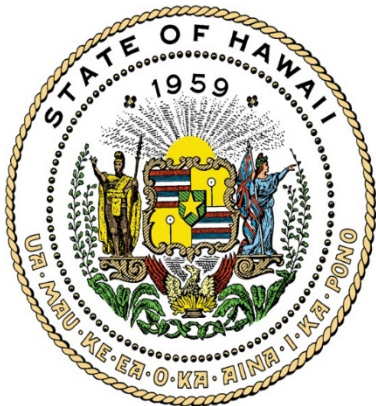




# Air Cargo in Hawaii's Economy

*2020 Update*



Department of Business,  
Economic Development & Tourism  
Research and Economic Analysis Division

December 2020

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## Table of Contents

I.	Introduction.....	3
II.	Hawaii Air Cargo Flows and Patterns.....	5
A.	Total Flow Volumes. ....	5
B.	Domestic and International Air Cargo. ....	7
C.	Air Cargo Transported by Type of Carrier. ....	9
D.	Air Cargo – Top 5 Origins and Destinations (Domestic and International). ....	13
E.	Top Air Cargo Carriers in Hawaii.....	15
III.	Jobs in Air Cargo Industry in Hawaii .....	16
IV.	Value and Composition of Hawaii Air Cargo.....	17
V.	Future Outlook for Air Cargo .....	20
	References.....	22

## I. Introduction

The air cargo industry is an essential component of Hawaii's economy. High value products as well as perishable time-sensitive fresh agricultural products and seafood are transported to and from the mainland and global destinations.

The exponential growth of air cargo started in 1997, with the Air Cargo Deregulation Act (US Congress, 1980). The deregulation spurred innovation and competition among air carriers, propelling the rapid expansion of air cargo both domestically and globally. US deregulation was followed by deregulation in Europe (Sharpenseel, 2001), and, more recently, Asia (Sharpenseel, 2010).

In addition to deregulation, developments in aerospace technology allowed planes to carry more cargo for longer distances. More recently, increased power and efficiency in airplane design and engines are crucial in increasing plane's cargo capacity and diversifying destinations even further (Crabtree, et al., 2020). The original 2016 *Air Cargo in Hawaii's Economy* report noted Qantas Airlines' announcement of its first non-stop service from Sydney, Australia to London (Qantas, 2017); since then, the route was tested, in November 2019, taking 19 hours and 19 minutes (Barracosa, 2019). Qantas used to be active in the Hawaii market, and this new long-distance non-stop service may open over time new European markets for Hawaii for airlines. If there is sufficient demand, it seems non-stop service to Europe is possible, since it is no longer a question of technological constraints.

Along with deregulation, the economy became more speed-driven and globally inter-connected (Kasarda et al., 2005). As the global economy entered the new millennium, trends have emerged that favor air cargo, including just-in-time inventory management, the exponential growth of e-commerce, and increased demand for perishable products.

The maritime transportation industry is much larger than the air cargo industry when measured by the volume of goods transported. According to Boeing, in 2019, the world maritime industry carried an estimated total of 11.9 billion tons compared to 60.9 million tons for the air cargo industry. By weight, more than 86 percent of world maritime trade is in raw materials and other bulk items. Most of these commodities, such as oil, metal ores, and grains, are low value, not time-sensitive, and shipped by sea in specialized tankers or bulk carriers. This maritime trade cannot be directly compared to the high-value, dry commodities associated with transport by air. It is estimated that less than 1 percent of world trade tonnage is carried by air cargo, but because of the high value of these goods, they represent about 35 percent of the value of goods shipped globally (Crabtree, et al., 2020).

Generally, goods that are shipped by air share one or more of the following characteristics: high value, light weight, time sensitive, and/or perishable (Lee, 2007).

For Hawaii, in 2018, the top commodities by value air freighted to the state (deplaned) included the following: precision instruments, electronics, miscellaneous manufactured products, machinery, motorized vehicles, transport equipment, textiles, pharmaceuticals, and textiles/leather.

On the other hand, among the top commodities by value air freighted out of the state (enplaned) were the following: meat/seafood, other agricultural products, precision instruments, textiles/leather , other foodstuffs, pharmaceuticals, and electronics.

It is important to note the shift in Hawaii's air cargo patterns from shipping cargo out of the state in greater volumes in 1990s (usually to international destinations), to much larger volumes of cargo air freighted into the state, especially and increasingly from domestic destinations. This shift is particularly pronounced starting in 2002, when domestically based air cargo destined for Hawaii increased by 55 percent over the previous year. This was not a one-time change, but a sustained new trend – domestically based Hawaii-bound cargo volumes remained at a new higher level up to the present time.

