Economic Impacts of FAA Budget Sequestration on the U.S. Economy

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EXECUTIVE SUMMARY

As a consequence of the Joint Select Committee on Deficit Reduction's failure last year to come up with a deficit reduction plan in accordance with the Budget Control Act of 2011 (BCA), sequestration of the federal budget is scheduled to begin with the FY 2013 budget and continue for eight years after that. Approximately one half – or $500 billion – would be cut from non-defense spending, including the Federal Aviation Administration (FAA). Although the nature of these cuts has yet to be described, questions have already been raised regarding the economic impact such cuts will have on the civil aviation industry, and on the national economy as a whole.

$1B Sequestration Impacting Current Air Service Leads to:

- **66,000** to **132,000** annual jobs lost nationally
- **$10** to **$20 billion** in annual reductions in economic activity
- Up to **$1 billion** in reduced Federal and State annual tax revenues

This study is meant to complement several other studies undertaken to estimate the economic impact of sequestration on defense and non-defense sectors of the U.S. economy.[1]

As this report went to print, the administration had not yet given specific guidance to FAA or any other government agency on the mechanics of sequestration. However, the Office of Management and Budget (OMB) Acting Director, Jeffrey Zients, has recently announced that sequestration cuts are likely to significantly impact FAA operations.[2] What follows, therefore, is an impact forecast based upon assumptions generated by two specific scenarios.

This study focuses on two illustrative scenarios and examines the economic impact of each on the economy, namely employment and earnings, as explained in more detail in the full report content. Under each scenario, we forecast significant negative economic impacts generated by the sequestration – especially relative to the federal budget savings.

Scenario A anticipates budget reductions to primarily impact current operations and functioning of today's air transportation system, with a proportionate reduction across line-

[1] See http://secondtonone.org

[2] "OMB, DoD remain mum on sequestration's impact on specific programs", http://www.federalnewsradio.com/?nid=513 and sid=2974792

items (Operations, Facilities and Equipment, Research, Engineering and Development and Next Generation Air Transportation System (NextGen)). We estimate that such reductions would lead to an annual decrease of 1) 36.5 to 73 million in passenger enplanements, and 2) 1 – 2 billion lbs. of air freight.

- Five and 10 percent reductions in passenger enplanements and air freight-related activity would lead to net job losses of 55,000 to 109,000 jobs annually.[3]
- 1 and 2 percent reductions in aircraft manufacturing would lead to net job losses of 11,000 to 22,000 jobs annually.
- The forecasted losses in output to the U.S. economy are estimated to be between $9.2 and $18.4 billion, with $2.7 to $5.4 billion lost in personal earnings to workers, leading to 66,000 to 132,000 jobs lost annually.
- The forecasted loss in Federal and State tax revenue is estimated to be between $500 million and $1 billion annually.

$1B Sequestration Impacting NextGen Leads to:

- Annual economic losses beginning in 2021 of **$40 billion**, growing to **$80 billion** by 2035
- Annual job losses beginning in 2021 of **700,000**, growing to **1.3 million** by 2035

Scenario B seems less likely at this point in time if sequestration is implemented proportionally across all line-items. This scenario, however, looks at the economic impact sequestration would have should it fall more heavily on research and development, which would primarily delay and scale down the implementation of the long anticipated Next Generation Air Transportation System (NextGen) initiative, resulting from an estimated 30 to 50 percent reduction in funding. The economic impact estimates under this scenario assume a capacity-constrained civil aviation system.

- NextGen implementation could be delayed until 2035;
- The forecasted economic losses could reach up to $40 billion in 2021, growing to $80 billion by 2035; and
- The forecasted employment losses could reach up to 700,000 jobs in 2021, growing to 1.3 million jobs by 2035.

[3] The estimates provided in this report represent the total impact of sequestration on the national economy as a whole including direct, indirect, and induced impacts.

About Econsult Corporation

Econsult Corporation is an economic consulting firm based in Philadelphia, PA with extensive expertise working for clients from all industries, including transportation entities, airports, governments, real estate developers and financiers, health care organizations, law firms, universities, and non-profits. While adapting to our clients' needs, Econsult Corp. has a straightforward and renowned methodology and approach. Econsult's goal is to provide accurate, sound, and specialized economic research to address economic issues raised by our clients and to inform policy and business decision-making.

1.0 INTRODUCTION

Congress's inability to reach a deficit deal is expected to trigger $1.2 trillion in sequestration cuts over nine years that would result in significant changes in various federal government programs and expenditures for the next fiscal year and beyond. The threat of sequestration was meant to lead to an eventual agreement among the political forces at be, but it did not succeed.

To date, speculation about what might be cut and how any such cuts would impact different industries and the overall economy has been fueled by the absence of any real clarifying information from the administration. Except for a few general comments about the negative effects of sequestration, departments and agencies have not identified specific sequestration targets. At this time, the Office of Management and Budget (OMB) has been reluctant to identify specific sequestration impacts to agency and department programs. Any sequestration budget cuts would likely be scheduled to commence on January 2, 2013, but observers suggest that agencies may start cutting back during the current fiscal year in anticipation of these budget reductions. Federal departments and agencies may begin implementing hiring freezes, buyouts and early retirements, even layoffs, through reductions-in-force, in order to bring payroll costs down during the remainder of FY 2012.[4]

1.1 FAA Budget and Sequestration

Many industries will be impacted by a reduction in federal government spending, should sequestration be implemented. The civil aviation industry has a particular interest in what might happen to the Federal Aviation Administration (FAA) budget and the potential impacts of any budget reductions on its programs.

This report identifies two, illustrative potential FAA budget responses (Scenarios A and B) to sequestration, and estimates the potential impact on the air transportation industry, and the national economy as a whole, that could result from each budget action.

[4] Only the Department of Defense (DOD) can include unobligated funding balances from the previous year's budget in its sequestration process; non-DOD departments and agencies (including DOT/FAA) cannot.

Federal budget sequestration, if implemented, is expected to reduce the FAA's annual appropriation by approximately $1 billion per year for nine years.[5] FAA's current FY 2012 annual budget is $15.9 billion, and the FY 2013 budget request is $15.2 billion (the year-over-year reduction is primarily the result of a scheduled reduction in Grants-in-Aid for Airports). Under sequestration, the FAA will have to decide what it must cut to reduce its 2013 budget by $1 billion. The primary components of the FAA FY 2013 budget request are:

- $2.4 billion in the Grants-in-Aid for Airports (AIP) (reduced from $3.4 billion), which cannot be further reduced via sequestration.

- $9.7 billion in the Operations account is subject to sequestration. In Scenario A, we assume that cuts will be made to the operating budget account.

