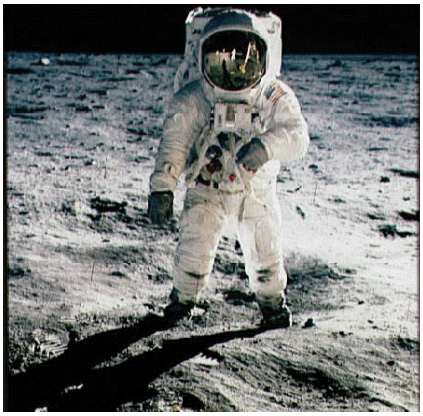
Space Alliance Technology Outreach Program

Economic Impact of Program Activities



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SPACE ALLIANCE TECHNOLOGY OUTREACH PROGRAM
The Economic Impact of Program Activities

Highlights

- SATOP was responsible for directly creating and/or maintaining 220 jobs in Fiscal Year 2005 and indirectly supporting another 535 jobs in the U.S. economy.
- SATOP intervention was directly responsible for a $106.0 million increase in output in the U.S. economy for Fiscal Year 2005.

Introduction

The Space Alliance Technology Outreach Program (SATOP), a program funded by the National Aeronautics and Space Administration (NASA) and administered by the Technological Research and Development Authority (TRDA) of Florida, provides free engineering assistance to small businesses. SATOP utilizes the knowledge and technology gained through America's space program to resolve technical issues from mainstream small businesses. SATOP helps small businesses overcome their challenges thereby increasing their probability of success, at no cost to the businesses themselves. SATOP finds professionals to assist these small businesses within an alliance of more than 55 space industry companies and organizations, which include AJT & Associates, New Mexico State University, Raytheon, The Boeing Company, and many other private companies, universities, colleges, and NASA field centers. A business can receive up to 40 hours of free technical assistance, and can typically have challenges resolved in less than 90 days. SATOP has helped companies with machine design, process engineering, materials selection, and a variety of other technical issues. Over 3,000 requests have been processed since the program's inception, and more than 2,200 resolutions have been provided to businesses by the program.

This study provides an analysis of the economic impact that SATOP has on the national economy using a recognized method of economic examination called input-output analysis. Input-output analysis enables economists to estimate the direct and indirect economic activity stimulated in a region's economy that is derived from employment activity, wage payments, and capital expenditures of a program such as SATOP. This study employs the IMPLAN Input-Output Model developed by the MIG Group in Minnesota. The model is built using national, state and county industry employment, wage, and output data from the U.S. Bureau of Labor Statistics and the U.S. Bureau of Economic Analysis.

Data

The primary data sources used to perform this analysis were participants' recorded responses to the SATOP program. From October 1, 2004 through September 30, 2005, SATOP provided assistance to 437 companies throughout the United States. Of those companies, 266 responded to an extensive telephone survey conducted by The Behavior Research Center, which obtained quantifiable answers about how SATOP assistance helped the business. The survey was conducted between October 2005 and January 2006. Of the 266 respondents to the telephone survey, 130 responses were found to hold quantifiable answers usable in this impact analysis. The responses focused on the number of jobs created or retained, a main impetus affecting an economy and on employee hours saved due to the SATOP assistance. In addition, some companies were able to provide the amount of additional revenues, sales and/or new investments which they attribute to the support received from SATOP. The usable responses were categorized by industry using the North American Industry Classification System Codes (NAICS) and then organized for input into the IMPLAN model.[1]

Input-Output Analysis

Input-output analysis is a means of quantitatively measuring economic relationships between different sectors and regions of an economy. The analysis starts with a transaction table, which describes the dollars that flow from one industry to another and, hence, the buyer and seller relationships that industries have with one another in an economy. Because of these relationships a change of activity in one industry will likely have some impact on the other industries in the economy. Likewise, some industries buy most of their supplies locally, while other industries buy most of their supplies from outside of their region. The same is true for an industry's output; some industries sell most of their products within the region, while some industries export their goods outside the region. An input-output model enables economists to examine the buyer and seller linkages of the key industries and to characterize the industry connections and the strength of these connections between industries and regions of the economy. Understanding the relationships the key industries have in the economy is important to the formation of economic development policy and strategies designed to foster a healthy and sustainable regional economy.

