

The Economic Contribution of the Aviation Industry to Alaska's Economy

A component of the

Alaska Aviation System Plan

Prepared for:

**Alaska Department of Transportation
and Public Facilities**

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This report is a component of the Alaska Aviation System Plan (AASP) and prepared by the ADOT&PF Division of Statewide Aviation and a study team led by DOWL. Economic analysis was prepared by Northern Economics, Inc. and CDM Smith, as subcontractors to DOWL.

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Executive Summary

With over 700 public, private and military airports in Alaska, aviation is an essential transportation network for residents, visitors, and access. Three hundred and ninety-four (394) of these facilities are public use, with two hundred and thirty-nine (239) owned and operated by the Alaska Department of Transportation and Public Facilities (ADOT&PF). This report presents an economic analysis of Alaska's entire aviation industry, with specifics on the rural airport system, and details the importance of this form of transportation in the everyday lives of Alaskans. A separate report analyzes the Alaska International Airport System (AIAS), which includes Fairbanks International Airport (FAI), Ted Stevens Anchorage International Airport (ANC), and Lake Hood Seaplane Base (LHD).

Study data is based primarily on surveys that targeted contributors to economic activity, such as airlines, airport tenants and Alaska residents. Telephone interviews with airport managers, city officials, and other community leaders provided supplementary evidence of the importance of airports to communities. Cargo and enplanement activity data were analyzed to assess additional economic impacts. Figure ES-1 shows the direct economic contribution in terms of gross state product and jobs.

In total, Alaska's airports contributed \$3.8 billion and more than 35,000 jobs to the state economy in 2017 (Figure ES-2). Aviation activity at ANC supported 15,500 of the total number of jobs, equating to about 1 in 10 jobs in Anchorage. About 40 percent of the economic contribution and 25 percent of jobs can be attributed to the rural airport system.

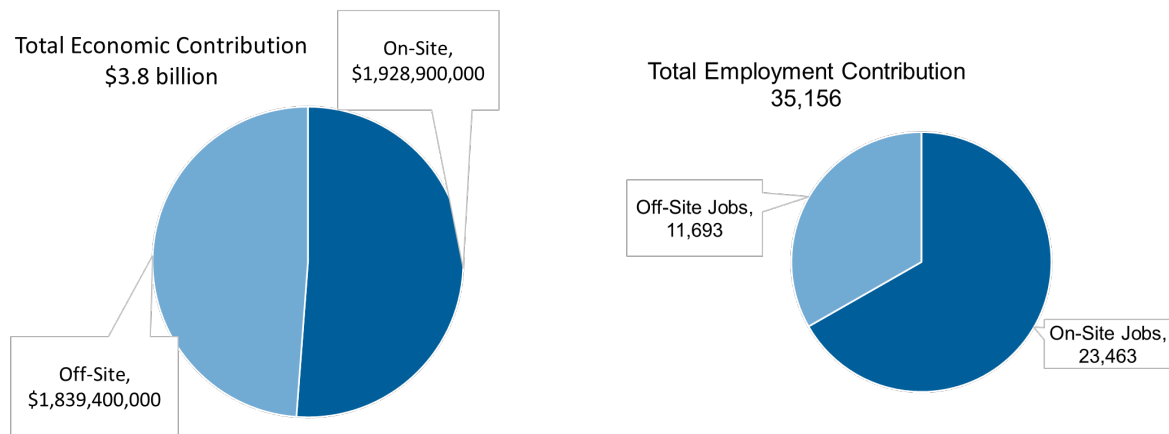


Figure ES-1 Alaska Aviation Industry's Estimated Economic Contribution to Statewide Economic Activity, 2017

Source: NEI estimates, 2018.

Inter-state aviation activity in Alaska peaks in the summer months while intra-state travel remains relatively constant throughout the year. During the 2016 tourism season, an estimated 1.85 million out-of-state visitors came to Alaska. At the time, Alaska's total residential population

was just under 740,000, not even half of the number of visitors to the state in just the peak tourism season alone.

Federal airport funding, or the Airport Improvement Program (AIP), constitutes a significant portion of the aviation economy in Alaska. In 2017, the total amount of AIP funding in Alaska was more than \$222 million (Figure ES-2). These expenditures fund capital improvements and are part of the on-site economic impacts as they contribute to the creation of additional jobs across the economy.

This spending alone contributed a total of \$586 million (on-site and off-site economic impacts) and nearly 2,600 jobs. The majority of these jobs are part of the planning, design, and construction industry and fund a variety of airport infrastructure projects. AIP spending also creates jobs in the wholesale trade sector and the engineering and architectural services industry.

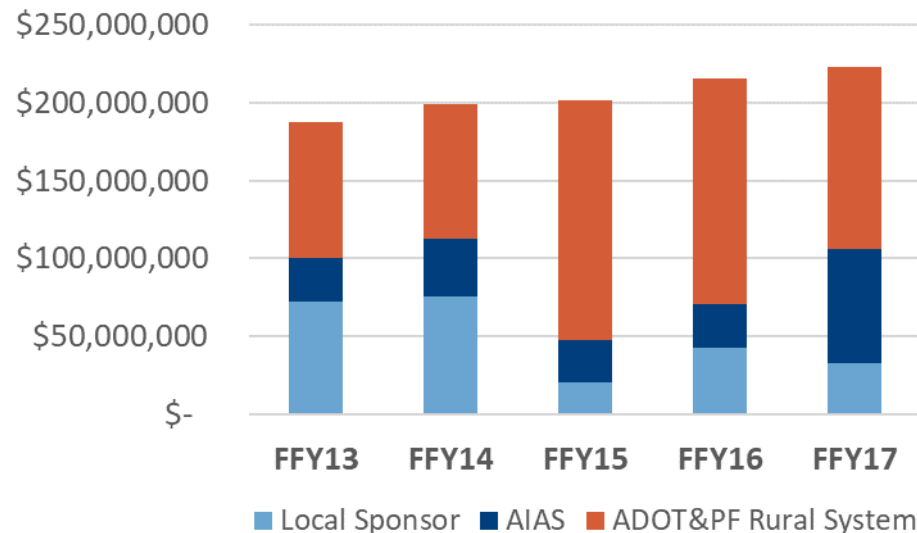


Figure ES-2 Annual AIP Grant Funding, 2013-2017

Source: ADOT&PF, 2018

Alaska's aviation system creates jobs and income for a wide array of local, national, and global companies and agencies. A few key statistical findings showing the importance of aviation to the Alaska economy in 2017 are:

- **The Alaska aviation industry supported more than 35,000 jobs statewide, or 7.8% of total state employment.** This represents a decrease of 12,000 from 2007.
- **The Alaska aviation industry contributed more than \$3.8 billion to the state economy.**
- Aviation activity at Ted Stevens Anchorage International Airport (ANC) supported about 15,500 jobs. **These on-site jobs represent more than 10 percent of the total employment in Anchorage, or 1 in 10 jobs.**
- **AIP funding in Alaska contributed a total of \$586 million and nearly 2,600 jobs.**
- Compared to other economic sectors in Alaska, **the aviation industry would be the 6th largest in the state**, ahead of Construction and Manufacturing, Trade, and Hospitality and Leisure.

Introduction

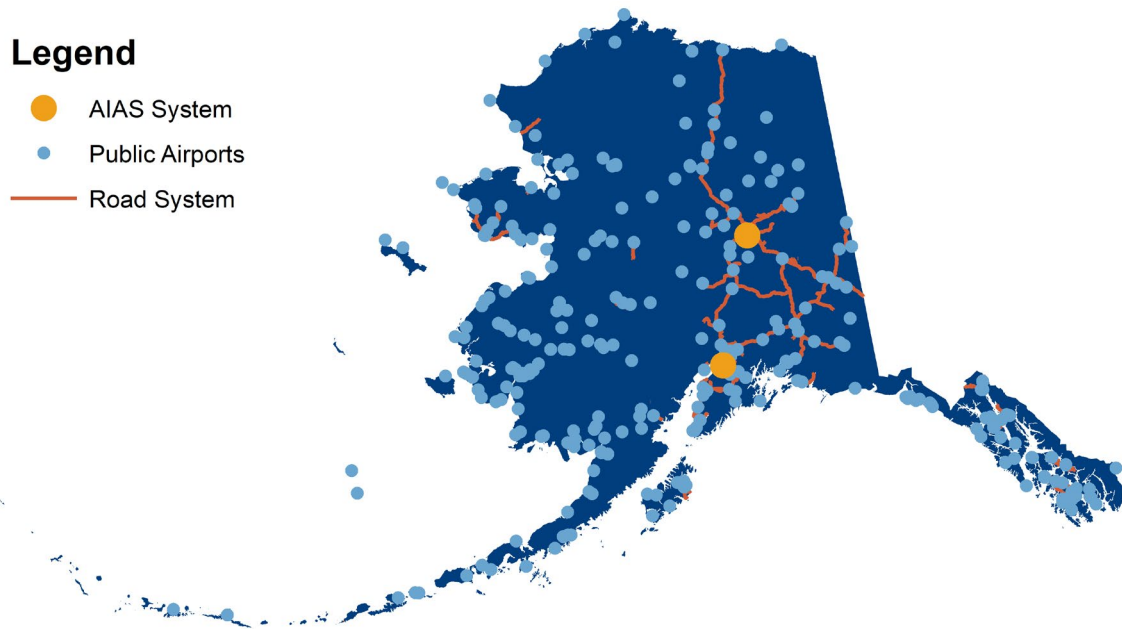


Figure 1. The Alaska Airport System

Source: Alaska Department of Transportation and Public Facilities (ADOT&PF), 2018.

Alaska's Unique Aviation Role

Aviation is an essential component of Alaska's transportation system. Alaska's unique mix of airports, seaplane bases, and heliports spread over remote geographic regions is a vital lifeline within the state, to destinations in the Lower 48 states, and to destinations around the globe. In most rural Alaskan communities, air travel is the only option for year-round passenger and cargo transportation.

"As a remote community we are dependent on air travel and air transport to maintain a healthy population and economy."
—Public Airport Leaseholder

Alaskans travel more by air for business, medical, and recreational trips than residents of the Lower 48, making airports a critical component of the social, economic, and cultural welfare of Alaska's communities. Communities off the contiguous road system depend on air transportation for movement of goods and people in ways that the Lower 48 states depend

on the interstate road system. In off-road Alaska, people not only travel for personal reasons, but also for critical needs such as accessing medical care and emergency medical transportation, personal business, and access to employment. Aviation supports many other industries such as tourism, fisheries, and other

"[Alaska] is a general aviation state, beneficial to not only the community but economic businesses in the Valley and Anchorage."
—Private Airport Manager

resource development.

Alaska's Airport System

The aviation system in Alaska is comprised of over 700 facilities, with 394 public airports. Figure 1 highlights Alaska's public airports, both on and off the contiguous road system. ADOT&PF's airport network, made up of 239 of those airports, is divided into two main systems: the Alaska International Airport System (AIAS),

including Ted Stevens Anchorage International Airport (ANC), Fairbanks International Airport (FAI), and Lake Hood Seaplane Base, and the rural airport system.

Report Content/Methods

The following study discusses economic impacts related to Alaska aviation and includes all ADOT&PF managed airports, as well as 157 public locally sponsored facilities, 313 private airports, and numerous other known landing areas. In addition, a separate report on the economic contribution of the AIAS is available.

This report provides information on the contribution of the aviation industry to Alaska's economy, describes the importance of Alaska's air network, and compares Alaska to other states. The information presented in the

following sections is based primarily on a survey effort that targeted all public airports managed by ADOT&PF and other entities, private airports, leaseholders located on ADOT&PF airports, and nearly 800 residents. The report appendices present more detailed information on the surveys and analytical methods employed in this project.

This document was conducted in accordance with Federal Aviation Administration (FAA) Advisory Circular 150/5070-7: *The Airport System Planning Process* and estimates the economic contribution of Alaska's aviation industry to the state's economy using 2017 data. Information compiled for this study supports state planning efforts, capital investment and operational spending that all contribute to a healthy aviation system and industry across Alaska.

"We are a small community... it is crucial that our airport stays open because it is our lifeline for several things including medivac, groceries, mail, doctors' appointments, tourism in and outflow, family visitors, LEO support, building supplies and supplies in general." –Public Airport Manager

Economic Contribution of the Aviation Industry

In Alaska, aviation is critical for businesses, rural residents, recreational fliers and visitors alike. The system supports a variety of local, national, and global industries. The *aviation industry*, in this study, includes all the businesses and organizations located at over 700 public and private landing areas recorded with the FAA in Alaska (FAA 2018a). These entities, including the airlines, airport concessions, air freight companies, and government and civic organizations operating on the airport, are collectively referred to in this report as “on-site” entities. Not included in this study’s definition are the other aviation-related businesses located off airport.

The total economic contribution is comprised of the on-site effects and the off-site effects. The on-site effects result from the aviation expenditures injected into the state economy through payroll, maintenance and operations (M&O), and capital spending by on-site entities. This study’s on-site spending measure does not include the portion of expenditures by visitors and other persons traveling on air transportation services and through airports. The off-site effects result from the spin-off spending as aviation employees and other businesses that support the on-site entities buy goods and services from the local vendors. For example, if an airport employee spends his wages on food, utilities, and clothing, this second round of spending creates the off-site effects in the economy. Economic definitions of on-site and off-site effects are included in the Methodology section.

The study team surveyed managers of Alaska public and private airports, as well as leaseholders located on ADOT&PF airports to collect primary spending and employment data. Data for leaseholders at locally sponsored airports was obtained by asking airport managers to provide estimates on behalf of their leaseholders, since a contact list is not available. The off-site effects were based on an input-output analysis of the survey and secondary data using the IMPLAN software program and database.

Economic Activity

Local spending by on-site entities generates economic activity and creates off-site effects in other sectors of the economy. Total spending by on-site entities in 2017 amounted to \$1.9 billion—this is the value of the economic value generated by activities within the airport premises. On-site spending in turn creates additional economic activity or off-site effects in other sectors of the economy. The economic contribution of the entire aviation industry through its off-site effects is estimated to be \$1.8 billion in 2017. Figure 2 shows the breakdown of the on-site and off-site effects. The rural airport system has a larger off-site than on-site contribution. In remote areas of Alaska, capital expenditure projects at the airports generate off-site effects that have substantial benefits to rural communities.

About 40 percent of the economic contribution is attributed to the rural airport system and the remainder is from the AIAS system.

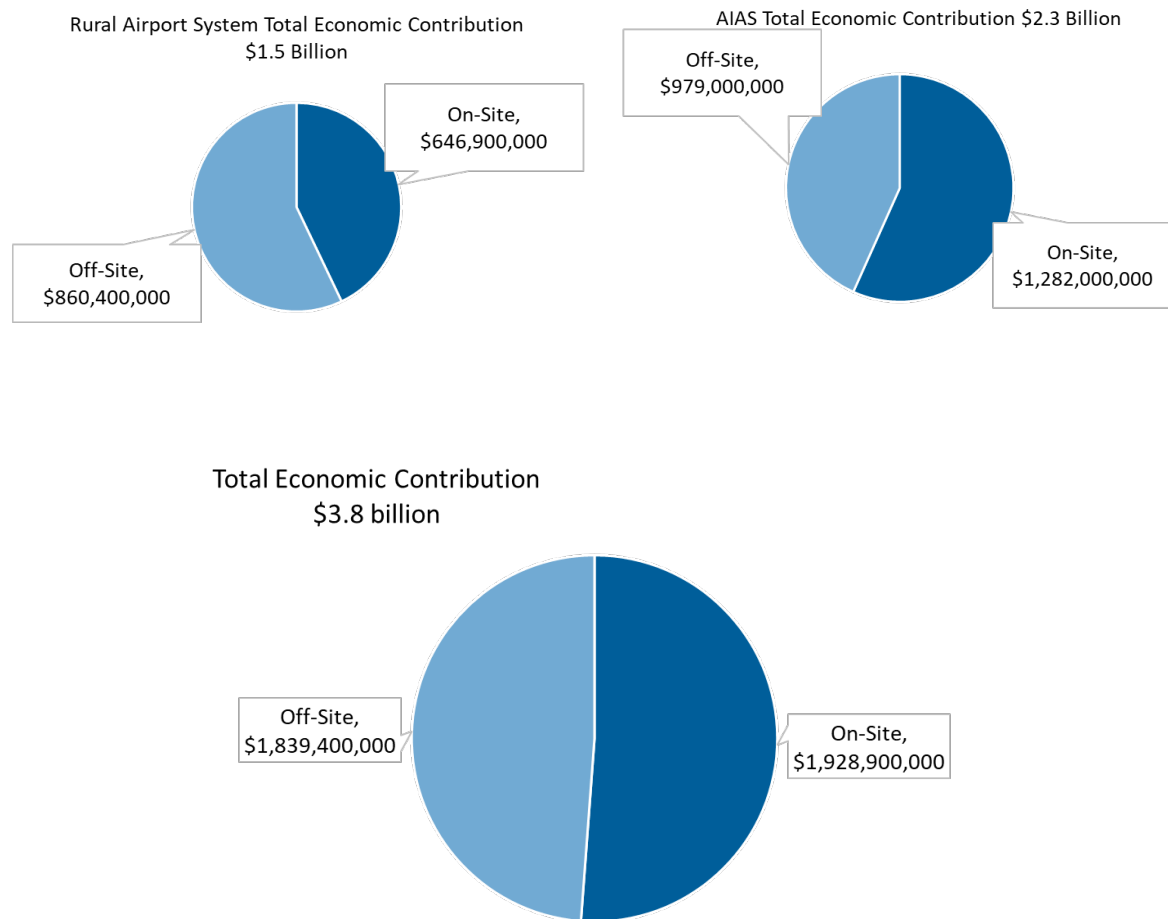


Figure 2. Alaska Aviation Industry's Estimated Economic Contribution to Statewide Economic Activity, 2017

Source: Northern Economics, Inc (NEI) estimates, 2018.

Table 1 shows the estimated economic contribution of the airports for both on-site and off-site effects. The aviation industry contributed about \$1.9 billion in direct spending to the states' economy through wages and M&O expenditures. That spending created an additional \$1.8 billion in off-site effects, for a combined economic output of nearly \$3.8 billion.

The table also shows that employee household spending generated an additional \$1 billion in economic activity in other sectors of the economy. Capital expenditures and operations spending throughout the industry generated further off-site effects.

Table 1. Total Economic Contribution of Businesses, Agencies, and Organizations Located at All Alaska Airports, 2017 (in Millions of \$)

Category	Airports	Leaseholders	Total
	Spending (\$ Millions)		
On-Site M&O			
ADOT&PF Rural Airport System	22.6	301.4	324.1
Locally Sponsored Public Airports	15.3	24.6	39.9
ANC	121.3	801.1	922.4
FAI	36.4	163.1	199.5
Private Airports	16.2	10.9	27.2
On-Site M&O Subtotal	211.9	1,301.2	1,513.1
On-Site Capital Expenditures			
On-Site Capital Expenditures	228.6	187.3	415.8
On-Site Capital Expenditures Subtotal	228.6	187.3	415.8
Off-Site Activity			
Additional Business Activity	202.7	568.3	771.0
Additional Household Activity	167.0	901.4	1,068.4
Off-Site Subtotal	369.7	1,469.7	1,839.4
Total On-Site and Off-Site Spending	810.2	2,958.2	3,768.4

Source: NEI estimates, based on survey results, 2018.

In total, the aviation industry generated nearly \$3.8 billion in economic activity throughout Alaska’s airport system—an amount equal to 7.1 percent of the state’s \$52.8 billion gross state product (GSP) in 2017 (U.S. Bureau of Economic Analysis [BEA] 2017).¹ The aviation industry in the United States accounted for 5.1 percent of national gross domestic product in 2014 (FAA 2017b), making Alaska’s aviation industry two percent higher than the

national average. In addition, many airports in Alaska are much smaller than in other states, something that highlights how much activity occurs across the state and throughout the year.

The 2007 study determined the aviation industry’s contribution at an estimated \$3.5 billion. That value, including inflation, is approximately equal to \$4.2 billion, confirming that the GSP slightly decreased over the last 10 years, from 8 percent to 7.1 percent.

Economic activity on airport property is a crucial component of Alaska’s economy. These

¹ GSP is the value of all the goods and services produced by the economy, less the cost of goods used in production.

companies and organizations are drawn from the primary economic sectors such as government, trade, transportation and utilities, and hospitality and leisure.

Figure 4 shows the relative industry contribution to Alaska's economy in terms of direct GSP and employment. If the aviation industry were a primary economic sector, it

would be Alaska's sixth largest in terms of contribution to GSP; larger than construction and manufacturing, trade, and hospitality and leisure. The 2007 report ranked the aviation industry fifth when compared to the same sector categories. Since then, the relative importance of several industry sectors have shifted, with health and education taking fifth place.

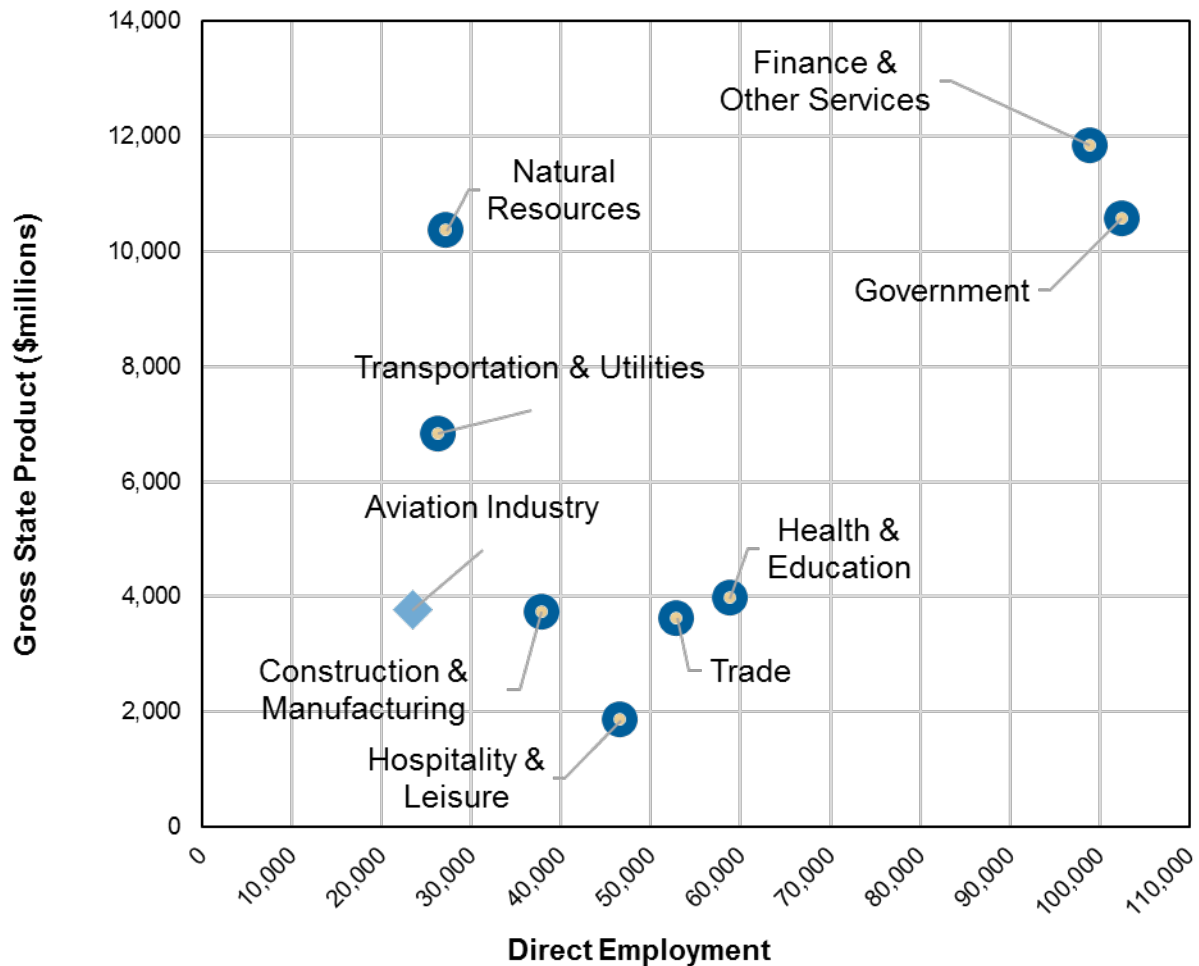


Figure 3. The Aviation Industry's Contribution to Alaska's Economy Compared to Primary Economic Sectors, 2017

Source: NEI estimates, 2018, derived from BEA data.

Several interviewees and survey respondents noted the importance FAA's Airport Improvement Program (AIP) grant funding to the airport development. Figure 5 shows the level of grant funding from 2013 to 2017. AIP funding for ADOT&PF managed airports is distributed to the Central, Northern, and Southcoast regions, to the AIAS international system, and to individual local sponsor airports located across the state.

AIP funding is used for a number of different types of airport related projects in Alaska. In 2017, it funded snow removal equipment, airport master plans, and design and

construction projects such for things like fencing, runways, taxiways, and aprons. In 2017, the total amount of AIP funding in Alaska was more than \$222 million, a total quite typical for state sponsors to receive each year. These expenditures for capital improvements are part of the on-site economic impacts and they contribute to the creation of additional jobs within the economy. This spending alone contributed a total (on-site and off-site economic impacts) of \$586 million and nearly 2,600 jobs. While this funding supports many construction jobs, it also contributes to the wholesale trade sector and engineering and architectural services industry.

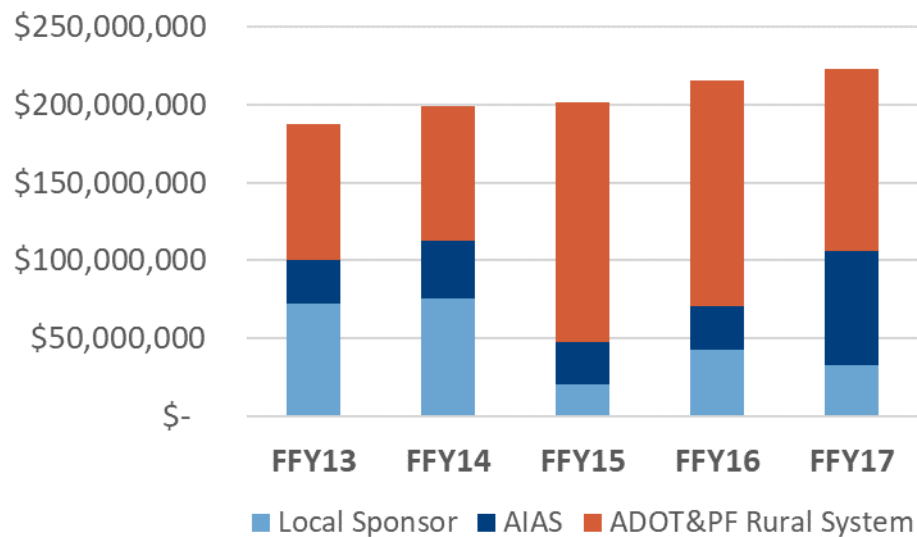


Figure 4. Annual AIP Grant Funding in Alaska

Source: ADOT&PF, 2018

Employment

In 2017, the aviation industry supported more than 35,000 on-site and off-site jobs across the state. The highest job concentration was located at the international airports and larger regional hub airports (Figure 6). Regional hub airports typically serve multiple surrounding communities by air and are often centers of economic activity in rural Alaska. An example of a hub airport is Bethel or Nome.

In this case, “off-site jobs” are the jobs created in other sectors of the economy generated from the spin-off spending by firms, agencies, and organizations located at Alaska airports. These types of jobs can include businesses related to aviation, like construction firms and suppliers of

materials for capital projects. Off-site jobs can also include retail, food service, and entertainment industry jobs that are generated when aviation industry employees spend their wages on goods and services. About 25 percent of those jobs are attributed to the rural airport system, and the remainder are from AIAS airports.

In 2007, 47,000 jobs were associated with Alaska’s aviation industry, with 27,000 off-site and 20,000 on-site. Since then, the total number of jobs has decreased by about 26%, to 35,000 jobs, with 23,400 on-site and 11,700 off-site jobs. The proportion of off-site to on-site jobs also decreased since 2007.

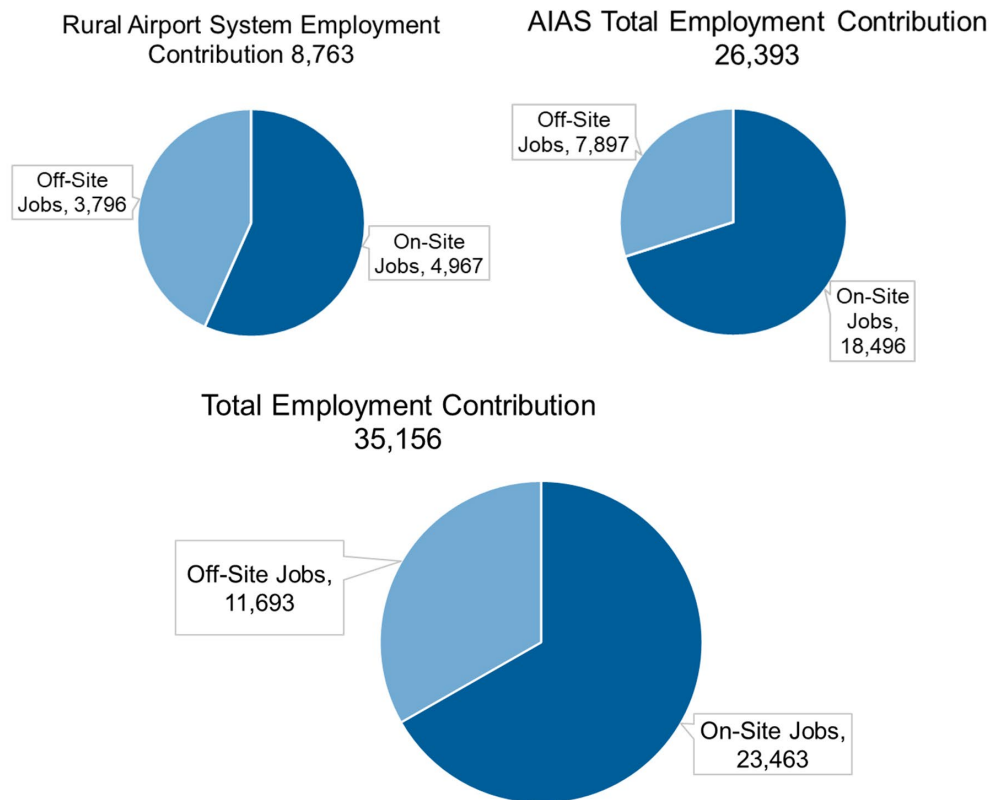


Figure 5. On-site and Off-site Employment Effects, 2017

Source: NEI estimates, 2018.

On-site activity includes nearly 2,300 full-time and part-time jobs directly related to the daily operations and maintenance of public and

private airports in Alaska. Table 2 shows the breakdown of on-site employment for airport operations by airport category.

Table 2. Number of Direct Full-Time and Part-Time On-Site Jobs Associated with Airport Operations, 2017

Category	Full-Time	Part-Time	Total Jobs
Rural System Airports	260	71	331
Local Sponsor Public Airports	94	47	141
ANC	1,204	0	1,204
FAI	68	4	72
Private Airports	168	382	550
Total	1,794	504	2,298

Source: NEI estimates, 2018.

Note: Direct employment estimates are based on information provided by respondents in the survey effort. Estimates for ANC and FAI employees are from phone interviews with airport managers.

The on-site total also includes more than 18,000 jobs created by on-site businesses, organizations, and government agencies operating at the airports in 2017 (see Table 3). These businesses include commercial air carriers, fixed-base operators, fuel distributors, caterers, air taxis, charter operations, general aviation services, state agencies, and other public agencies. Direct jobs are leaseholder employees, for example, who are responsible for employee fringe benefits like insurance and

retirement. Contractor jobs are long term employees working on-site but are contracted through an off-site company, who assumes responsibility for fringe benefits. The on-site expenditure for contracted employees is the amount of money paid from the leaseholder to the contractor. The employment levels shown here underscore the value of airports in creating jobs in various businesses and communities across the entire state.

Table 3. Number of Full-Time and Part-Time On-Site Jobs Associated with Businesses Located at Alaska Airports in 2017

Category	Leaseholder Employees		Leaseholder Contractors		Total Jobs
	Full-Time	Part-Time	Full Time	Part Time	
Rural System Airports	826	574	237	32	1,669
Local Sponsor Public Airports	464	240	13	4	721
ANC	11,420	1,236	381	38	13,075
FAI	2,422	262	81	8	2,773
Private Airports	118	61	3	1	183
Total	15,250	2,373	715	83	18,421

Source: NEI estimates based on survey data, 2018.

Table 4 shows the on-site and off-site jobs (or multipliers) generated by the aviation industry in 2017. When employees of on-site entities spend their wages on goods and services within

the state, it creates additional jobs. Spending by on-site aviation employees and vendors created over 11,000 off-site jobs across the state in 2017.

Table 4. Total Economic Employment of Businesses, Agencies, and Organizations Located at All Alaska Airports, 2017

Category	Airports	Leaseholders	Total
	Jobs		
On-Site M&O			
Rural System Airports	331	1,669	1,999
Local Sponsor Public Airports	141	721	862
ANC	1,204	13,075	14,279
FAI	72	2,773	2,845
Private Airports	550	183	733
On-Site M&O Subtotal	2,298	18,421	20,719
On-Site Capital Expenditures			
On-Site Capital Expenditures	1,432	1,311	2,743
On-Site Capital Expenditures Subtotal	1,432	1,311	2,743
Off-Site Activity			
Additional Business Activity	1,943	2,554	4,497
Additional Household Activity	1,142	6,055	7,197
Off-Site Subtotal	3,084	8,609	11,693
Total On-Site and Off-Site Jobs	6,814	28,342	35,156

Source: NEI estimates, 2018

Note: Multiplier effects are based on industry multipliers provided by IMPLAN. Direct inputs to the model are based on expenditure estimates derived from the surveys, and ANC financial statements.

Spending on wages, materials, and services for M&O translated to about 20,700 on-site jobs, and capital expenditures spending generated about 2,700 jobs. The largest portion of off-site jobs were created by household spending of employees. These jobs are created in the food service, retail, entertainment, healthcare, and a variety of other sectors where people spend their earnings in the economy.

In total, more than 35,000 jobs were generated by the firms, agencies, and businesses that make up the aviation industry. This provides approximately 7.8 percent of total jobs in Alaska's economy in 2017, including the self-employed and the military.

