect impact made up 95% of the total impact. In recent years, airport impact analysis methodology has moved away from this approach and now measures only the amount of goods and services actually sold to the airport as indirect impact. This methodology is now standardized and seen in hundreds of airport economic impact studies produced after the introduction of computerized input-output models since 2000.

The most recent economic study (based on calendar year 2019 data) for the Watsonville Municipal Airport uses a standard methodology based on input-output analysis. Like all other impact studies produced in recent years, the indirect impact component includes purchases by airport employers of goods and services from local businesses. Because of this progression in the methodology of analysis, the total economic impact of the current study and the AMBAG 2003 study are not comparable. However, direct on-airport output and employment should be comparable, since the figures were collected in the same way. The methodology for estimating the number of visitors in 2003 was not specified and therefore visitor spending should be interpreted with caution.

Below is a summary listing of the standard guidelines the FAA follows in funding airport economic impact studies and in their own periodic reports on the impact of civil aviation.

1. The airport's direct economic impact refers to aviation activity within the airport property lines. Non-aviation activity on airport property can be included but must be identified and shown separately.

2. The off-airport activities that can be included in the economic impact are

    (a) aviation or non-aviation employers with through-the-fence agreements,

    (b) off-airport spending on lodging, etc., by visitors from outside the region that arrived at the airport by air,

    (c) off-airport local suppliers to aviation, limited to the amount of purchases by airport employers and the associated jobs and payroll to produce the goods or services supplied (indirect impact), and/or

    (d) off-airport household spending by employees involved in production of direct and indirect output (induced impact).

**Examples of Current Methodology**

Below are three current descriptions of what should be included in an economic impact analysis. None include a component similar to the broad $627.3 million component from the AMBAG 2003 study for Watsonville Municipal Airport.

From Wikipedia, we see indirect effects are the specific business to business transactions. The direct, indirect, and induced effects make up the total economic impact.

https://en.wikipedia.org/wiki/Economic_impact_analysis

**Sources of Economic Impacts** [ edit ]

In addition to the types of impacts, economic impact analyses often estimate the sources of the impacts. Each impact can be decomposed into different components, depending on the effect that caused the impact. *Direct effects* are the results of the money initially spent in the study region by the business or organization being studied. This includes money spent to pay for salaries, supplies, raw materials, and operating expenses.[2]a

The direct effects from the initial spending creates additional activity in the local economy. *Indirect effects* are the results of business-to-business transactions indirectly caused by the direct effects. Businesses initially benefiting from the direct effects will subsequently increase spending at other local businesses. The indirect effect is a measure of this increase in business-to-business activity (not including the initial round of spending, which is included in the direct effects).[2]

*Induced effects* are the results of increased personal income caused by the direct and indirect effects. Businesses experiencing increased revenue from the direct and indirect effects will subsequently increase payroll expenditures (by hiring more employees, increasing payroll hours, raising salaries, etc.). Households will, in turn, increase spending at local businesses. The induced effect is a measure of this increase in household-to-business activity. Finally, *dynamic effects* are caused by geographic shifts over time in populations and businesses.[2]

From the website for IMPLAN, the leading input-output model now in use for airport impact studies, the indirect impact is purchase of inputs from other industries.

https://blog.implan.com/what-is-implan

Indirect Effects

Indirect impacts stem from local industries' purchases of inputs (goods and services) from other local industries. These purchases are also known as intermediate expenditures.

For example, if the direct impact is the construction of a building, the first round of indirect effects will include a purchase of ready-mix concrete. This purchase of ready-mix concrete spurs the ready-mix concrete manufacturing industry to in turn purchase more sand and gravel. This purchase of sand and gravel is part of the second round of indirect effects. This cycle of spending continues to work its way backward through the supply chain, with each round of impacts getting smaller and smaller, until all money leaks from the local economy by way of imports, taxes, and profits, which do not generate additional impacts locally.

The FAA for several years has produced a report on The Economic Impact of Civil Aviation on the U.S. Economy.

https://www.faa.gov/about/plans_reports/media/2020_jan_economic_impact_report.pdf

The FAA methodology combines indirect and induced impacts into the "secondary impact" and notes that part of that impact is "payments to suppliers." There is no mention in the methodology section of including in the economic impact a summation of annual gross revenues of businesses that are not aviation businesses but are in some way related to aviation. The FAA uses the term "primary impact" instead of "direct impact," to differentiate between primary and secondary impact. In standard input-output analysis, the impacts from models such as IMPLAN are reported as direct effects, indirect effects and induced effects and the secondary impact is the sum of indirect and induced effects.


The Economic Impact of Civil Aviation on the U.S. Economy
January 2020
Federal Aviation Administration

### Multipliers

Multipliers measure the impact of a particular category of spending on the rest of the economy, specifically on output, earnings and employment. The BEA publishes industry-level multiplier estimates.

### Output

Output is the current dollar production of goods or services by a production unit and is measured by total sales or receipts of that unit, plus other operating income, commodity taxes (sales and excise taxes) and changes in inventories.

### Primary Impact

This is a term used to categorize the dollar amounts that flow through the civil aviation industry. Primary impact refers to the first round of expenditures within each sector that are collected from government and private sources. These amounts are applied against the RIMS II multipliers to derive secondary impacts.

### Seasonal Adjustment

Many aviation-related time series data display seasonal patterns. For example, travel tends to pick up during the summer and the end-of-year holiday season and slow down at other times of the year. Seasonal adjustment is a statistical process that removes such patterns to reveal underlying trends. In other words, seasonal adjustment removes the effects of recurring seasonal influences from time series. This process "quantifies seasonal patterns and then factors them out of the series to permit analysis of non-seasonal"[xxv] trends in the data.

### Secondary Impact

This is a term used to categorize the dollar amounts that flow through the civil aviation industry. Secondary impacts result from follow-on spending down the supply chain after the initial round or primary impact. This includes payments to suppliers, and suppliers of suppliers, as well as spending by employees of those businesses. Secondary impacts therefore capture both interindustry and household spending that derive from activity in the respective sectors.

### Total Economic Activity

Total economic activity is a term used interchangeably with Gross Output.

### Total Impact

Total impact is the sum of primary and secondary impacts.

### Value Added

Value added refers to the current dollar contribution to production by an individual producer, industry or sector during a specified time period. It is measured as the difference between gross output and goods and services purchased for use in production. (These purchased goods and services are also called input purchases or intermediate inputs.) Measures of value added consist of employee compensation, production-related taxes, imports less subsidies and gross operating surplus. Value added can be summed or aggregated across individual producers over an entire sector, industry or nation; at the national level, total value added equals GDP. The BEA publishes national- and selected sector-level annual and quarterly measures of value added, as well as selected annual industry measures.

[xxv] Bureau of Labor Statistics, "Fact Sheet on Seasonal Adjustment in the CPI." February 23, 2010.


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