- $3 billion in the Facilities and Equipment and Research, Engineering and Development accounts, including more than $1 billion for NextGen. In Scenario B, we assume that sequestration will mostly affect NextGen funding.

1.2 FAA Sequestration Scenarios

How sequestration will be imposed upon the FAA remains unclear, although an across-the-board 8.5 percent reduction of the Operations, Facilities and Equipment, Research, Engineering and Development, and NextGen accounts seems likely. As with every component of the budget coming under sequestration, the amount of discretion given to the FAA in allocating cuts will determine how much political and strategic positioning, as well as protection of mission, will influence its decision-making. Consequently, we focus on two, plausible scenarios that will illustrate the primary types of impacts that may potentially unfold. These scenarios are not meant to be mutually exclusive; rather, the two show the potential impacts of reductions in two key FAA arenas: 1) operating and maintaining the current air transportation system, and 2) developing the future air transportation system (NextGen). If sequestration occurs, it is very unlikely that either of these missions will remain untouched.

Because FAA is a relatively small agency with a critical operational mission that impacts the national economy, it must prioritize its resources to assure that existing air traffic system operations suffer the least possible disruption from sequestration. Hence, budgets for future

[5] The mandated sequester of $1.2 trillion is debited by 18 percent for the calculated reduction in debt service, with the remainder divided in half between defense and non-defense. Each half ($492 billion) is eventually divided by 1/9th in order to determine the annual sequester amount. For each half, the "base" is calculated using a host of rules, exceptions, and limitations spelled out in current law. The $54.7 billion annual amount (per half) is the numerator placed on top of the base, which is the denominator. The resulting percentage is applied to every program unless otherwise spelled out in law. Sequestration takes place each year for nine years, and is estimated to result in a reduction (on the non-defense half where FAA resides) of approximately 8.5 percent. FAA's "hit" would therefore be in the range of $1 billion, with the $3.35 billion AIP program exempt from reduction (Congressional Research Service, "Budget Sequestration and Selected Exempted Programs and Special Rules", April 2012, p.22).

capabilities in development (i.e. NextGen) would be sacrificed to assure safe and efficient current operations under the budget constraints imposed by the BCA and sequestration. Because NextGen is not a budget line item itself, but is integral to other line-items, the agency would be expected to choose preserving current operational components of sequestered line-items by disproportionally cutting the future NextGen instead.

Considering the uncertainty of sequestration, we analyzed each scenario and point out what the ultimate impacts would likely be within the bounds of the current estimates. Thus, this report evaluates potential impacts for two illustrative sequestration scenarios, using current FAA operational financial data and air traffic trends for both passengers and commercial freight.

- ***Scenario A:*** *Budget reductions will be distributed proportionally to the overall budget (2/3 ops + 1/3 NextGen), with the primary impact on current operations and functioning of today's air transportation system. Looking at economic impact numbers provided by FAA and using our assumptions of five percent and 10 percent reductions, we estimate the impact such budget cuts would have on the overall economy[6]. This includes impacts directly diminishing FAA's size and scope, as well as indirectly impacting employment and business activity in the U.S. that are dependent on civil aviation.*

- ***Scenario B:*** *Budget reductions will primarily be applied to research and development and capital/facilities, with the primary impact on the NextGen program. Under this scenario the primary impact will be a significant delay and scaling down of NextGen. The economic impact estimates under this scenario assume a capacity-constrained civil aviation system, which will increasingly - for at least the next 25 years - miss opportunities to develop, and contribute to the national economy.*

[6] We use one and two percent reductions for aircraft manufacturing, as seen in Section 2.2.4.

2.0 SCENARIO A: PRIMARY REDUCTIONS IN OPERATIONS

Scenario A supposes that the FAA applies the $1 billion sequestration reductions roughly in proportion to the budget shares. In this scenario, two-thirds or more of the cuts would come from the budget for FAA operations, and one third from the capital, equipment and facilities line items.

For purposes of our analysis, we assume that cuts in the latter group could avoid severely impacting the NextGen efforts. Therefore, in Scenario A, the focus is placed on the impacts of the larger cuts in the operations side of the budget.

In a letter to the Joint Select Committee on Deficit Reduction, Congressman Norm Dicks estimated that sequestration would lead to[7]:

- the closure of 246 airport control towers;
- the layoff of 1,200 air traffic controllers (an estimate that has now been raised substantially and represents nearly 10 percent of the current employment of 15,000); and
- the layoff of 9,000 TSA airport screeners and 1,600 customs inspection officers.

These cuts would hobble the air transportation system, and leave it unable to support today's level of civil air travel.[8] This would, therefore, have a significant aggregate impact on national (and international) air travel, and associated effects in the hotel, restaurant, convention and tourism-related industries, as well as commercial air freight traffic and aircraft manufacturing.

Due to the ongoing nature of transportation uses, and the nine-year nature of the sequestration cuts[9], this is not simply seen as delaying a single type of business, and it is unfortunately unlikely that much of any lost activity in all travel-related industries could be recouped later. For at least a decade, we assume that travel activity would, after an initial drop in volume, expand at a slower growth rate than currently forecasted.

[7] Letter of Congressman Norm Dicks, Ranking Minority Member, House Committee on Appropriations, to the Joint Select Committee on Deficit Reduction, October 13, 2011.

[8] Additional costs, not quantified or monetized here, would be due to the significant slowing down of FAA's administration of existing programs and construction, as well as severe strains on the rail and road transportation networks in various parts of the country. Throughout, however, we assume the FAA and all stakeholders in the air transportation system will work to maximize the production and efficiency of the system, regardless of the reductions. In a recent study, Center for American Progress (CAP) Sr. Fellow Scott Lilly suggests that over 100 U.S. airports could be shuttered as the result of what he describes as a "plausible sequestration apportionment."

[9] The sequestration cuts are not simply for a single year, but repeated over nine years. It would therefore be difficult (if not impossible) in 2014, for example, to find program funding elsewhere, unless other line items were to be cut. This condition also applies to the NextGen discussion in Section 3.0.