Airports: Providing Access

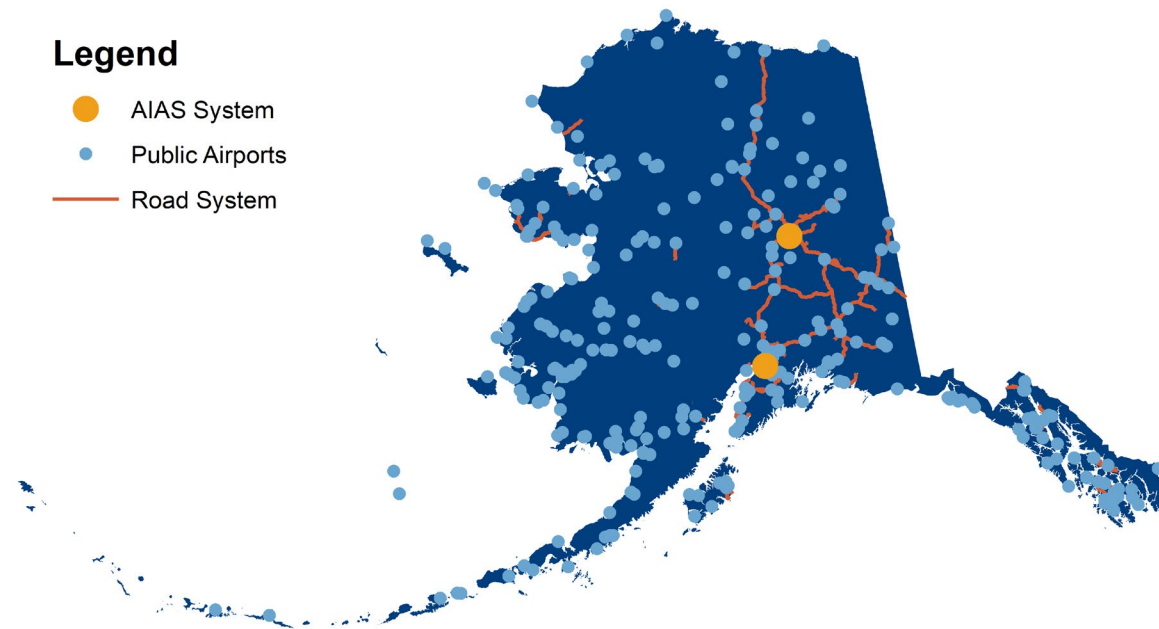


Figure 6. Alaska's Public Airport System

Source: ADOT&PF, 2018.

Alaska's Aviation Lifeline

Air transportation is an efficient means for moving people, goods, and materials into and out of remote communities in Alaska, improving the quality of life for both travelers and residents. Alaskans are often required to travel more by air for business, medical, and recreational trips than residents of the Lower 48, making airports a critical component of the social, economic, and cultural welfare of Alaska's communities. The study documented aviation's importance with a telephone survey

of nearly 800 residents, interviews with airport managers and other community officials, and an analysis of enplanements and freight volumes compared to four similar western states.

Communities off the contiguous road system depend on aviation for movement of goods and people in ways that the Lower 48 states depend on a surface transportation systems. Figure 7 highlights public airports across the state, both on and off the contiguous road system.

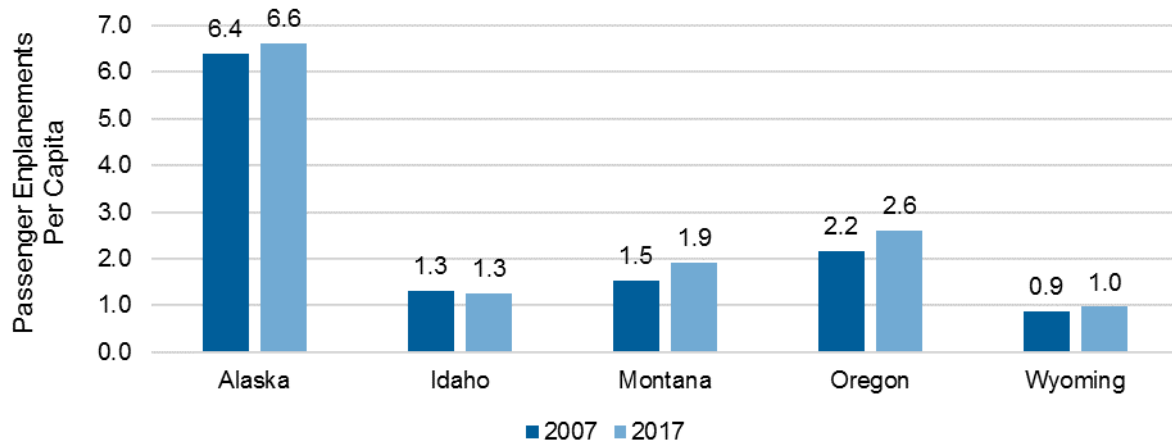


Figure 7. Comparison of Passenger Enplanements per Capita for Selected Western U.S. States, U.S. Carriers International and Domestic Flights 2007, 2017

Source: NEI estimates derived from Bureau of Transportation Statistics (BTS), 2018 and U.S. Census, 2018.

The study compared enplanements and freight deliveries per capita for the State of Alaska with comparable western states. Figure 8 presents a comparison of Alaska per capita enplanements to four other states, in both 2007 and 2017. Alaska enplanements per capita more than double those of the other states, at 6.6 enplanements per person. This value accounts for travel of Alaska residents and non-residents. From 2007 to 2017, per capita enplanements increased a small amount in each of the studied states except for Idaho, which had no change.

Figure 9 presents a comparison of Alaska per capita freight volumes to other comparable

states, in both study years. Per capita freight volumes are much larger in Alaska. At 2,935 pounds of freight per person in 2017, the per capita freight weight in Alaska was 53 times larger than that of the next highest state, Oregon. Per capita freight volumes include transit cargo, which does not represent the amount of freight or goods that are consumed by residents of the study state.

From 2007 to 2017 the per capita freight weight in Alaska increased by more than 30 percent. The per capita freight weights in Montana and Wyoming also increased but decreased in Idaho and Oregon.

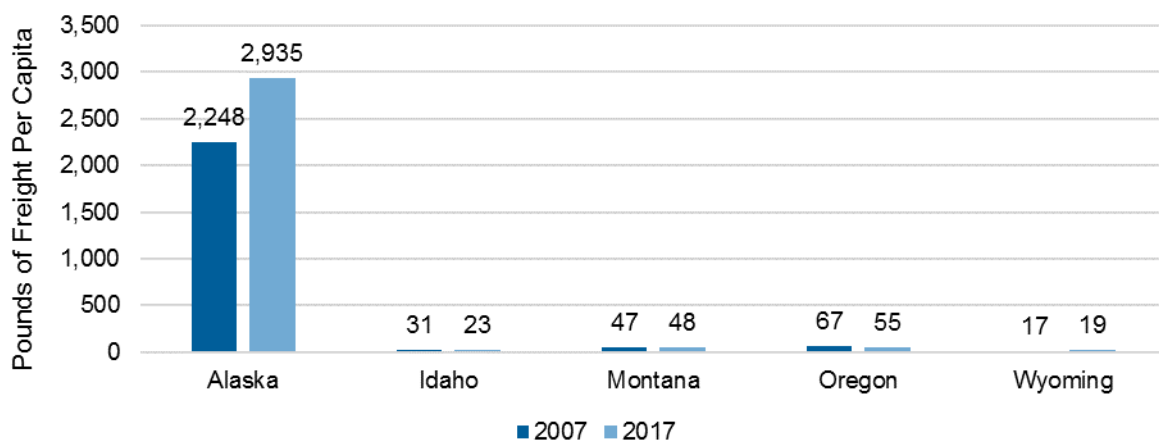


Figure 8. Comparison of Freight Weight per Capita for Selected Western U.S. States, U.S. Carriers International and Domestic Flights 2007, 2017

Source: NEI estimates derived from BTS, 2018 and U.S. Census, 2018.

Enplanements

In off-road Alaska, air travel is the primary year-round means of moving freight and passengers for most of these communities. This includes personal travel and critical needs such as accessing medical care and emergency medical transportation, personal business, and access to employment. Aviation provides an income source for communities with recreational opportunities and tourism destinations; visitors often bring a substantial infusion of cash into an otherwise isolated economy.

Figure 10 compares the total number of enplanements from Alaska's rural system airports to all airports in the state from 2010 to 2017. The data shows that nearly 40 percent of passenger activity in Alaska occurs at rural system airports and demonstrates passenger travel peaks in the summer months each year. A variety of factors can impact growth or decline in air passenger and freight transportation. They can include activities such as tourism, oil and mineral exploration, and scientific research.

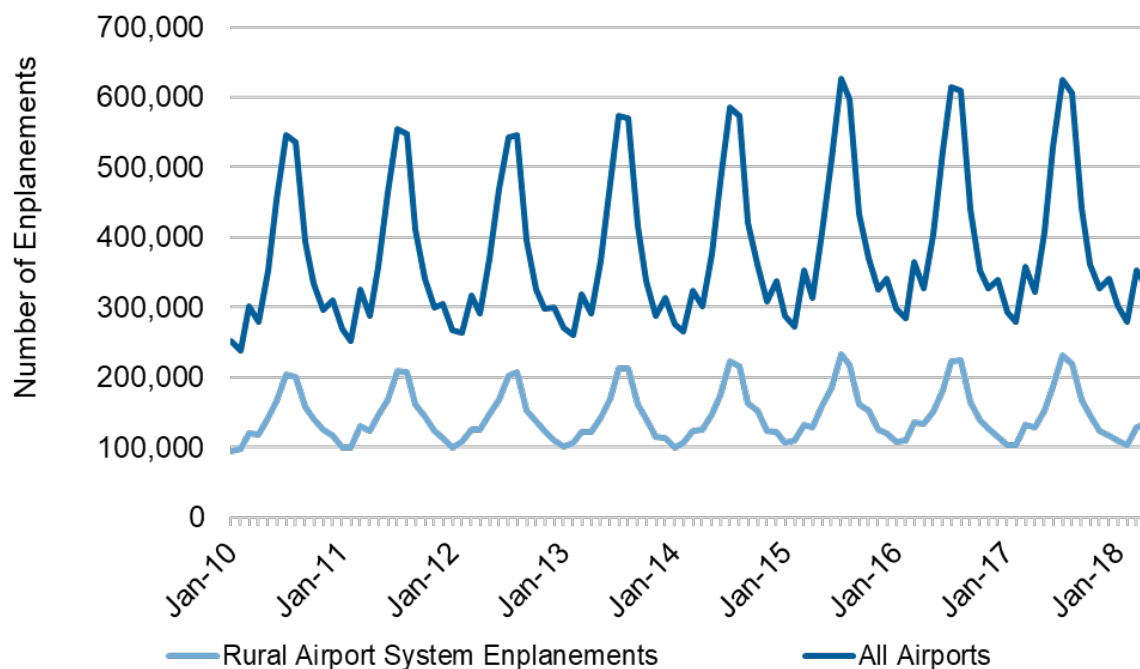


Figure 9. Monthly Alaska Enplanements from 2010 to 2017

Source: NEI estimates derived from BTS, 2018.

Figure 11 shows the average monthly enplanements for the Rural Airport System from 2010 to 2017. Enplanements in July and August are significantly higher than during winter months. This provides further evidence that aviation in Alaska depends heavily on the tourism industry during the summer months.

These flights include fly-out fishing and hunting trips, sightseeing tours, and travel to remote lodges. Commercial fishing, construction, geological/mining exploration, and hunting can also contribute to higher passenger activity in the non-winter months.

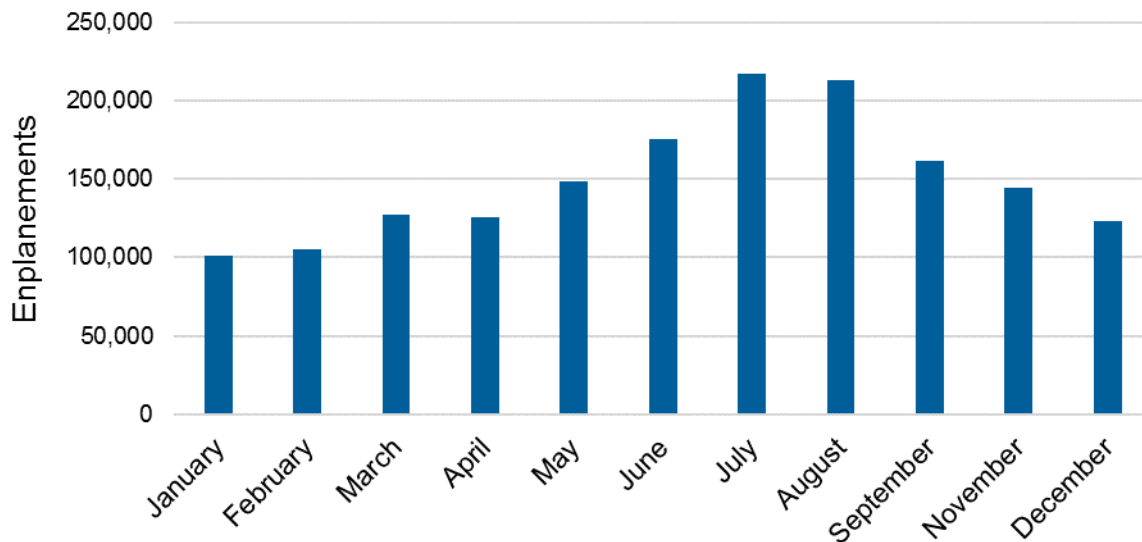


Figure 10. Average Monthly Enplanements for the Rural Airport System, 2010-2017

Source: NEI estimates derived from BTS, 2018.

Cargo

Most off-road communities depend on air freight for most of the year. Other than coastal communities with year-round ocean access, waterborne freight is limited to ice-free periods often only 2–3 months of the year. Air travel is the primary means of moving freight into and out of communities the rest of the year. Freight requiring fast delivery must also go by air. Air freight not only provides off-road communities with food and other necessities, but also larger items like ATVs and household furniture. It also facilitates income from outside the community through shipments of fresh seafood products or other locally produced items.

The majority of the nation moves mail through ground transportation while Alaska primarily uses air. Figure 12 presents 2017 per capita mail cargo volumes for 18 rural Alaska communities which were also studied in the

prior report. Mail weight per capita increased in most of the communities from 2007 to 2017. Airports with high volumes of mail are usually hubs for the U.S. Postal Service (USPS) mail program in Alaska. Several Southeast Alaska communities have very low levels of mail delivery by air because year-round, low-cost ferry and barge service is available, and because many of the rural airports support only small aircraft.

Another unique aspect of Alaska's aviation industry is the transport of fresh seafood. Frozen fish is usually transported by boat, but specialty markets for fresh or live fish and shellfish must be serviced by plane. Remote coastal communities that do not usually have larger aircraft in the winter can have scheduled and/or chartered flights in the summer, specifically to export seafood.

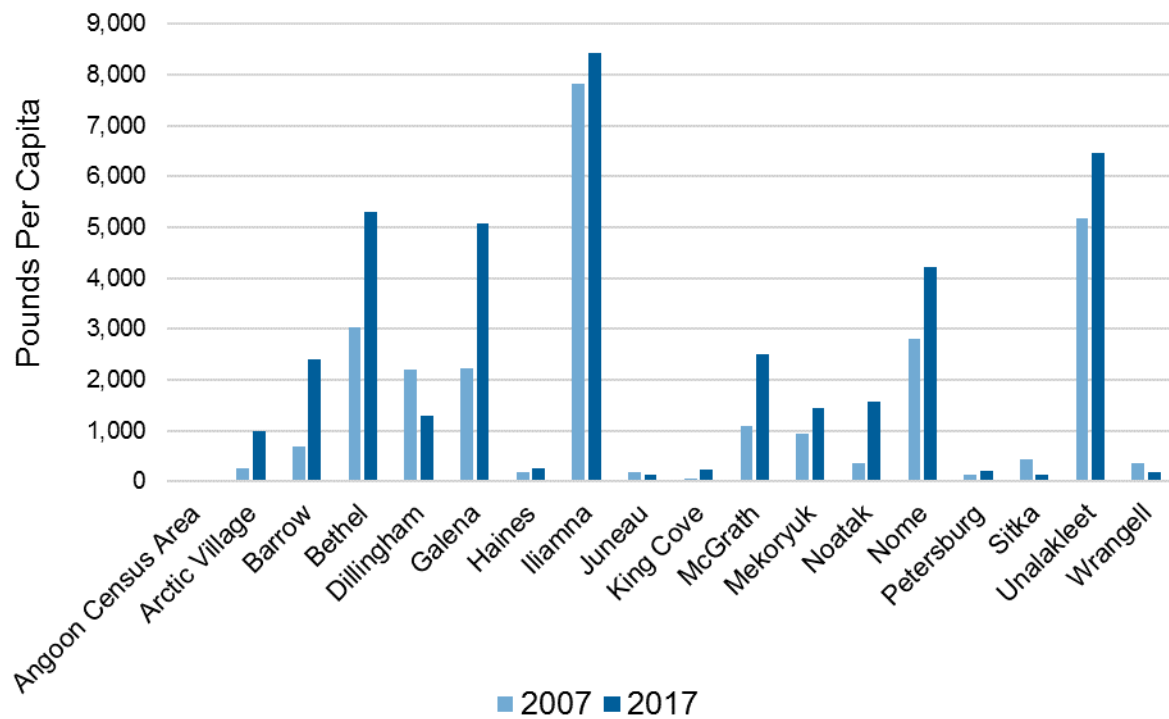


Figure 11. 2017 Mail per Capita for Representative Rural Alaska Communities

Source: NEI estimates derived from BTS, 2018, and AKDOL, 2018.

Figure 13 compares domestic flight freight weights to trends in aviation fuel prices. Not surprisingly, rises in fuel price relate to decreases in freight movement. Conversely, lower fuel prices lead to increases in freight movement. Fuel is a major cost component for both passenger and cargo aircraft carrier companies. Decreasing fuel prices lowers cargo costs and increases activity. This effect is significant since so much freight is moved by air rather than by road. There is an overall decreasing trend in cargo arriving at rural Alaska airports, which may be related to declines in related economic sectors. For example, the loss of North Slope oil jobs and weak oil prices may influence cargo movement due to exploration activities. Conversely, high oil

prices can also affect cargo and passenger activity by increasing state revenues and spending, permanent fund dividends, and household income.

The figures also show seasonality in cargo movement. Peak activity occurs in summer and fall with a low typically in February. Alaska's airports are important for international freight, but there is also a significant amount of interstate and intrastate activity. Domestic cargo activity includes the movement of equipment and supplies to rural airports, outbound seafood, construction activities, inbound retail goods, and a large amount of pass through freight traveling via ANC to other U.S. states.

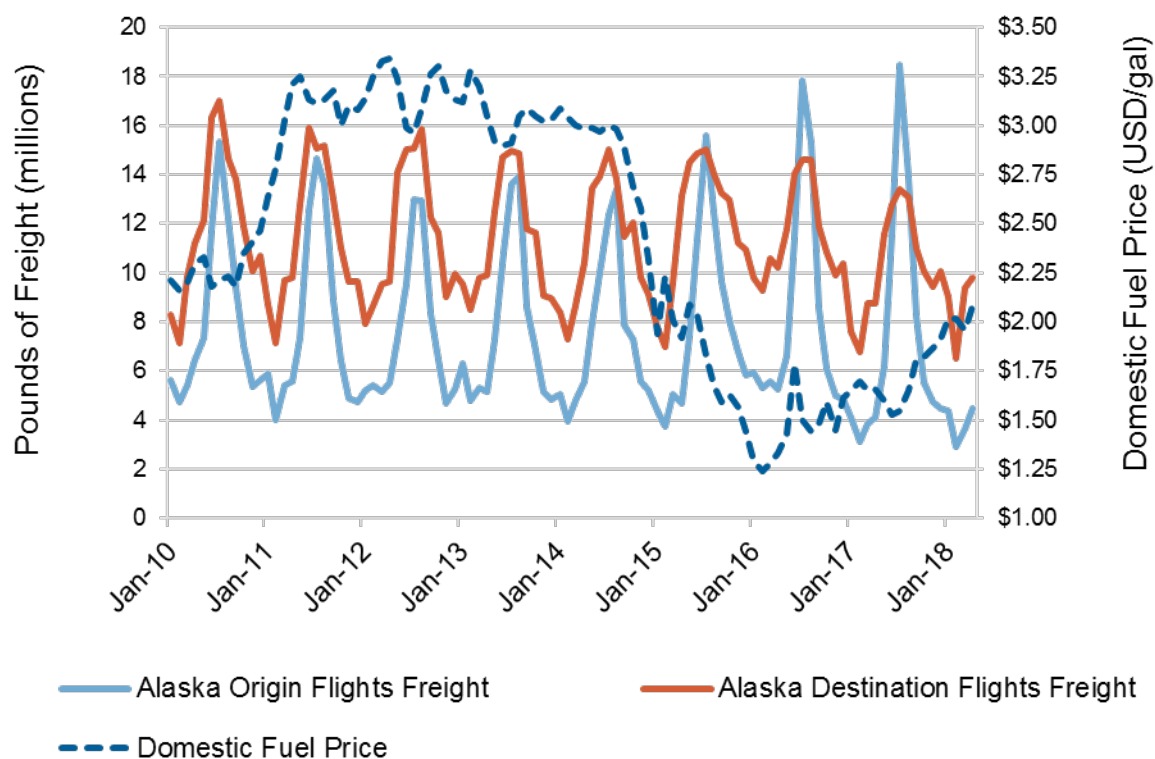


Figure 12. Rural Airport System Monthly Domestic Freight Weights, 2010 to 2018

Source: NEI estimates derived from BTS, 2018 and U.S. Census, 2018.

Air Travel by Trip and Purpose

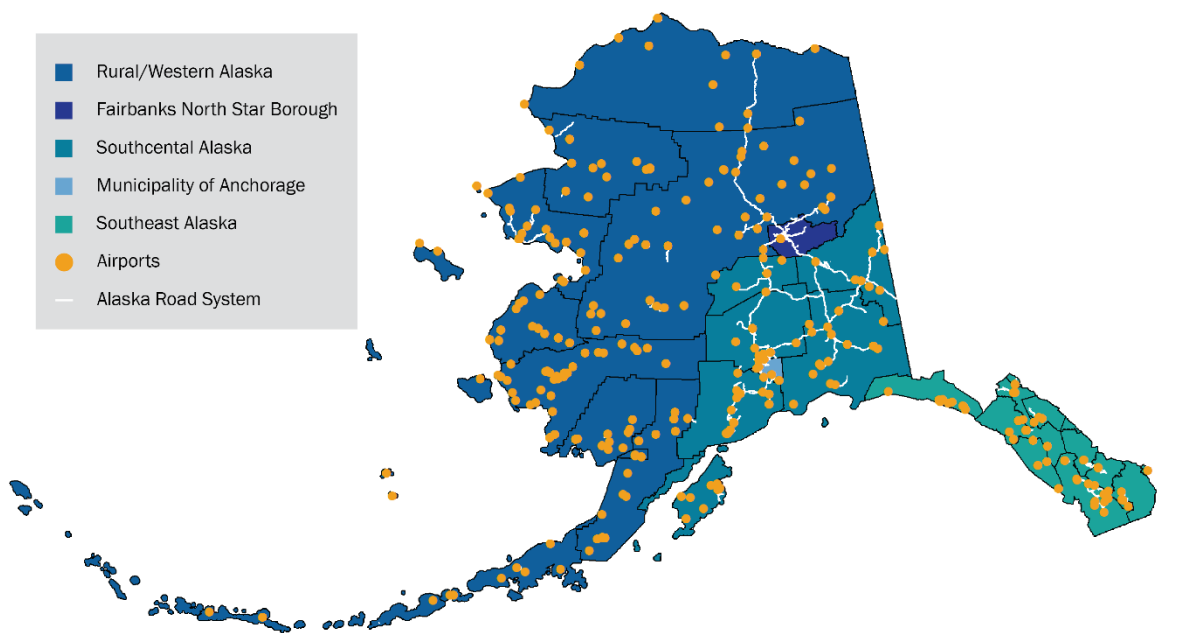


Figure 13. Resident Phone Survey Area Boundaries

Source: ADOT&PF.

The study conducted a phone survey of Alaska residents to determine the frequency and purpose of their air travel. The phone survey interviewed 786 Alaska residents in communities throughout the state. Appendix E shows the distribution of respondents by region and community, using self-reported ZIP codes.

The survey demonstrated a clear difference in trips taken per year for communities connected to the road system and those not. Of the areas recorded, the Southcentral², Anchorage, and Fairbanks regions include mostly residents who live in communities connected to the road system.

The Southeast and Rural regions include mostly residents without access to the contiguous road system, who depend on air service as their primary method of transportation. Figure 14 displays the survey boundaries, and more detailed information is included in the Methodology section. The differences between regions of the state in travel modes and habits are shown in Table 5 through Table 7.

"Anytime the airport has to close, or if flights cannot get in or out due to weather, the results are felt almost immediately by the entire region." -Airport Manager

² The 'Southcentral' region includes the Matanuska Susitna Borough, the Kenai Peninsula Borough, the Kodiak Island Borough, the Southeast Fairbanks census area, and the Valdez-Cordova census area. See the Methodology section for definitions and boundaries of the phone survey study areas.

Table 5 shows the mean number of trips per household in the past year by type of trip and airport region. Rural residents traveled the most, with an average of 6.3 trips per year, with about half categorized as personal. Rural residents averaged two work and medical trips per year. Reliance on flying to hub communities to access medical care is much more common in rural Alaska than in other regions, as many rural communities have very limited medical services

or none at all. After rural residents, Southeast residents traveled the second most frequently, at an average of 4.3 trips per year for work or personal reasons. While Southeast communities are mostly off the road system, the Alaska Marine Highway System and other marine transportation offer an alternative to air transport. Residents of the other three regions traveled approximately three times per year, mostly for work or personal trips.

Table 5. Mean Number of Trips by Air during Past 12 Months

Trip Purpose	Southeast	Rural	Southcentral	Anchorage	Fairbanks
Work Trips	1.8	1.6	1.1	1.3	0.8
Personal Trips	1.7	2.8	1.3	1.9	1.8
School or Church Trips	0.2	0.1	0.2	0.0	0.2
Medical Trips	0.5	1.7	0.1	0.1	0.2
Other Trips	0.1	0.1	0.1	0.1	0.2
Total Trips	4.3	6.3	2.7	3.4	3.2

Source: Alaska Survey Research, 2018.

Table 6 shows the mean number of travelers from a single household on trips in the last year by type of trip and region. The rural region is unique in that residents fly for medical reasons almost as often as they fly for personal ones. In fact, rural residents used aviation for medical trips over 30 times as frequently as the Southcentral and Anchorage regions, which have medical care readily available via roads.

Other regions fly predominantly for personal trips. These figures show how essential aviation is for jobs in Alaska with flights connecting workers to their job sites, business partners, and needed supplies. Personal trips are a chance for residents to see friends and family, to access recreational areas such as fishing or camping spots, to shop for goods not available locally, or to go on vacation.

Table 6. Mean Number of Travelers from Household on all Trips by Air during Past 12 Months

Mean Number of Travelers from Household	Southeast	Rural	Southcentral	Anchorage	Fairbanks
Work Trips	1.9	1.6	1.1	1.3	1.2
Personal Trips	2.8	3.8	2.2	2.9	2.5
School or Church Trips	0.2	0.1	0.3	0.1	0.3
Medical Trips	0.8	3.2	0.1	0.1	0.2
Other Trips	0.1	0.3	0.1	0.2	0.3
Total	5.8	9.0	3.8	4.5	4.5

Source: Alaska Survey Research, 2018.

Survey respondents were asked how often they traveled by air and which airport they used most often. Table 7 shows the distribution of individuals and how frequently they flew. Over 50 percent of respondents that primarily use the Sitka or Bethel airport have gone on seven or more trips in the last year. Fairbanks residents also fly regularly, with nearly 47 percent making seven or more trips annually.

Although off-road communities system fly more frequently, on-road communities also tend to fly regularly. The large percentages of people flying at least three times a year reflect Alaska's aviation culture, as well as the fact that ground transportation is limited by such large distances. Even in Kenai, which is connected by road to Anchorage, 30 percent of residents fly

"I believe our airport has a very significant role in our community. Though we are still on the road system, the nearest commercial airport is over 80 miles away, so our airport provides travel for business and pleasure, cargo shipments, tourism, emergency medical care transportation, a destination for military aircraft for both mission-oriented flights and training, etc..." -Airport Manager

seven or more times per year and an additional 20 percent fly between three and six times per year. The drive from Kenai to Anchorage is about three hours, but residents of the Kenai Peninsula use the airport to reach recreational opportunities and to speed up their trips to Anchorage, either as a destination or connection to the Lower 48.

Table 7. Frequency of Air Travel by Alaska Residents per Year, by Airport Most Used

Airport Used Most	1 to 2 per Year (%)	3 to 6 per Year (%)	7+ per Year (%)
Anchorage	36.6	33.9	29.5
Fairbanks	25.5	27.9	46.6
Juneau	23.0	41.9	35.1
Bethel	28.1	21.1	50.8
Ketchikan	36.2	34.5	29.3
Kenai	49.1	21.1	29.8
Kodiak	0	77.8	22.2
Sitka	20.6	20.6	58.8
Nome	0	68.8	31.2
Other Airport	18.5	30.7	50.8

Source: Alaska Survey Research, 2018.

Case Studies

The following case studies examine several parts of Alaska's economy and quality of life that are particularly dependent on aviation (tourism, cargo, health care, bypass mail, and the Essential Air Service Program), as well as trends that affect aviation nationally and in Alaska.

Medical and Healthcare

The following sections provide an overview of how access to healthcare differs in Alaska compared to other states, details on hospital and clinic access, and air medical activities and operators in Alaska. This includes discussions on the types of air ambulance aircraft, specific air medical operators serving Alaska, and the types of memberships and services they offer.

Access to Healthcare in Alaska

Access to healthcare is different in Alaska than in any other state. As with all aspects of life in the state, remoteness and limited road access present a major hurdle; 82 percent of Alaska's communities are inaccessible to a statewide or interstate road system (ADOT&PF 2018). Visitors come to the state to experience a level of remote, backcountry tourism offered nowhere else in the United States in Alaska's vast public lands and preserves. Residents of these communities and Alaska visitors both require access to top quality healthcare for regular treatment and emergencies.

For these reasons, Alaska has a heightened need for air medical operators. These companies fly specially outfitted air ambulance aircraft equipped with life-saving medical equipment comparable to a surface ambulance. Air medical operators may perform emergency medical evacuation from remote locations using helicopters or transport patients from rural communities to hospitals in Anchorage or Seattle, among other activities. However, the cost of this service—often tens of thousands of dollars per flight—makes the service infeasible without payment assistance. Air medical operators typically offer memberships which act as a sort of air ambulance insurance to residents of or visitors to Alaska, protecting against the massive cost of an emergency flight.

Even with the widespread availability of air medical service, healthcare in Alaska comes with issues not experienced in most other states. For example, air medical operators still depend on adequate runway and weather conditions when performing patient transfers or emergency search and rescue. The state's shortage of weather reporting equipment and facilities—detailed in the Trends section—compounds this problem. Alaska's long nights, or months of darkness in the Arctic north, also present a major issue for air medical operator access. Remote villages that only have an unlit runway as a point of access are basically inaccessible for medical operations at night or during the Arctic winter. These issues make improvements in weather reporting and runway lighting all the more crucial for Alaska public safety.

The lack of reliable 911 emergency response is also a major issue for healthcare in Alaska. An estimated one in four Alaskans lacks accessibility to 911 emergency services, with rural and remote communities least likely to receive service. Even in areas with 911 service there are several issues. Alaska's 911 dispatch has a shortage of staff, and with the state's recent increase in property crime inundating 911 responders, those in need of emergency healthcare service may not get through to emergency responders. In addition, location services have historically been inconsistent, particularly in cases of re-routed calls, but a new bill signed in August 2018 by former Governor Bill Walker aims to fix this issue (the law went into effect on January 1, 2019). This will not, however, fix the problem that 911 response is unavailable in most of Alaska's remote backcountry regions (Anchorage Daily News 2018; State Scoop 2018).

Alaska Hospitals and Clinics

By the sheer nature of its geographic size, Alaska presents unique challenges in terms of healthcare. The state's hundreds of communities are spread throughout its geographic area, but Alaska's low population—under 740,000 residents, the third fewest of all states—means that the state has a small number of advanced

healthcare facilities. An advanced healthcare facility may be a hospital with a renowned surgical reputation for a specific medical field, or it may be a hospital equipped for trauma patients. To help fill this void, Alaska has numerous free and affordable clinics located in communities throughout the state.



Kanakanak Hospital in Dillingham.

Source: Dave Wilson.

However, for emergencies—those medical cases needing the most immediate care—trauma centers are essential. A trauma center is a hospital specifically equipped to provide medical care for trauma victims—often patients that have suffered from severe injuries such as a vehicle accident or gunshot wound. The American Trauma Society (ATS) certifies applicant hospitals as trauma centers, assigning one of five levels based on the trauma care capabilities of the specific facility. The most advanced trauma centers (Level I) provide all phases of trauma care to patients, from immediate emergency care to rehabilitation.

The least advanced trauma centers (Level V) provide only initial stabilization and diagnosis before transferring the patient to a facility with higher capabilities. The other three categories provide levels of care between these two (ATS 2018). A hospital need not be certified by the ATS to have trauma or emergency care, but ATS certification has long been a way for trauma centers to coordinate and disseminate information.

Because of its widely distributed population, Alaska has very few advanced trauma centers compared to other states. Figure 15 details the locations of hospitals and clinics throughout the state, showing hospitals that are designated by the ATS as trauma centers. Alaska has no Level I trauma centers, and only two-Level II, both of which are in Anchorage (Providence Alaska Medical Center and Alaska Native Medical Center). Also distributed throughout much of the state are 15 Level IV trauma centers capable of stabilizing patients before transport to a more advanced facility. The closest Level I trauma center to Alaska is Harborview Medical Center in Seattle, Washington. This distribution of hospitals, particularly advanced trauma centers, means that Alaska residents and visitors experiencing any type of severe trauma outside of the state's largest cities will almost certainly need to be transported by air to Anchorage. The worst cases, and those in need of specialty care will need to be transported even farther to Seattle. Like all other everyday aspects of life and the economy in Alaska, emergency healthcare is almost completely dependent upon the state's airport network.