The input-output table used to identify economic linkages of the key industries has been developed by IMPLAN from data published by federal-state government sources including the Bureau of Economic Analysis and U.S. Department of Labor among others.

Total Employment and Capital Expenditures Economic Impact

SATOP contributes to the economic health of the nation in two major ways. First, SATOP creates new employment opportunities as well as retains employment for the country's residents who receive wage, salary and employer paid benefit compensation for their efforts. Some of these employees work directly for the businesses that SATOP assists and others work for businesses that provide services or inputs to those businesses. Second, when these workers spend their wages, they create an additional economic stimulus as their expenditures ripple through the region's economy creating additional economic activity. In economic terms, the jobs supported by SATOP are considered the 'direct' employment and those at service providers are termed 'indirect' employment. The stimulus provided by workers' expenditures is known as the 'induced' impact.

The total employment impact is derived much like a domino effect; the presence of jobs created or saved by SATOP and their corresponding payroll stimulate and support other employment in the country, defined as 'indirect' and 'induced' employment. The stimulus is provided by the people who work directly for those businesses receiving paychecks, which they then use to purchase goods and services in the U.S. economy. This demand for goods and services, such as video rentals, groceries, apparel, automobiles, appliances, and housing in turn, creates other employment in the regional economy and further stimulates economic activity. The strength and type of relationships that exist within the economy between all of the different industrial sectors determine the extent and reach of the direct economic activity under consideration. Economists refer to these relationships as "economic linkages."

For this analysis, the jobs that were created or retained were summed, and the employee hours saved were noted and divided by 2080, or the hours worked by a full-time (40 hour week) worker in a full year of employment, thus equating the number of hours saved by SATOP assistance into full-time positions. This position count was then calculated to obtain the full-time positions that SATOP contributed. In addition, these jobs also included the employment effect of gross sales and investment expenditures at SATOP supported companies. The total number of direct jobs computed this way was 220. Looking two-years out, the IMPLAN analysis shows a direct full-time employment effect of 224 jobs. The four-year direct job effect from the positions that SATOP helped retain or create in Fiscal Year 2005 equates to 245 full-time positions (see Table 1).

Total impacts are determined by adding the impact of the direct employment and capital expenditures to the indirect and induced employment and expenditures from a SATOP project. The magnitude of the impact of the direct employment on each industrial sector is dependent upon the nature of the

economic linkages that exist between the sectors within the economy. For example, as can be seen from Table 1, the impact of the employment from the SATOP project stimulates more jobs in the Services and Wholesale & Retail Trade sectors than in the Transportation & Utilities sector or the Manufacturing sector. The Services sector contains the majority of the services used by consumers, including personal repair services, business services such as photocopying and data processing, and professional services such as legal and accounting services. The Retail sector contains virtually all the goods purchased by consumers, with everything from cars, furniture and clothing to jewelry, groceries and appliances. All together, one job retained or created by SATOP stimulates nearly two and one half other jobs in the economy on an annual basis. In economic terms, the jobs supported by SATOP have an employment multiplier of 2.4.[2]

Table 1 - Total Direct and Indirect Jobs Attributable to SATOP Assistance (FY2005)

	NAICS Code	Year 1	Year 2	Year 4
Direct Jobs		**219.7**	**223.7**	**244.6**
Indirect and Induced Jobs				
Agriculture & Mining	11, 21	14.1	14.2	15.9
Construction	23	5.7	5.8	6.4
Manufacturing	31-33	61.0	61.9	68.2
Transportation & Utilities	22, 48-49	31.3	32.0	34.7
Wholesale & Retail Trade	42, 44-45	85.5	87.3	95.3
Finance, Insurance & Real Estate	51-53	70.2	71.4	78.2
Services	54-56, 61-62, 71-72, 81	262.6	267.2	291.7
Public Administration	92	4.6	4.7	5.1
Subtotal Indirect and Induced Jobs		**535.0**	**544.5**	**595.5**
Total Direct, Indirect and Induced Jobs		**754.7**	**768.2**	**840.0**

Note: Table columns do not sum due to rounding.