One of the reasons for the large increase in Hawaii-bound domestic air cargo volumes is, certainly, e-commerce. Not just e-commerce, per se, but the inventive nature of internet-based retailers to attract more customers by providing discounted, and often free, shipping. For example, according to Amazon, starting in January 2002, the company started providing free shipping with orders over a certain threshold amount. And while there is no data available showing how actual online orders originating in Hawaii changed from 2001 to 2002, Hawaii-based internet shoppers benefitted from this service, because it now allowed them to receive their orders fast and free of shipping charge (Amazon, 2002).

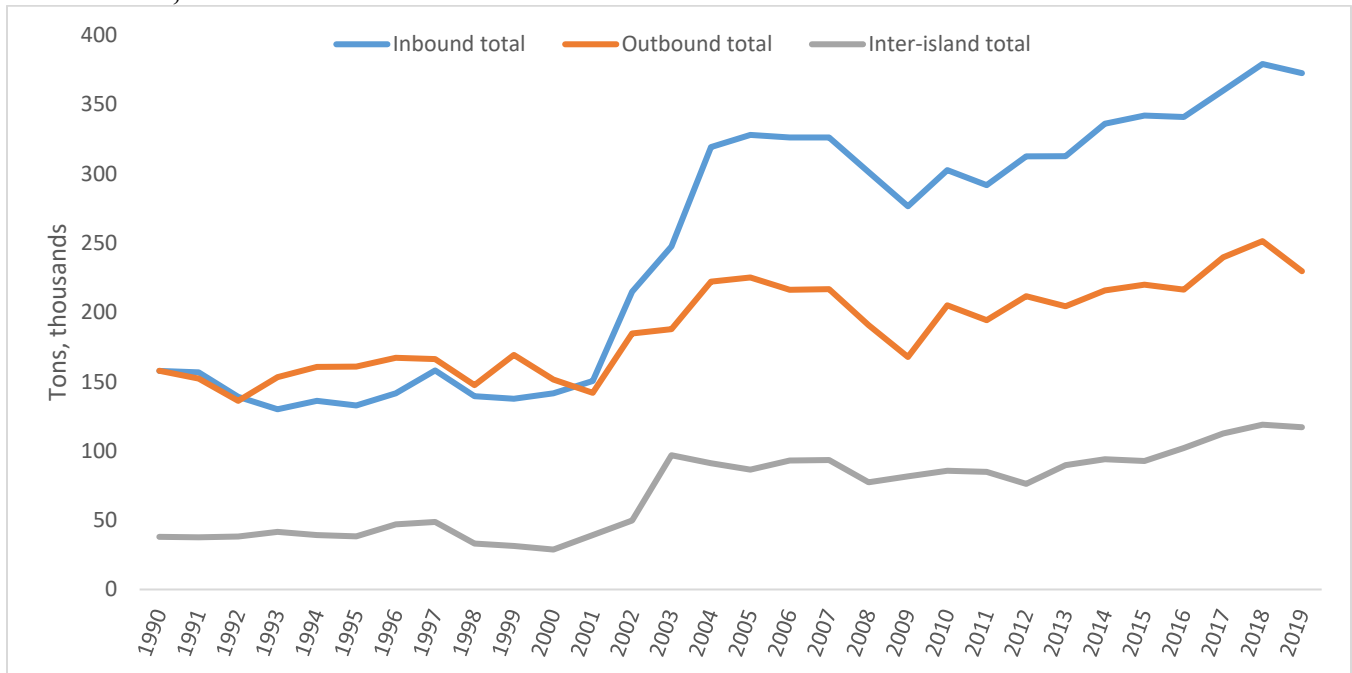
Given the importance and the continued steady forecast for growth of e-commerce in the United States and in Asia Pacific, and, realizing the benefits to the Hawaii-based consumers in particular, it is likely that air cargo volumes to Hawaii will remain high.

Due to changes in data formatting, this update uses a different data set from the 2016 report, and thus has slightly different air cargo totals for the 1990-2016 time period – there is less cargo, by volume, in this data set compared to the 2016 report data set, particularly in the earlier time periods, though the trends are nearly identical. The data in this update is more closely aligned with the data used in DBEDT's Data Book for the most recent data; the only difference between data in this report and the Data Book is that the Data Book's air cargo data is supplemented with additional data from the Hawaii State Department of Transportation (DOT). In order to have consistent data throughout the report, the supplemental data from the DOT is not included in the totals.