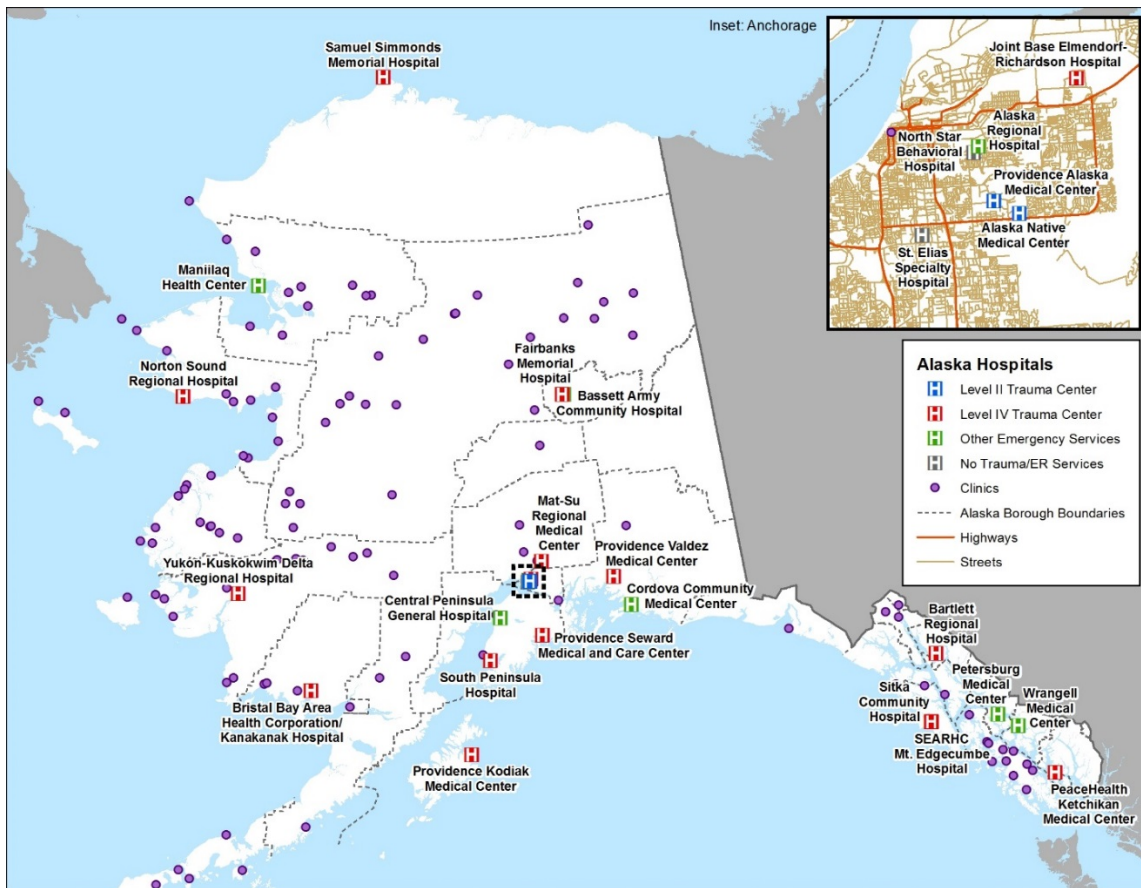


Figure 14. Hospitals and Trauma Centers in Alaska

Source: ATS, 2018 CDM Smith, 2018, and FreeClinics.com, 2018.

Beyond the trauma centers certified by the ATS, Alaska has several other hospitals with emergency services. Only two hospitals—North Star Behavioral Hospital and St. Elias Specialty Hospital—lack trauma or emergency services. Table 8 identifies all these hospitals and their level of trauma center or emergency services. Most trauma patients can be treated in Alaska, with those transferred out of state typically being unique cases such as burn victims or those needing specialty pediatric services

(Heyano 2018). However, even hospitals with moderate trauma care capabilities must sometimes transport patients to more advanced facilities. For example, Bartlett Regional Hospital in Juneau estimates that 2 percent of its patients (337) were transported from their facility in Juneau to another hospital in 2016, most often a hospital in Anchorage or Seattle (Juneau Empire 2017).

Table 8. Hospitals and Trauma Centers in Alaska

Hospital Name	City/Location
Level II Trauma Centers	
Alaska Native Medical Center	Anchorage
Providence Alaska Medical Center	Anchorage
Level IV Trauma Centers	
Bartlett Regional Hospital	Juneau
Bristol Bay Area Health Corporation/Kanakanak Hospital	Dillingham
Fairbanks Memorial Hospital	Fairbanks
Joint Base Elmendorf-Richardson Hospital	Anchorage
Mat-Su Regional Medical Center	Palmer
Norton Sound Regional Hospital	Nome
PeaceHealth Ketchikan Medical Center	Ketchikan
Providence Kodiak Medical Center	Kodiak
Providence Seward Medical and Care Center	Seward
Providence Valdez Medical Center	Valdez
Samuel Simmonds Memorial Hospital	Barrow
SEARHC Mt. Edgecumbe Hospital	Sitka
Sitka Community Hospital	Sitka
South Peninsula Hospital	Homer
Yukon-Kuskokwim Delta Regional Hospital	Bethel
Emergency Services; Undesignated by ATS	
Alaska Regional Hospital	Anchorage
Bassett Army Community Hospital	Fort Wainwright
Central Peninsula General Hospital	Soldotna
Cordova Community Medical Center	Cordova
Maniilaq Health Center	Kotzebue
Petersburg Medical Center	Petersburg
Wrangell Medical Center	Wrangell
No Emergency Services	
North Star Behavioral Hospital	Anchorage
St. Elias Specialty Hospital	Anchorage

Source: ATS, 2018 and CDM Smith, 2018.

Alaska's extensive network of free and affordable clinics is also essential to the state's healthcare infrastructure. According to the FreeClinics database, Alaska has 188 clinics located throughout the state. Clinics included in this database are typically owned and operated by non-profit organizations and rely on federal and state subsidies for funding, passing along free or nearly free services to patients. In Alaska, these clinics are widely distributed throughout the state (Figure 15). While Anchorage is home to 21 of these clinics, only one other community has more than one (Akutan, with two). The other 165 are in 165 different communities. In combination with the state's hospitals, Alaska residents and visitors have numerous options for health care services, but like other aspects of life in the state, healthcare often relies upon aviation.

Air Ambulance Aircraft

Air medical operators fly specially modified aircraft that are air ambulances in both name and function. Air ambulances may take the form of rotorcraft, piston-engine aircraft, or small jets, with each providing specific benefits and functions in the air medical industry.

Rotorcraft (helicopters) are ideal for transporting a patient over short distances. They are also essential for emergency evacuation from remote locations inaccessible to fixed-wing aircraft. Table 9 lists several helicopters commonly customized to be air ambulances, most of which have a range of approximately 300 to 400 nautical miles, with some able to reach well over 500 nautical miles. Some of these helicopters are only capable of transporting one patient with a team of emergency medical technicians (EMTs), but several can carry up to two stretchered patients with the crew.

Fixed-wing airplanes are more suited to transporting patients greater distances quickly. In cases of emergency, fixed-wing aircraft such as those listed in Table 9 can be used to rapidly transport a patient that is already near an

airport. The downside to these aircraft is that they can only land on runways, so they are not always suitable to remote evacuation. However, fixed-wing air ambulances are utilized for far more than just emergency transportation, as residents in remote communities will often use them to reach routine care or planned surgery in larger cities.

Emergency medical operations in Alaska are dependent on both helicopters and fixed-wing aircraft. If an emergency occurs in the wilderness, such as a remote search and rescue operation, a helicopter may be required to transport the patient to the nearest airport, where the patient can then be transferred to a faster, longer-range fixed-wing aircraft to get to a hospital for treatment. Both helicopter and fixed-wing air medical service is available in Alaska and utilized extensively for everything from routine patient transfer to emergency evacuation and search and rescue operations.

Nationwide, the Association of Air Medical Services (AAMS) estimates that air medical operators transport approximately 400,000 patients by helicopter and 150,000 by fixed-wing aircraft each year. Of all air medical operations, approximately 54 percent are hospital-to-hospital transports, and additional 33 percent are scene response (typically using helicopters), and the final 13 percent are other cases such as organ transplant or other patient transfer (Association of Air Medical Services, 2018).

The level of access these aircraft have to Alaska residents depends on the airport facilities, model of aircraft, and inter-agency coordination. Alaska ADOT&PF's efforts to pave many more runways for cargo access has helped access for King Air aircraft. One carrier, LifeMed Alaska, estimates that their King Air can now fly into half of the village airports throughout the Yukon-Kuskokwim region. LifeMed Alaska also reported rendezvousing with both the Air National Guard and Coast Guard to transfer patients to hospitals (Heyano 2018).

Table 9. Common Aircraft Employed as Air Ambulances

Aircraft Model	Aircraft Type	Maximum Range (Nautical Miles)
Helicopters		
AgustaWestland AW109	Twin-engine	503
AgustaWestland AW139	Twin-engine	573
Bell 206	Single-engine	324
Bell 222	Twin-engine	386
Bell 230	Twin-engine	378
Bell 412	Twin-engine	529
Bell 429	Twin-engine	390
Bell 429	Twin-engine	390
Eurocopter AS350*	Single-engine	357
Eurocopter AS-365*	Twin-engine	447
Eurocopter EC130*	Single-engine	329
Eurocopter EC135*	Twin-engine	343
Eurocopter EC145*	Twin-engine	370
MBB BO-105*	Twin-engine	600
MBB/Kawasaki BK 117*	Twin-engine	292
Sikorsky S-76	Twin-engine	411
Fixed-Wing Airplanes		
Beechcraft King Air 200	Twin-engine turboprop	1,802
Cessna 208 Caravan	Single-engine turboprop	1,070
Cessna Citation V	Twin-engine Jet	1,960
Gulfstream Jet	Twin-engine Jet	7,000
Lear Jet 35	Twin-engine Jet	2,874
Pilatus PC-12	Single-engine turboprop	1,845

*Aircraft now rebranded under the Airbus banner.

Note: Maximum range may vary depending on specific model.

Source: Air Medical Net, 2018 and Association of Air Medical Services, 2018.

Beyond airport improvements, access is also improved through further modifications to both dedicated air ambulance aircraft and those used only part time for medical operations. These modifications are particularly important in Alaska. LifeMed Alaska, for example, modifies its Learjets with tire gravel guards to further

expand their full range of airport access. Additionally, small regional carriers or fixed-base operators (FBOs) may have one aircraft that is equipped to provide medevac service from bush villages to regional hubs where they can transfer to one of the above aircraft to be transported to a hospital in Anchorage or

another city. For example, Grant Aviation at Bethel Airport uses a modified Cessna Caravan for medevac throughout the Yukon-Kuskokwim region 10 to 20 times per month (DOWL 2016a). Floatplanes are also sometimes modified for use as air ambulances. At Sitka Seaplane Base, FBO Harris Air has DHC-2 Beaver floatplane that has been partially modified for medevac use. The Beaver has a range of 455 nautical miles, nearly five times the range needed to transport a patient from Sitka to Juneau for transfer to a fixed-wing aircraft with longer range (DOWL, 2016b).

Cost of Medical Flights

Without assistance, the cost of an air ambulance transport would be financially crippling. The National Association of Insurance Commissioners (NAIC) estimates that the national average air ambulance trip is 52 miles and costs between \$12,000 and \$25,000 per flight (National Association of Insurance Commissioners, 2018). However, this is a national average, and the distances flown in Alaska between communities and hospitals are typically much greater than distances flown in the lower 48 states. As such, air medical flights cost much more on average for Alaska residents and visitors than for patients in most other states. In 2017, Bartlett Regional Hospital estimated that the cost of air medical transport from Juneau started at \$30,000 and could reach \$170,000 per flight (Juneau Empire 2017). These flights depart from a city, however, and flights from a rural part of Alaska to a regional hub and onto a city such as Anchorage could potentially cost more.

A patient will rarely end up paying for all or even most of an air medical operation out-of-pocket. Typically, air ambulance flights are paid for with some combination of insurance, Medicare/Medicaid, out-of-pocket expenses, and paid membership to air medical companies. Insurance company policies on air ambulance transportation vary by company.

Medicare's official policy on emergency air medical transportation is that it is covered if the patient's pickup location is not easily reached by ground transportation or in cases where the distance or other obstacles make it more practical and faster than a ground ambulance. In cases of non-emergency transportation,

Medicare covers part of the air medical operation if a doctor's statement that the transportation is medically necessary is provided. For scheduled/regular non-emergency trips, the doctor's statement must be acquired no earlier than 60 days before the trip. For unscheduled/irregular non-emergency trips, the doctor's statement must be provided no later than 48 hours after the trip. If covered, Medicare pays for 80 percent of the Medicare-approved amount (U.S. Department of Health and Human Services 2018).³

For Alaskans, the most economical way to protect against a massive bill for air ambulance service is having both insurance and an air medical membership. Air medical operators require members to already have insurance that covers air ambulance costs. Under this arrangement, the insurance company will still pay for the percentage of the total cost of air ambulance service determined in the individual insurance plan, but the air medical operator would accept this amount as the total. The air medical operator then makes up the difference using annual membership fees, which vary depending on the company and plan.

As with surface ambulance transport, trauma victims in need of air ambulance transport will receive the service regardless of insurance or air medical membership coverage. One caveat is that a severely injured patient may not always be capable of telling the first responders the particular air medical provider with which he or she has a membership, making it imperative for plan members to carry an air medical membership card in the same way they would a regular insurance card.

Both Medicaid and the Children's Health Insurance Program are available to members of federally recognized American Indian and Alaska Native tribes. Qualifying members receive Medicare service without premiums, enrollment fees, or out-of-pocket costs. Alaska Natives that are enrolled in these programs thusly receive free travel to and from the Native Medical Center in Anchorage (U.S. Department of Health and Human Services 2018).

³ The Medicare-approved amount is the amount the providing doctor or supplier can be paid but may be less than the total that the doctor or supplier charges.

Air Medical Operators in Alaska

Alaska is served by several air medical operators, some of which have operation bases throughout the state, and some which are based in other states but available to support patients in Alaska. These companies typically offer

membership packages to Alaska residents, and some offer temporary plans for visitors planning trips in the remote Alaska wilderness. Table 10 lists the most prominent air medical operators in Alaska, if they have a base in the state, and their aircraft capabilities.

Table 10. Prominent Air Medical Operators in Alaska

Air Medical Operator	Base(s) in Alaska	Aircraft Capabilities in Alaska
Air Ambulance Network	No	Fixed-wing only
Air Ambulance Worldwide	No	Fixed-wing only
AirCARE1	No	Fixed-wing only
Guardian Flight	Yes	Fixed-wing only
LifeMed Alaska	Yes	Rotorcraft and fixed-wing
Medevac Alaska	Yes	Rotorcraft and fixed-wing
REVA	No	Fixed-wing only
University of Washington Medicine	Yes	Fixed-wing only

Source: Air medical operator websites, 2018.

The following sections provide additional details on air medical providers serving Alaska, their service areas, and membership plans.

Air Medical Operators Based in Alaska

For trauma patients, time can be of the utmost importance when receiving care. Air medical operators located in Alaska are the best equipped to reach patients faster and get them to hospitals for care in the shortest amount of time. Several air medical operators have air ambulance bases at airports throughout the state. While not all air medical operators offer memberships, Medevac Alaska, which opened in 2017, does not yet offer memberships; they nonetheless provide several options for Alaska visitors as they explore their air ambulance options.

Figure 16 shows the locations of these air ambulance bases. With seven base locations each, LifeMed Alaska and Guardian Flight are the most dispersed air medical operators in the state. LifeMed Alaska has fixed-wing and ground-based services in Anchorage, and helicopter services nearby in both Palmer and Soldotna. LifeMed also has fixed-wing services in Juneau, Fairbanks, Bethel, and Dutch Harbor. Southeast Alaska receives helicopter air ambulance service via Medevac Alaska's base at Skagway. All other established air medical bases only have permanent fixed-wing service, but this does not preclude air medical operators from using these or other airports for helicopter air medical operations when necessary.

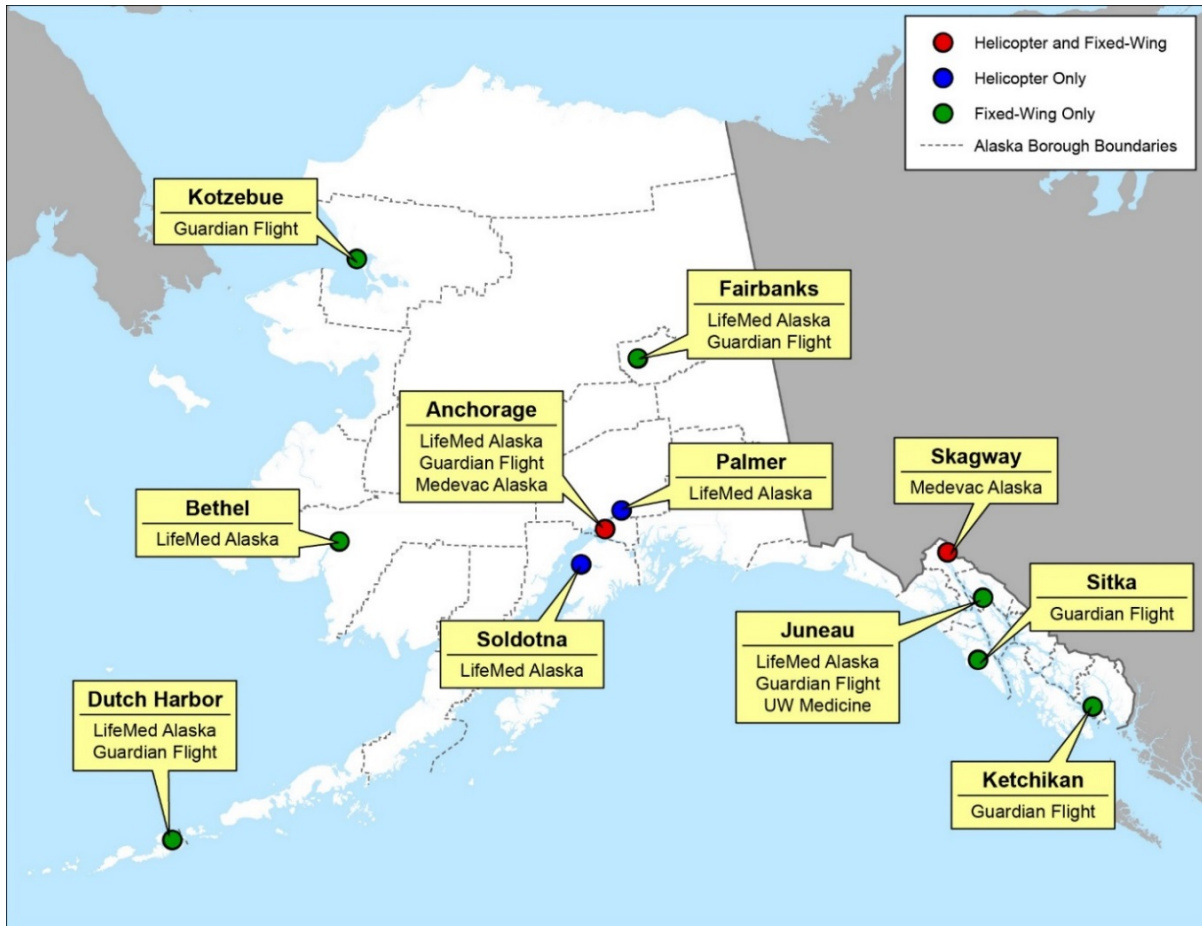


Figure 15. Air Medical Bases in Alaska

Source: Air medical operator websites, 2018.

LifeMed Alaska can provide the most advanced and extensive air medical services in Alaska and specializes in both emergency on-scene responses and patient transfers from home to hospital or hospital to hospital. The company has Alaska's only air ambulance teams for pediatric or neonatal specialty or high-risk OB. LifeMed's typical critical care team is one nurse and one paramedic, but specialty doctors such as pediatric specialists or cardiac surgeons may also accompany patients. In addition, LifeMed Alaska specializes in treating patients suffering from a full variety of health issues and emergency trauma.

With a fleet of 11 fixed-wing aircraft—six Learjets, four King Airs, and one Cessna Grand Caravan—and two Bell 407 helicopters, LifeMed's aircraft are outfitted to be mobile intensive care units. The company can respond to emergencies outside of Alaska, but its

services are tailored to Alaska residents. LifeMed's website has specific instructions for members on how to prepare landing sites for a backcountry rescue, in addition to survival tips in the event of a weather delay. Furthermore, the company has a remote site registration program for backcountry lodges and campsites so that air ambulance operators can be best prepared to make rescues at these sites. As of 2018, LifeMed Alaska offered its membership to Alaska residents for \$49 annually (Heyano 2018).



LifeMed Alaska Cessna Caravan.

Source: LifeMed Alaska.

Approximately 3,600 medical flights, mostly inter-facility transfers, are operated annually by LifeMed. The company states that tourism in the Denali region creates a higher need for emergency medevac. For example, LifeMed once picked up a burn victim in Talkeetna by helicopter, transferred the patient to a Learjet in Anchorage, and had them to a specialty burn center in Seattle in just a few hours. Cruise ship tourists also present a higher need for emergency medevac (Heyano 2018).

In contrast to LifeMed Alaska, Guardian Flight is not solely located in the state, but manages 13 air medical programs at over 50 bases in 15 states, including its seven bases in Alaska. The company operates 23 fixed-wing aircraft, a fleet comprised of Beechcraft King Airs, Learjets, Hawker 400s, and Cessna Caravans. All these aircraft are capable of transporting two stretchered patients, flight crew, and medical staff. Like LifeMed Alaska's fleet, the aircraft used by Guardian Flight have been modified to be mobile intensive care units, and transport both emergency trauma patients and medical transfers. Guardian Flight medical staff maintain extensive critical, intensive, and/or emergency care experience and training, and have advanced certifications in trauma, critical care, and neonatal resuscitation. As of 2018, an annual membership to Guardian Flight cost Alaskans \$125 (Guardian Flight 2018).

The University Of Washington College Of Medicine (UW Medicine) operates Airlift Northwest, an air medical company with six bases in Washington and one in Juneau, with

partnering airports throughout Southeast Alaska. The Juneau base has two fixed-wing aircraft, a Pilatus PC-12 and Learjet 31. Like LifeMed Alaska and Guardian Flight, Airlift Northwest's membership program AirCare is designed to cover the patient responsibility portion of air ambulance service. Airlift Northwest's flight nurses have certifications in cardiac life support, pediatric life support, trauma care, and neonatal resuscitation. Airlift Northwest's AirCare membership costs \$99 for Southeast Alaska residents. The company also offers a vacation membership to those visiting Southeast Alaska that costs \$80 for three months of coverage (2018 cost).

Out-of-State Air Medical Operators Serving Alaska

In addition to the companies that have aircraft and medical staff based within Alaska, several other national and global air medical companies also serve the state. AirCare1 operates throughout the world, and in Alaska has flown to nearly 40 different airports. AirCare1 is not an emergency response operator, however, and only provides pre-planned medical transport flights for its customers. Similarly, REVA is a company with bases throughout North and South America that provides pre-planned medical transport to customers. Both Air Ambulance Network and Air Ambulance Worldwide provide services including standard patient transfer, critical care transport, commercial medical escort, and international services. While none of these companies can provide services as tailored to Alaska residents and visitors as those discussed above, they nonetheless provide additional options for those in need of medical transport.

ADOT&PF Healthcare Priorities

When evaluating and prioritizing potential airfield improvement projects, ADOT&PF gives each project a score within the 15 criteria of its Aviation Project Evaluation Criteria. Health and Quality of Life (Access to Basic Necessities) is one of the most significant factors considered and ranks second among these 15 criteria after only Safety. Within the project evaluation process, an airfield project receives points towards prioritization if it provides a significant or moderate contribution to improved health or quality of life.

These contributions to health and quality of life include access to healthcare and emergency services, making improvements at airports with air medical bases and surface access to hospitals a particularly high priority for ADOT&PF. For example, Dillingham Airport is a less than 10-minute road drive to the Level IV Trauma Center at Kanakanak Hospital, a key healthcare center for southwest Alaska and the Bristol Bay region. From October 2012 through September 2013, 96 emergency medevac operations passed through Dillingham Airport, emphasizing the importance of the airport to Alaska's healthcare system and the healthcare of Alaskans and visitors. Six air medical operations could not fly from Dillingham over this time due to weather conditions, further emphasizing the need for improved airfield facilities and weather reporting equipment for Alaska's airports.

Several other Alaska airports are similarly crucial to healthcare in the state. Bethel Airport, a hub for many communities in the Yukon-Kuskokwim Delta region, is a very short drive to the Yukon Kuskokwim Delta Regional Hospital, a Level IV Trauma Center. Another Level IV Trauma Center, Samuel Simmonds Memorial Hospital in Barrow, is a short drive to Wiley Post-Will Rogers Memorial Airport. Potential airfield improvements at such airports undoubtedly score high in the health and quality of life category of ADOT&PF's Aviation Project Evaluation Criteria.

Medical and Healthcare Summary

As with all aspects of life in Alaska, aviation is extremely important to healthcare. Over 80 percent of the state's communities are inaccessible by road, meaning that residents rely on air medical operators for transport to hospitals for such things as routine care and surgery. Hospitals equipped for emergency services are located throughout Alaska, but with only two facilities certified as Level II trauma centers—and both located in Anchorage—many trauma patients require air transport for anything beyond stabilizing treatment.

Air ambulance aircraft have been specially modified for the transport of trauma patients, and act as mobile intensive care units. Both helicopters and fixed-wing airplanes are used as air ambulances, with the former best for short distance flights (or remote landings) and the

latter for long distance, high speed transfer. Common helicopter air ambulances include several Bell and Eurocopter models, that typically have a range of between 300 and 400 nautical miles. Common fixed-wing air ambulances include the King Air and Learjet, typically have ranges of approximately 1,800 nautical miles but may travel further depending on the actual aircraft.

The cost of air medical transport would be financially crippling for patients without the assistance of insurance, Medicare, and air medical memberships. Typically, insurance or Medicare will pay approximately 80 percent of the total cost, but a patient copay on a \$100,000 cost is still a huge out-of-pocket expense. Membership to an air medical provider acts as a secondary insurance that protects against the huge out-of-pocket patient expense, usually for a low annual fee.

To fit the state's need, Alaska is served by several air medical companies that offer membership options, some of which have bases located throughout the state. LifeMed Alaska and Guardian Flight each have seven air ambulance bases in the state, with the former offering both helicopter and fixed-wing air ambulance services. UW Medicine's Airlift Northwest offers service focused on Southeast Alaska and offers a membership package for vacationers to Southeast.

These air medical operators, as well as new providers like Medevac Alaska and other nationwide companies that operate in Alaska but do not have established bases, ensure that Alaskans will continue to have access to air medical transport no matter how remote their location.

Tourism and Remote Access

Alaska is home to one of the most unique tourism industries in the United States. Nowhere else has the breadth and depth of cruising, flightseeing, hunting, fishing, camping, hiking, and wildlife viewing. The state is home to 6 of the 10 largest national parks in the nation, including the largest, Wrangell-St. Elias. Alaska contains 55 million acres of national park land, or about 65% of all the designated national park land in the United States, and most of this park land is only accessible by air.

In total, nearly 90 percent of Alaska is owned by the federal or state government, which contributes to the need for access to remote areas and creates unbridled opportunities for outdoor recreation. This remoteness and expansiveness is the very thing that makes Alaska so unique. Alaska's highway and road network is extremely limited, and many parts of the state are inaccessible by any mode other than aviation.

This document summarizes many of the characteristics of Alaska's unique tourism market, its remote nature, and its reliance on aviation for both access and activities. This overview includes a profile of the state's large air taxi industry.

Alaska Tourism Statistics

The Alaska Department of Commerce, Community, and Economic Development (DCCED) periodically commissions updates to the Alaska Visitors Statistics Program (AVSP). These studies use traffic counts at exit points and a massive surveying effort to assess the volume of visitors to the state in addition to the nature of their arrival, length of stay, activities, spending, and many other factors of their time spent in Alaska. The most recent of these studies is AVSP 7, published by McDowell Group in 2017. This document covers the May through September summer tourism season of 2016. The following sections provide a summary of the study's findings.

During the 2016 summer tourism season, an estimated 1.85 million out-of-state visitors came to Alaska. In 2016, Alaska's total residential

population was just under 740,000, not even half of the number of visitors to the state in just the peak tourism season alone. The 1.85 million visitors in summer 2016 was the highest volume of visitors ever recorded entering Alaska during a single season, a 21 percent increase over the number of visitors the state experienced in 2010, the year in which tourism and the economy largely returned to normal following the recession. Of the total 1.85 million visitors, 79 percent visited for vacation or pleasure, and an additional 13 percent to visit friends or family. Only five percent reported visiting purely for business reasons.

As shown in Figure 17, the Southeast and Southcentral regions of Alaska received the greatest number of visitors. Due in part to the cruise ship activity in the region, Southeast Alaska saw over 1.2 million visitors in 2016, followed by Southcentral, which includes Anchorage, with 975,000 visitors. Interior Alaska, with destinations such as Denali National Park, received approximately 543,000 visitors, while the more remote Southwest and Far North regions experienced far less tourism. Each region of Alaska requires its own form of access. Southeast Alaska is typically accessed via either cruise ship—100 percent of surveyed cruise visitors visited Southeast— or aviation, as there is no direct road access. While in Southeast, visitors may take smaller air taxi flights between islands and destinations. Visitors to Southcentral primarily fly into ANC— 78 percent of visitors that arrived in Alaska via air travel reported visiting Southcentral— before renting cars and driving to destinations such as Denali or Fairbanks.

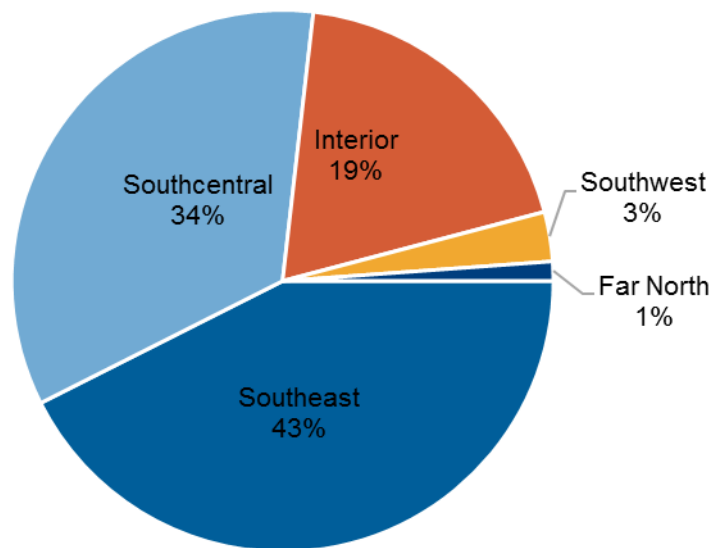


Figure 16. Visitors by Alaska Region, 2016

Source: McDowell Group, 2017.

Table 11 displays top destinations reported by survey takers, including all destinations and those only reported as overnight stays. It should be noted: this data is skewed by the inclusion of cruise ship passengers making day stops at several Southeast Alaska cities such as Juneau,

Ketchikan, and Skagway. For overnight stays, the only destinations with at least a 10 percent response rate were Anchorage, Denali National Park, Fairbanks, and Seward, all destinations located outside of Southeast Alaska.

Table 11. Top Alaska Destinations, 2016

All Destinations		Overnight Stays Only	
City or Park	Percent of Visitors (%)	City or Park	Percent of Visitors (%)
Juneau	61	Anchorage	36
Ketchikan	58	Denali National Park	17
Skagway	48	Fairbanks	16
Anchorage	47	Seward	10
Glacier Bay National Park	29	Talkeetna	6
Seward	23	Homer	6
Denali National Park	28	Palmer/Wasilla	5
Fairbanks	17	Kenai/Soldotna	4
Hoonah/Icy Strait Point	13	Other Kenai Peninsula	4
Talkeetna	11	Juneau	4

Source: McDowell Group, 2017.

A majority of the 1.85 million visitors, 55 percent of the total, arrived via cruise ship, while an additional 40 percent arrived via commercial or general aviation air travel.⁴ Only five percent of the total arrived via highways or ferries. However, those arriving via air travel stay longer in the state than those arriving via cruise, an average of 10 days total compared to 8.4 days, respectively. Those arriving by air are also far more likely to stay in a hotel or lodge than those arriving by cruise ship. Of those that arrived in Alaska by air, 55 percent reported staying in a hotel and 20 percent reported staying in a rustic, backcountry lodge often directly associated with a tourism or air charter company. Those arriving via cruise naturally spend most of their nights on the ship, but the

study found that 25 percent extend their stays in the state to stay in hotels and 12 percent stay in lodges.

AVSP 7 found that visitors to Alaska spent an average of \$1,057 per person per trip, or \$115 per person per night. Figure 18 provides an overview of how visitors to Alaska spend this money while in the state, with expenses split evenly over several categories including vacation packages, tours/activities/entertainment, shopping, food and beverage, and lodging.

⁴ The ASVP classifies air visitors as those that enter and leave Alaska via air and highway/ferry as those that enter and leave Alaska via highway or ferry (or a combination of the two). Cruise ship visitors include those that both enter and leave the state via cruise ship or those that enter or leave on a cruise ship and use another mode for the other end of the trip.

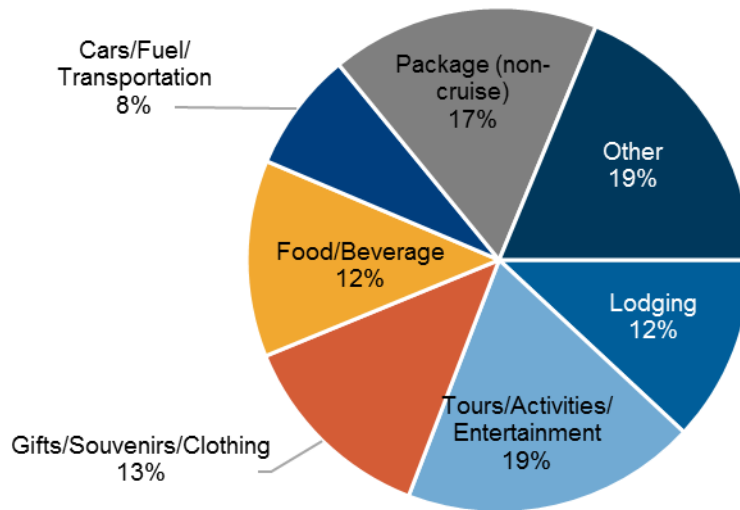


Figure 17. Spending by Alaska Visitors, 2016

Source: McDowell Group, 2017.