2.1 Reduced Air Travel, Commercial Freight and Aircraft Manufacturing

The modeling of the potential impact from the capacity constraints caused by Scenario A is based on the following chain of causal relationships, measured by annual numbers for passenger-related impacts and commercial freight-related impacts:

Capacity constraints → **Reduced air passenger volume**

- Reduced passenger volume:
  - Reduced aggregate travel expenditures (net of increases in other travel modes)
  - Reduced hospitality industry (hotel and dining) expenditures (net)
  - Reduced tourism (entertainment, recreation and cultural/arts) expenditures (net)
- For each, the reduced (net) expenditures generate (net) employment impacts

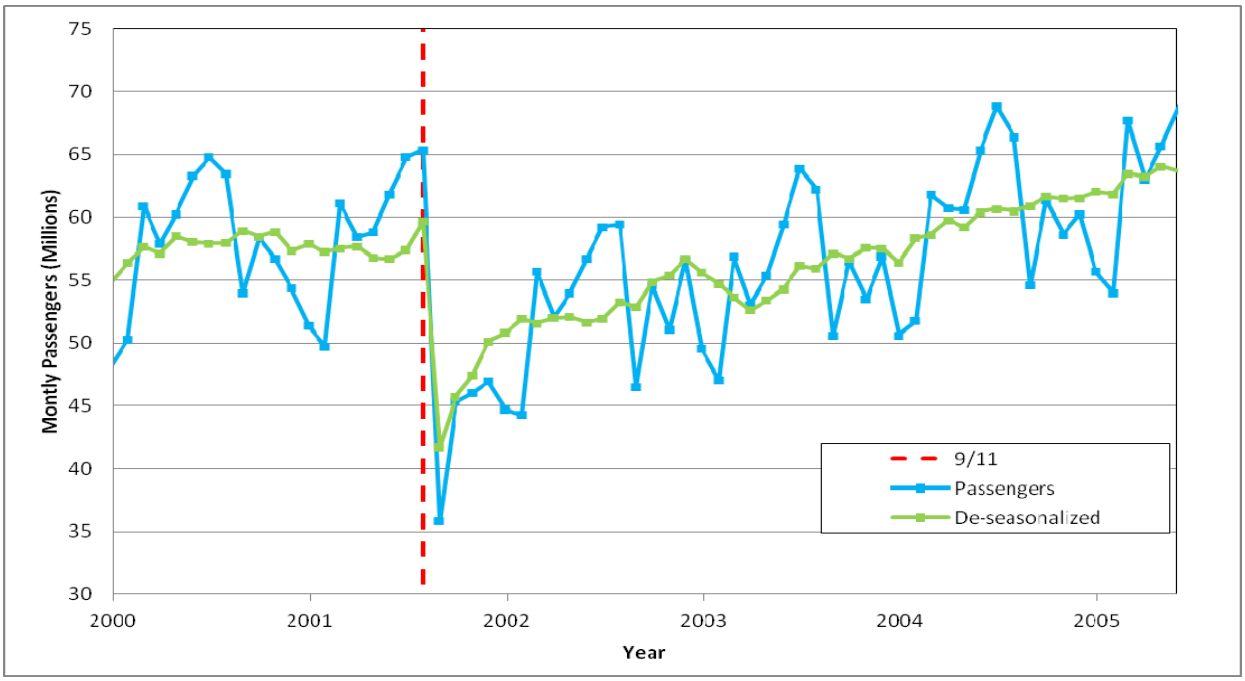
Capacity constraints → **Reduced commercial air freight volume**

- Reduced commercial air freight volume:
  - Reduced aggregate air freight expenditures (net of increases in other travel modes)
  - Increased business costs associated with slower shipping
- For each, the reduced (net) expenditures or increased costs generate (net) employment impacts

There is little precedent for cuts of this magnitude and for the constriction in capacity that would accompany them. The closest analogous situation may be that of the impact from the September 11th terrorist attacks on air travel. These attacks caused a tremendous drop in passenger travel with far reaching ripple effects throughout the national (and international) economy. In a widely-cited 2004 paper, Ito and Lee estimated that these attacks resulted in an immediate 30 percent drop in air-travel demand and an ongoing effect of an approximate seven percent dampening of pre-9/11 demand shown in Figure 1.[10]

[10] Ito, Harumi and Darin Lee (2004). *Assessing the Impact of the September 11 Terrorist Attacks on U.S. Airline Demand*.

Figure 1: Trends in Air Passenger Travel from 2000 to 2005



Source: Bureau of Transportation Statistics (2005), Econsult (2012)

The mechanism by which sequestration cuts are expected to impact air travel and air freight is different from that of a terrorist attack[11], but it is reasonable to assume that the effects will be similar: disruptions to normal service, weakening of consumer confidence, increased costs and time delays, and ultimately a significant drop in passenger air travel and freight shipments. In contrast, the 9/11 impacts were found to be largely (though certainly not completely) transitory, in that the post 9/11 growth rate allowed volume to "catch up" over time. Given the longer term nature of the capacity constraints implicit in Scenario A, we would expect the future "catch-up" growth rate would be lower, especially for passenger travel.[12]

Based on the assumed magnitudes of the budget cuts in personnel and operations, and an assumption that the FAA will ultimately try to minimize the negative impact on the system (and bounded by the 9/11 impact estimates), we posit Scenario A air passenger level reductions and air freight volumes of five percent (minor) and 10 percent (major) to estimate the Scenario A potential economic impacts shown in Table 2a. According to FAA data, annual enplaned passengers for 2011 were 730 million, and based on the reductions in the model this would lead to an annual decrease of 36.5 to 73 million in passenger enplanements. Similarly, air

[11] That particular impact was primarily due to a decrease in demand, while sequestration's impact would be felt via a reduction in capacity or supply.

[12] Based on the myriad additional factors which come into play when looking at worldwide air transportation activity, we focus on the domestic travel industry only.

freight volumes are estimated to have roughly reached 20 billion lbs. in 2011 and we assume reductions of 1 – 2 billion lbs. per year.

Table 2a: Estimates for Annual Loss in Passenger and Air Freight Volumes under Scenario A

Impact Forecast	Passenger Enplanement (annual in millions)	Loss in Passenger Enplanement (annual in millions)	Commercial Freight (annual in billion lbs.)	Loss in Commercial Freight (annual in billion lbs.)
-5%	730	36.5	20	1
-10%	730	73	20	2

Finally, the reductions assumed here would likely have a negative impact on the demand for new aircraft, at least relative to current demand forecasts developed by the aircraft industry and based on a non-constrained future.[13]

2.2 Estimates of Potential Economic Impacts

Given the FAA's estimate of a $2.9 trillion annual economic impact of civil aviation (comprised of $1.3 trillion from passenger travel and related activity, and $1.6 trillion from air freight cargo and related activity)[14] and assuming a 50 percent fixed system costs, we estimate that Scenario A enplanement/air freight/manufacturing reductions would generate gross and net economic impacts as shown in the sections below.

2.2.1 Impact Estimates Under Scenario A: Approach and Methodology

No forecast of the future can be made with complete certainty. Assumptions about current actions, the relationships between variables, and future macroeconomic conditions are all central to estimating potential future impacts.