## II. Hawaii Air Cargo Flows and Patterns

**A. Total Flow Volumes.** Historically, air cargo volumes freighted out of the state have been higher than cargo destined for Hawaii. Figure 1 shows that while the volume of air freight out of the state increased in 2000s as compared to the 1990s, air cargo inflows into the state have been growing much faster over the same period.

**Figure 1. Air Cargo and Mail: Total Annual Tonnage in Hawaii – Inbound, Outbound, and Inter-Island, 1990 - 2019**



Source: DBEDT calculations based on data from the United States Department of Transportation, Bureau of Transportation Statistics, *Air Carrier Statistics (Form 41 Traffic)- All Carriers*

Taking a look at how air cargo flows differ in Hawaii, it is worth noting that, while air cargo freighted out of Hawaii increased only slightly during the entire period analyzed (1990 to 2019), by about 1.5 percent per year on average, total air cargo and mail coming to Hawaii increased at much larger volumes, by 4.5 percent per year on average. Increases in inter-island air cargo and mail shipments were even larger, by about 6.9 percent per year on average during 1990-2016. For perspective, Hawaii’s GDP has grown by about 4.3 percent per year on average.

In addition, comparing average annual air and mail cargo volumes in Hawaii during the 1990s and 2010s, there was a 134 percent increase in cargo and mail on flights coming to Hawaii, while cargo and mail going out of the state increased by just under 40 percent. Air cargo and mail on inter-island flights more than doubled in 2010s compared to the 1990s, increasing by about 147 percent (Table 1).

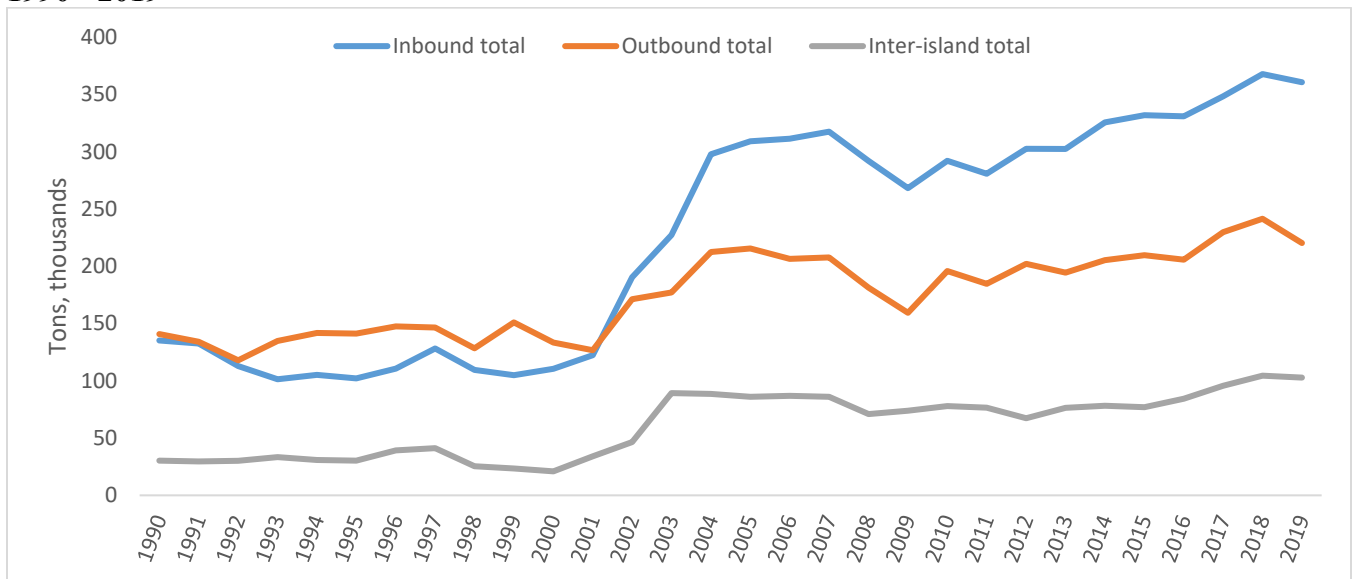
**Table 1. Total Air Cargo and Mail Flows in Hawaii: 1990 – 2019**