Table 12 shows the dollar amounts of these activities and the total for Alaska assuming 1.85 million visitors. In total, ASVP 7 estimated that Alaska visitors spend over \$1.9 billion during the tourism season of 2016. In 2016, Alaska's gross domestic product (GDP) was approximately \$47.5 billion dollars, meaning

that the spending of visitors during the summer tourism season alone accounted for over 4 percent of the state's total GDP (BEA 2018). The highest volume spending categories were tours/activities/entertainment with over \$370 million total and non-cruise tour packages with over \$336 million total.

Table 12. Spending by Alaska Visitors and Alaska Total, 2016

Spending Category	Spending Per Visitor (\$)	Percent of Trip Total (%)	2016 Alaska Total (\$)
Lodging	126	12	233,100,000
Tours/Activities/Entertainment	200	19	370,000,000
Gifs/Souvenirs/Clothing	137	13	253,450,000
Food/Beverage	133	13	246,050,000
Cars/Fuel/ Transportation	81	8	149,850,000
Package (non-cruise)	182	17	336,700,000
Other	198	19	366,300,000
Trip Total	1,057	100	1,955,450,000

Source: McDowell Group, 2017.

Visitors to Alaska take part in a wide array of activities while in the state. AVSP 7 asked survey participants if they took part in over 20 different activities, from shopping and cultural activities to hiking, flightseeing, and wildlife viewing. Figure 19 summarizes the results of this survey effort, with transportation-related activities shown in red. The most commonly reported activity was shopping, which was reported by 75 percent of all survey respondents and largely skewed by cruise ship

arrivals. Many of the other most popular activities are far more specialized for Alaska, including wildlife viewing (45 percent), Alaska's unique cultural activities such as museums, native tours, and gold panning (39 percent), day cruises (39 percent), and hiking or nature walking (34 percent). Many of these activities take place at remote locations, requiring further air travel once tourists have arrived in Alaska. Flightseeing was tied with tramway for the ninth most reported activity at 13 percent.

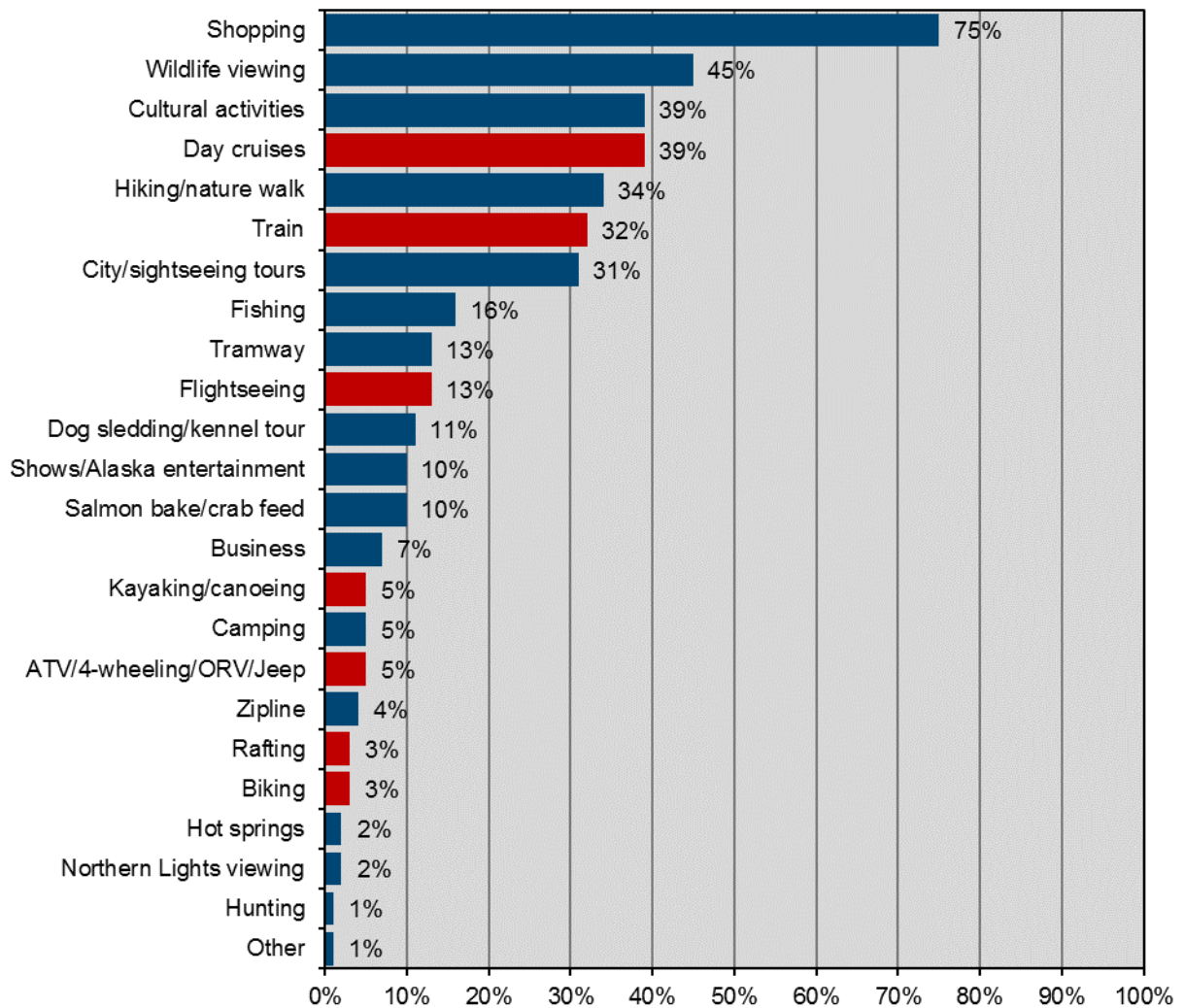


Figure 18. Activities by Alaska Visitors, 2016
Source: McDowell Group, 2017.

AVSP 7 provided a comprehensive overview of the May to September peak tourism season, but off-peak tourism in Alaska has grown significantly in recent years. Aurora viewing is one of the most popular winter tourism

activities for the state, as the northern lights begin showing up in late August and continue through March, long after the peak tourism season is over. Other popular winter tourism activities include cross-country and downhill

skiing, snowshoeing, snowmobiling, ice fishing, and ice skating. Anchorage is home to the 10-day Fur Rendezvous or “Fur Rondy” Festival, a gathering founded in the 1930s that is held every March. Fur Rondy features uniquely Alaskan events ranging from the Running of the Reindeer and snowshoe softball games to an outhouse race and sled dog races, among many others. The growth of Fur Rondy is indicative of the growth of winter tourism in many parts of Alaska. In 2003, the festival brought in approximately \$18 million in profits, but by 2013 had grown to \$30 million, a volume of spending that has been largely maintained in recent years (YourAlaskaLink.com 2016; YourAlaskaLink.com 2017).

Farther north is the Fairbanks North Star Borough, a major setting-off point for interior and northern Alaska winter tourism such as aurora viewing that continues to experience increases in winter tourism as peak season tourism numbers stay relatively flat. In 2008, off-peak tourism from October through April accounted for only 26 percent of the year’s total bed tax collections in the borough, but by 2016 this percentage had increased to 35 percent. The borough’s 2016 collections were over \$5.2 million, only the second time bed tax collections had exceeded \$5 million. Tourism analysts in Fairbanks attribute much of this growth to aurora viewing, but other attractions such as the World Ice Championships and Chena Hot Springs also bring significant visitors (Alaska Journal of Commerce 2017).



Mt. Denali. Source: DOWL.

Accessing Alaska’s Parks and Recreation Areas

Alaska is home to the largest volume of public lands in the country. The state has 24 National Park Service Units that operate parks, preserves, and monuments throughout the state (Figure 20). Alaska is home to both the country’s largest national park in Wrangell-St Elias National Park & Preserve, which is 13.2 million acres in size and a UNESCO World

Heritage Site, and to the largest state park in Wood-Tikchik State Park, which is 1.6 million acres in size (15 percent of the United States’ total state park area). Figure 20 also shows the locations of Alaska’s various state parks and recreation areas. In total, the Alaska Department of Natural Resources (DNR) Division of Parks and Outdoor Recreation operate and maintain 97 state parks, state recreation areas, state recreation sites, and state historic sites within the state.

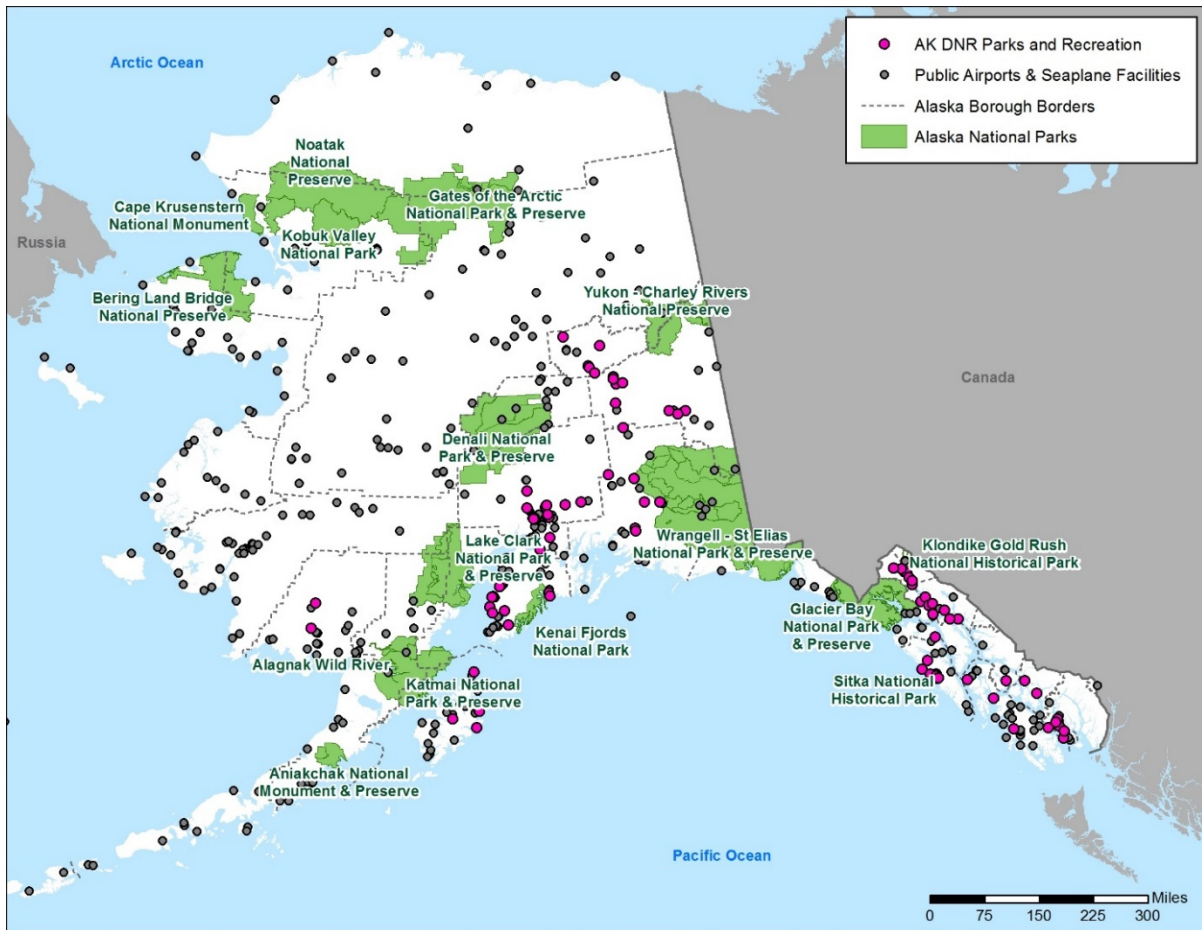


Figure 19. Alaska National Parks and Public Lands

Source: CDM Smith, 2018 and National Park Service, 2018.

Tourism in Alaska goes far beyond the state's national and state parks, but perhaps nothing illustrates the remote nature of tourism in the state like these areas. Table 13 lists Alaska's national parks, their estimated number of visitors in 2017, and the level of surface access to each. These parks, and those with no surface access, typically require visitors to land on a remote airstrip or seaplane base in a small aircraft such as a single-engine Cessna or DHC-2 Beaver floatplane. Some of the state's busiest

national parks—Glacier Bay and Sitka—are only accessible via an isolated road network, but also visited frequently by cruise ship. However, even the parks located on the highway network typically require out-of-state and foreign visitors to initially arrive via air travel, while the huge size of several of these parks means that many remote areas are only accessible via remote airstrips and seaplane bases.

Table 13. Alaska National Parks, Visitor Volume, and Surface Access

National Park	Total Combined Area (acres)*	2017 Visitors	Surface Access
Alagnak Wild River	30,887	Data unavailable	None
Aniakchak National Monument & Preserve	602,599	100	None
Bering Land Bridge National Preserve	2,691,320	2,642	Roads
Cape Krusenstern National Monument	643,153	15,000	Roads
Denali National Park & Preserve	6,028,490	642,809	Highway Network
Gates of the Arctic National Park & Preserve	8,472,420	11,177	Roads
Glacier Bay National Park & Preserve	2,647,000	547,057	Isolated road network
Katmai National Park & Preserve	3,931,630	37,818	Isolated road network
Kenai Fjords National Park	547,484	303,598	Highway Network
Klondike Gold Rush National Historical Park	12,675	906,485	Highway Network
Kobuk Valley National Park	1,751,120	15,500	Roads
Lake Clark National Park & Preserve	4,008,130	22,755	Isolated road network
Noatak National Preserve	6,563,600	17,000	Isolated road network
Sitka National Historical Park	43	194,880	Isolated road network
Wrangell-St Elias National Park & Preserve	13,125,100	68,292	Highway Network
Yukon-Charley Rivers National Preserve	2,520,780	952	Isolated road network

Source: CDM Smith, 2018, Google Maps, 2018, and National Park Service, 2018.

*"Highway network" means at least parts of the park are accessible via Alaska's main highway system.

*"Roads" means the park is accessible via other roads, but not highways.

*"Isolated road network" refers those parks that are only accessible via a disconnected road network, such as those found on an island.

*Includes combined park and preserve area, where applicable.



Aleknagik Airport. Source: ADOT&PF.

Of the 97 parks and recreation sites operated by Alaska DNR, 30 are not accessible by any road, and require air or boat access. Many of those that are on the state's road system are only accessible by car in a limited fashion. For example, of the six parks located in the Kodiak Region, three are on Kodiak Island's road system, but a traveler must first reach the island via plane or boat. In many cases, tourists desiring to reach these parks or the most remote of areas will travel on a small air carrier or air taxi flight to reach their final destinations.

Like nearly every aspect of the Alaska economy, tourism is incredibly dependent upon the state's aviation network. With over 400 FAA-

recognized public-use airports, seaplane bases, heliports, and backcountry airstrips, Alaska has the most widespread aviation network of any state in the nation and in North America. Table 14 details the 22 airports located within the boundaries of Alaska's national parks and preserves. Due to its immense area, it is unsurprising that several of these airports are located within the 13 million acres of Wrangell-St. Elias National Park and Preserve. Many more Alaska aviation facilities are located in close proximity to national parks and preserves. In total, 176 public airports, seaplane bases, and heliports are located inside or within 50 miles of a national park or preserve boundary.

Table 14. FAA-Recognized Airports Located Within Alaska's National Parks and Preserves

FAA ID	Associated City	Facility Name	Ownership	Use	National Park/Preserve
AKP	Anaktuvuk Pass	Anaktuvuk Pass	Public	Public	Gates of the Arctic
CZN	Chisana	Chisana	Public	Public	Wrangell-St Elias
INR	Denali National Park	McKinley National Park	Public	Public	Denali
KGZ	Glacier Creek	Glacier Creek	Public	Public	Wrangell-St Elias
4Z5	Horsfeld	Horsfeld	Public	Public	Wrangell-St Elias
5Z5	Kantishna	Kantishna	Public	Public	Denali
Z90	Kantishna	Stampede	Public	Public	Denali
5Z9	Katmai National Park	Lake Brooks (Seaplane Base)	Public	Public	Katmai
LKK	Kulik Lake	Kulik Lake	Public	Public	Katmai
4AK3	Long Lake	Long Lake	Private	Private	Wrangell-St Elias
MYK	May Creek	May Creek	Public	Public	Wrangell-St Elias
0AK5	May Creek	Young Creek	Private	Private	Wrangell-St Elias
AK0	McCarthy	Jakes Bar	Public	Public	Wrangell-St Elias
15Z	McCarthy	McCarthy	Public	Public	Wrangell-St Elias
AK31	McCarthy	Swift Creek	Private	Private	Wrangell-St Elias
IBN	Nabesna	Devils Mountain Lodge	Private	Private	Wrangell-St Elias
TP0	Port Alsworth	Port Alsworth	Private	Private	Lake Clark
AK51	Port Alsworth	Wilder/Natwick LLC	Private	Private	Lake Clark
9AK0	Tok	Sportsmens Paradise	Private	Private	Wrangell-St Elias
3AK	Yakutat	Dry Bay	Public	Public	Glacier Bay
AK76	Yakutat	East Alsek River	Public	Public	Glacier Bay
L20	Yukon Charley Rivers	Coal Creek	Public	Public	Yukon-Charley Rivers

Source: CDM Smith, 2018 and FAA, 2018b.

Tourism Air Taxi

A large industry of air taxi and charter flight companies supports the tourism industry in Alaska. These businesses range from air taxi companies that fly visitors to remote locations throughout Alaska's national parks and preserves to those that offer specific excursions and nature tours. The National Park Service maintains a directory of commercial visitor service providers associated with each national park, and divides providers by the type of service provided, including air taxi service. In total, Alaska's national parks and reserves are served by nearly 90 of these businesses, with many of the air taxi or charter operators serving several parks and many more serving state parks. However, this is less than a third of the total 310 air carrier companies operating in Alaska, many of which are air taxi companies.

Table 15 lists the Alaska national parks with the most air taxi company partnerships, according to the National Park Service. With 40 air taxi companies serving it, Katmai National Park and Preserve is served by the most companies, followed by Lake Clark National Park and Preserve. Both parks contain a wide variety of natural features, from mountain ranges and glaciers to large freshwater lakes and lowlands for wildlife viewing. Such a variety of features

makes them ideal for a full range of air taxi and charter services.

Alaska air taxi companies offer a variety of services and activities to customers, ranging from scheduled flights and set vacation packages to air tours and custom charter vacations. Many of these businesses offer vacation packages that include charter service from Anchorage or Fairbanks and aerial excursions to remote locations.

Aviation is essential for tourists visiting both Alaska's most popular destinations and its most remote and exclusive. Alaska draws some of the most adventurous vacationers in the world, many of which seek a remote, isolated experience in which they are flown to a distant location and left by the pilot for a long period of time to hunt, fish, backpack, or a combination of several activities. In total, 86 percent of the air taxi companies serving Alaska national parks provide some form of remote drop-off service, with many other air taxi companies also likely providing these services (Information derived from air taxi company websites). Companies that serve northern preserves and parks such as Bering Land Bridge National Preserve and Noatak National Preserve offer travel packages for drop-off hunting, fishing, and backcountry wilderness camping.



View of Ruth Glacier Flightseeing from Cockpit. Source: DOWL.

Table 15. Alaska National Parks Served by the Most Air Taxi/Charter Companies

National Park	Number of Associated Air Taxi Companies
Katmai National Park & Preserve	40
Lake Clark National Park & Preserve	33
Denali National Park & Preserve	14
Wrangell-St Elias National Park & Preserve	14
Kobuk Valley National Park	13
Noatak National Preserve	11
Gates of the Arctic National Park & Preserve	10
Aniakchak National Monument & Preserve	8
Glacier Bay National Park & Preserve	8
Kenai Fjords National Park	8
Yukon-Charley Rivers National Preserve	8
Bering Land Bridge National Preserve	7
Alagnak Wild River	6
Cape Krusenstern National Monument	6

Source: National Park Service, 2018.

Most air taxi companies offer multiple services. When looking at all air taxi businesses serving Alaska's national parks, the most common activity other than point-to-point air taxi service is flightseeing (Figure 21). Flightseeing is aviation sightseeing and is offered by over 50 companies. Flightseeing is an easy way to take in many of the state's most breathtaking views, from the glaciers and islands of Southeast Alaska to the mountainous expanse of Denali. Flightseeing tours are often guided by the pilot, who offers detailed information about the terrain, history, wildlife, and other natural features of the area being toured. Flightseeing tours may also include mid-tour landings on glaciers or at remote locations for a meal or other activity that is included as part of the charter package. Many flightseeing companies

are based at hub airports or nearby at smaller seaplane facilities or airstrips, making flightseeing to many destinations accessible for Alaska's visitors.

The other most common activities are wildlife viewing (57 percent) and hunting or fishing excursions (53 percent).

One thing uniting many of the businesses is their ability and willingness to work with customers to craft custom vacations and excursions. Forty-nine percent of the air taxi companies have a form of custom charter service. This may be for adventure vacationers taking long, self-guided backpacking tours, or for big game hunters wanting to be dropped off in a particularly remote part of Alaska. Many of

these businesses specifically emphasized their willingness to work directly with customers to deliver the vacation experience they desire. This

capability begins with the freedom of business pilots to fly when and where they are asked on demand.

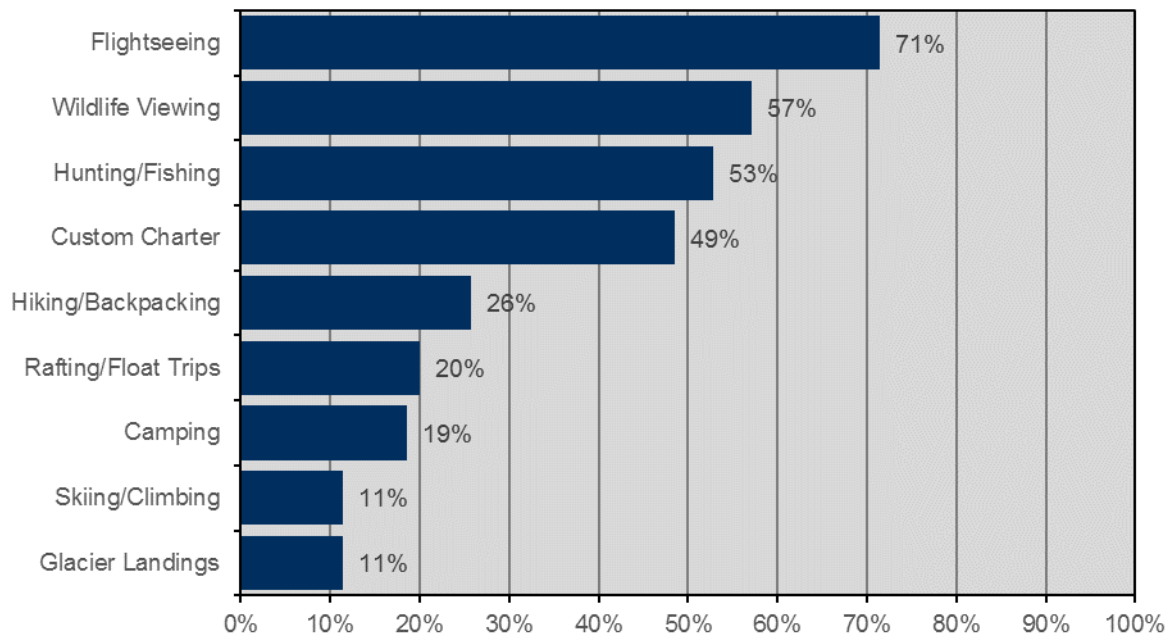


Figure 20: Most Common Tourism Flight Services Provided by Air Taxi Companies

Sources: Air Taxi Company Websites, 2018 and National Park Service, 2018.

Many of these companies provide additional services and excursions beyond air taxi and charter. Several own and operate remote lodging, allowing tourists to ski or explore during the day but enjoy the comfort of a lodge at night. For example, Ultima Thule Lodge (located on the Chitina River, south of Ultima Thule Peak in Wrangell-St. Elias National Park and Preserve) offers various aviation excursions including flightseeing and wildlife viewing in addition to Alaska-specific excursions such as spring skiing and the Iditarod. Ultima Thule Outfitters owns and operates a landing strip adjacent to the lodge.

Air Taxi Companies

As stated, 310 air carrier companies serve Alaska, with many of these being air taxi companies. Many of the activities offered by Alaska air taxi companies fall under the umbrellas of flightseeing or remote drop-off. Flightseeing may also include glacier landings or wildlife viewing, while remote drop-off services are typically associated with most of the

remaining services mentioned above, including hiking and backpacking adventure tourism, remote location skiing, hunting and fishing trips, and rafting. Many air taxi companies provide several services, including a combination of flightseeing and remote drop-off (sometimes on the same charter). The following sections provide specific examples of air taxi companies with specialized flightseeing and remote drop-off services, in addition to other activities.

Denali

As one of the most famous and visited sites in Alaska, flightseeing around Denali is in high demand during the peak summer months. Flightseeing around Denali typically includes tours over sites such as the Denali peak, Mount Foraker, Mount Hunter, Harper Icefall, Ruth Glacier and the Great Gorge, and several other glaciers. Denali and its surrounding regions are served by many air taxi companies that offer a wide variety of tours. Air tours may range from 20 minutes to over 100 minutes and include glacier landings. Some of these companies also provide flightseeing viewing of the Iditarod.

Southeast Alaska

Because it includes mountainous expanses, glaciers, icefields, the Tongass National Forest, and the ocean, Southeast Alaska offers a wide variety of possibilities for visitors. The presence of Juneau International Airport and the region's many deep-water ports for cruise ships also provide a multitude of entry points for visitors before they embark on more specialized activities.



Floatplane glacier flightseeing near Juneau.
Source: CDM Smith

The Juneau Icefield is 1,500 square miles in total area, and companies provide extensive flightseeing of the over 40 large valley glaciers and other small glaciers emerging from it. Like flightseeing tours at Denali, those in Southeast Alaska may also include glacier landings or other additional activities. Air taxi companies operating in Southeast also offer services such as bear viewing and transport to US Forest Service cabins.

Northern Alaska

The northern regions of Alaska are home to National Parks and Preserves such as Noatak, Gates of the Arctic, and Kobuk Valley, and attract some of the more adventurous hunters and backpacking vacationers. Wildlife viewing excursions and aurora viewings are also popular. Hunters come to northern Alaska seeking caribou, Dall sheep, moose, and black and grizzly bears on both chartered and custom trips. Fishing is also a popular activity for visitors to the region. Beyond hunting, air taxi companies operating in northern Alaska offer experiences such as aurora viewing, Arctic Circle boating, and polar bear viewing.

Other Areas Served

These are but a few examples of the types of services air taxi companies offer tourists in Alaska. Visitors may choose trips for wildlife viewing of moose, bears, seals, and bald eagles. Air taxi operators make regular trips to such locations as Lake Clark National Park, Wolverine Creek, the Wrangell Mountains, Prince William Sound, and Yakutat Bay, among others. Other companies offer bear hunting excursions on Kodiak or a variety of fishing trips. As stated, many companies are willing to design a customized Alaska trip that is as unique as the individual visitor.

Air Taxi Trends and Concerns

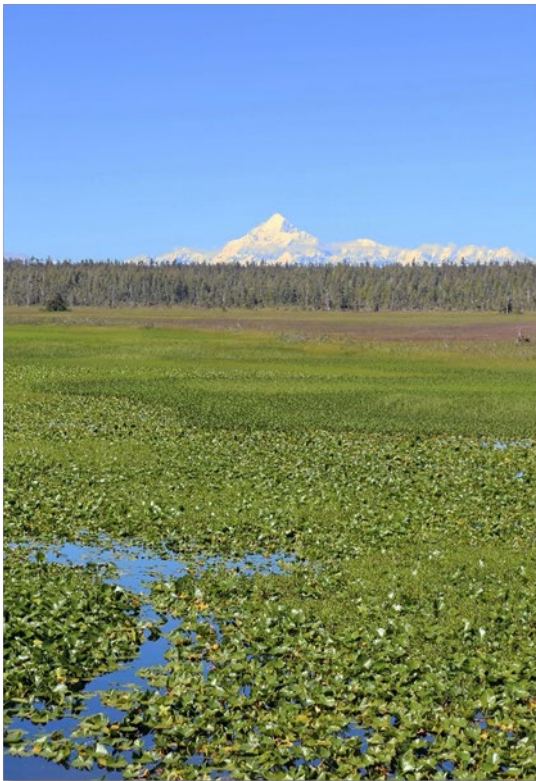
A survey of Alaska aviation stakeholders and interviews with air taxi companies revealed that companies and stakeholders share certain concerns about the aviation industry in Alaska. The following highlight some of the more commonly reported concerns:

- The fluctuating cost of fuel can impact air taxi companies' bottom lines, as vacation packages often carry a set price.
- Unpredictable weather is always a concern and can cause delays for both short flightseeing tours and longer air taxi trips.
- Air taxi companies making short trips to remote locations and national parks may sometimes have a similar effect as cruise tourism. It can cause a brief saturation of visitors without a huge influx of revenue for remote communities and can take business away from the air taxi and lodging companies located in these locations.

Tourism and Remote Access Summary

Alaska provides some of the most unique tourism experiences in the United States, and much of this would be impossible without the state's widespread aviation network. A review of the Alaska Visitors Statistics Program (AVSP) revealed the following about tourism in Alaska:

- Southeast Alaska is the most popular destination, largely due to cruise ship arrivals, with cities such as Juneau and Ketchikan being the most visited sites in the state. However, when accounting for only overnight stays, destinations such as Anchorage and Denali National Park are more popular.
- Alaska visitors spent the most (19 percent of total) on tours, activities, and entertainment, followed by non-cruise packages (17 percent) and shopping (13 percent).
- The most popular activities were shopping (75 percent of visitors), wildlife viewing (45 percent), cultural activities (39 percent), and day cruises (39 percent).



View of Mt. St. Elias from Yakutat. Source: DOWL.

Alaska has the largest volume of public lands in the country, and is home to the largest National Park, Wrangell-St. Elias National Park & Preserve. Remote areas of Wrangell-St. Elias and other destinations are accessible only by air, and access to these areas is made possible by Alaska's network of over 400 public-use airports, seaplane bases, heliports, and backcountry airstrips.

The state's tourist industry is supported by a large air taxi industry which serves destinations throughout Alaska. Other than scheduled trips to remote locations in the state, the most common activities by air taxi companies are flightseeing, wildlife viewing, and remote drop-off for hunting, fishing, and backcountry trekking. Many of these air taxi companies offer set vacation and excursion packages but also give visitors the option to design a unique, custom charter experience.

Cargo

Alaska is the home of one of the most unique and widespread air cargo environments in the world. On one hand, ANC is one of the busiest air cargo airports in the world and located within nine hours of 90 percent of the industrialized world. The airport is a major stopover, processing, and refueling point for North American and Asian cargo carriers. As explained later in this case study, expansive international cargo rights, enabled by the Stevens Amendment, further enable this volume of cargo at Anchorage as well as FAI. FAI serves as a nearby alternate airport to ANC, saving carriers fuel costs compared to what they would otherwise pay to use more distant alternate airports. Operating as an airport system, ANC and FAI are attractive and cost-effective locations for international flights.

On the other hand, most of Alaska's communities are accessible only by air, requiring air freight shipping via the bypass mail system for not only mail but everyday supplies and necessities. The bypass mail system, which is run by the USPS but operated by independent certified carriers, delivers goods to communities while reducing stress on USPS facilities.

The following sections discuss current trends in Alaska air cargo at all scales, including the intra-

state cargo, the bypass mail system, and international air cargo at Anchorage and Fairbanks.

Air Cargo Industry Trends

Carrier Trends

Recent years have seen dramatic changes in the airline industry, including several recent mergers, acquisitions, hub changes, and the emergence of Amazon air. Many of these events also have a significant impact on the air cargo industry. For example, Alaska Airlines acquired Virgin America in 2016 for \$2.6 billion. Before the merger, Virgin America did not offer air cargo service, meaning the belly space of its 70 Airbus aircraft went unused for cargo shipments. Alaska Airlines will use this belly space, expanding their total cargo capacity by 40 percent (200 million pounds) in the contiguous United States while also increasing destinations and flight frequency. Specifically, this acquisition expanded the airline's network within California (Air Cargo News 2018; Alaska Airlines 2018).

The air cargo industry has experienced several mergers and acquisitions in addition to Alaska Airlines' acquisition of Virgin America. Specifically, FedEx acquired TNT Express in 2015, BAX Global shut down its Toledo hub in 2011, DHL pulled out of its Wilmington, Ohio hub in 2009, and Kitty Hawk Aircargo went out of business in 2008.

In 2018, it was announced that Delta Air Lines and Korean Air had formed a joint venture partnership that would allow passengers to benefit from both airlines' comprehensive global aviation networks. This joint venture also includes a transpacific cargo co-operation wherein the airlines will share belly cargo space on each other's passenger aircraft flying between the United States and Asia. This creates a combined network of over 290 destinations in the Americas and over 80 in Asia, and a combined cargo volume of approximately 268 million tons (Delta Air Lines 2018).

Online shopping giant Amazon has also entered the air cargo industry with the launch of Amazon Air in 2015. The company is currently constructing a 920-acres facility at Cincinnati/Northern Kentucky International

Airport that will serve as its hub, with more than 200 flights scheduled per day at that site alone (Delta Air Lines 2018).

Trends in Modal Shift

For much of the new millennium, air cargo's percentage of total global freight tonnage reduced as carriers turned more to sea or surface transport. From 2000 through 2013, air freight's share of total global containerized or unitized cargo reduced from 3.1 percent to 1.7 percent as growth in air cargo slowed compared to other modes (Material Handling & Logistics, 2014). Demand for air cargo in relation to other modes is highest when there is a larger demand for rapid, just-in-time shipments, as when retailers are looking to restock (such as during reemergence from economic downturns).

While air cargo represents a relatively low volume by weight of global freight shipments, it makes up for this in the value of the goods transported. Shipment by air is preferred for low-weight, high value merchandise, such as electronics, but also for freight such as medical supplies. In total, the International Air Transport Association (IATA) estimates that air cargo transports over \$6 trillion in goods annually, or approximately 35 percent of global trade by value.