The below estimates are based on the FAA's 2011 economic impacts for 1) passenger air travel and industry-related output, 2) air freight cargo and industry related output, and 3) aircraft manufacturing[15], which are indirectly calculated using an industry-standard RIMS II input-

[13] "Boeing raises world sales outlook", July 23 2012, http://www.cbc.ca/news/business/story/2012/07/03/boeing-outlook.html

[14] This includes private and public direct expenditures and the resulting indirect and induced impacts.

U.S.DOT FAA, "The Economic Impact of Civil Aviation on the U.S. Economy", August 2011

[15] FAA, The Economic Impact of Civil Aviation on the U.S. Economy, Table 4 "Real Primary Output 2008 versus 2009 (2005 Dollars)", August 2011, p.24

output model, which uses multipliers from the Bureau of Economic Analysis to model how the economic activity in one sector impacts all other sectors.[16]

Using the FAA's estimates on the economic impacts of passenger air travel (which include tourism), and on the economic impacts of air freight cargo (which include all air freight-related industries), we applied a five and 10 percent reduction in activity and evaluated what these minor and major reductions would mean in terms of overall economic output, earnings to workers, and total employment (see Tables 2b and 2c and Appendix A for more details on the FAA output, earnings and employment estimates).

The Gross Annual Loss column of Tables 2b and 2c show what a five percent and 10 percent reduction in overall economic activity due to sequestration cuts would lead to (namely output, earnings, and employment losses).

The key to forecasting potential economic impacts is the ability to understand that people and businesses change their behavior when conditions change. In this case, we believe a large part of these reduced expenditures will be recouped elsewhere in the economy. People could utilize other transportation modes or shift travel locations, or even increase non-travel spending. Businesses could change production and distribution processes in the face of a constrained air freight system.

Given this, we assume that approximately 90 percent of the expenditure loss in the passenger travel sector could be recouped by shifts to other transportation modes, new destinations, or different spending, and that 98 percent for air freight cargo could be recouped by shifts to other freight modes, or even by shifts in industrial production, processes and distribution systems. These estimates appear in the Net Annual Loss columns of Tables 2b and 2c. Air freight assumptions in Table 2c suggest that by making the air system less efficient, air freight-using companies overall would have to adjust, thus reducing a small portion of their total output (only accounting for an actual loss in output of 2 percent). The Net Annual Loss column shows the net loss after accounting for the shift, namely, the output, earnings, and jobs which would disappear or not be created.

Regarding aircraft manufacturing, the estimates shown in Table 2d suggest that this industry will be impacted by a reduction in civil aviation activity, even when taking into account the current backlog in aircraft orders (estimated to reach a seven-year production equivalent). Domestic manufacturers produce aircraft for foreign carriers and domestic airlines purchase foreign-made aircraft. As a result, a decrease in domestic demand should not translate dollar-for-dollar into domestic production cuts. We therefore conservatively estimate net output reductions to reach between one and two percent.

[16] Numbers shown cover all facets of the U.S. economy and therefore include small businesses and their employment numbers.

2.2.2 Impact via Reduced Air Travel

Included in the economic impact estimates in Table 2a are spending and employment far beyond the transportation sector itself, since air travel is an important component of many other industries, especially the travel and tourism industry for long-haul passengers.

Some of this travel and goods shipment activity will shift to other modes of travel and carriage, thereby increasing the economic impacts generated by other industries. Additionally, some of the displaced expenditures would be spent in other, non-travel related activity, generating additional economic benefits for other industries; though it should be noted that these would be second-best options that would reduce business efficiency, increase business and personal costs, and generate additional, negative impacts.

We assume that on balance 90 percent of the reduced civil aviation spending related to passenger travel is recouped by economic activity shifted to other industries and travel expenditures spent in different locations, as well as travel via other transportation modes. After this adjustment, our estimated *net* reductions in overall economic activity, earnings and employment are shown in Table 2b.

Table 2b: Estimates for Gross and Net Annual Losses of Budget Cuts on Civil Aviation: Economic Impact on Passenger Travel and Related Activity

Reduction	Gross Annual Loss	Net Annual Loss
Output (billions $)		
5%	$55.4	$5.5
10%	$110.8	$11.1
Earnings (billions $)		
5%	$17.0	$1.7
10%	$33.9	$3.4
Jobs (thousands)		
5%	454	45
10%	907	91

Source: FAA (2011), Econsult (2012)

2.2.3 Impact Via Increased Air Freight Inefficiencies

Turning to the impacts stemming from reductions in the air freight cargo sector, we assume that 98 percent of the total economic activity (direct spending, indirect, and induced) reduced by air freight-using industries would be recouped by businesses spending elsewhere, whether it be carriage by other freight modes or shifting into other production or distribution systems. Therefore, we assume the overall net negative impact would be the equivalent of a two percent

reduction in the overall output (and corresponding earnings and employment), as illustrated in Table 2c.

Table 2c: Estimates for Gross and Net Annual Losses of Budget Cuts on Civil Aviation: Economic Impact on Air Freight Cargo and Related Activity

Reduction	Gross Annual Loss	Net Annual Loss
Output (billions $)		
5%	$82.4	$1.6
10%	$164.9	$3.3
Earnings (billions $)		
5%	$21.8	$0.4
10%	$43.6	$0.9
Jobs (thousands)		
5%	465	9
10%	930	19

Source: FAA (2011), Econsult (2012)

2.2.4 Impact Via Reduced Civil Aircraft Manufacturing

In particular, one industry that would likely be impacted indirectly by these budget cuts and reductions in civil aviation is the aircraft manufacturing sector, not included in the tables above. However, as for the industries addressed in our tables 2b and 2c, predicting the actual overall economic impacts of such reductions is not easy task, especially considering production trends for this industry.

Current orders and production trends for civil aircraft manufacturing in the U.S. bring estimates of the current backlog in aircraft production to a seven-year full production equivalent. However, current backlog trends are taking into account and assuming a future that is not as capacity-constrained as the one we posit in Scenario A. Moreover, as noted above, domestic airline demand includes foreign aircraft and foreign airlines purchase of U.S.-manufactured aircraft.

Thus, domestic aircraft manufacturers would not bear the full impact of declining demand. We therefore anticipate the estimated net annual economic loss in Scenario A would generate a small, yet not negligible, decrease in the domestic aircraft manufacturing industry, equivalent to one to two percent of output reduction (for $2 to $4 billion and 11,000 to 22,000 jobs).