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While the direct impacts in Fiscal Year 2005 were smaller than the quantifiable responses in Fiscal Year 2004, the summed indirect and induced impacts were nominally comparable. The industry mix of responding businesses in Fiscal Year 2005 created a relatively larger multiplier effect based on fewer direct jobs added or saved by respondent firms. This is evident in the employment multiplier of 2.4 in Fiscal Year 2005 versus the employment multiplier of 2.0 in Fiscal Year 2004. The group comprising the quantifiable responses in Fiscal Year 2005 displayed dynamic business models and practices magnifying the economic reverberations that ripple through the economy in the form of indirect and induced impacts.

Specifically, the quantifiable responses from Fiscal Year 2005 SATOP assisted businesses indicate a return to the manufacturing sector. But beyond

manufacturing, numerous businesses reported comprehensive business models which included research and development and design services to compliment the basic manufacturing component. While it was these types of businesses which were able to quantify the largest direct impacts, the respondents in Fiscal Year 2005 once again displayed the trend started in the year prior with a significant portion of inventors seeking SATOP assistance. The individual inventor continues to receive the benefits of SATOP by perpetuating the creative mind. Though their direct impacts in this analysis are minimal, the inventor is an important element to the economic future of the United States representing the potential for unfathomable benefits.[3]

Total Income and Wage Impact

The salaries and wages paid by the recipients of SATOP's assistance explains the majority of the total personal income impact from SATOP but additional components of personal income are generated due to the indirect and induced effects. Table 2 details the components of personal income for both the direct and indirect employment impact of SATOP.

Personal income by place of residence captures all sources of income that people receive including salaries, wages and employer-paid benefits as well as the earnings of proprietors. Added to this are earnings from other property type income which includes dividends, interest, and rent.

Table 2 - Personal Income Attributable to Employment Impact of SATOP (FY2005)

Components of Personal Income	Year 1	Year 2	Year 4
	(in millions of dollars)		
Labor Income	$34.5	$35.2	$38.4
Employee Compensation	$30.6	$31.2	$34.1
Direct	$10.5	$10.7	$11.7
Indirect and Induced	$20.1	$20.4	$22.4
Proprietors Income	$3.9	$4.0	$4.4
Other Property Type Income	$15.7	$16.0	$17.5
Total Personal Income	**$50.3**	**$51.2**	**$55.9**

Note: Table columns do not sum due to rounding.

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Direct and indirect employee compensation due to the activities of SATOP totaled approximately $50.3 million for Year 1, with approximately $30.6 million in employee compensation, $3.9 million in proprietor income, and $15.7 million in other property type income. Total personal income was $51.2 million for Year 2, with $31.2 million represented by employee compensation, $4.0 million

in proprietor income, and $16.0 million in other property type income. Year four anticipates a benefit of $55.9 million from the jobs created and retained in Fiscal Year 2005. Of that $55.9 million, $34.1 million is from employee compensation, with another $4.4 million from proprietor income, and $17.5 million from other property type income.

The 220 direct positions that were created or retained during Fiscal Year 2005 were responsible for $10.5 million in direct employee compensation for the first impact year of the study. The second year direct employee compensation impact was $10.7 million. Four years out, the direct employee compensation impact is $11.7 million.

Total Output Impact

Output is another economic measure that can be used to analyze the economic impact of program activities. Output is the value of what is produced, or the end product of economic activity derived from the factors of production, namely land, labor, capital and entrepreneurship.

Table 3 - Total Industry Output Attributable to SATOP Assistance (FY2005)

	NAICS Code	Year 1	Year 2	Year 4
		(in millions of dollars)		
Direct Output		**$36.1**	**$36.7**	**$40.2**
Indirect and Induced Output				
Agriculture & Mining	11, 21	$1.7	$1.8	$1.9
Construction	23	$0.6	$0.6	$0.6
Manufacturing	31-33	$18.6	$19.0	$20.8
Transportation & Utilities	22, 48-49	$4.5	$4.5	$5.0
Wholesale & Retail Trade	42, 44-45	$7.4	$7.5	$8.2
Finance, Insurance & Real Estate	51-53	$13.8	$14.1	$15.4
Services	54-56, 61-62, 71-72, 81	$19.8	$20.1	$22.0
Public Administration	92	$3.5	$3.6	$3.9
Subtotal Indirect and Induced Output		**$69.9**	**$71.1**	**$77.8**
Total Direct, Indirect and Induced Output		**$106.0**	**$107.8**	**$117.9**

Note: Table columns do not sum due to rounding.