Air cargo's place in the global freight industry is potentially threatened by several current and expected developments. In the United States, a trend towards "reshoring"—the return of manufacturing jobs to the United States—would mean shorter shipping distances to domestic markets, and therefore a decreased need for air transport. Additionally, several emerging technologies may threaten air cargo's traditional advantage of speed. Autonomous vehicles, including trucks, can operate nonstop other than to refuel, greatly reducing delivery speeds. Hyperloop transportation, introduced by Elon Musk in 2013, has the potential to vastly increase freight shipment speeds over land, with Virgin Hyperloop One touting speeds over 600 miles per hour (Inbound Logistics 2017).

These technology trends are unlikely to impact air cargo in Alaska, at least in the short term. Cargo from Asia will still need to arrive in the United States before being distributed using other modes, while the limited road network

within Alaska means that any huge shift to driverless trucks will have little if any impact on the movement of goods within the state.

Intra-State Cargo and Mail in Alaska

Alaska contains not just one of the world's major cargo hubs, but an extensive intra-state cargo and mail network as well. Over 80 percent of Alaska's communities are inaccessible via the state's road and highway network, requiring air freight service for the delivery of everything from building materials and merchandise purchased online to small parcel mail and everyday necessities such as groceries and household supplies. Intra-state cargo and mail activity in Alaska may take the form of cargo being carried by carriers such as UPS and FedEx (or by smaller carriers contracted by the larger carriers) or mail sent by the USPS. Of the latter, most is sent through the state's bypass mail program. Most of the air cargo and mail destined for the rural airport system is funneled through Ted Stevens Anchorage International Airport, the primary cargo and passenger gateway for the state.

Bypass Mail

The Alaska Bypass Service (ABS) program is a program administered by the USPS that allows bulk shipments of palletized goods, largely foodstuffs, to be sent to rural Alaska

communities. These shipments "bypass" usual USPS postal sorting and handling, going straight from shipper to the recipient. Bypass mail is classified as non-priority parcel post mail by the USPS, which is a ground-based service, but is delivered via air to Alaska's communities. The ABS program is wholly unique to the state and was designed so that goods and supplies could be delivered to Alaska's communities efficiently and affordably

Justification for the ABS comes from the U.S. Constitution. A passage known as "The Postal Clause" (Article I, Section 8, Clause 7) empowers Congress "To establish post offices and post roads." This Clause was used to justify the establishment of the USPS and laws have since been established that ensure universal service to all communities. The USPS needed to establish an efficient way to service remote bush communities in Alaska, and thus, the bypass mail system was born.

While the ABS is operated under the umbrella of the USPS, shipments are often sent by independent carriers that contract with the USPS. Bypass mail starts in Anchorage or Fairbanks before moving to one of several regional hubs and then to one of over 120 bush points. Figure 22 depicts bypass mail connections in the state, with many bush points being quite distant from their regional hubs.

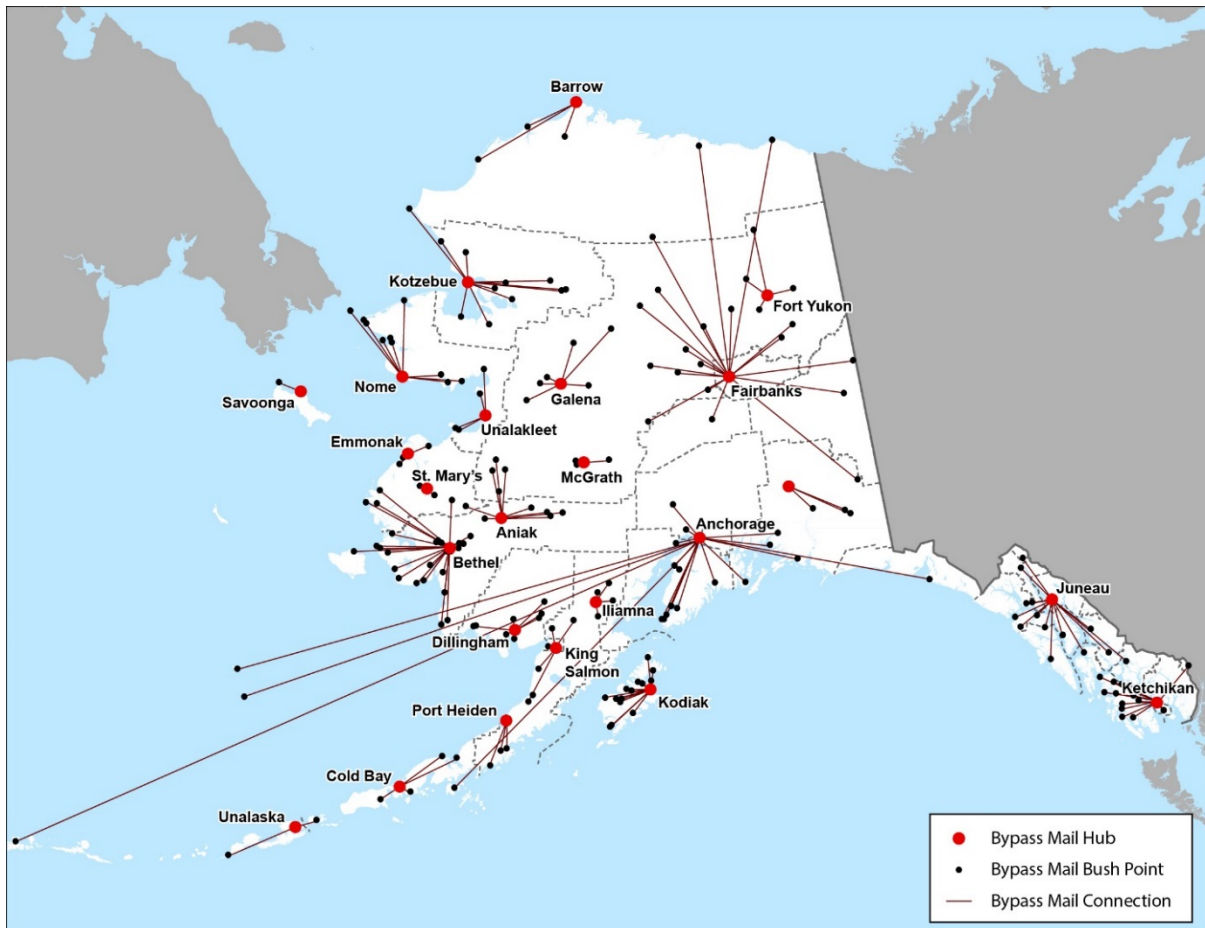


Figure 21: Bypass Mail Hubs and Bush Points

Note: lines not representative of actual routes or flight paths.

Source: USPS, 2018.

In terms of originating bypass mail, Anchorage International Airport accounts for half of the state's total weight by tonnage, with over 50,000 tons shipped in 2016 (Figure 23). This is because most bypass mail comes through Anchorage to be sorted before being shipped to other regional hubs (and then to final

destinations). The volumes depicted in this figure may include bypass mail that is shipped multiple times, adding to the weight totals of multiple airports. Following Anchorage, the next busiest airports by bypass weight were Deadhorse with 7 percent and Bethel and Juneau with 5 percent each.

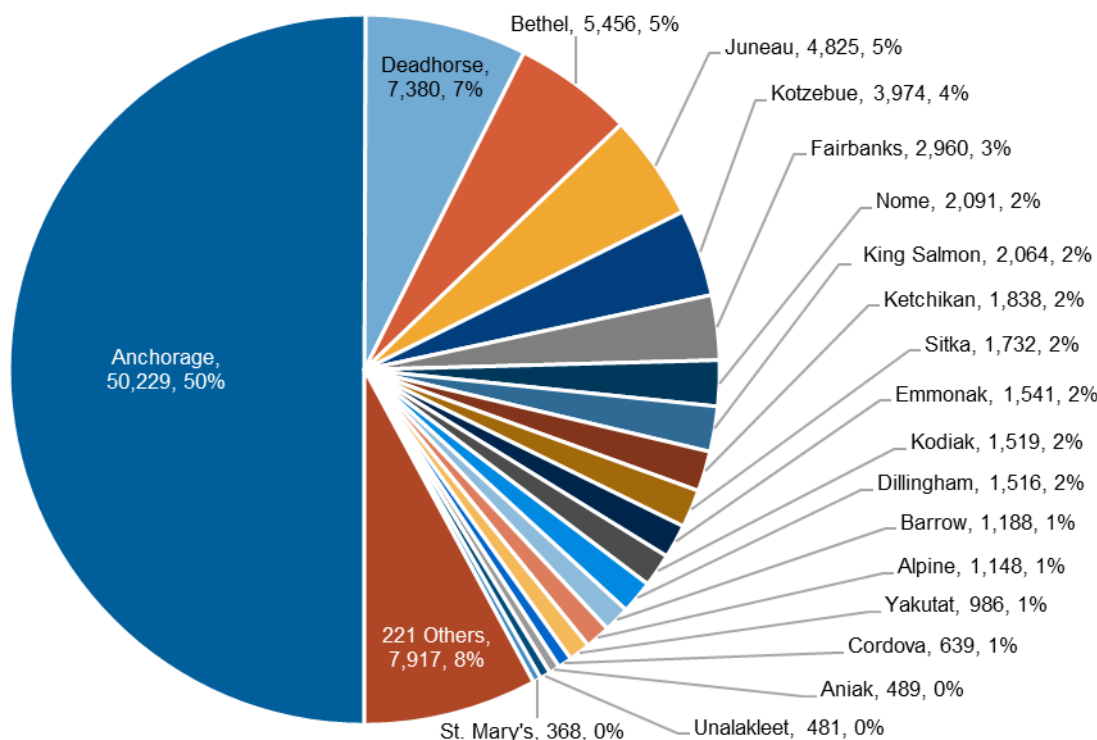


Figure 22: Intra-State Bypass Mail Tons by Alaska Origin Airport, 2016

Source: ADOT&PF, 2012.

To be shipped under USPS bypass mail, freight must be in palletized loads of at least 1,000 pounds but no more than 2,500 pounds. A single bypass shipment may contain multiple loads but cannot exceed 50,000 pounds in total. USPS certifies carriers to carry bypass mail, and carriers are then responsible for the weighing, labeling, and shipping of bypass freight. Bypass mail cannot include accountable mail (that requiring signature proof of delivery), hazardous materials, or building and construction materials. Items requiring refrigeration or freezing are allowed but mailed at the shipper's risk (USPS 2012).

Bypass mail recipients are typically retailers that receive goods at a subsidized shipping rate through the program. Retailers often offer goods at a significant markup, a facet of the bypass economy that has received criticism in the past. In 2011, the USPS Office of Inspector General published a report on the status of the program entitled "Alaska Bypass: Beyond Its Original Purpose." A section of this report offered a detailed analysis of retail prices throughout the system. The report noted that a bag of potato

chips that sold for \$4.29 in Anchorage was marked up to \$9.99 in Bethel, despite costing as little as 35 cents to send the bag. The shipping savings afforded to retailers is rarely, if ever, passed on to residents.

However, being a retailer that depends on the bypass mail system to supply its stock comes with a certain amount of risk. If a retailer purchases perishable items for resale, and those items do not sell, this is a sunk cost for the retailer. In addition, the retailer assumes the risk that shipments will arrive on time, which is less of a certainty when traveling by air during times of inclement weather than is surface shipping modes. Weather risks that prevent retail goods from arriving on time are increased by the lack of airport IFR infrastructure, including weather reporting.

Intra-State Cargo

In Alaska, intra-state cargo is all intra-state shipping not regulated under the umbrella of the USPS. This typically includes UPS and FedEx shipping to homes and businesses on planes

owned or contracted by the carriers. Because of the nature of shipping in Alaska, and the infrequency of flights to some of the more distant bush communities, intra-state cargo may find itself on the same contracted carrier flight as bypass mail.

Figure 24 summarizes the volumes of intra-state air cargo originating at Alaska airports in 2016, noting that a total of 264 facilities were originating airports for cargo that year. In total, Anchorage accounted for nearly half (44 percent) of the total weight by tons, with the next closest airport, Deadhorse, accounting for only 7 percent of the total.

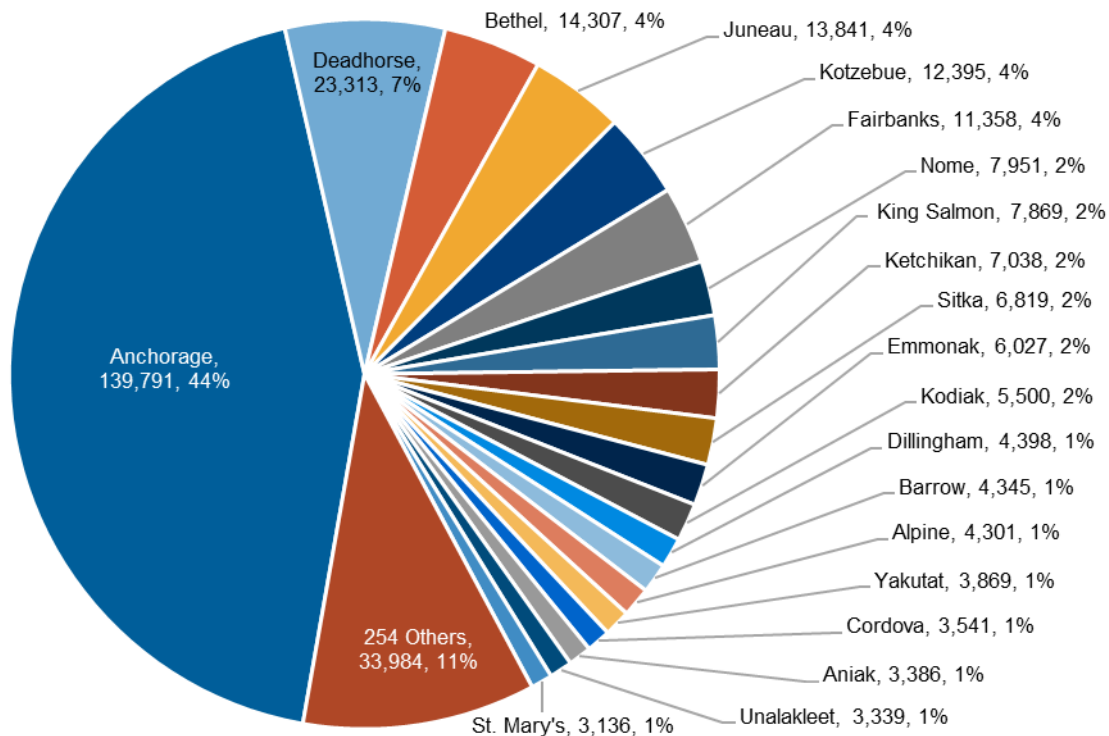


Figure 23: Intra-State Air Cargo Tons by Alaska Origin Airport, 2016

Source: ADOT&PF, 2012.

The emergence of e-commerce, particularly Amazon Prime, has been extremely beneficial to rural Alaska residents. A \$119 yearly subscription (\$99 prior to 2018) gives members unlimited free shipping on items purchased from Amazon. In the past, rural Alaska residents have relied on bypass mail for everyday supplies or have flown to Anchorage to shop at big box retailers such as Costco. Amazon Prime provides previously unforeseen shopping access for these residents for items ranging from kitchen supplies and clothing to furniture and automobile parts, while rural schools and governmental agencies may also use the service for supplies.

Increased Amazon Prime membership in Alaska has caused some businesses to adapt to keep up. For example, an Anchorage area Costco reported making more items available online while increasing bypass mail orders. Shipping companies, meanwhile, may need to adapt both to deliver Amazon goods and to remain competitive. It is unclear how much Amazon Prime may eventually change the shipping industry in rural Alaska, but it nonetheless represents a major shift (Anchorage Daily News 2016).

Unique Aspects of Cargo in Alaska

Cargo shipped through Alaska between Asia and the Americas includes everything from electronics and clothing to livestock and food. For example, a massive volume of the Asian-manufactured electronics is shipped to the United States through Anchorage, while the airport has also seen such unique travelers as the Budweiser Clydesdale horses. Intra-state cargo and bypass mail, meanwhile, may deliver everything from toothpaste to road infrastructure. The following provide a few specific examples of how cargo in Alaska is unique.

Cellular Phones

Anchorage International Airport is the major gateway for Asian-produced cellular phones on their path to the Americas. “If you own a smart phone, it came through Anchorage,” says John Parrott, former manager of Anchorage International Airport. When Apple released its most recent iPhone model, every phone came through Anchorage on FedEx.

Even when cellular phones are not fully manufactured in Asia, their various parts may pass through Anchorage on their way to a North American factory. BlackBerry, for example, ships phone components such as SIM cards and casings from Shanghai to Memphis by way of Anchorage. They are then assembled in Memphis where they can be distributed

throughout the United States using the only United States airport with more cargo activity than Anchorage (Parrott 2018). Three of the busiest cargo airports in the world combine to deliver one product (Air Cargo News 2018).

Antonov Design Bureau in Fairbanks

The Antonov Design Bureau’s AN-225 is the world’s largest cargo plane by capacity and the heaviest aircraft in the world with a maximum takeoff weight of 710 short tons. The aircraft flies cargo to and from FAI, utilizing the entirety of the 11,800-foot runway 02L/20R. Since being repurposed as a commercial cargo aircraft, the AN-225 has primarily been used to transport some of the heaviest cargo ever sent by air. It typically transports heavy vehicles to and from Fairbanks.

Infrastructure Materials on Intra-State Cargo

In most states, things we typically take for granted such as basic concrete and piping would be transported on trucks. In Alaska, most communities are isolated from the broader road network, but must still maintain their infrastructure and buildings. These communities then depend on the vast airport network for the delivery of such things as culverts, pipelines, and building materials. The image below depicts culverts being delivered to Edward G. Pitka Airport in Galena on an Everts Air Cargo DC-9.



Culverts being delivered to Galena by Everts Air Cargo. Source: Shawn Crites (ADOT&PF).

Alaska Salmon Exports

As a state with fewer than 750,000 permanent residents, Alaska does not contain the manufacturing workforce to make it a powerhouse in the export of locally-made goods. However, what items are created (or captured) in-state have the benefit of Alaska's air cargo industry to ship these items both domestically and internationally. For example, Alaska's river salmon industry helps to support

salmon season in the Pacific Northwest. On a single day in May of 2018, Alaska Air Cargo shipped 64,000 pounds of fresh salmon caught in the Copper River to Seattle on four flights. Alaska Air Cargo has partnerships with Alaska's three largest food processing companies (Trident Seafoods, Ocean Beauty Seafoods, and Copper River Seafoods) so that fish can be transported to Anchorage, Seattle, and onto other locations throughout the country.



Kalitta air cargo aircraft during technical stop at Anchorage International Airport. Source: Zane Giles.

Air Cargo Summary

Alaska has the most unique air cargo environment in the United States, and possibly the world. The combination of massive volumes of international cargo passing through the state and the reliance on small intra-state cargo carriers due to most Alaska communities being inaccessible by air is unlike anything in the lower 48 states.

Because it is located less than nine hours from most of the industrialized world, ANC is the fifth busiest cargo airport in the world, and the crucial through point for cargo traveling between Asia and the Americas. Expansive air cargo transfer rights for Anchorage and FAI help to enable this cargo activity. Eight of the top

twelve cargo carriers in Alaska are foreign based companies, with seven being based in Asia. The top company, Hong Kong-based Cathay Pacific Airways, moved over 1.7 million tons of cargo through Alaska by certified maximum gross takeoff weight (CMGTW) in 2017. UPS followed with over 1.6 million tons by CMGTW. International air cargo at Anchorage fluctuates throughout the year, peaking in November as retailers in the lower 48 states scramble to stock shelves for the holiday shopping season. Cargo at Fairbanks, meanwhile, peaks during Alaska's summer tourism season.

The state's extensive intra-state cargo network is necessary because over 80 percent of Alaska's communities are inaccessible by the road network. Intra-state air cargo involves both the

USPS's bypass mail system and non-USPS intra-state cargo carried by companies such as UPS and FedEx (or contracted by these companies to smaller carriers). Cargo carried intra-state nearly all funnels through Anchorage before heading out to regional hubs and onto remote bush communities. The bypass mail system is funded by the USPS and was established to help remote communities get access to everyday supplies and needs without overloading post offices. Bypass mail is carried by independent carriers certified by the USPS.

Alaska's air cargo environment is as unique as it is expansive. The state, particularly Anchorage, is poised to remain a major player in global air cargo, and while companies such as Amazon Prime are bringing changes to the intra-state cargo economy, what will not change is rural Alaskans' reliance on the state's expansive airport network for the acquisition of supplies necessary for everyday life in the bush.

Value of Alaska Bypass Service and Essential Air Service

Alaska Bypass Service

Using a hub-and-spoke air distribution system, the ABS program typically takes the form of moving goods from wholesale outlets located in Anchorage and Fairbanks to retail stores and private residences in rural communities only accessible by air for much or all of the year.⁵ Goods are collected and packaged by a shipper, inducted into the USPS system as mail using the computerized SAMS-AK system, and tendered to a commercial air carrier who assumes responsibility for transport and delivery to the addressee. USPS then reimburses the air carrier for the cost of transporting the goods from a hub airport to their final destination. The rate that USPS pays to an air carrier is based on the carrier's reported operating expenses; this used to set a fair and compensatory rate.

In addition to reimbursing air carriers for the costs of transporting the goods, USPS collects the postage that program customers (e.g., retail stores in rural communities) paid to authorized shippers (i.e., private firms in Anchorage and Fairbanks that gather and palletize the goods ordered by a customer, and deliver them to the designated carrier).⁶ Customers pay the same rates as ground-based parcel post (Northern Economics, Inc. 2013a). Goods shipped via the program must be ordered from shippers in minimum quantities of 1,000 pounds. Pallets generally travel the same routes and in the same planes as Priority Mail, Priority Mail Express, and First-Class mail.

The communities included in the ABS program are defined by USPS according to statutory authority. Approximately 140 off-road communities in the rural airport system are currently eligible, and 113 were participating as of 2013. The wide geographical distribution of these communities, together with the approximate volumes shipped, are shown in Figure 25. The ABS program provides community residents access to fresh food and basic supplies that they otherwise could not afford with higher air freight prices. Moreover, the ABS program means more frequent air passenger service and lower fares for residents because the revenues air carriers receive from the program help cover their operating and fixed costs (Northern Economics, Inc. 2013a).

While the ABS program costs are a concern for the federal government, the costs of building roads to remote Alaskan communities and shipping mail by road would be a far greater cost to the federal government. In 2013, the AASP estimated that the capital costs of building a road system in western Alaska would be about three times more than the cost of building the current airport system, and maintenance costs for a road system would be 4 to 5 times more.

⁵ An exception is Barrow. After being trucked to Deadhorse, goods are flown to the hub of Barrow and then distributed by air to other outlying communities.

⁶ Generally speaking, shippers can be broken out into two major categories: those that send and sell their own products (e.g., Sysco, Pepsi, Odom [Coca-Cola]) and those that bundle and send a variety of wholesale products sourced from various manufacturers (e.g., Northwest, Alaska Freight Service, ANICA) (Northern Economics, Inc. 2013a).

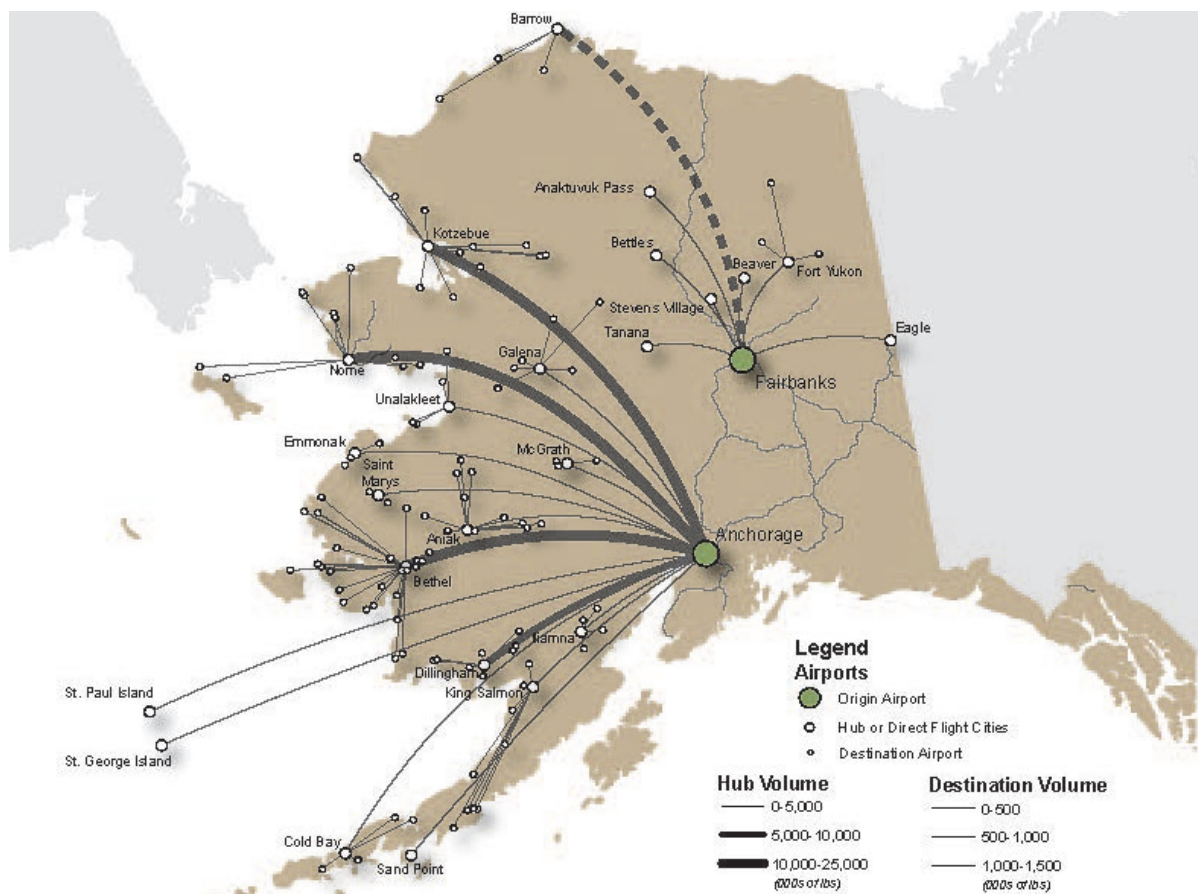


Figure 24. Alaska Communities Participating in the Alaska Bypass Service Program

Source: Northern Economics, Inc, 2013a.

Note: The communities included in Alaska Bypass are defined by the USPS according to statutory authority and are limited to those communities where air travel is the only means of providing Universal Service. The exception to this rule is Barrow. Bypass Mail to Barrow is trucked to Deadhorse and flown from Deadhorse to the Barrow hub then to outlying communities.

The volume of goods transported under the ABS program has increased substantially since the program's inception in 1972. Currently, an average of around 0.5 million pounds of goods are delivered to each eligible community every year; on a per capita basis this amounts to between 700 and 1,800 pounds of goods per person each year (Northern Economics, Inc. 2013a).

The absence of the ABS program would result in an increase in the price of goods and/or a smaller selection of goods in rural community stores. Based on current air cargo rates, Northern Economics, Inc. (2013a) estimates that rural community residents would incur a total cost of approximately \$179.3 million for the same volume of goods currently shipped,

with annual per capita costs increasing by nearly \$2,500. Without the program, residents would need to reduce their consumption of goods by 80 to 85 percent to keep overall household costs level at present amounts.

Public entities would incur higher shipping costs, as the ABS program is critical for the delivery of supplies to schools and government facilities. According to analysis, the State of Alaska annually ships roughly 1.95 million pounds annually via the program, while rural school districts (which are largely state and federal funded) ship 3.2 million pounds. These shipments cost the state and school districts approximately \$0.8 and \$1.3 million, respectively. Annual costs would increase by approximately \$3.2 million and \$5.2 million,

respectively, if current volumes were shipped via air cargo.

Removing the ABS program would also result in increased air passenger fares and/or lower flight frequencies for many rural Alaskans. Northern Economics, Inc. (2013a) estimated the overall increase in average ticket fares that would be needed to replace lost revenues from the ABS program if the program was scaled down. If revenues dropped by 50 percent (or roughly \$50 million), ticket prices would need to increase 5 to 10 percent if carriers evenly distributed cost across all passengers (i.e., routes to ineligible as well eligible communities). Carriers that are highly dependent on revenues from the program would need to increase fares by one-quarter or more to stay revenue neutral. This amount would be reduced if carriers spread costs over cargo as well as passengers. Removing the ABS could also reduce access to healthcare and increase the cost of certain government

programs, like welfare and public safety, that are dependent upon air travel in the bush.

The importance of the subsidies USPS pays annually to air carriers for ABS program services varies significantly depending on the size of the air carrier, the geographic scope of its operations, and its dependence on transporting cargo. These revenues to the carriers flow through Alaska's economy, the economies of the Pacific Northwest, and the national economy through the off-site effect as these companies and their workers spend those revenues (Northern Economics, Inc. 2013a).

USPS calculates the value of the ABS program subsidy as the difference between the cost of air transportation from hub airports to rural village airports and the average cost of ground transportation if it were available. The value declined between fiscal year (FY) 2011 and FY2015, and then increased in FY2016 (Table 16).

*Table 16. Estimated Value of Alaska Bypass Service Program Subsidy, FY2012–2016
(in Millions of \$)*

FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
123	122	114	112	107	113

Source: Postal Regulatory Commission, 2018.

As with other USPS operating expenses, the ABS program is funded by the revenue USPS raises through the sale of postage. USPS lost money on the ABS program since its inception in 1972. It is estimated that the program only covers about 29 percent of its costs (USPS Office of Inspector General 2011). Certain features of the ABS program itself contribute to the challenge of controlling costs. The costs for the program are inflated by the system for setting the rates USPS must pay air carriers. The U.S. Department of Transportation (USDOT) determines the rates based on the airlines' reported operating expenses. This system provides little incentive for the airlines to reduce their costs and gives USPS limited flexibility to react to changing conditions, such as an increase in fuel prices (USPS Office of Inspector General 2011).

The Rural Service Improvement Act of 2002 attempted to modify the ABS program to improve passenger air service and make Alaska's air carrier industry more efficient by excluding from the program carriers that did not provide sufficient passenger and air cargo service. Between 2002 and 2010, total estimated efficiency, as measured by average revenue ton miles per operating hour, increased more than 40 percent (Northern Economics, Inc. 2013a). At the same time, the number of participating air carriers declined dramatically. The result was a more efficient system, as measured by payload moved by a given unit of effort and air carrier profitability.

However, the data shows limited gains in efficiency in more recent years. Requirements for maintaining a minimum of 20 percent passenger market share and the minimum

service requirements force air carriers to fly more frequently than the size of many of their markets dictate, which results in lower carrier profitability and overcapacity in the system. In addition, other provisions of the Rural Service Improvement Act increase the cost of moving goods by discouraging mainline air carriers from flying directly to eligible rural communities and discouraging smaller air carriers from flying directly from hubs to communities (Northern Economics, Inc. 2013a).

Essential Air Service

Essential Air Service (EAS) is a federally funded program implemented after the deregulation of the U.S. airline industry in 1978. The program ensures a minimum level of commercial air service continues to be available in rural areas across the country. This program helps to provide regular service to communities that probably would not have service in the absence of a subsidy. Remote communities depend on the program for affordable travel. Without the program, many communities would be completely isolated for extended periods of time.

The USDOT, as program administrator, determines a minimum level of air service in each eligible community. In addition, current program regulations require the following elements of basic essential air service:

- service to a medium or large hub airport, as defined by the FAA;
- service with no more than one intermediate stop to the hub;
- service with aircraft having at least 15 passenger seats at communities that averaged more than 11 passenger enplanements a day in any calendar year between 1976 and 1986;
- service with pressurized aircraft (under certain conditions); and
- flights at reasonable times, accounting for the needs of passengers with connecting flights.

If no air carrier is willing to provide the specified level of service to an eligible community on a subsidy-free basis, USDOT is required to solicit proposals for subsidized service. USDOT issues a request for proposals to all scheduled carriers to provide service to the community and institutes a carrier selection proceeding using a bid system. It is required by law to use the following four key criteria when considering carriers' proposals to provide subsidized service: a) service reliability; b) contractual and marketing arrangements with a larger carrier at the hub; c) interline arrangements with a larger carrier at the hub; and d) community views (Tang 2017).

The request for proposal advises air carriers that their proposals for subsidy should be submitted on a sealed bid, "best and final" basis, and set forth the level of service (frequency, aircraft size, and potential hubs) that would be appropriate for the community given its location and traffic history. Once the carrier proposals are received, USDOT formally solicits the views of the community as to which carrier and option it prefers. After receiving the community's input, USDOT issues a decision designating the selected air carrier and specifying the service pattern (routing, frequency, and type of aircraft), annual subsidy rate, and effective period of the rate. USDOT generally establishes two-year EAS service contracts, which allows for frequent bidding and gives communities as well as USDOT flexibility to switch carriers (Tang 2017).

The EAS program is funded through annual transfers of FAA overflight fees, supplemented by annual Congressional appropriations of varying size. A reduction in the EAS program's annual appropriation in the mid-1990s compelled the USDOT to limit eligibility, but communities in Alaska are generally exempt from almost all EAS eligibility requirements, except one measure established by the Consolidated Appropriations Act of 2014 and the Continued Appropriations Resolution of 2015. Both laws directed that no EAS program funds be used to enter into a new contract with a community located less than 40 miles from the nearest small hub airport before USDOT has negotiated with the community over a local cost share. However, this requirement does not affect any Alaska communities since none are

within 40 miles of the nearest small hub airport (Northern Economics, Inc. 2013b; Tang 2017).

There were 237 Alaska communities on the original list of EAS-eligible communities. The EAS list of eligible communities is updated multiple times per year, and as of May 2018, 62 Alaska communities receive subsidized air service (Figure 26). This represents a considerable increase from the 44 subsidized

communities in 2015. The increase is due to additional Alaskan communities requesting subsidized service, which is allowed by law (Tang 2017). The current number of Alaska communities with subsidized service represents more than one third of the total number of communities participating in the program. Of the communities eligible for the program, only 6 are located on the road system.