Table 2d: Estimates for Gross and Net Annual Losses of Budget Cuts on Civil Aviation: Economic Impact on Aircraft Manufacturing Activity

Reduction	Net Annual Loss
Output (billions $)	
1%	$2.0
2%	$4.1
Earnings (billions $)	
1%	$0.6
2%	$1.1
Jobs (thousands)	
1%	11
2%	22

Source: FAA (2011), Econsult (2012)

2.2.5 Scenario A Summary of Findings

The Net Annual Loss columns in the above tables show the estimated negative economic impacts associated with Scenario A. Losses in output to the U.S. economy could reach approximately $9.2 to $18.4 billion, including $2.7 to $5.4 billion in earnings to workers across the country and the elimination of 66,000 to 132,000 U.S. jobs (Table 2e).

Table 2e: Estimates for Gross and Net Annual Losses of Budget Cuts on Civil Aviation: Total Economic Impact - Freight, Passenger, and Related Activity, and Aircraft Manufacturing

Reduction	Gross Annual Loss	Net Annual Loss
Output (billions $)		
Major Reduction	$139.9	$9.2
Minor Reduction	$279.7	$18.4
Earnings (billions $)		
Major Reduction	$39.3	$2.7
Minor Reduction	$78.7	$5.4
Jobs (thousands)		
Major Reduction	930	66
Minor Reduction	1,859	132

Source: FAA (2011), Econsult (2012)

2.2.6 Aggregate Annual Tax Revenue Losses to Federal and State Governments

Considering our estimates of annual output, earnings, and employment losses, Federal and State annual tax revenues would also be impacted (see Table 2f below).

Industry averages show that company profits represent approximately 15 percent of total economic output. For the Federal level, we used a 12.1 percent effective corporate tax rate and a 9.3 percent effective personal income tax rate.[17] For the State level, we calculated average rates based on the actual taxes paid relative to total profits and income reported in 2011 (2.3 percent effective corporate tax rate and two percent effective personal income tax rate).[18] After establishing these average rates both for Federal and State taxes, we applied those to our estimated annual output and earnings losses, under both our major and minor reductions assumptions.

Our estimates show that under our minor reduction assumption, approximately $167 million Federal and $32 million State corporate tax revenues would be lost, reaching $335 million and $63 million respectively under our major reduction assumptions.

Our estimates below show that under our minor reduction assumption, approximately $250 million Federal and $56 million State personal income taxes would be lost, reaching $499 million and $112 million respectively under our major reduction assumption.

Aggregate losses to Federal and State personal income tax could reach $834 million at the Federal level, and $175 million at the State level, for a potential loss in revenue of approximately $1 billion, under our major reduction scenario.

Table 2f: Aggregate Annual Fiscal Impact Estimates for Federal and State Governments

	Corporate	Personal Income	Total
Federal Taxes (million $)			
Minor Reduction	167	250	417
Major Reduction	335	499	834
State Taxes (million $)			
Minor Reduction	32	56	88
Major Reduction	63	112	175

Source: Econsult (2012)

[17] http://online.wsj.com/article/SB10001424052970204662204577199492233215330.html and http://www.taxpolicycenter.org/UploadedPDF/412497-ETR.pdf

[18] U.S. Census tax revenue data.

3.0 SCENARIO B: PRIMARY REDUCTIONS IN NEXTGEN

In Scenario B, sequestration cuts are concentrated in the research and development, capital equipment and facilities (i.e. non-operating) portions of the FAA budget. As before, it is understood that there would likely be reductions in operations, but our focus is centralized on the continued implementation of NextGen. For purposes of this analysis, we assume that by making heavier cuts in this program, the FAA could avoid severely impacting the operations budget, therefore in Scenario B, the focus is placed on the impacts of the larger cuts in the NextGen side of the budget. We understand that the sequestration process will likely make the magnitude of this scenario far less likely, so we condition our findings to reflect this.

Scenario B assumes that major sequestration cuts would significantly slow and reduce the scope of the NextGen program, and its full implementation would be delayed by at least 10 years into the future (i.e. no sooner than 2035, compared to the current plan to have it fully implemented by 2025).

Our estimates of the potential economic impacts of sequestration are based upon previous studies conducted by the FAA and Deloitte.[19]

[19] This study references the following reports and documents: U.S. Contract Tower Association Annual Report 2011; The Aerospace and Defense Industry in the U.S: A financial and economic impact study; Transforming the Air Transportation System - A Business Case for Program Acceleration; Destination 2025; the Federal Aviation Administration Budget Estimates FY 2013; The Economic Impact of Civil Aviation on the U.S. Economy; The U.S. Economic Impact of Approved and Projected DOD Spending Reductions on Equipment in 2013; National Airspace System Capital Investment Plan FY 2013–2017; the Next Generation Air Transportation System; NextGen ATS Communication, Navigation, and Surveillance Test Bed; NextGen Implementation Plan; and Ongoing Government Failures in Air Transportation.

3.1 NextGen Described

A significant portion of the FAA's non-operations budget authorization has been (and is expected to continue) supporting the development and continued roll-out implementation of a new, satellite-based air transportation control system. This initiative will transform the seriously outdated Air Traffic Control (ATC) and Air Transportation System (ATS) currently in use in the United States[20] and eventually air traffic control systems throughout the world. [21]

Dubbed the "Next Generation Air Transportation System" or simply "NextGen", these programs, equipment, and facility improvement initiatives are already being implemented throughout the country. The substantial transformation of the U.S. air transportation system is expected by 2025. It is safe to say that NextGen is considered crucial for the future of air transportation and our nation's economic growth; it is not merely a luxury.

NextGen is not a single program or project. Rather, it is a carefully-crafted series of improvements to system and aircraft equipment and technological upgrades to existing systems, combined with new operational procedures designed to make the overall air transportation system safer and more efficient. The framework for the new system has been determined; the steps necessary to build and implement it are being developed on an ongoing basis. Initial steps have been developed and are currently being implemented, and important NextGen system components are scheduled to be rolled out from now until 2018, with the ultimate full implementation planned for 2025.

NextGen will be the most significant improvement to the U.S. air transportation system since radar was introduced in the late 1950's. It will fundamentally transform each of the three foundational elements of air traffic control: communications, navigation, and surveillance. New advances in digital communication satellite guidance systems will enhance safety, improve pilot and controller situational awareness and significantly increase overall air transportation efficiency.