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In Fiscal Year 2005, SATOP contributed $106 million to the national output, $36.1 in direct impacts and $69.9 million in indirect and induced impacts. In Year 2, the direct impact is estimated to be $36.7 million, with indirect and induced impacts of $71.1 million. This corresponds to a total impact of $107.8 million nationally. In Year four, Fiscal Year 2005 activity is estimated to result in a $117.9 million impact on total output, composed of $40.2 million in direct output and $77.8 million in indirect and induced output. For every direct job

created, a total of $482,260 was contributed to total economic output in Year 1, $482,088 in Year 2 and $482,140 in Year 4.

As with the employment multiplier, the output per direct job measure in Fiscal Year 2005 shows a significant increase over Fiscal Year 2004 levels. The direct employment created or retained through Fiscal Year 2005 SATOP assistance corresponds to sectors with higher productivity which illustrates the strong economic linkages of the businesses who sought and received assistance.

Similar to the employment impacts displayed in Table 1, the service sector received the greatest nominal output impact, but by only a small margin (see Table 3). This is due to the differences in "output per employee" in each industry. Manufacturing and finance, insurance & real estate industries have high measures of output per employee, while services and wholesale & retail trade have significantly lower returns on output per additional employee.

The total output attributable to SATOP assistance in Fiscal Year 2005 is as great as Fiscal Year 2004 even with fewer quantifiable responses due to the industry mix of respondents. In fact, Year four output estimates are larger in the Fiscal Year 2005 analysis by $1.5 million even with a 17% decrease in quantifiable responses.

In summary, while the number of quantifiable survey responses was down from Fiscal Year 2004 which conversely lead to smaller direct impacts, the nature of the Fiscal Year 2005 SATOP assisted businesses created comparably larger indirect and induced impacts due to the strength of their ties to the national economy.

Conclusion

This analysis demonstrates that the Space Alliance Technology Outreach Program generates significant economic impacts on the national scale. Employment contributions by SATOP provide a direct economic stimulus of a total of 220 job opportunities nationally. These direct jobs, in turn, stimulate more than 535 additional jobs in other sectors of the economy. This equals an employment multiplier of over 2.4, which means that for every job created or retained through SATOP's assistance approximately two and one half other jobs are created or retained elsewhere in the U.S. economy. Through over $10.5 million in paid salaries, wages and employee benefits in Fiscal Year 2005, recipients of SATOP assistance contributed to both the economic well-being of their employees and an estimated 535 indirect jobs throughout the U.S. economy, increasing personal income by $50.3 million in Year 1, $51.2 in Year 2, and $55.9 in Year 4. The national benefit of SATOP in terms of economic output is estimated to be $106.0 million in Year 1, $107.8 million in Year 2, and $117.9 million in Year 4. These estimates are based on the

measurable impacts of SATOP and do not include the potential benefits of new inventions and technologies supported and advanced through the program's efforts in subsequent years.

[1] Using MIG's IMPLAN Input-Output model, we were able to derive these figures. IMPLAN is an economic impact assessment modeling system which uses national, state and county industry employment, wage, and output data from the U.S. Bureau of Labor Statistics and the U.S. Bureau of Economic Analysis in order to perform the analysis. To achieve the impact results, we used the financial and employment data obtained by SATOP, and employed it within the IMPLAN impact model.

[2] To get the multiplier effect, we took the total number of full-time direct jobs that SATOP was responsible for creating or retaining for each of the study years (219.7 in Year 1). We then took the total number of indirect and induced positions supported by SATOP, which was 535.0 in Year 1, and divided this number by the number of direct positions, 219.7. This gives the multiplier effect for jobs, which in SATOP's case, is 2.44 in Year 1, 2.43 in Year 2, and 2.43 in Year 4. In simplistic terms, the employment multiplier describes the ratio of direct employment contributed to by SATOP to the indirect and induced employment of others in the regional economy.

[3] The economic impacts attributable to SATOP as reported in this analysis are based on only quantifiable survey responses from SATOP assisted businesses in Fiscal Year 2005. 266 of the 437 assisted companies responded to the survey and 44% of the respondents in this sample identified a quantifiable impact. As in previous years, no estimate or extrapolation has occurred to attempt to quantify the actual benefits received by all assisted businesses. Therefore the economic impacts displayed in this report represent a minimum estimate of the actual impact of the program.