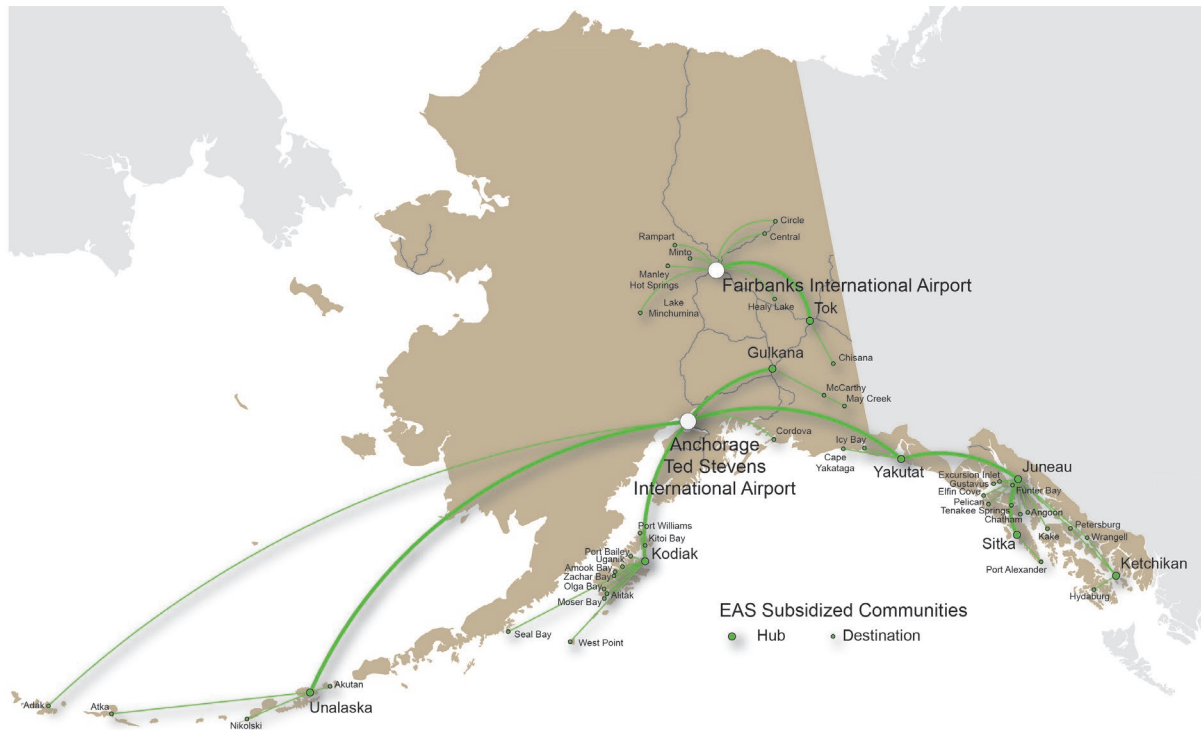


Figure 25. Alaska Communities Participating in the Essential Air Service Program

Source: Northern Economics, Inc. 2013a.

The number of passengers served by EAS program flights in Alaska is not readily available; the EAS program office does not compile this information as there are no requirements regarding minimum enplanement figures or per-passenger subsidies in Alaska. However, Northern Economics, Inc. (2013b) estimated that the program annually subsidized the movement of more than 88,000 passengers and indirectly supported the movement of more than 4 million pounds of mail and 1.7 million pounds of air freight to Alaska communities. Studies of the economic impacts of the EAS program on participating communities nationwide indicate that the program generates a range of benefits, such as easy access to the national transportation network, new business

opportunities, attraction of qualified human resources, and improved local tourism (Özcan 2014). Additionally, many rural communities rely on aviation for healthcare services. Without the EAS, access to hospitals and routine healthcare would cost significantly more. For more information refer to the Medical and Healthcare Case Study.

In addition, the program helps support broader regional economies that include non-subsidized communities. The planes that carry passengers to subsidized locations are often the same planes that fly to unsubsidized communities, allowing air carriers to fully and efficiently utilize high cost fixed assets. Efficient plane utilization lowers costs for both the EAS

program and consumers in the rural airport system (Northern Economics, Inc. 2013b).

A list of participants in the EAS program as of May 2018 are shown in Table 17. The average

subsidy per community was \$357,927, which is far less than the \$2,553,332 average of subsidized communities in the Lower 48 States (Hall et al. 2015, USDOT 2018).

Table 17. Annual Contract Subsidy Rate for Alaska Communities, May 2018

Community	Subsidy	Community	Subsidy	Community	Subsidy
Adak	\$2,907,935	Funter Bay	\$14,040	Pelican	\$348,103
Akutan	\$227,987	Gulkana	\$206,128	Perryville	\$629,853
Aleknagik	\$890,001	Gustavus	\$776,790	Petersburg	\$470,525
Alitak	\$36,655	Healy Lake	\$113,082	Pilot Point	\$212,971
Amook Bay	\$36,655	Hydaburg	\$195,319	Port Alexander	\$99,364
Angoon	\$303,298	Igiugig	\$200,933	Port Bailey	\$36,655
Atka	\$990,578	Kake	\$181,621	Port Heiden	\$491,662
Central	\$162,474	King Cove	\$638,087	Port Williams	\$36,655
Chatham	\$6,048	Kitoi Bay	\$36,655	Seal Bay	\$36,655
Chignik	\$362,099	Koliganek	\$314,029	South Naknek	\$139,998
Chignik Lake	\$362,099	Lake Minchumina	\$102,300	St. George	\$354,910
Chisana	\$93,018	Levelock	\$188,636	Tatitlek	\$102,779
Circle	\$162,474	Manley	\$41,819	Tenakee	\$152,127
Clark's Point	\$116,093	Manokotak	\$308,849	Twin Hills	\$227,121
Cordova	\$3,107,161	May Creek	\$130,964	Uganik	\$36,655
Diomedes	\$190,476	McCarthy	\$130,964	Ugashik	\$212,971
Egegik	\$386,567	Minto	\$41,819	West Point	\$36,655
Ekwok	\$102,288	Moser Bay	\$36,655	Wrangell	\$470,525
Elfin Cove	\$124,795	New Stuyahok	\$103,877	Yakutat	\$3,107,161
Excursion Inlet	\$30,792	Nikolski	\$331,986	Zachar Bay	\$36,655
False Pass	\$220,753	Olga Bay	\$36,655		

Source: USDOT, 2018.

Note: EAS eligible communities are updated on a regular basis. This table reflects May 2018 eligible communities.

Since FY2002, Congress has supplemented the overflight fees with discretionary annual appropriations of varying size. The trend in EAS program costs as of 2016 is shown in Figure 27 (reproduced from Tang 2017). Despite efforts to

limit spending for EAS program subsidies, program expenditures nationwide rose 132 percent between 2008 and 2014, after adjusting for inflation, and are projected to continue rising (Tang 2017).

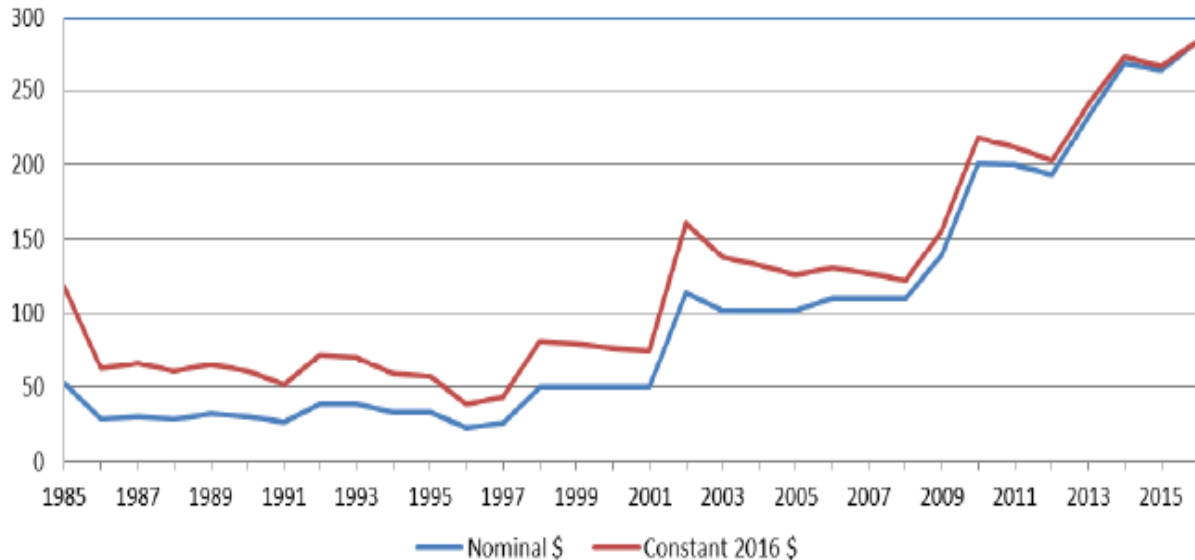


Figure 26. Annual Estimated Cost of Essential Air Service Program, 1985-2016 (in Millions of \$)
Source: Tang, 2017.

Tang (2017) attributed external factors to the EAS's rising program cost, including high aviation fuel prices from 2008 through 2014 and the prospect of higher pilot wage costs due to changes in federal regulations. However, as with the ABS program, certain features of EAS itself contribute to the challenge of controlling costs. The statute governing the program does not list cost among the factors that USDOT must consider when evaluating air carriers' bids to provide subsidized service, and neither the carriers nor the communities receiving subsidized service are obliged to select service options that minimize USDOT's costs.

Interactions between EAS and Alaska Bypass Service

The EAS and ABS programs are similar in that they provide many of the same benefits to rural Alaska communities, namely passenger, freight, and mail carriage. In addition, they both help keep costs down for rural residents who daily deal with some of the highest prices for food, heating fuel, electricity, and transportation in the United States. However, there are no communities that benefit from both the EAS and

ABS programs (Anchorage and Fairbanks interact directly with both programs but only as primary hubs). ABS program communities are eligible for EAS program subsidies should the number of flights they receive fall below a prescribed level, but the revenues earned by air carriers from the ABS program, together with the flight frequency minimums, are supporting flight frequencies above EAS program minimums.

Both programs have long-term demographic consequences for the state by improving the daily lives of rural Alaskans. Over the past two decades, an average of 7,700 adults moved from a rural to an urban area in the state during each five-year period, or about 11 percent of the rural population (Howell 2015). Some rural areas recoup these population losses through higher birth rates. However, in the absence of an economical and efficient mail system and passenger carrier network, it is likely that out-migration would increase at a pace that would soon leave many rural communities with insufficient populations to maintain basic public services, thereby creating a self-reinforcing cycle of decline.

Trends in Aviation and Technology

The aviation industry is impacted by internal and external forces. For example, in just the past 20 years, aviation in the United States has been greatly affected by both the events of September 11, 2001, and the recession of 2008 and 2009. In addition, changes in operational efficiency and safety, as well as advances in technology, are working to modernize the aviation industry.

This section examines trends in the aviation industry both at the national level and those specifically impacting Alaska. Included are analyses of recent trends in aviation activity, including a 10-year look at aircraft operations, passenger enplanements, increases in commercial service load factors, and air cargo tonnage. Also included are analyses of the national aircraft fleet, the declining pilot population, and the increasing average ages of both. Finally, the section analyzes aviation technology trends most likely to impact Alaska, including NextGen, a shortage of weather reporting across the state, the Wide Area Augmentation System (WAAS), and a possible replacement for avgas.

Aviation Activity Trends

Aircraft Operations

Like many aspects of the global economy, aviation activity was greatly affected by the recession of 2008 and 2009, although aviation was already entering a period of decline. Figure 28 summarizes aircraft operation trends in Alaska and all the United States from 2007 through 2017. Total operations declined throughout the country during this period at a rate of 1.8 percent annually. Alaska also experienced a decline in the number of operations, but less so at the rate of 1.4 percent annually. During the recession years from 2007 through 2010, the United States experienced far greater decline at the rate of 5.5 percent annually, while Alaska experienced only a 2.1 percent annual loss over these years. Alaska's relatively small decline in comparison to the rest of the country amplifies the importance of aviation to the residents and businesses of the state. For much of the country, aviation and travel may be among the first things cut from business budgets when the economy is lean, but in Alaska, aviation is a necessity of everyday life.

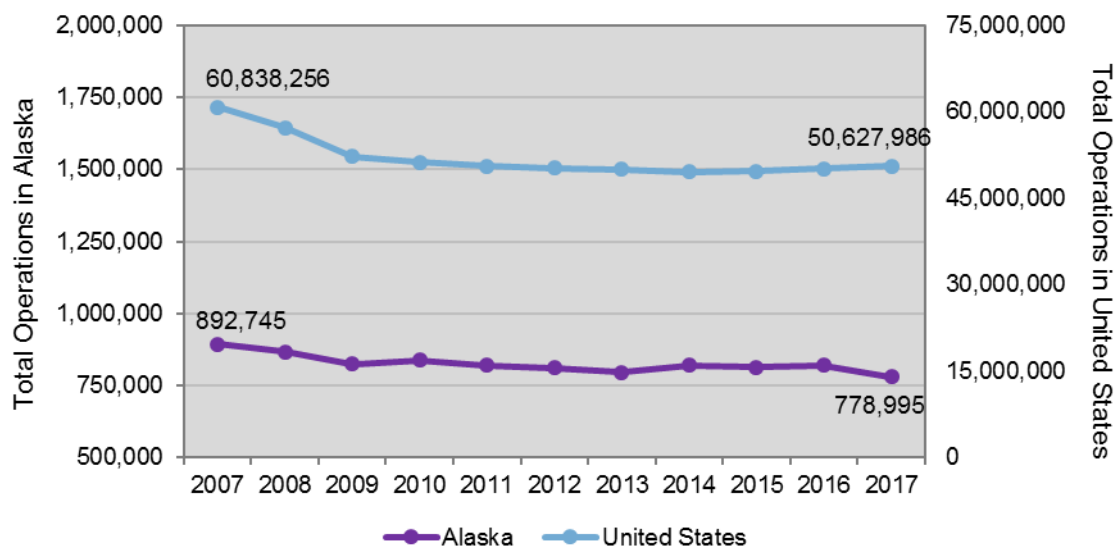


Figure 27: Aircraft Operations in Alaska and the United States, 2007-2017

Source: FAA, 2018a.

Nationally, air taxi operations experienced the largest decline over this period, losing operations at a rate of 4.7 percent annually, while air carrier operations grew nationally at an average annual rate of 1.1 percent (Figure 29). By comparison, air taxi operations only decreased at an annual rate of 0.6 percent in Alaska from 2007 through 2017, but air carrier operations decreased at a rate of 1.6 percent annually. In Alaska, military operations experienced the largest decline with an average annual loss of 1.9 percent. In both Alaska and

the United States as a whole, general aviation (GA) operations experienced a dramatic drop from 2006 to 2007 before recovering in 2009. In Alaska, for example, GA operations decreased by over 20 percent 2007 to 2008, but recovered by 38 percent from 2008 to 2009. Over the entire period of 2007 through 2017, Alaska GA operations saw growth, albeit at the low rate of 0.2 percent annually. Nationally, GA operations declined at an average rate of 1 percent annually over this period.

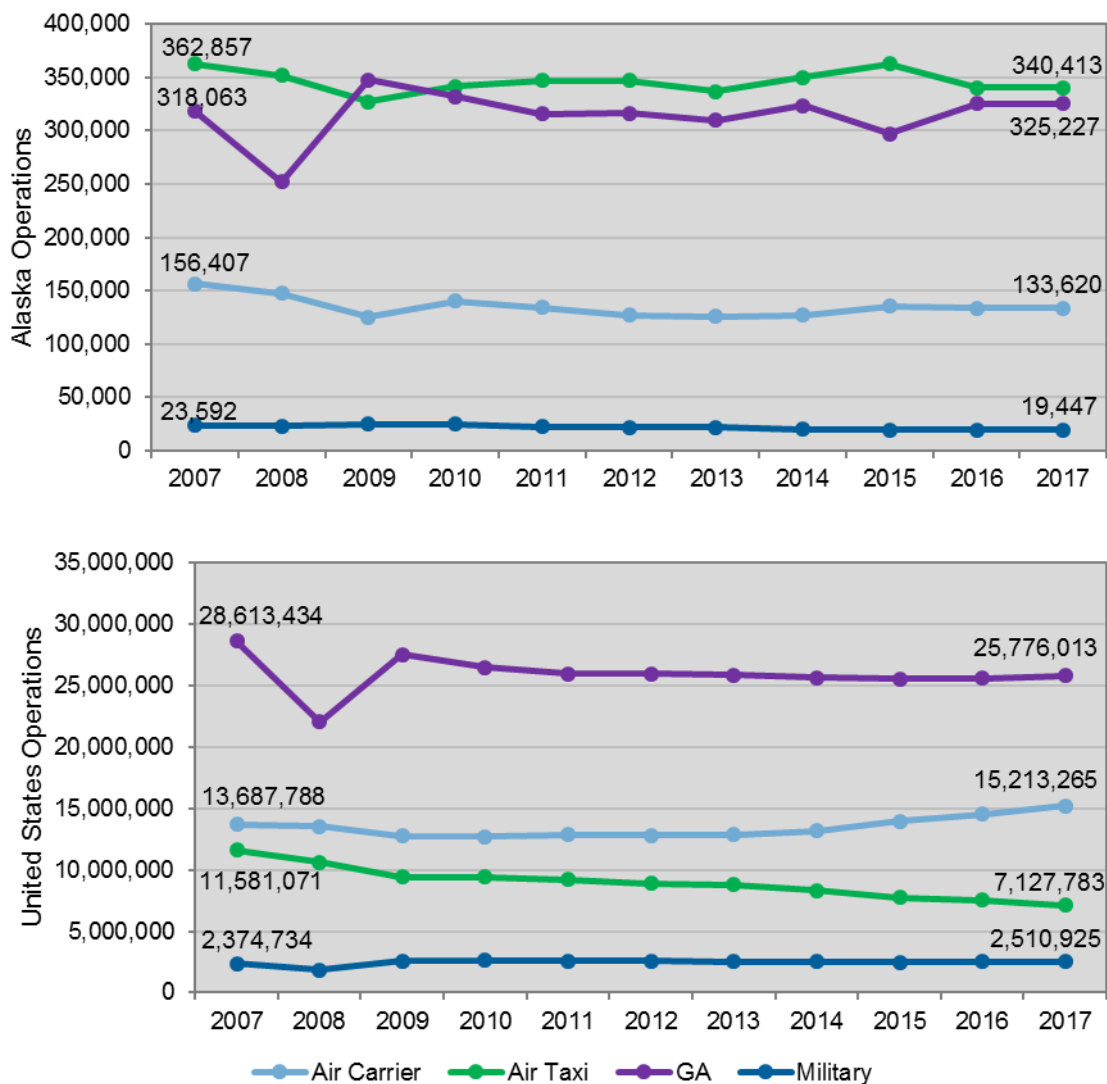


Figure 28: Aircraft Operation Split in Alaska and the United States, 2007-2017

Source: FAA, 2018a.

Passenger Enplanements

Over the same period from 2007 through 2017, passenger enplanements have grown at a higher rate than have commercial aircraft operations. Figure 30 summarizes U.S. and Alaska enplanement trends over this period. While enplanements were also affected by the recession, particularly from 2008 to 2009, they

not only recovered, but have risen far above pre-recession levels. There were over 857 million passenger enplanements in the country in 2017, a total increase of over 12 percent from 2007. From the low point in 2009 to 2017, enplanements increased at an average annual rate of 2.53 percent, resulting in a nearly 23 percent total increase.

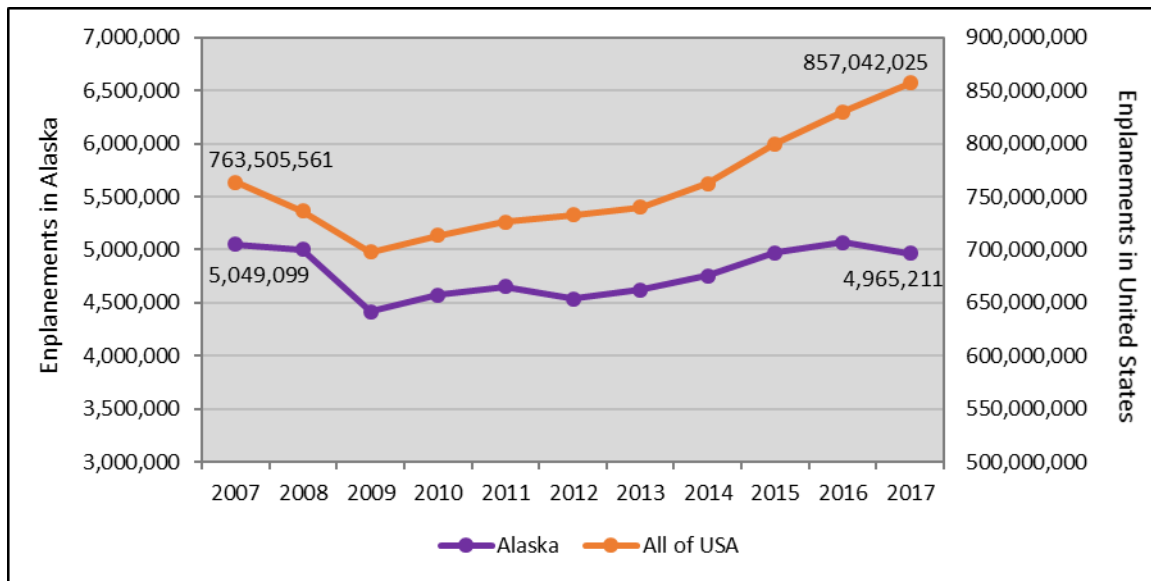


Figure 29: Enplanement Trends in Alaska and the US, 2007-2017

Source: FAA 2018g.

In Alaska, commercial enplanements likewise experienced a decline during the recession but have not experienced the dramatic growth in the years since, as they have throughout the country. In 2017, enplanements in Alaska were actually slightly lower than in 2007. However, enplanements in Alaska have experienced mostly steady growth since bottoming out in 2009 during the recession. From 2009 through 2017, enplanements in Alaska grew at an annual rate of 1.48 percent, good for a 12.5 percent total increase.

Nationwide, between 2007 and 2017, passenger enplanements increased 1.16 percent annually, while commercial operations only increased 1.06 percent annually. This difference reflects two industry trends that result in more passengers per flight: increased load factors and the recapitalization of fleets to larger more efficient aircraft. Figure 31 summarizes load factor trends from 2007 through 2017 in Alaska and the United States as a whole. For all flights from commercial service airports in the United States, load factors increased from 79.5 percent in 2007 to 82.5 percent in 2017, an average annual growth rate of 0.38 percent.

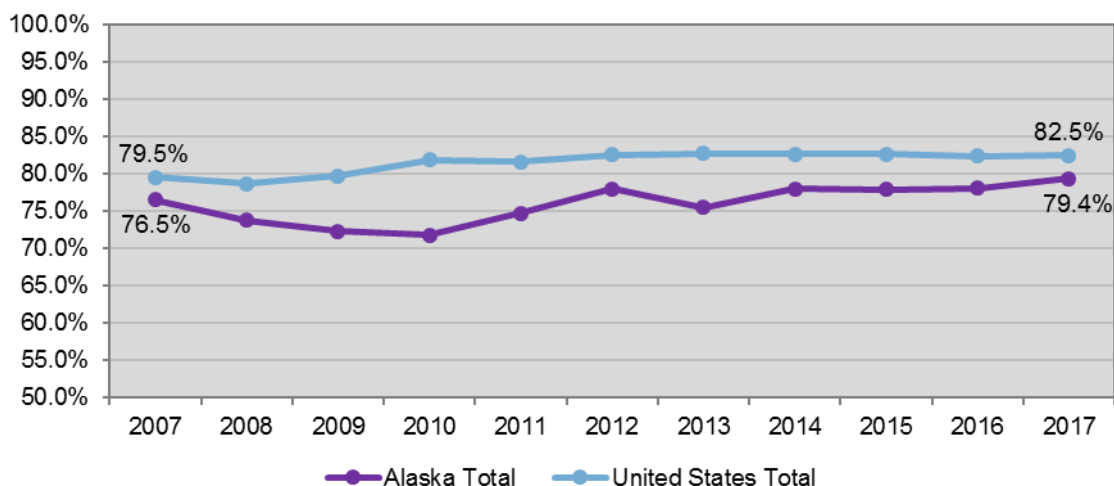


Figure 30: Load Factors at Commercial Airports in Alaska and US, 2007-2017

Source: BTS 2018.

While load factors are generally lower in Alaska due to so many flights to or between small communities, they nonetheless grew at a similar rate to national load factors. In 2007, the load factor at Alaska commercial airports was 76.5 percent, and had grown to 79.4 percent by 2017, an average annual increase of 0.36 percent.

There are currently 87 airports in Alaska recognized by the FAA as commercial service facilities. In 2017, the load factors at these

airports ranged from only 14 percent to over 83 percent. Figure 32 shows the load factors at Alaska's five busiest airports (by 2017 enplanements) and compares them to the combined load factor of all other commercial service airports in the state. Only one of these busy airports (Bethel) has a comparable load factor to the rest of the state. The rest are much higher, with Anchorage having a higher load factor than the national average—83.7 percent for Anchorage in 2017 compared to 82.5 percent for the United States as a whole.

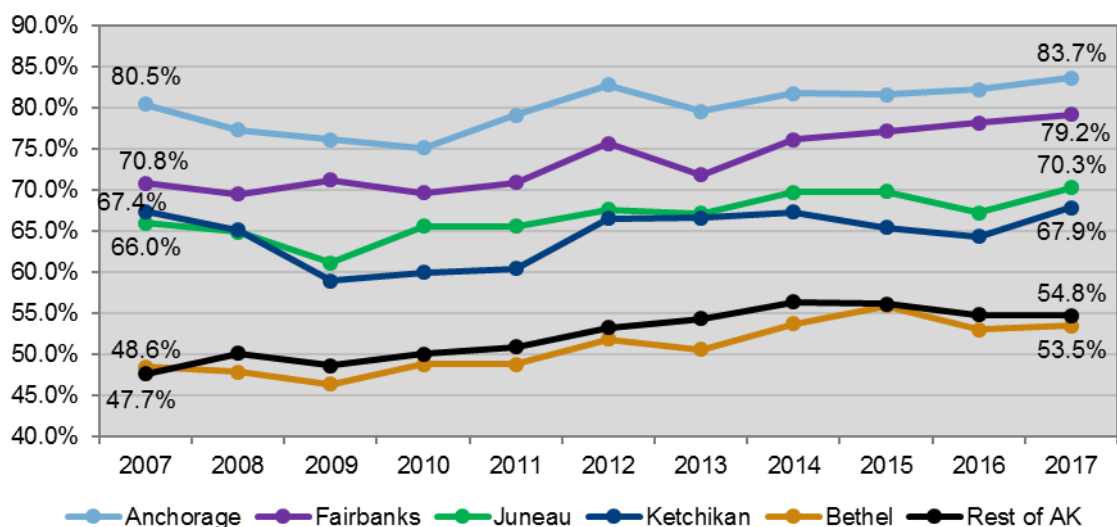


Figure 31: Load Factors at the Busiest Commercial Airports in Alaska, 2007-2017

Source: BTS 2018.

In Alaska, some of the increase in load factors can be attributed to policies and a significant fleet change at Alaska Air Group (Alaska Airlines and Horizon Air). From 2007 to 2017, Alaska Air Group phased out many of their operations on the Boeing 737-400 in favor of higher capacity aircraft such as the 737-800 and 737-900. Figure 33 summarizes the percentage of total 2007 and 2017 departures by aircraft type for Alaska Air Group flights within, to, or from Alaska. High capacity aircraft (150 or more seats by Alaska Air Group departure) are shown

in shades of blue, medium capacity (100 to 149 seats) are shown in shades of green, while lower capacity aircraft (fewer than 100) are shown in shades of red. In 2007, the 737-400 accounted for 45 percent of all operations, while it had fallen to just 14 percent by 2017. Meanwhile, the percentage of departures flown on high capacity aircraft such as the Boeing 737-800 and 737-900 grew from only 19 percent of Alaska Air Group's total 2007 departures to 51 percent in 2017.

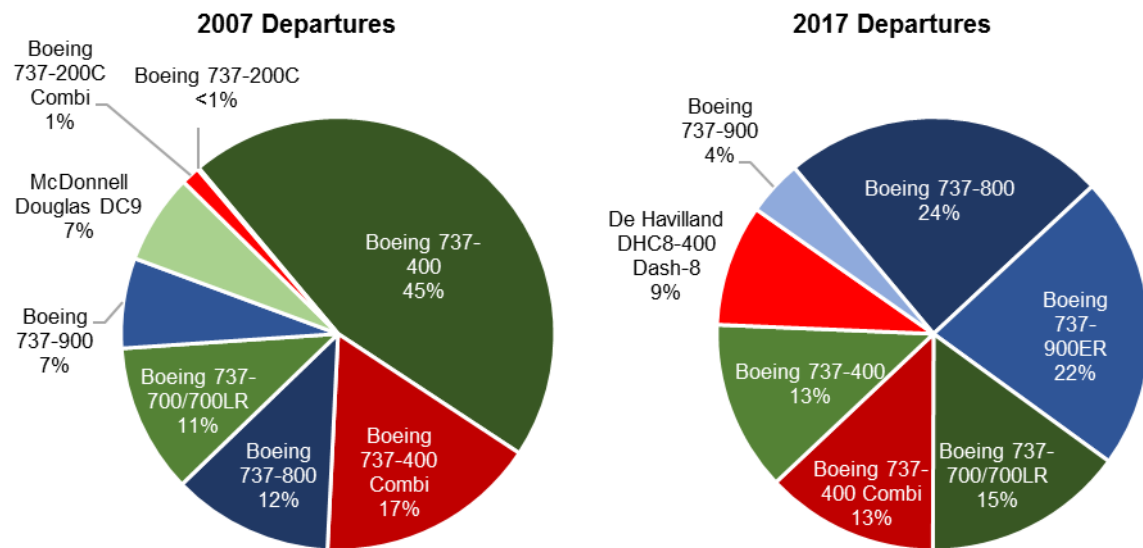


Figure 32: Alaska Air Group, 2007 and 2017

Source: FAA T100 Data 2018.

Along with this change in their fleet, Alaska Air Group also pushed for higher load factors throughout their operations. In 2007, the airlines' total load factor was 64 percent, a number that increased to 72 percent by 2017. In combination with the shift towards higher capacity aircraft, Alaska Airlines transported 20 percent more passengers (4.8 million in 2017 compared to 4.0 million in 2007) on only 0.9 percent more operations (47,981 departures in 2017 compared to 47,556 in 2007). In 2018, this trend towards higher capacity aircraft only continued for Alaska Air Group, which in March removed both the Boeing 737-400 Combi and De Havilland DHC8-400 Dash-8 (Q400) from commercial passenger use. With their removal, all Alaska Air Group flights are now flown on aircraft with at least 100 passenger seats.

Air Cargo

Air cargo is a major worldwide economic sector that plays a vital role in international commerce and Alaska is a major transit point for international air cargo between Asia and North America. International transit cargo is by far the largest movement of air cargo in Alaska, served by a combination of cargo integrators such as FedEx and UPS and all-freight carriers operating at ANC. International and interstate air cargo originating in Alaska, or with a final destination in Alaska, is moved in some measure by most commercial aircraft but primarily aboard dedicated freighters. Since there is no scheduled wide-body passenger service in Alaska, belly cargo is limited to relatively small amounts on narrow-body passenger aircraft. Air cargo

movements within the state deliver everyday necessities to many communities that are not accessible by road. Several regional carriers provide air cargo service with some cargo movements supported by the bypass mail program.

The domestic air cargo industry has experienced significant flux and change in the recent past. Rising fuel costs and a recessed economic climate caused an industry shift to trucking, where unit cost savings became a higher priority than shipment time. A variety of acquisitions and company closings essentially left domestic air cargo dominated by FedEx and UPS excluding smaller regional contract or charter operators. Amazon also is making a major move into the domestic air cargo industry.

Air cargo is a massive economic engine for the AIAS. About 50 cargo carriers operate in or through Alaska. About 63% of all Asia-bound US air cargo and 72 percent of all US-bound Asia air cargo passes through Anchorage. Cargo-related activity accounts for nearly two-thirds of all revenue for the AIAS. By CMGTW, Cathay Pacific Airways was the busiest cargo carrier in Alaska in 2017 with 15 percent of statewide CMGTW (Figure 34), all from operations through Anchorage. Following were the United Parcel Service (UPS) (14 percent), China Airlines (9 percent), and Federal Express (FedEx) (9 percent). FedEx is the only carrier operating routes both within Alaska and along the transpacific routes. Although several regional carriers also operate in Alaska, intra-state activity accounts for only about 4.4 percent of total air cargo volume carried in the state by weight (BTS 2018).

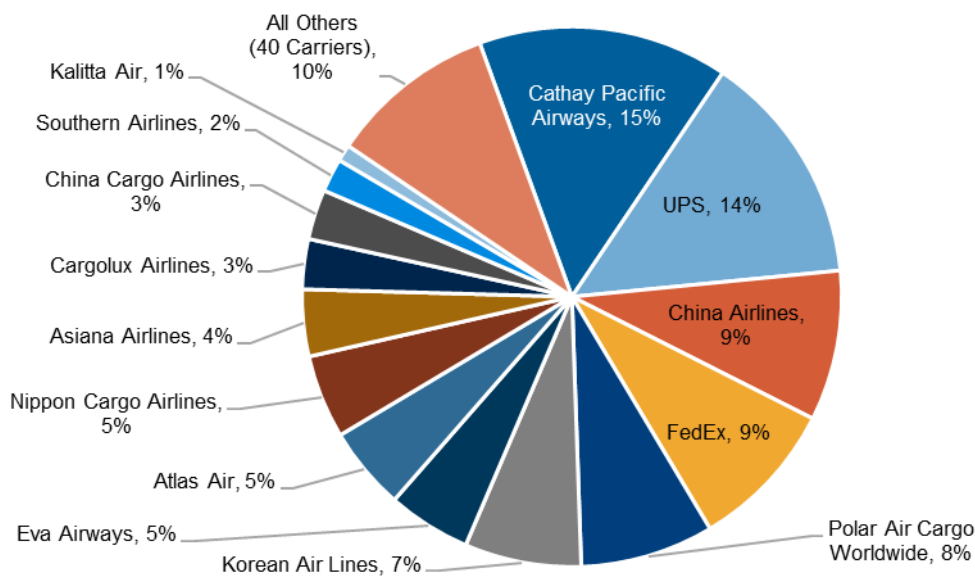


Figure 33: Busiest Cargo Carriers in Alaska by CMGTW, 2017

Source: ADOT&PF, 2018.