NextGen is not a one-sided government investment program. Airlines, carriers and aircraft owners (collectively, "aircraft operators") are expected to be full partners in this effort, as they have to purchase, install, adopt, and utilize new equipment and procedures. Aircraft operators' "buy-in" to the overall effort is considered crucial, but since it will require large private

[20] From the FAA: NextGen is the Federal Aviation Administration's multi-year effort to improve the efficiency, safety, capacity, and environmental performance of the aviation system. These funds would continue to support the transformation from a ground-based radar surveillance system to a more accurate satellite-based surveillance system; the development of 21st century data communications capability between air traffic control and aircraft to improve efficiency; and the improvement of aviation weather information.

[21] As part of NextGen, the FAA continually works with other countries to upgrade and coordinate international air transportation activity. The ultimate benefits of NextGen include large global system impacts, which are not quantified in this analysis. Additionally, the potential impacts of deploying NextGen to military/national defense-security are not included, though these would all increase the total cost of delay.

investment costs and operational changes, the industry players are carefully watching the FAA to gauge the credibility of the new system actually being developed and implemented.

Defining, let alone estimating, NextGen's ultimate economic impact is no easy task, even without sequestration. The FAA notes that it is constantly refining the program itself and revising the benefit estimates, typically looking forward eight to 10 years out.

3.2 Scenario B Impact on NextGen Implementation

The key question associated with the Scenario B NextGen sequestration funding cut is*: what happens to the timing and extent of its development and the rollout of its implementation?* Would it merely be delayed by a few years, or by many years, be permanently derailed, or might it only be partially implemented?

Thus, rather than look at specific line-item cuts, our Scenario B assumes the reductions are of such a magnitude that they essentially:

> *(a) slow the development and implementation of NextGen for at least 10 years beyond the current target full implementation date (delayed from 2025 until beyond 2035), or*
>
> *(b) slow as in (a) but also reduce the breadth and scope of the new system, or*
>
> *(c) derail the effort completely from today forward.*

Based on our discussions and analysis, we do not believe that the potential cuts could be made in such a way as to only marginally alter the timing of NextGen rollout, so option (a) is not evaluated. Option (c) is outwardly a very strong, negative assumption. It is hard to envision a world in which the antiquated air transportation system in use today is not upgraded in some fashion over the next several decades. Furthermore, this would lead to a future for which we could not describe a base case forecast. Consequently, we assume the Scenario B means a significant delay in implementing a modified, "less upgraded" air transportation system by 2035.

This is a plausible scenario for at least three reasons. First, if FAA wanted to restore NextGen funding in years two through nine despite continued sequestration cuts, it would not be able to find other parts of its budget to compensate. Second, the current plan for NextGen investments has the research and development components increasing significantly in the next few years[22], and Scenario B sequestration would effectively hit at a most crucial time in the program's life cycle. Third, the credibility with aircraft operators that NextGen will actually happen is a crucial ingredient for successful implementation. The dire Scenario B level of derailment would

[22] Deloitte, Transforming the Air Transportation System: A Business Case for Program Acceleration, Figure 31 "NextGen Program Investment, 2010-2025", p.51

undoubtedly cause the industry to lose faith in the FAA's ability to accomplish the transformation, and aircraft operators would not make the necessary private investments.

3.3 Economic Impact of NextGen Reductions

Conceptualizing the nature of potential impacts by significantly delaying the development and implementation of NextGen is not necessarily straightforward. In "standard" impact study cases, delay of a project[23] would be measurable in time (i.e., construction expenditures and ongoing operations spending delayed for a known number of months or years).[24] This would allow an estimate of the *present value* of the delayed spending levels (and hence loss for the period), relative to some base forecast.

The impact of delaying the implementation of NextGen does not have the same, clean quantitative construct. To begin with, the primary benefits that would derive from the adoption and use of the new air transportation system would be in the form of *reduced future aircraft operating expenditures and improved system performance*, generating substantial savings for users of the system. Certainly, significant value can be assigned to quality of service increases (e.g.: increased capacity, reduced delays, fuel-saving, routing, greater safety, etc.), and decreased user costs (reduced fuel, personnel, and time), which generate higher equipment utilization rates, greater profits, and additional capital to purchase newer, more efficient equipment. System efficiency also reduces fuel burn (less carbon emissions) and leads to better designed air traffic patterns around congested airports (less noise and delays).[25] Not only would the nation see vast improvement in services, implementation of NextGen would free up scarce resources that could be shifted into more valuable uses in the transportation sector and into other industries.

The primary negative impact or "cost" of the NextGen reductions envisioned in Scenario B is therefore in the form of delayed or lost, future benefits or, equivalently, greater future costs for users than if NextGen is implemented as planned.[26]

It is important to note that the short term, immediate impacts are likely to be very small, since the budget amounts are small and since the vast bulk of the benefits are expected over the long

[23] Or expenditures on a government contract.

[24] Professor Stephen Fuller's estimates of the economic impact of DOD spending cuts under sequestration were based on reduced budget expenditures and the loss of contracts and subsequent employment. In this case, we do not focus on the annual reduced spending for the development of NextGen ATS, but rather the spending on its implementation and foregone benefits.

[25] Deloitte, Transforming the Air Transportation System: A Business Case for Program Acceleration, Figure 31 "NextGen Program Investment, 2010-2025", p.25

[26] We also note the direct impact on certain parties of the reduction of government (FAA) spending caused by the sequestration. However, that is common to all forms of government spending reductions, and the more significant impact on the overall economy is via the lost or delayed benefits that would have otherwise accrued. The anticipated government and private investment expenditures to roll out NextGen have an estimated Net Present Value (NPV) of $31 billion (through 2034).

term, upon future implementation. In order to measure this negative impact, the slowing and lessening of the NextGen effort must be valued relative to some "base case" forecast that includes quantitative estimates of the future benefits that would be generated by full implementation by 2025.

These conceptual and methodological issues have been carefully identified and addressed in Deloitte's "Transforming the Air Transportation System", a comprehensive analysis prepared for the FAA and interested parties. Deloitte identified three tiers[27] of future benefits for the U.S., Europe and the rest of the world, and examined four different economic-environment implementation schedules.[28] Their analysis developed four forecasts covering a range of economic conditions scenarios, and examined how those forecasts (and hence the NPV[29] of net benefits associated with NextGen, the EU's SESAR and like systems) would change if the program implementation were to be accelerated or delayed by five years. By estimating a large decrease in NPV caused by a five-year delay, and a moderate increase in NPV from a five-year acceleration (both across all alternatives), they concluded that there is a "business case" to be made for encouraging the acceleration of the program. In essence, Deloitte already estimated the economic impact (in terms of investment returns) of the delay case, albeit only for a five-year delay.

For our estimation of the Scenario B impact, this study modified and extended the Deloitte estimates of the cost of delaying the planned implementation by ten years, to 2035. Further, we extrapolated Deloitte's forecasts, with some adjustment, to estimate the NPV of delaying NextGen implementation by five years for reduced scope.[30]

Deloitte estimated the NPV of the NextGen net benefits associated with the base case forecast (calculated through 2035) for the United States to be $281 billion ($897 billion for the Global total). Delaying the full implementation until 2030 reduces the U.S. NPV by nearly $50 billion, while accelerating by five years would increase the NPV by $20 billion.[31]

Based on the rollout schedule, and an FAA estimate that the cumulative (not NPV) benefits of NextGen through 2020 will be $24 billion, we assume that most of this reduction would take

[27] Tier 1 is comprised of three categories: OPEX Savings, Infrastructure Savings and Capacity Savings (airline). OPEX Savings include fuel, labor, ownership, maintenance, insurance and passenger hard cost savings. Infrastructure Savings include the operational savings generated by NextGen and Capacity Savings include the extra profit from increased capacity. Tier 2 benefits include Emissions Savings (CO_2, NOX, and SOX) and Noise Savings. Tier 3 benefits include Opportunity Cost Savings, Economic Savings (value added per flight multiplied by the additional number of flights), and Soft Costs that are currently attributed to flight delays.

[28] These include Grounded, Turbulence, Steady Flight and Take-off. Because there is no common view of the macroeconomic future, there is no clear, universally accepted "base case" forecast. Deloitte used Steady Flight as its base forecast, and we concur with their rationale for doing so, and use the same Steady Flight base forecast.

[29] Deloitte's time horizon for estimating NPV of benefits is 2010 to 2035.

[30] Although our estimates do not include losses related to fuel and emissions savings, there will be a cost associated with not implementing or delaying the implementation of NextGen .

[31] Note that if the NextGen were to stop today there would still likely be some positive NPV due to the improvements already implemented.

place in the later years. Deloitte also estimated the annual net benefits of $29 billion would begin in 2026, if the NextGen is fully implemented by that time. Based on those numbers, we calculated $30 billion per year for the annual impact going forward from 2026, growing to $50 billion by 2035.

The Deloitte study implicitly assumed, even with different implementation timetables, that the NextGen program would remain on track, in that it assumed the aircraft operators would continue to make the investments necessary to fully implement the new system. Our Scenario B assumes that aircraft operators take a more pessimistic view of NextGen's implementation schedule and react by significantly altering their equipment plans. This means Deloitte's estimates of costs and delay would not be as severe as what would be the case in Scenario B.

We conservatively assume that under Scenario B, the Deloitte NPV loss would increase due to two factors:

(a) Extended delays of program implementation by an additional five years (through 2035) with an additional loss of $50 billion annually.

(b) Greater loss through 2030 due to earlier reductions in Research and Development and implementation (including reduced industry investment in new NextGen equipment) with an additional loss of $50 billion annually.

Therefore, combining further delay with a reduced level of NextGen improvement, we estimate the reduction in NPV due to Scenario B to be $150 billion over the 2010 - 2035 period. If we further assume that 50 percent of those lost economic output benefits are recouped via spending elsewhere in the economy, the forecast result is an overall NPV loss of $75 billion, more heavily weighted in the out years.

If smooth growth of net benefits is assumed over the period, we estimate the following **annual direct costs associated with delayed benefits** would be:

2013 – 2020: $15 billion (cumulative)

2021 – 2035: $15 billion, growing to $30 billion by 2035 (annual)

These lost benefits can be seen as direct costs to our economy in future years, and the 2013 impact would be negligible. These additional costs would have a multiplier effect on total economic activities. By using standard economic impact multipliers, we can generate **estimates of economy-wide economic and employment reductions**[32] associated with Scenario B.

[32] This excludes the employment reductions directly associated with the sequestration itself, which is estimated to be 15,000 - 30,000/year.

Specifically, we utilized the civil aviation industry multiplier of 2.75 from the U.S. DOT and FAA August 2011 report[33]:

2013 – 2020:	Economic Impact: $40 billion (cumulative) [34] Employment Impact: 40,000 (annual)
2021 – 2035:	Economic Impact: $40 billion, growing to $80 billion (annual) Employment Impact: 700,000, growing to 1.3 million (annual)[35]

If sequestration's impact on NextGen is not as severe as posited in Scenario B, then these negative impact estimates would decline, but any departure from the current rollout and implementation plan is likely to have large impacts resulting from the sheer magnitude of the expected benefits. For example, if the impacts were only 25 percent as severe as assumed in Scenario B, we would still forecast a net negative impact of $10 to $20 billion in annual economic losses in the out years.

[33] The 2.75 multiplier is consistent with the multiplier derived in the economic impact of $1.3 trillion suggested by FAA and U.S. DOT in the August 2011 report *"The Economic Impact of Civil Aviation on the U.S. Economy".*

[34] Since these initial reductions will mainly involve Research and Development job categories, average employee cost used for calculating the economic impact for 2013-2020 is $120,000/year, while it is $60,000/year beginning in 2021 for all job categories.

[35] These "costs" are essentially the equivalent of the benefits our economy would lose if the air transportation system is not improved as planned.

APPENDIX A

Table A1: Economic Impacts of the Passenger Air Travel Industry with Gross Reductions of five and 10 percent (in billions of dollars and thousands of jobs)

		Base			First Estimated Reduction			Second Estimated Reduction		
Description	**Impact**	**Output**	**Earnings**	**Jobs**	**Output**	**Earnings**	**Jobs**	**Output**	**Earnings**	**Jobs**
Airline Operations	Travel	296.6	91.9	2,007.0	281.8	87.3	1,906.7	266.9	82.7	1,806.3
Airport Operations	Travel	78.9	27.5	614.0	75.0	26.1	583.3	71.0	24.8	552.6
Civic Aircraft Manufacturing	Manuf.	84.3	21.5	418.0	83.5	21.3	413.8	82.6	21.1	409.6
Civic Aircraft Engine and Engine Parts Manufacturing	Manuf.	20.9	5.6	112.0	20.7	5.5	110.9	20.5	5.5	109.8
Civilian Other Aircraft Parts and Equipment	Manuf.	72.2	21.5	454.0	71.5	21.3	449.5	82.6	21.1	409.6
Air Couriers	Travel	72.0	21.5	637.0	68.4	20.4	605.2	64.8	19.4	573.3
Visitor Expenditures	Travel	597.0	178.8	5,329.0	567.2	169.9	5,062.6	537.3	160.9	4,796.1
Travel Arrangement	Travel	12.8	4.0	118.0	12.2	3.8	112.1	11.5	3.6	106.2
Subtotal - Commercial	-	*1,234.7*	*372.3*	*9,689.0*	*1,181.8*	*356.1*	*9,253.8*	*1,129.0*	*339.9*	*8,818.5*
General Aviation Operations	Travel	38.8	12.0	262.0	36.9	11.4	248.9	34.9	10.8	235.8
GA Aircraft Manufacturing	Manuf.	25.8	6.6	128.0	25.8	6.6	128.0	25.8	6.6	128.0
GA Visitor Expenditures	Travel	11.9	3.6	106.0	11.3	3.4	100.7	10.7	3.2	95.4
Subtotal - General Aviation	-	*76.5*	*22.2*	*496.0*	*74.0*	*21.4*	*477.6*	*71.4*	*20.6*	*459.2*
Total Impact	-	**1,311.2**	**394.5**	**10,185.0**	**1,255.8**	**377.5**	**9,731.4**	**1,200.4**	**360.6**	**9,277.7**