By total processed cargo weight, ANC is the second busiest cargo hub in the United States, second only to Memphis International Airport (Airports Council International 2018). Both FedEx and UPS have significant cargo hubs at Anchorage, while FedEx also operates a shipping center at FAI. The latter is largely for intra-state cargo going to Fairbanks or continuing to northern regions of Alaska.

ANC is one of the world's major cargo hubs for two primary reasons. First is the airport's location. Anchorage is less than nine and a half hours from 90 percent of the industrialized world. While some cargo planes such as the Boeing 777 can make the full trip from Beijing to Memphis, it is more profitable to make a refueling stop in Anchorage. This allows carriers to carry more cargo with less fuel. It also allows

carriers to reorganize cargo loads for specific locations throughout the United States, particularly along the west coast, as it does not make economic sense to fly cargo all the way to Memphis only to immediately bring it back west.

Second, Alaska has the most expansive air cargo transfer rights of any state in the country. The Merchant Marine Act of 1920 (the Jones Act) established laws preventing cabotage—the transport of goods between two points in the same country by a foreign-built, foreign-owned, or foreign-flagged vessel—that were eventually applied to aviation as well. Alaska has gained exceptions to this law, and the state’s international cargo laws were expanded further in 2004. These cargo rights mean that air cargo to or from a foreign country can now be transferred to another airline in Alaska without breaking its international journey.

Figure 35 summarizes trends in total landed cargo weight in Alaska and the entire nation from 2007 through 2016. Like all the global economy, air freight in the United States saw a decline during the recession of 2008 and 2009 but has since recovered to higher levels than before the recession. In 2007, domestic airports landed over 76.5 million tons of cargo and by 2017 that number had increased to nearly 83 million tons, an average annual increase of 0.80 percent. In Alaska, the air cargo industry has not recovered similarly to the rest of the country. In 2017, Alaska airports—primarily Anchorage—landed over 8.6 million tons, which is below the pre-recession 2007 amount of 9 million tons. Overall, Alaska landed weight decreased at an average annual rate of 0.46 percent over this period.

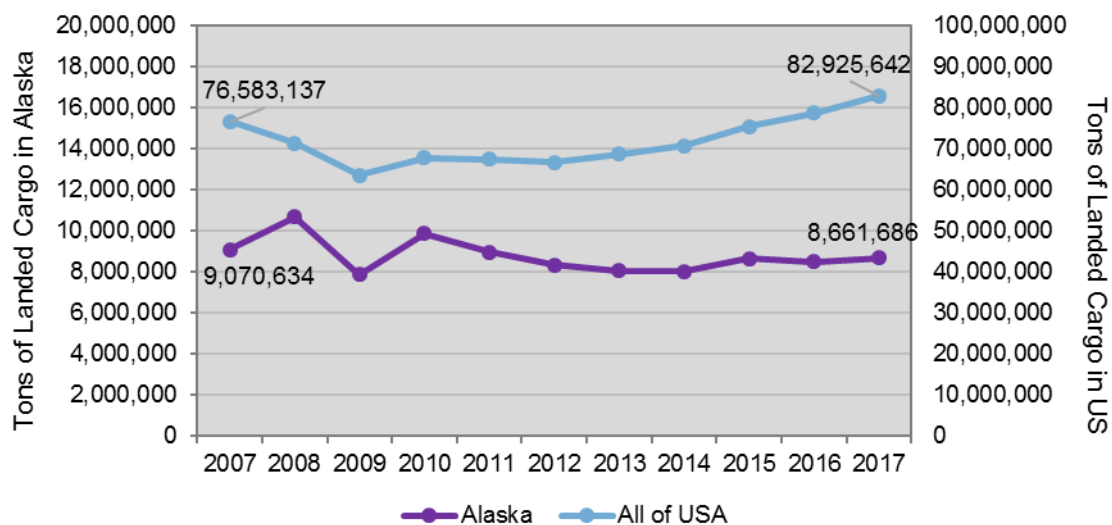


Figure 34: Cargo Landed Weight in Alaska and the US, 2007-2017

Source: FAA 2018g.

Aircraft Shipments and Age of Fleet

The number of new aircraft being delivered is a strong indicator of the state of the GA industry. Figure 37 summarizes the number of new aircraft shipments by type from 2007 through 2016 in the country. As with many facets of the aviation industry, the shipment of new aircraft was greatly affected by the recession of 2008

and 2009. From 2008 to 2009 alone, the number of new aircraft shipped was reduced by more than half, from 3,079 to 1,585, bottoming out in 2009 at 1,334 new aircraft. However, unlike many of the other indicators detailed here, the shipment of new aircraft has not recovered to pre-recession levels. There was a gradual increase from 2010 to 2014, but since, levels have again seen a decrease, albeit very gradual.

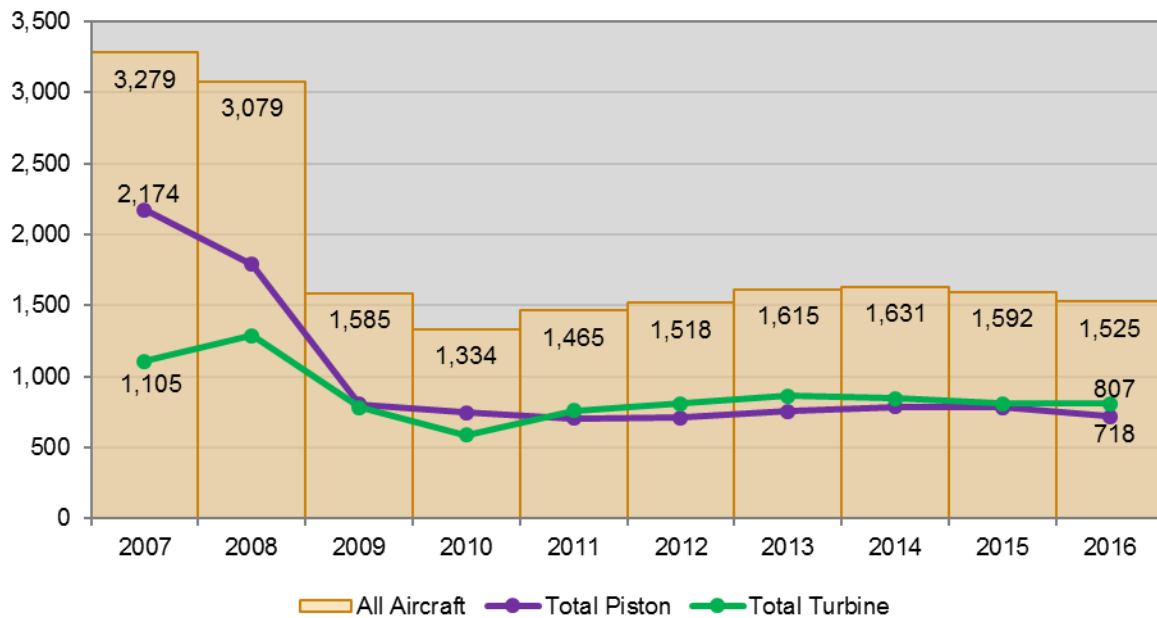


Figure 35: New Aircraft Shipments in US, 2007-2016

Source: 2016 General Aviation Statistical Databook & 2017 Industry Outlook, GAMA, 2016.

Shipments of both piston and turbine aircraft were affected by the recession. Notable is that the shipment of piston aircraft accounted for nearly twice that of turbine aircraft prior to the recession, but as of 2016 had fallen below shipment levels for turbine aircraft. This decrease from 2,174 new piston aircraft in 2007 to only 718 in 2016 represents an average annual loss of over 11 percent. While the shipment of new turbine aircraft has not recovered to pre-recession levels, it has not experienced as dramatic a decline, decreasing at a still-staggering rate of 3.4 percent over this period, but remaining largely stable since the end of the recession. The increased use of business aviation is one reason for turbine aircraft experiencing this decline less severely than piston aircraft, including the rise of fractional jet ownership through companies such as NetJets and Flight Options.

The age of the national GA aircraft fleet also reveals how the number of new aircraft shipments is decreasing. Figure 38 summarizes the age of the GA aircraft fleet in Alaska and the country from 2008 through 2017. Throughout the US, the average age of a GA aircraft increased from 34 years in 2008 to 38 years in 2017. The GA aircraft fleet in Alaska is significantly older than that of the lower 48 states, somewhat due to older aircraft from the lower 48 states being used in Alaska after deemed outdated for lower 48 use. The average age of an aircraft in 2008 was 43 years and has now increased to an average age of 50 years in 2017. The aging of both the national and state GA fleets corroborate the conclusions drawn by the data on new aircraft shipments. The decreasing number of aircraft shipments means that average age of the national GA fleet is getting older.

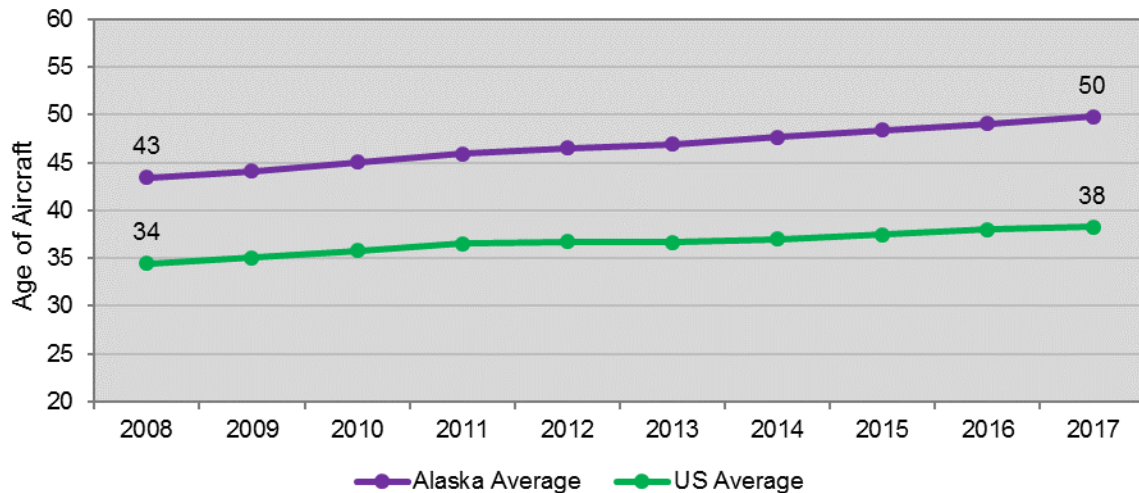


Figure 36: Age of GA Aircraft Fleet in Alaska and US, 2008-2017

Source: FAA, 2018d.

Pilot Population

Throughout the aviation industry, there is concern of a pilot shortage affecting commercial operators, air taxi operators, and other businesses. There is a shortage of pilots entering the industry, a development that affects all aspects of aviation, and as such the national pilot population is getting older on average.

Because of the importance of aviation in Alaska for everything from daily commutes to shopping trips and business operations, pilots are far more prominent in Alaska than in other states. In Alaska in 2017 there was one pilot for every 92.5 residents. No other region of the country has a pilot for fewer than 300 residents, with areas such as the Southern and Eastern states⁷ only having one pilot per 700-plus residents. However, as is detailed below, the pilot shortage is not yet affecting Alaska at as high a rate as it is affecting the entire country.

The aviation industry is experiencing a decline in both commercial and private pilots. The Airline Safety and Federal Aviation Administration Extension Act of 2010 is the most significant reason for the commercial pilot shortage. The act, which was enacted in 2013, increased the flight hour requirements from just 250 to 1,500 for first officers (co-pilots) to hold an Airline Transport Pilot (ATP) certificate. The act also requires first officers to have an aircraft

type rating, which involves additional training on top of typical flight time training. This act greatly increased both the time and cost for flight training, significantly decreasing the number of new pilots entering the industry.

In addition to new restrictions for gaining an ATP, several factors are leading to a decline in the private pilot population. The increasing cost for gaining a private pilot license is the primary factor for the decrease in the private pilot population. As the cost of aircraft, fuel, flight insurance, and legal liability costs have increased, so too has the cost of flight training and operating a GA aircraft. Increased airspace regulation has also led to higher GA flight training costs, and these factors, in addition to a decreasing interest in recreational flying and higher competition from other recreational options, have led to a reduced interest in GA and a pilot shortage throughout the nation.

Figure 39 summarizes the number of pilot certificates in the country by type from 2008 to 2017.⁸ Over this 10-year period, total non-student pilot certificates decreased from over

⁷ FAA Regions were used in this analysis.

⁸ This data does not include student pilot certificates. In 2010, the FAA increased the duration of student pilot certificates for pilots under 40 from 36 to 60 months. In 2016, the FAA removed all expiration dates on student pilot certificates. These events immediately resulted in a significant growth in student pilot certificates, decreasing the validity of analyzing the number of student pilot certificates over time, hence their exclusion from this analysis.

530,000 in 2008 to just over 460,000 in 2017, an average annual decrease of 1.61 percent. Private and commercial certificates have decreased at greater rates, with private pilot certificates decreasing at a rate of 3.44 percent

and commercial certificates decreasing at a rate of 2.63 percent. These losses in the pilot population are offset somewhat by growth in airline transport, rotorcraft, and sport pilots.

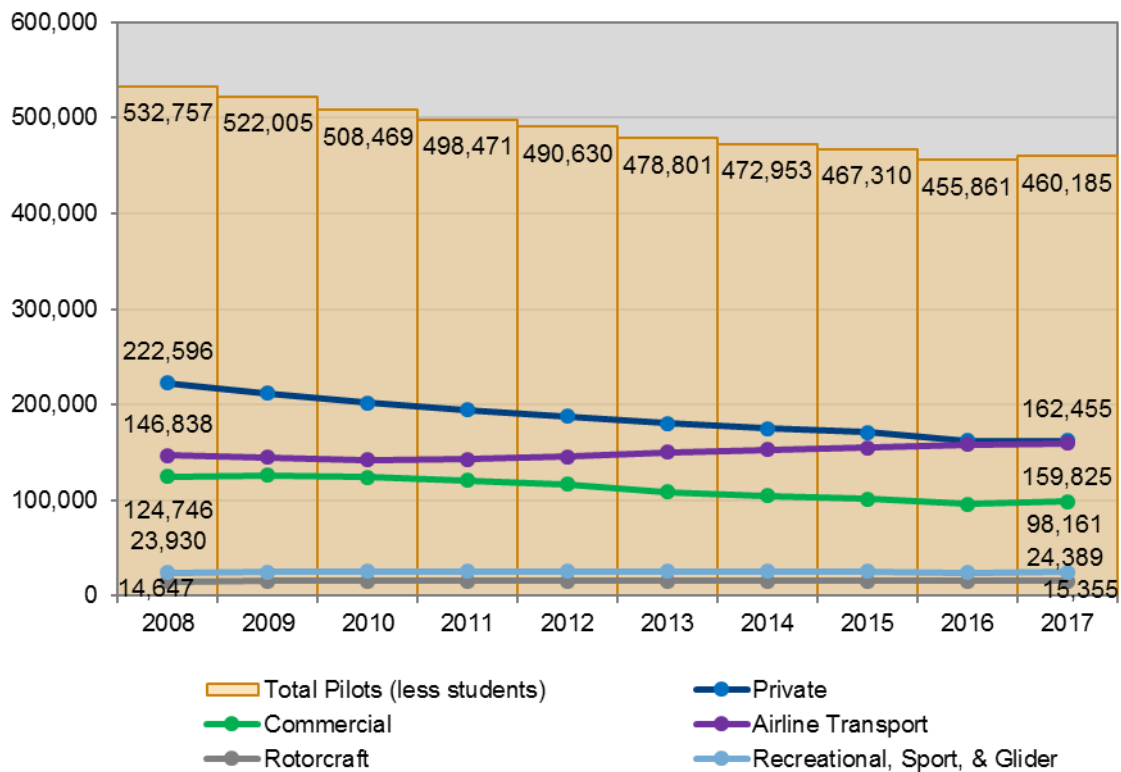


Figure 37: National Pilot Certificate Trends, 2008 to 2017

Source: FAA, 2018f.

Note: Excludes student pilots.

Alaska's pilot population is also decreasing but is relatively stable in comparison to the rest of the country (Figure 40). From 2013 to 2017, total pilot certificates in Alaska decreased from nearly 7,000 to just below 6,500, an average annual decrease of 0.97 percent. While this is a slower decrease than that seen in the rest of the country, it is nonetheless a somewhat concerning trend for a state that depends on aviation as its most critical mode of transportation.

With 82% of Alaska's communities off the main road system, aviation is essential to everyday life. This is undoubtedly the reason why the pilot population has decreased at a slower rate in Alaska but is also the reason why further decline in pilot numbers would impact Alaska in a more severe manner than other states.

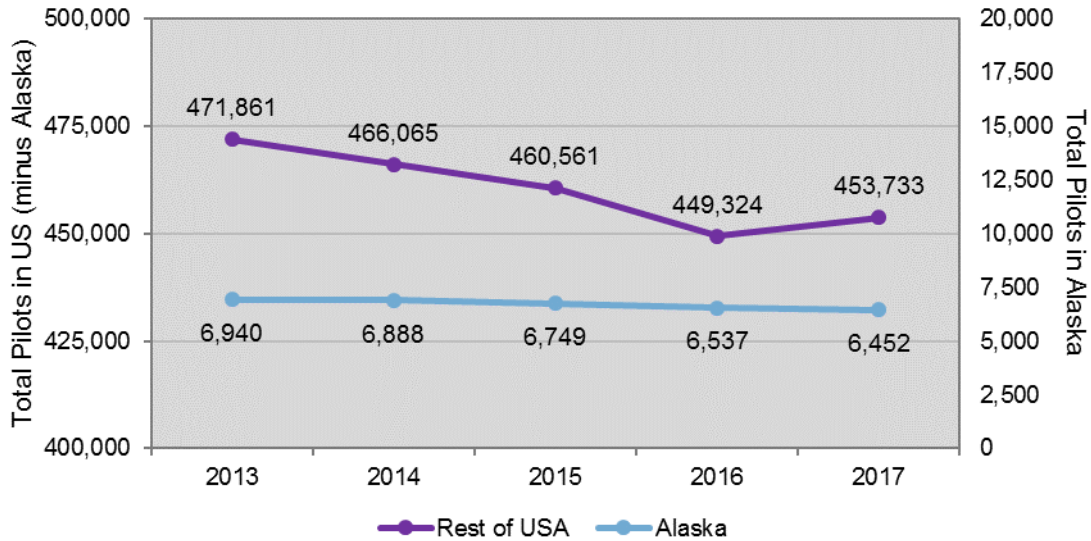


Figure 38: Number of Registered Pilots, Alaska and Rest of US, 2013-2017

Source: FAA, 2018f.

Note: Excludes student pilots.

Note: 10-year data unavailable from FAA.

The decrease in the total pilot population has been largely due to a shortage of new pilots entering the industry. As stated, this has caused the average age of the nationwide pilot population to be older than in years past.

Table 18 summarizes the national average age, by certificate type, of pilots in 2008 and 2017. The average age of sport, private, commercial, and airline transport pilots all increased over this period, with private pilots' age increasing at an average annual rate of 0.47 percent and commercial pilot age increasing at an average annual rate of 0.34 percent.

Table 18: Average Age of Pilots by Certificate Type, National Fleet, 2008 to 2017

Type of Pilot Certificate	Average Age: 2008	Average Age: 2017	Average Annual Growth Rate: 2008-2017
Sport	53	57	0.79%
Recreational	50	49	-0.25%
Private	47	49	0.47%
Commercial	45	46	0.34%
Airline Transport	49	51	0.47%

Source: FAA, 2018f.

By composition, the current pilot population in Alaska is like that of the rest of the United States (Figure 41). In Alaska, nearly 95 percent of total non-student pilot certificates are private (39 percent), airline transport (34 percent), or commercial (22 percent) pilots. Throughout the rest of the United States, these three categories

make up over 90 percent of the total. Glider and sport pilot certificates are much more common throughout the rest of the country, but still make up a very small percentage of total pilots compared to private, airline transport, and commercial pilots.

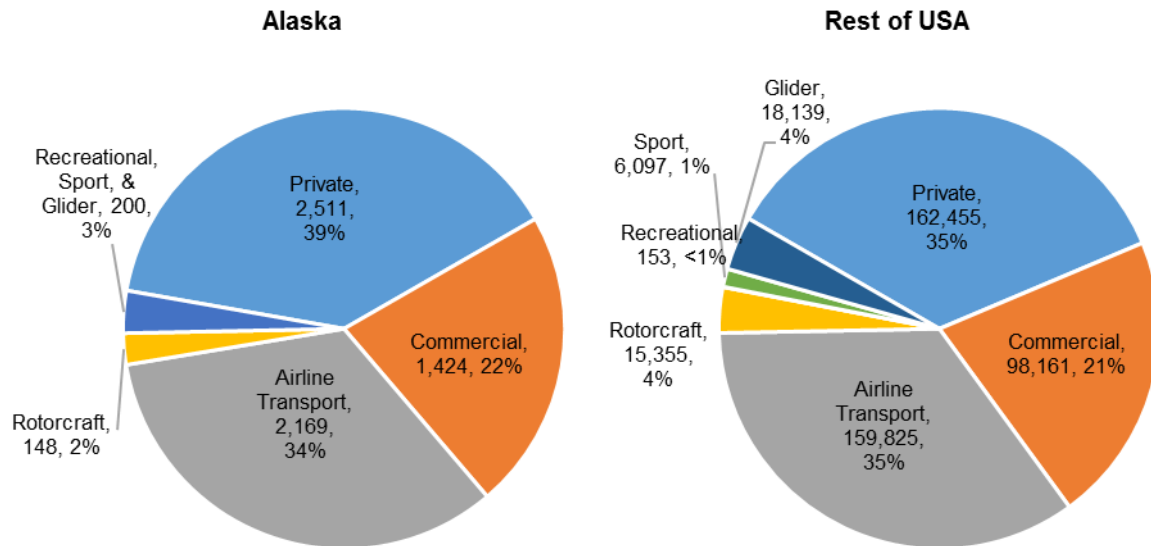


Figure 39: Pilot Certificates by Type in Alaska and the Rest of the United States, 2017

Source: FAA, 2018f.

The pilot shortage is hurting smaller air carriers and air taxi companies more than it is the larger companies. Larger companies can afford to pay recently certified pilots more, while they can also afford to entice existing pilots away from smaller companies with higher salaries. Over the long term, the pilot shortage also has the potential to drastically affect Alaska's economy, not only by hurting small businesses that rely on aviation for their everyday operations, such as flightseeing and tourism air taxi companies, but also by limiting the shipment of freight and mail to and from the state's remote communities.

Technology Trends

In most of the world, technological advances are a constant part of the aviation industry, helping to make flying safer and more efficient. In Alaska, new technologies certainly impact aviation, but because aviation in Alaska is far more prevalent than in other states, and because many residents rely on a relatively older aircraft fleet, these advances may have a

lessened impact compared to other regions. Conversely, issues that may be of lesser importance to other regions may be of higher importance to Alaska aviators. The following sections provide an overview of aviation technology trends most impacting Alaska.

NextGen

The Next Generation Air Transportation System, commonly referred to as NextGen, is the FAA's long-term plan to transform the US air transportation system by shifting air navigation from a primarily ground-based system to a satellite-based system. Using the global positioning system (GPS), certain ground-based enhancement systems, and new in-aircraft technologies, NextGen aims to improve operational efficiencies throughout the system, leading to shorter flight routes, less fuel consumption, reduced congestion and delay, fewer environmental impacts, and greater safety. The key components of NextGen are discussed in the following sections.

ADS-B

A key component of NextGen is Automatic Dependent Surveillance-Broadcast (ADS-B). The groundwork for implementation of ADS-B throughout the national airspace was laid in Alaska from 1999 to 2006 as part of the Capstone project. The FAA provided avionics to aircraft in addition to the supporting ground equipment as part of research and development effort to improve navigational efficiency and safety. The success of the project and its merging with the Surveillance and Broadcast Services (SBS) program have helped to lead to the rapid expansion of ADS-B use.

ADS-B consists of two systems, ADS-B Out and ADS-B In. ADS-B Out provides air traffic controllers with position, altitude, airspeed, and other critical information on equipped aircraft. ADS-B In allows equipped aircraft to receive weather information and ADS-B Out data from other aircraft, helping with collision avoidance.

ADS-B is an important and immediate concern for pilots and aviators throughout the country. The FAA has set a deadline of January 1, 2020 for all aircraft that operate within certain classes of controlled airspace to be equipped with ADS-B Out avionics (there is no FAA requirement for ADS-B In). The cost of an ADS-B Out transponder is typically several thousand dollars, a significant cost for private aircraft operators and small aviation businesses. For example, the Garmin GTX 345, pictured below, costs nearly \$5,000 directly from the company, and the cost of installation can push the total cost significantly higher.



Garmin GTX 345 ADS-B Out Transponder. Source: Garmin (2018).

In much of Alaska, there is less concern over ADS-B than in many parts of the country, as Alaska has limited controlled airspace over its airports compared to many states. Many of

Alaska's airports and unpaved airstrips have no instrument approach procedure (IAP), and pilots fly under visual flight rules (VFR), eliminating any need for ADS-B Out. ADS-B In would be of greatest use to Alaska GA pilots, and the cost of an ADS-B In receiver is typically far less than the ADS-B Out transponder. However, the lack of a mandate over ADS-B In and the high cost of ADS-B Out will likely mean that ADS-B, in either of its forms, will not be adopted by a large percentage of Alaska's GA aircraft. Still, there remains a push to expand ADS-B ground stations in the state, with Aircraft Owners and Pilots Association (AOPA) representatives pushing the FAA to install as many as 12 new stations (George 2018).

NextGen Navigation

En Route Automation Modernization (ERAM) and Terminal Automation Modernization and Replacement (TAMR) are two equipment replacement programs aimed at improving navigation throughout the country. ERAM replaces the En Route Host computer at the 20 FAA Air Route Traffic Control Centers and aims to better automate several air traffic control functions, extend surveillance range, and increase the tracking capacity for each center from its current limit of 1,100 aircraft to 1,900. The TAMR program is replacing Terminal Radar Approach Control (TRACON) facilities with the new Standard Terminal Automation Replacement System (STARS), a new system that will improve cost-effectiveness while improving infrastructure and functionality.



ERAM computer. Source: FAA, 2018c.

NextGen Communication

Beyond ADS-B, NextGen includes several components designed to improve communication throughout the national aviation system. The Collaborative Air Traffic Management Technologies works to improve FAA's Traffic Flow Management System, a network for disseminating traffic data to users such as the military, airlines, air traffic control, and the public.

Data Communications (Data Comm) is a system that allows air traffic controllers to communicate to equipped aircraft using digitally written messages, helping to improve communication accuracy on route instructions and other information. Data Comm is optional and requires carriers to equip their aircraft with Future Air Navigation System avionics and VHF Digital Link radios. Data Comm was first installed in 2013 at Memphis International Airport and Newark Liberty International Airport and is now in use at 62 towered airports. Currently, Data Comm only operates for tower communications, but initial en route communications are planned to be in place by 2020 with full en route services planned for 2023. Despite being an FAA system, 43 international airlines are already utilizing Data Comm when flying within the National Airspace System (NAS). Implementation of Data Comm at three of Alaska's towered airports (Anchorage, Fairbanks, and Juneau) is not expected to occur soon. Data Comm uses the ERAM system, while Alaska still utilizes the Microprocessor En-Route Automate Radar Tracking System, meaning implementation of Data Comm would also require installation of ERAM (AOPA 2018).

The National Airspace System Voice System (NVS) will replace the current switch-based voice communication system used by air traffic control with a router-based system that provides a nationwide networking, monitoring and communication sharing capabilities. NVS will be an interconnected traffic control communication system that can allow aircraft to reach any air traffic control facility networked into the NVS, allowing for the shifting of workload between facilities, or the shifting of communications between facilities if a facility is out of service. NVS testing is still underway at the FAA William J. Hughes Technical Center in Atlantic City, New Jersey, with NAS connection

planned for three Seattle locations in 2019.⁹ After the initial evaluation phase, NVS will first be implemented at 20 en route centers followed by TRACONs and towers. The FAA is still developing its implementation schedule, with full deployment of the system planned for 2026. It is unclear when NVS will be implemented in Alaska, but the system would apply only to Anchorage, Fairbanks, and Juneau due to the limited number of control towers, TRACONs, and en route centers in the state.

Another system aimed at improving communication and information dissemination is the System Wide Information Management (SWIM infrastructure), which went live in 2016. SWIM establishes data format standards, translating data from different systems into standard formats and consolidating multiple data connections into a single access point, while supporting collaboration within and between the domestic and international aviation communities. The SWIM Terminal Data Distribution System (STDDS) converts surface data from control towers and TRACONs into easily accessible information published by the NAS Enterprise Messaging Service. SWIM uses several types of terminal systems. In Alaska, there is a full STDDS site in Anchorage and a STARS in Fairbanks (FAA 2018h).

Weather Reporting in Alaska

NextGen has planned improvements for weather reporting in the aviation community, often using some of the above technologies and systems. However, in Alaska the need for improvements to current weather reporting technologies is more immediate. Because aviation is the only form of access for most Alaska communities, timely and automated surface weather reporting to pilots is extremely important. Weather reporting capabilities are particularly crucial for emergency flight operations, for which rapid response may mean the difference between life and death. On a more basic level, automated weather reporting is an issue of safety. With so many Alaskans in the air at any given time, more weather reporting options improves the safety of the entire system.

⁹ Seattle En Route Center, Seattle TRACON, and Seattle-Tacoma International Airport.

Alaska currently has a shortage of adequate technology for weather reporting for both instrument flight rule (IFR) operations and VFR operations. The following sections provide an overview of these issues and ongoing efforts to overcome them.

Weather Reporting for IFR Operations

Most commercial operations, aircraft operating under IFR, and/or aircraft using an IAP are required to use weather information disseminated by the FAA through an FAA-certified weather station.

Stations certified by the FAA include the automated weather observing system (AWOS-III or higher only), automated surface observing system, and automated weather sensor system, in addition to certain manned stations such as aviation paid weather observers (A-Paid) or FAA contract weather observers. The FAA's general rule is that to be certified, the weather station must be able to provide capabilities comparable to an AWOS-III or higher, providing cloud height and visibility.

Certified weather reporting stations are typically assumed to have a coverage area of approximately 30 nautical miles. This is used to assess the density of coverage in most of the United States. However, due to Alaska's size, it would need about double the number of certified weather stations to meet a similar density. Compounding this issue is the state's widespread system "advisory" weather stations that are not certified by the FAA, and thus not available to pilots for up-to-the-minute weather reporting or flight planning (FAA 2018).

One such system, the modulated automated weather system (MAWS), is owned and operated by the National Weather Service, and like an AWOS-III, provides cloud ceiling and visibility data. Despite this, MAWS are not certified by the FAA, leaving them unusable for IFR operations.

Weather Reporting for VFR Operations

Pilots flying under VFR are free to use any of the uncertified, advisory weather stations, including MAWS and other systems such as remote automatic weather stations, automated UNICOMS (universal communications stations),

and AWOS below AWOS-III capabilities. Also available for use to VFR pilots is the FAA's system of over 230 weather camera stations throughout the state (the FAA has also installed numerous camera stations in British Columbia and Yukon). Feeds to these cameras are available online, providing pilots with basic weather information on the ground.



Weather camera image from Anaktuvuk Pass (AKP).
Source: FAA 2018e.

One limitation to these weather camera stations is that they are dependent on daylight for providing accurate information. Alaska's high latitude means that winters experience extremely long nights, with the region above the Arctic Circle experiencing no daylight during this time. The lack of daylight renders these weather cameras effectively useless to pilots. Aviation advocacy groups in Alaska, including AOPA, are currently pushing the FAA to begin research into systems that would provide this low-cost weather reporting to pilots at night. Such possible systems include low-light sensors and infrared sensors. The FAA has not begun this research.

AASP Efforts to Improve Weather Reporting

The shortage of weather reporting in Alaska is of immediate concern to the Alaska ADOT&PF and the system planning process. The AASP Aviation Weather Work Group examined the shortage of weather reporting facilities in Alaska, specifically the shortage of FAA-approved systems. The work group's main goal was to examine ways to provide additional aviation weather data throughout Alaska. In pursuit of this goal, the work group cataloged the locations and types of FAA-approved weather stations, advisory (non-FAA-approved) weather reporting stations, weather cameras,

and A-Paid reporting. The work group examined the cost of improving weather reporting in Alaska while looking at possible funding sources, pointing out that many small communities may lack the ability to provide the local funding match of the total cost of an AWOS-III or similar system.

The work group developed a priority list of airports most in need of on-site weather reporting. The highest importance was given to the 21 airports that currently have a published instrument approach but no FAA-approved weather reporting. Other important factors included NPIAS level of service, number of enplanements, AASP classification, and the distance to an FAA-certified weather station. The work group also made several policy recommendations such as halting FAA and NWS defunding and deactivation of A-Paid stations until additional automated stations can be built and joining the Alaska Airmen Association and other groups in support of systems such as MAWS being included in the WMSCR and NADIN, among others.

Wide Area Augmentation System

The aviation industry anticipated that GPS would provide significant enhancements to navigation, and while it provided excellent en route positional awareness, it was initially found to lack sufficient accuracy for use in all but the least demanding IAPs and could not be used to provide any sort of glideslope (vertical) guidance. The WAAS was designed to improve satellite navigation and allow pilots to rely on GPS for all phases of flights, including for instrument approaches. WAAS is a system that

improves the horizontal and vertical accuracy of GPS to the point where WAAS-guided approaches now match the accuracy of precision instrument approaches and can offer vertical guidance to as low as 200 feet above the airport surface in as little as 0.5 miles of visibility.

The WAAS is a combined system of the GPS, WAAS geostationary satellites, and ground-based Wide Area Reference Stations (WRS). The WRS collect data from the GPS and geostationary satellites to allow for more accurate navigation data to be communicated to pilots. Aircraft equipped with the proper receiving avionics and operating within a WRS service area can utilize the WAAS for enhanced navigation and approaches. The WAAS allows for localizer performance with vertical guidance (LPV) approach procedures. An LPV typically allows for a decision height of 200 feet and visibility of 800 meters, like a CAT I instrument landing system. An LPV with a decision height of 200 feet is typically referred to as an LPV 200.

The WAAS was commissioned for use in 2003. Initially, it was only available for LPV navigation in the lower 48 states. By 2008, WAAS coverage had expanded to include nearly all of Alaska within medium LPV 200 coverage and has only expanded since. There are now seven WAAS WRS in Alaska: Anchorage, Fairbanks, Juneau, Cold Bay, Bethel, Kotzebue, and Barrow.

Figure 42 shows current LPV 200 coverage by the WAAS. All the contiguous United States is now within nearly optimal range of WAAS stations for LPV use. Only parts of the Aleutian Islands and Hawaii remain out of range.

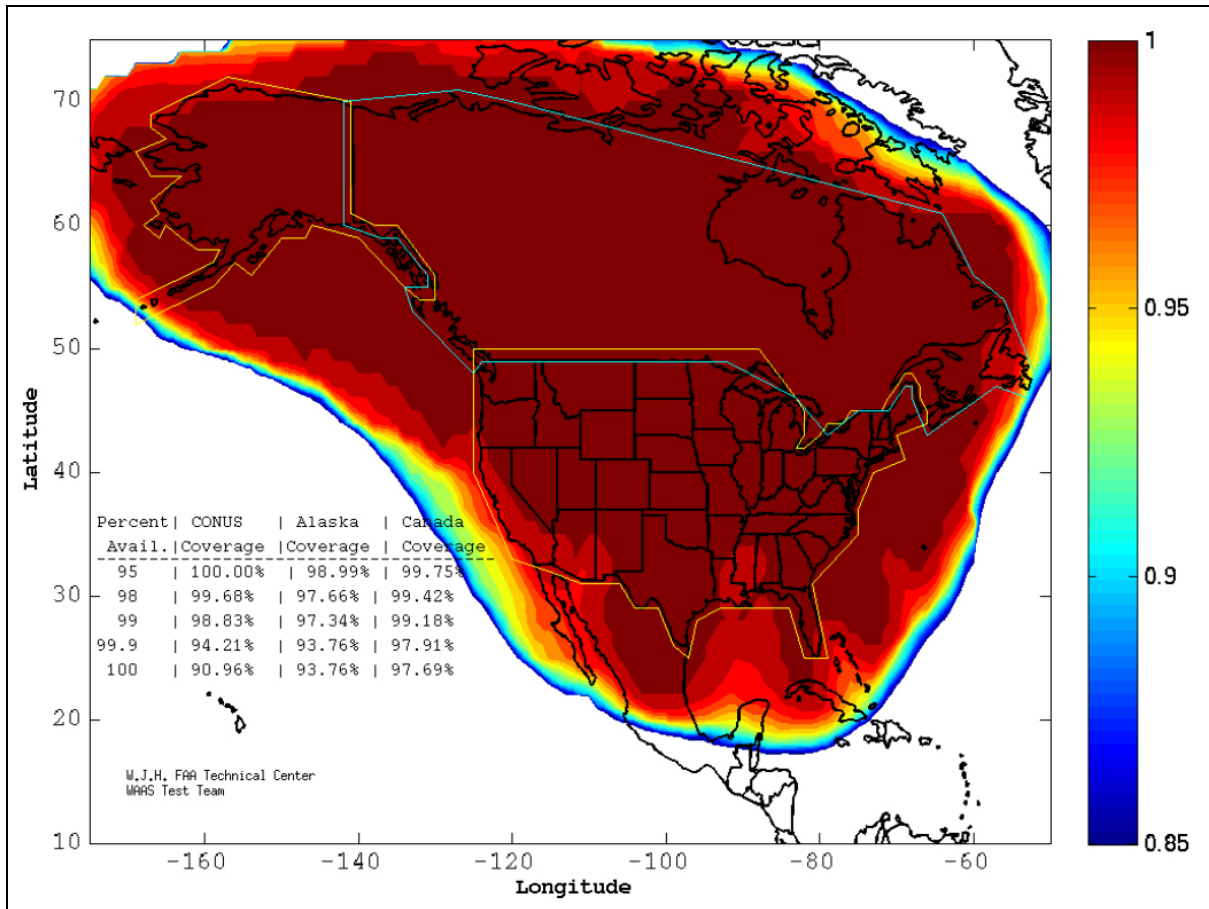


Figure 40: WAAS LPV 200 Coverage for May 29, 2018

Source: FAA, 2018i.

Improving and expanding instrument approaches in Alaska is a continuing priority for ADOT&PF and the AASP process. In 2012, an AASP work group developed a scoring system for determining which airports are most suited or in need of an instrument approach, using minimums (height above touchdown and visibility), AASP classification, and activity levels as factors. The work group touted the numerous benefits of WAAS-enabled IAPs such as greater safety and capacity, lower cost of implementation compared to on-ground approaches, near-precision capabilities, and simplified aircraft equipment.

Unleaded Aviation Fuel

100 low lead aviation gasoline (100LL or avgas) is the only transportation fuel still containing lead, which is used to prevent engine detonation or knocking. In addition to there being only one

manufacturer of the lead additive (Innospec), there is increased pressure from environmental lobbyists to eliminate the use of avgas through regulation, and the aviation community generally acknowledges that avgas will eventually be replaced with an unleaded alternative.

The FAA has identified several issues and challenges in the effort to replace avgas with an unleaded alternative. Of chief importance is the continual functionality and safety of the existing fleet while operating on a new fuel. With over 140,000 active piston aircraft made by dozens of manufacturers and with nearly limitless modifications and designs, ensuring the airworthiness of the fleet on a new fuel is a monumental undertaking. Also, of concern is the distribution of the new fuel, and whether existing avgas fuel farms can be used or affordably modified to distribute the

replacement fuel. The fuel must also be viable from a market stand point for operators, airports/FBOs, and the energy companies. Finally, the new fuel requirements must consider environmental considerations beyond merely removing the lead; any additives that serve a similar function as the lead must not create other adverse environmental effects, in addition to the disposal of unused avgas.

Undertaking the effort to develop an unleaded alternative to avgas is the Piston Aviation Fuels Initiative, a collaborative effort of aviation and fuel industry stakeholders. Two fuels, submitted by Shell and Swift—were selected out of 17 original submissions, and are in their second phase of testing (FAA 2017c). Like much of the aviation industry, Alaska aviators are currently in a wait and see mode with this development, as a shift from avgas to an unleaded alternative could have potentially dramatic ramifications on airport infrastructure, the aircraft fleet, and costs to operate.

Any significant changes to aircraft or airport infrastructure would only be amplified in Alaska. For example, if airports must replace their fuel farm tanks, these will have to be shipped to remote airport locations. Even modification equipment would require higher shipping costs to Alaska locations than to the lower 48 states. Aircraft ownership per capita is also much higher in Alaska than in the rest of the country, so any aircraft modifications needed to use the new fuel will affect a larger percentage of the state population. In addition, Alaskans fly an older fleet on average than pilots in the lower 48 states, which may also affect the ease and cost of using the new fuel.

Trends Summary

The aviation industry is in a constant state of change, influenced by external and internal factors. Since 2000, the industry has been greatly affected by 9/11 and the recession of 2008 and 2009 but has also experienced great technological advancements. The recession affected activity levels throughout the industry, with certain sectors recovering better than others. For example, commercial activity such as passenger enplanements and air cargo have recovered and grown past pre-recession levels, while GA operations and the shipments of new aircraft have continued a steady decline in recent years. The national pilot population is also in decline, decreasing at an average annual rate of 1.61 percent from 2008 through 2017. As fewer pilots and new aircraft enter the industry, the average ages of both the pilot population and national fleet are gradually increasing.

This section also provided an overview of emerging technologies of concern to national and Alaskan aviation, as well as ongoing concerns within the state such as the availability of weather information for Alaska pilots. For example, elements of NextGen, such as ADS-B are becoming increasingly prevalent and will soon be required for certain airspace, the reach of WAAS into Alaska has expanded substantially in recent years, and certain weather-reporting systems are not approved for inclusion in the FAA's broadcasting systems despite availability and demand within the state. Furthermore, a shift to unleaded aviation fuel will have far reaching impacts on aviation in the state.

Looking Ahead

In addition to determining the economic impact of the aviation industry on Alaska's economy, this study sought to identify perceived industry challenges. The study used surveys and interviews to gain insights from firms and individuals operating in the industry as well as from passengers and users of aviation services. The following subsections describe the major findings from the surveys and interviews. Survey responses are confidential and are aggregated for this report and quotes are not attributed to individuals.

Future Challenges for the Aviation Industry

The survey asked firms, agencies, and organizations operating on airports to provide their views on challenges facing future business and aviation-related businesses in Alaska. Many public airport managers noted that aging infrastructure and a lack of maintenance funding were serious concerns. Dips and cracks in the runway were common concerns for several smaller airports, and about half of survey respondents commented on the need for runway repairs or improvements.

"Currently the airport is in fairly good condition, but it is an aging infrastructure and we're seeing more maintenance difficulties with the runway, especially in the springtime with soft areas and heaving." –Public Airport Manager

The changing climate may also affect the degradation and safety of Alaska's airports. Several airport managers noted having difficulty with runway slumping or settling. They also

noted poor drainage and increased winter rain/ice as a threat to safe operations. This can cause additional expenses for keeping the runway surface clear for air service.

One serious issue for leaseholders was their inability to find quality labor. With an aging population of pilots, there seems to be a general shortage of skilled workers in the aviation market. Another problem faced by leaseholders is a change in the aviation economy. With a greater demand for tourism related services and decreases to related sectors like North Slope oil jobs, many companies have shifted resources to

"The price of fuel is always a big one for us. When the price of fuel goes up, the cost of our fuel must go up also. This sometimes causes our customers to buy fuel elsewhere." –Airport Leaseholder

meet new market demands.

Airport leaseholders commented on the cost of fuel as a significant factor in the operation of their businesses. Expenditures on jet fuel are a big concern for suppliers, commercial air carriers, and smaller air taxi companies.

Figure 43 compares domestic Alaska enplanements to domestic fuel prices. The drop in fuel prices in 2015 led to an increase in enplanements in 2015, 2016, and 2017. Savings in fuel costs are partially passed on to consumers in the form of cheaper tickets. Surveyed leaseholders were concerned with the increasing trend in fuel prices which can be observed in late 2017 and early 2018.

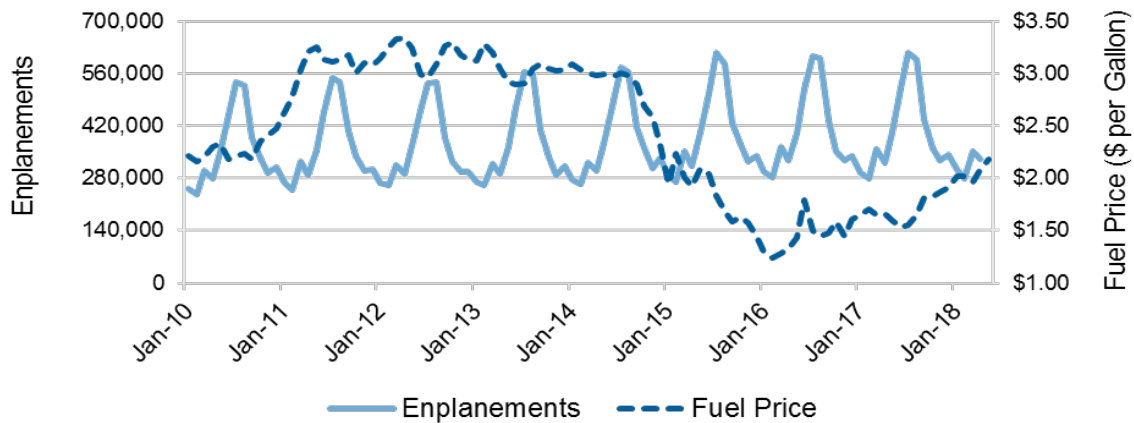


Figure 41. Alaska Enplanements for Domestic Flights and Domestic Fuel Price

Source: NEI estimates derived from BTS, 2018.

Airport Grades and Improvements Needed

The resident phone survey also asked questions to measure users' level of satisfaction with Alaska airports. Of respondents who made at least one trip per year, 72 percent identified ANC as their primary airport. Residents were asked to provide a "grade" for their primary airport (A through F) and Table 19 contains the average grade and GPA given to public airports. The overall airport grade (for all respondents) was a B+, except for the Southeast region, which received an overall airport grade of B.

Residents were also asked to grade various services provided at public airports. In each region, concessions and amenities received the lowest grade of the four service areas that were provided in the survey. In general, Alaska residents appear to be satisfied with the quality of air travel in the state. Alaska airports across each of the regions earned a B- or better in every category.

Table 19: Alaska Resident Average Grade and GPA for Public Airports and Services

Dimension	Southeast		Rural		Southcentral		Anchorage		Fairbanks	
Ease of travel through the airport	B+	3.67	B+	3.49	B+	3.63	A-	3.71	A-	3.86
Transportation to and from the airport	B+	3.41	B+	3.48	B	3.27	A-	3.59	B+	3.42
Airport Concessions and amenities	B-	2.72	B-	2.80	B-	2.96	B	3.24	B-	2.74
Availability of parking at the airport	B-	2.89	B-	2.96	B	3.26	B	3.22	B	3.42
Overall Airport Grade	B	3.29	B+	3.31	B+	3.48	B+	3.57	B+	3.54

Source: Alaska Survey Research, 2018.

Survey respondents were also asked to comment on how the airport could be improved. Most residents thought that no improvement was needed, and they were content with the status of the airport. The number one improvement requested by residents who used ANC was better parking availability. ANC passengers thought that parking was generally

congested, too far away, or difficult to find open spaces. The number one requested improvement by FAI passengers was food concessions. Respondents thought that the airport could benefit from having more food options and having them spread out across the airport.

Requested improvements at Bethel's airport were varied ranging from better concessions and food to parking. Users of Nome airport noted that the facility should be much larger.

Southeast airport users were most concerned with availability of parking. Ketchikan airport users requested more and better parking spacing, as well as more food options, and a bridge to provide driving access instead of a ferry. At JNU the most requested improvement was parking, closely followed by overcrowding in the drop-off pick-up zone, and availability of food inside the terminal. Sitka users noted that more long-term parking spaces would be helpful, but they also mentioned enlarging the airport and having a larger variety of airline companies.

Users of Kodiak's airport suggested an expansion of the terminal with more airlines and seating would be needed. Attachment D contains the full comments for Anchorage, Fairbanks, and Juneau travelers.

Future Travel

Respondents from communities in all regions indicated that they would be traveling more during the next 12 months (see Table 20). Of

those in off-road communities, 13.9 percent indicated they would travel more by air compared to 10.1 percent who would travel less. Residents in Southeast Alaska and on the road system indicated they would travel significantly more in the future. About 20 percent of Anchorage and Southcentral residents planned to travel more, compared to only 7 percent who would travel less. Fairbanks residents planned to increase their air travel by the most of any surveyed region. About 27 percent of Fairbanks residents planned to travel more, with only 2 percent planning to travel less than they had in the previous year.

Survey respondents who planned to travel by air less in the future were asked about the reason for the change in their travel habits (Table 21). About 12 percent of those respondents said they would travel more using alternative methods, but the majority indicated they would travel less altogether in the future (85 percent). Overall, passenger travel will probably increase in the near future. About 90 percent of residents predicted they would travel by air the same amount or more than they had in the last 12 months.

Table 20. Future Travel by Airport Region

	Southeast	Rural	Southcentral	Anchorage	Fairbanks
Changes to Travel Pattern	(%)				
Travel more	21.6	13.9	20.3	19.4	26.7
Travel less	6.4	10.1	7.2	7	2.3
Travel the same	72	74.7	72.4	72	69.8
Not sure	0	1.4	0	1.6	1.3

Source: Alaska Survey Research, 2018.

Table 21. Future Travel for Residents Expecting to Travel Less by Air

Expected Future Travel	Percent of Surveyed Residents (%)
Use other methods more	11.8
Travel less altogether	85.4
Not sure	2.8

Source: Alaska Survey Research, 2018.

Conclusions

Economic Output

In total, Alaska's aviation industry contributed nearly \$3.8 billion to the state's economy in 2017, with approximately equal portions coming from on-site entities and off-site effects. On-site entities can include state and federal agencies at the airports, as well as leaseholders. On-site spending includes employee wages, goods, and services that are purchased for regular operations, as well as for construction projects. Of the \$3.8 billion contribution, \$586 million is due to AIP funding. AIP funded projects are wide ranging, from desktop environmental studies to removal of storm debris from runways. All of these spending sources have additional benefits to Alaska through off-site effects.

The off-site effects are generated through household spending of wages, and through local purchases of materials and services. The off-site effects are important in both rural and urban Alaska, with about 40 percent of the economic contribution coming from the rural airport system. Construction on runways, terminal facilities, contracts for snow removal, and other projects all contribute to economic growth in Alaska's rural communities. Other off-site effects are generated in the tourism industry, which is most active during the summer months. These effects can be broad as well, spilling into the cruise ship industry or to local guiding and lodging services in remote locations throughout the Alaska wilderness.

Employment

In total, Alaska's aviation industry contributed about 35,000 jobs to the state's economy in 2017. The number of on-site employees at Alaskan airport has decreased by about 12,000 since 2007, but the aviation industry still supports about 7.8 percent of jobs in the state. That concentration is even higher in Anchorage, with about 10 percent or 1 in 10 Municipality of Anchorage jobs located at the airport. These jobs are related to the rural airport system because Anchorage is the departure point for many scheduled flight services to rural Alaska.

Anchorage is also the location of Alaska's primary mail sorting facility, so Bypass Mail shipments depart from Anchorage, along with a variety of other important cargo shipments.

About 25 percent or 8,800 of those jobs were associated with the rural airport system. 5,000 of those jobs were on-site at the airports, and the remaining 3,800 were off-site jobs. In rural Alaska, on-site jobs can include state airport employees, employees of federal agencies, cargo and passenger airline workers, aviation industry support, flight tour operators, and many more. Off-site jobs are generated through on-site spending and can be related to off-site tourism businesses like hotels, lodges or gift shops. There are also off-site effects in the construction, commercial fishing, healthcare, retail, and other sectors.

Rural Alaska

Alaska's rural airport system must serve many of the functions that can normally be supplied by a road system in the lower 48 states. Compared to Anchorage residents, residents of rural Alaska travel about twice as often by air. Even basic travel needs, such as business, school and church trips must all be by air. Because there is so little road infrastructure in rural Alaska, even groceries, household goods, and construction materials are transported to rural Alaska by plane. Some coastal communities can travel by ferry or receive shipments of freight by barge, but this is only for a few brief months in the summer. The EAS and Bypass Mail programs help to provide affordable passenger and freight services to rural Alaska communities. Alaskan communities represent about one third of the eligible EAS communities, and the Bypass Mail program is unique to Alaska.

Rural Alaska communities are also dependent on aviation for medical services. While many villages have clinics, there are few hospitals and trauma centers. Residents also travel by air for routine medical care, often traveling to larger hub cities to see general physicians, dentists, or specialists.

Rural communities also rely on aviation to bring employment opportunities. In southeastern and

southwestern Alaska, the commercial fishing industry contributes to air freight activity through shipments of fresh seafood. These shipments often pass through Anchorage before traveling to Asia or the lower 48 states. Tourism can also contribute to economic activity in rural

communities. Tourists purchase gifts, pay for tour guides, eat at restaurants and stay at hotels while traveling. This spending generates additional jobs and economic activity that would be unavailable without Alaska's rural aviation system.

Methodology

Aviation Activity Data

Three separate data sources were used to evaluate the level of passenger and freight activity at Alaska's airports. The FAA collects and publishes data on landed weight and passenger enplanements at commercial service airports. Landed weight is a manufacturer rating of the maximum landing weight, which includes the weight of an aircraft and its maximum cargo capacity. It is not a measure of actual cargo movement, but it does capture some information about the relative size of aircraft landing at airports. This information is used by the FAA to determine funding, and it can be used as a general indicator of airport activity.

Analysis of actual aviation cargo movement must rely on aircraft carrier reported data. Carriers report to both the USDOT and state level DOTs. At large airports like ANC and FAI, cargo and passenger data are collected to determine fees and taxes that must be paid to the airport for using its infrastructure and services. This data is carefully collected and compiled to generate forecasts and observe industry trends. Cargo weight is recorded either as enplaned, deplaned, or transit cargo. When international flights stop at ANC for refueling, most of the plane's cargo does not leave the aircraft. This is recorded as transit cargo. If cargo is removed from the plane (deplaned) or loaded (enplaned), it is recorded separately. When possible, the study team evaluated ANC and FAI's cargo and passenger activity with data provided by ADOT&PF.

Broader analysis of Alaska cargo and passenger movement must rely on a separate source of carrier reported data. The BTS compiles carrier-reported data that is submitted to the USDOT. The data is reported for both market analysis and as segmented data. Segmented data reports total passenger and cargo volume for each individual flight segment. Market data reports enplaned passengers at each departure point for multi-segment trips. The study team conducted airport activity analysis with only market data. Airport collected data is generally more reliable

than BTS data, but most rural airports do not collect data from carriers. The statewide analysis uses BTS market data to comment on general aviation trends like seasonality due to tourism and the effect of fuel prices on cargo movement. Aviation reporting to the government accounts only for scheduled service flights. Additional aviation activity can occur in the government and general aviation sectors that would not be reflected in the analysis presented in this report. Additional flight segments could include charter or business aviation, firefighting, aerial wildlife surveys, guided hunting, or personal and recreational flights. BTS data generally underestimates the level of aviation activity.

Survey Methodology

The study developed a comprehensive survey methodology to explore the various parts of Alaska's aviation industry. In total, the study developed and administered four different surveys to gather the data required to assess the contribution of Alaska's airports to the state's economy and to provide insight on the importance of the rural and international airport systems to Alaska residents. The analysis surveyed public airports (managed by ADOT&PF and other entities), leaseholders located on ADOT&PF properties, managers/owners of private airports, and 786 Alaska residents who have flown within the last 12 months. Each survey collected specific pieces of data required to generate both a quantitative and qualitative picture of the contribution of the state's airports to the economy and local communities.

The following subsections briefly describe each survey effort.

ADOT&PF Business/Leaseholder Survey

The study conducted a mail/internet survey of ADOT&PF leaseholders. Appendix A contains the complete survey instrument. ADOT&PF provided a list of its current leaseholders, which included approximately 815 unique leaseholders or leaseholder contacts. The study

team sent a letter to each lessee to request they complete an online survey and received 102 responses. This amount equals a raw response rate of 12.5 percent, while the functionally complete response rate was 10.9 percent. The survey generated enough responses from the population to perform the analysis. However, the study team augmented estimates using published employment values for companies who did not complete the survey. Estimates were also validated by comparing to values published by the FAA.

Each leaseholder received a letter asking them to participate in an internet-based survey. The preliminary data was heavily biased with responses from support service companies at small airports and underestimated the economic impacts at ANC and FAI. The study team then contacted selected leaseholders—primarily larger companies that did not respond to the letter—with additional requests by phone and/or e-mail. Follow up responses were used to amend the analysis but were not included in calculation of averages applied to missing observations.

The survey asked the leaseholders to:

- Identify their business type within a pre-identified group of categories
- Estimate the number of full-time and part-time positions held in an average month in 2017 by direct and contract employees
- Estimate the amount spent on direct and contract employee salaries in 2017
- Estimate their capital and operating expenditures, including the in-state portion, in 2017

In addition, the survey asked respondents an open-ended question about what they saw as the current and future challenges facing their business and aviation-related businesses in general.

The analysis uses the data from this survey to directly estimate the employment at state-owned and operated airports as well as to provide a vehicle for scaling up the business estimates from the private and non-ADOT&PF

Public airport surveys into estimates of employment and payroll benefits.

Public Airports Survey

A single survey instrument (Appendix B) was used to collect information for public airports around the state. The team sent an email invitation for airport managers to participate in the survey online. The study surveyed the ADOT&PF M&O managers in each of ADOT&PF's three regions and the non-ADOT&PF Public managers of various airports. The non-ADOT&PF public airports range from dirt or field strips on public lands to large municipally-owned airports such as the Kenai Municipal Airport, Merrill Field, or Juneau International Airport.

In total, the managers provided responses for 90 public airports around the state, but only 74 were functionally complete. There were complete responses for 68 of the 240 ADOT&PF owned and operated airports (28 percent), and 6 responses for other airports. 'Other' airports include Department of Natural Resources (which manages dozens of airstrips around the state) as well as float docks like Juneau and Taku Harbor. Managers for these airports reported no employees and limited maintenance. Some qualitative data like comments were available for 80 of the responses.

The survey instrument asked each manager (ADOT&PF and non-ADOT&PF) to provide four key pieces of information:

- The number of full-time and part-time positions filled in an average month in 2017
- The total amount spent on M&O in 2017
- The percentage of M&O expenditures that were spent in-state
- The total amount spent on capital expenditures in 2017

Private Airports Survey

The study team administered a survey instrument to owners and managers of Alaska's private airports. The survey instrument is attached in Appendix C. The study team

identified more than 300 private airports in the state that are recognized by the FAA. The owners/managers were invited to participate in the online survey by mail. We obtained 35 functional responses. This number is equivalent to 10.8 percent of the owners who were identified. The study team extrapolated statewide estimates of employment and spending by applying average values of the respondents to the non-respondents. Private airport owner/managers were asked to provide four key pieces of information:

- The number of full-time and part-time positions filled in an average month in 2017
- The total amount spent on M&O in 2017
- The percentage of M&O expenditures that were spent in-state
- The total amount spent on capital expenditures in 2017

Alaska Resident Travel Survey

An Alaska firm conducted a phone survey of 786 Alaska residents about their travel patterns in the last 12 months. Those respondents were at least 18 years old and had flown at least once within the last 12 months. The sample frame included residents in 28 communities throughout the state, which were identified using the respondent's self-reported ZIP code.

The survey used five regions to create cross tabulations using the respondent's zip code. The 'Southcentral' region includes the Matanuska Susitna Borough, the Kenai Peninsula Borough, the Kodiak Island Borough, the Southeast Fairbanks census area, and the Valdez-Cordova census area. The Southeast region included the Yakutat borough and all areas south of Yakutat. Fairbanks and Anchorage were each counted as separate regions, and the remainder of the state was considered part of the rural region. The survey instrument is attached in Appendix D, and the distribution of phone respondents by region and community is in Appendix E.

The randomized phone survey included landline and cellular telephone numbers. The results were "weighted to yield a sample with a representative distribution by geographical

area, as well as by age, ethnicity and gender of the respondent" (AK Survey Research 2018).

Economic Impact Analysis

The economic impacts of the aviation industry to the state's economy were quantified using input-output (I-O) analysis. I-O analysis is an economic tool used to measure the effects or impacts of an economic activity and is typically used to evaluate the benefits of a project, an entity, or an industry to the local, regional, and state economy. The analysis is based on a model of the inter-industry transactions within a community, region, or state. The I-O model is a matrix that tracks the dollar flow between industries within a specified economic region of interest. The model can measure how many times a dollar is re-spent in, or "ripples" through, a community (or a larger economic region) before it leaks out.

The I-O model yields multipliers that are used to calculate the indirect and induced effects on jobs, income, and business sales/output generated per dollar of spending on various types of goods and services in the study area. To evaluate the economic effects to the state or a particular region, only the "local" (i.e., within the state or within the region) expenditures are used in the model; the rest are considered leakages. More leakages mean smaller multipliers; and the larger the local expenditures, the greater the multiplier effects.

The multipliers for any given industry in any given location are unique, based on industry composition and geographic area.

IMPLAN™ software was used to develop the I-O model for the Alaska economy. IMPLAN is a widely used software package used for economic impact assessments, and Northern Economics has used the software for decades in Alaska. IMPLAN uses specific data on what inputs are needed to produce the goods or services for over 500 industries. IMPLAN also has borough-specific data on what industries are available locally from which to purchase those inputs. The study applied the most recent IMPLAN data (2017 data) on multipliers for all the economic sectors in the Alaska I-O model. Figure 44 illustrates conceptually how the total economic impacts or benefits are determined.

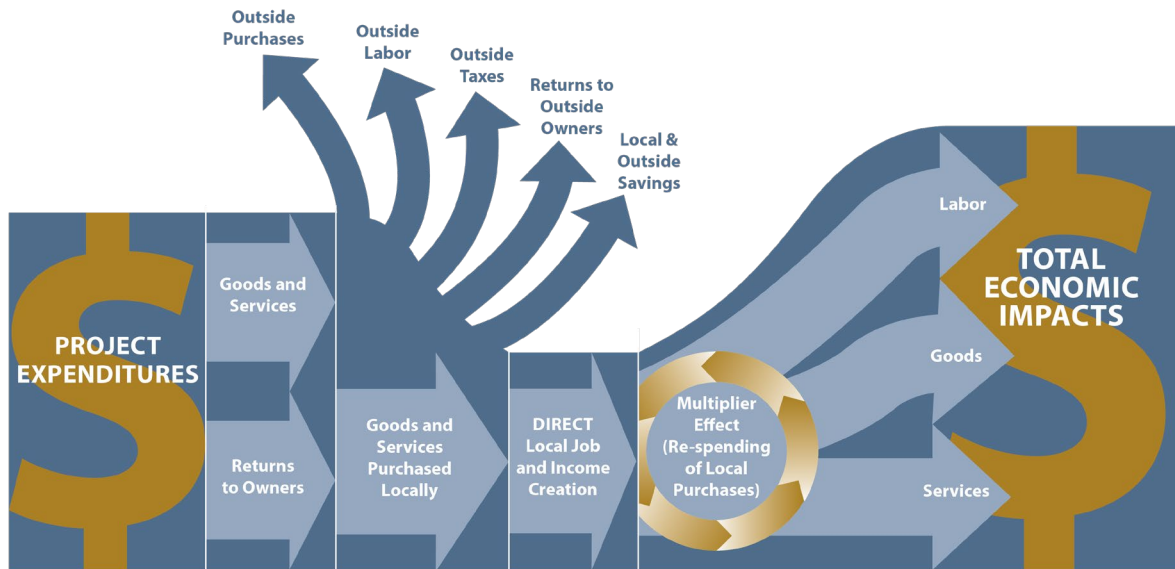


Figure 42. Framework for Evaluating the Total Economic Effects of Local Spending

Source: NEI, 2015.

The *aviation industry*, as defined in this statewide study, includes all the businesses and organizations located at public and private airports in Alaska. These entities, which include the airlines, airport concessions, air freight companies, airline support services, and even government and civic organizations, are collectively referred to in this report as “on-site entities.” Not included in this study’s definition of the aviation industry are the other aviation-related businesses that are not located at airports (e.g., off-site air freight companies or aircraft parts manufacturing companies). Also, not included in this report is the value of spending by visitors. Tourism is an important component of Alaska’s economy but estimating the amount of off-site money spent by tourists would require a separate survey and analysis. It was not a component of this report.

The measure of the total economic contribution is comprised of the direct (or on-site) effects and the induced (or multiplier/off-site effects). *Direct effects* result from aviation expenditures injected into the state economy through payroll, M&O, and capital spending by on-site entities. Not included in this study’s direct spending measure is the portion of expenditures by visitors and other persons traveling on air transportation services and through airports. The *induced effects*, which are also referred to as multiplier effects, result from the spin-off spending as aviation employees and other

businesses that support the on-site entities buy goods and services from the local vendors.

Direct spending and direct employment by the aviation industry were estimated using primary data from surveys of all public airports (managed by ADOT&PF and other entities), private airports throughout the state, and leaseholders located on ADOT&PF airports (see detailed descriptions of each survey in the Survey Methodology section above). The study then used secondary data to supplement information not available from the survey data such as wages and salaries by occupation.

Survey data used as inputs to the I-O model include the following:

- Direct full-time and part-time employment
- Total payroll
- Annual M&O expenditures
- Share of M&O expenditures spent in-state
- Capital expenditures
- Share of capital expenditures spent in-state

The study obtained operating expenditures for ANC and FAI from the operating and financial summary information (*Form 127*) submitted to the FAA as part of the Airport Financial Reporting Program (FAA 2017a).

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Acronyms

AASP	Alaska Aviation System Plan
ABS	Alaska Bypass Service
ADOT&PF	Alaska Department of Transportation and Public Facilities
ADS-B	Automatic Dependent Surveillance-Broadcast
AIAS	Alaska International Airport System
AIP	Airport Improvement Program
ANC	Ted Stevens Anchorage International Airport
AOPA	Aircraft Owners and Pilots Association
A-paid	aviation paid weather observer
ATS	American Trauma Society
AWOS	automated weather observing system
BTS	Bureau of Transportation Statistics
CMGTW	certified maximum gross takeoff weight
EAS	Essential Air Service
ERAM	En Route Automation Modernization
FAA	Federal Aviation Administration
FAI	Fairbanks International Airport
FY	fiscal year
GPS	Global Positioning System
GSP	Gross State Product
I-O	input-output
IAP	instrument approach procedure
IFR	instrument flight rule
LPV	localizer performance with vertical guidance
M&O	maintenance and operations

MAWS	modulated automated weather system
NADIN	National Airspace Data Interchange Network
NAS	National Airspace System
NEMS	National Airspace System Enterprise Messaging Service
NVS	National Airspace System Voice System
STARS	Standard Terminal Automation Replacement System
STDDS	SWIM Terminal Data Distribution System
SWIM	System Wide Information Management
TAMR	Terminal Automation Modernization and Replacement
TRACON	Terminal Radar Approach Control
USDOT	U.S. Department of Transportation
USPS	U.S. Postal Service
VFR	visual flight rules
WAAS	Wide Area Augmentation System
WMSCR	Weather Message Switching Center Replacement
WRS	Wide Area Reference Station

Definitions

Alaska's Aviation Industry	In this study the 'aviation industry' includes all airports and airport leaseholders in Alaska.
Capital Expenditures	Money used by a company or government agency to invest in new assets or improve/renovate existing assets.
Enplanement	A single passenger boarding an aircraft.
Gross State Product (GSP)	The value of all the goods and services produced by the economy, less the cost of goods used in production.
Off-site	Entities not located on airport premises. Also referred to as 'indirect', 'induced', or 'multiplier'.
On-site	Entities which operate on the airport premises. This include the airlines, airport concessions, air freight companies, airline support services, government and civic organizations, and others. Also referred to as 'direct'.
Full Time Equivalent (FTE)	Full time equivalent jobs represent positions requiring at least 2,080 hours per year. This is the same as working 8 hours per day, 5 days per week, and 52 weeks per year. A part time position that requires only 20 hours per week is equal to 0.5 FTE jobs, because the employee works half the amount that a full-time employee works.