Source: FAA (2011), Econsult (2012)

Table A1 depicts the total economic impacts of the passenger air travel and aircraft manufacturing industries as currently estimated by the FAA (base columns) and after five percent and 10 percent reductions (one and two percent estimated reductions for aircraft manufacturing). [36] We divide the industry categories into "Travel" and "Manufacturing" for purposes of estimating the overall economic impacts in Section 2.2

[36] FAA, The Economic Impact of Civil Aviation on the U.S. Economy, Table 4 "Real Primary Output 2008 versus 2009 (2005 Dollars)", August 2011, p.24

Table A2: Economic Impacts of the Commercial Air Freight Industry with Gross Reductions of five and 10 percent (in billions of dollars and thousands of jobs)

Category	Base	5 % reduction	10 % reduction
Total Output	1648.6	1,566.2	1,483.7
Total Earnings	436.4	414.6	392.8
Total Employment	9,300.0	8,835.0	8370.0

Source: FAA (2011), Econsult (2012)

Table A2 illustrates the total economic impacts of the commercial air freight industry, as currently estimated by the FAA (base column), and after five percent and 10 percent reductions. The FAA utilized data from the Freight Analysis Framework (FAF), a data product of the Federal Highway Administration, which tracks both domestic and international freight flows by commodity by mode. The FAA calculated the economic impacts of the air cargo freight sector, including related manufacturing activity; Econsult calculated the total output, earnings and employment stemming from five percent and 10 percent reductions to the sector. Table 2c in the main body of the report shows the differences between the base and reduced scenarios, assuming 98 percent of the gross loss is recuperated through shifts to other freight modes or productions.

APPENDIX B

Table B1: Economic Impacts of the Travel Spending with Gross Reductions of five and 10 percent (in millions of dollars and number of jobs)

State	Spending 5% Reduction	Spending 10% Reduction	Employment 5% Reduction	Employment 10% Reduction
Alabama	$ 31.94	$ 63.89	287	574
Alaska	$ 8.43	$ 16.86	98	195
Arizona	$ 57.68	$ 115.35	549	1,099
Arkansas	$ 23.51	$ 47.03	225	451
California	$ 395.75	$ 791.50	3,045	6,089
Colorado	$ 57.23	$ 114.47	528	1,057
Connecticut	$ 39.04	$ 78.09	232	465
Delaware	$ 6.21	$ 12.42	57	115
Florida	$ 283.95	$ 567.90	2,705	5,410
Georgia	$ 86.52	$ 173.03	876	1,752
Hawaii	$ 63.44	$ 126.89	528	1,057
Idaho	$ 13.31	$ 26.62	92	184
Illinois	$ 120.23	$ 240.47	1,081	2,161
Indiana	$ 38.16	$ 76.31	358	716
Iowa	$ 27.51	$ 55.01	243	487
Kansas	$ 23.07	$ 46.14	210	421
Kentucky	$ 32.39	$ 64.78	327	653
Louisiana	$ 39.93	$ 79.86	382	764
Maine	$ 11.98	$ 23.96	114	228
Maryland	$ 53.68	$ 107.37	434	868
Massachusetts	$ 63.89	$ 127.78	455	909
Michigan	$ 65.66	$ 131.33	534	1,067
Minnesota	$ 45.70	$ 91.40	506	1,013
Mississippi	$ 26.18	$ 52.35	309	618
Missouri	$ 51.02	$ 102.04	453	906
Montana	$ 12.87	$ 25.73	107	214
Nebraska	$ 16.42	$ 32.83	164	329
Nevada	$ 111.80	$ 223.61	1,081	2,162
New Hampshire	$ 13.75	$ 27.51	87	174
New Jersey	$ 78.53	$ 157.06	740	1,479
New Mexico	$ 23.96	$ 47.92	209	418
New York	$ 213.85	$ 427.70	1,540	3,080
North Carolina	$ 71.87	$ 143.75	716	1,432
North Dakota	$ 8.43	$ 16.86	89	178
Ohio	$ 66.55	$ 133.10	601	1,201
Oklahoma	$ 26.18	$ 52.35	286	573
Oregon	$ 33.72	$ 67.44	292	584

Pennsylvania	$ 86.52	$ 173.03	780	1560
Rhode Island	$ 7.54	$ 15.08	49	99
South Carolina	$ 42.59	$ 85.18	435	869
South Dakota	$ 9.76	$ 19.52	100	200
Tennessee	$ 59.01	$ 118.02	530	1,061
Texas	$ 209.41	$ 418.82	2,064	4,128
Utah	$ 24.40	$ 48.80	271	541
Vermont	$ 7.99	$ 15.97	73	147
Virginia	$ 80.75	$ 161.50	784	1,569
Washington	$ 51.47	$ 102.93	390	779
West Virginia	$ 10.65	$ 21.30	106	213
Wisconsin	$ 39.93	$ 79.86	409	819
Wyoming	$ 10.65	$ 21.30	110	221
Total	**$ 2,985**	**$ 5,970**	**26,645**	**53,290**

The numbers shown in the Spending and Employment columns are an apportionment across the states of the portion of our spending and employment net loss estimates shown on Table 2b. The visitor expenditures component of overall travel spending represents approximately half of total air travel spending.

The weight assumptions used to apportion our net losses are based on the economic impact study conducted by Power of Travel for the U.S. Travel Association. [37] We assume that the proportional shares of air and non-air related travel spending are constant across states and based on weights that we obtained by applying state travel spending over national travel spending. Using these, we apportion the estimated net economic losses in the travel and hospitality industries across states as shown in this Table B1. The implied precision of these estimates is due to the method used to calculate the apportionment, and not due to detailed data.

[37] See http://www.poweroftravel.org/economic-impact/