Time period	Inbound		Outbound		Inter-island	
	Tons, annual average	Average annual growth	Tons, annual average	Average annual growth	Tons, annual average	Average annual growth
<b>1990-2019</b>	247,022.1	4.5%	188,774.1	1.5%	70,152.7	6.9%
<b>Last 5 years: 2015-2019</b>	358,923.6	1.8%	231,408.6	0.9%	108,653.9	5.2%
<b>1990s</b>	142,910.2	-1.3%	157,067.9	0.7%	39,335.8	-1.7%
<b>2000s</b>	263,147.0	9.5%	190,452.7	1.1%	73,767.9	18.3%
<b>2010s</b>	335,009.1	2.3%	218,801.6	1.2%	97,354.3	3.7%
<b>Difference in Annual Average 1990s and 2010s</b>	<b>+192,098.9</b>	<b>+134.4%</b>	<b>+61,733.7</b>	<b>+39.3%</b>	<b>+58,018.5</b>	<b>+147.5%</b>

Source: DBEDT calculations based on data from the United States Department of Transportation, Bureau of Transportation Statistics, *Air Carrier Statistics (Form 41 Traffic)- All Carriers*

When splitting air cargo from air mail volumes, there is an almost inverse relationship between air cargo and air mail: as air cargo volumes increased, air mail decreased. Figure 2 and Figure 3 show this difference and their divergent paths.

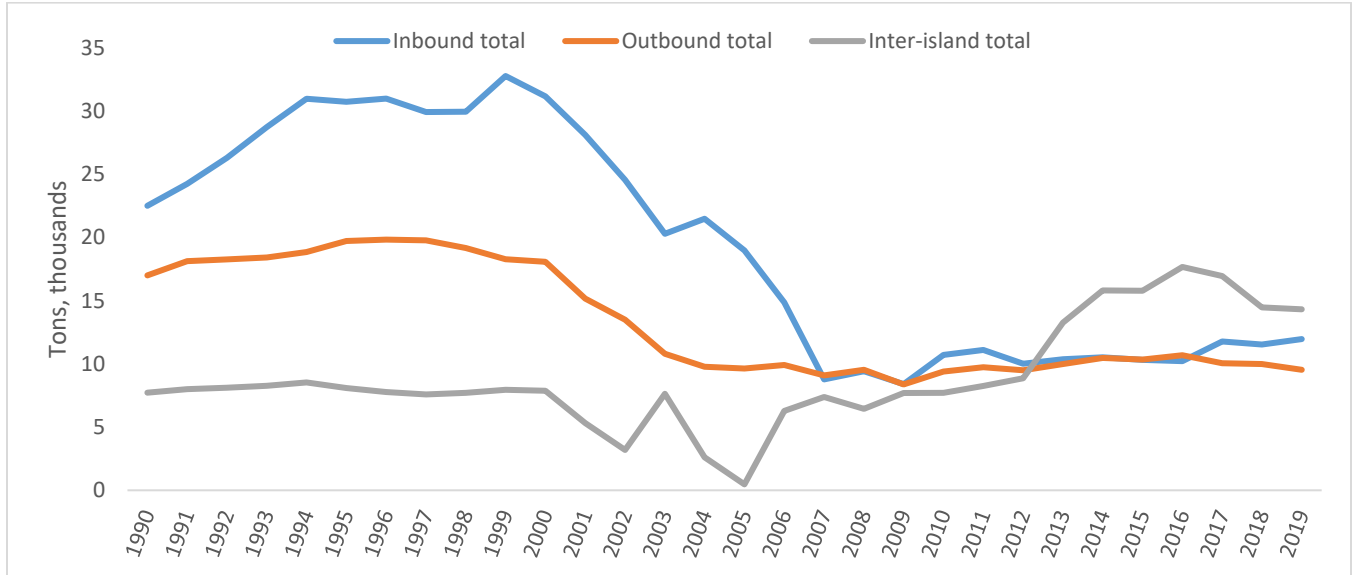
**Figure 2. Air Cargo in Hawaii: Total Tonnage – Inbound, Outbound, and Inter-Island, 1990 - 2019**



Source: DBEDT calculations based on data from the United States Department of Transportation, Bureau of Transportation Statistics, *Air Carrier Statistics (Form 41 Traffic)- All Carriers*

With large decreases in volumes of air mail from 1990s into 2000s, there is a noticeable shift to cargo. The only category where air mail volumes increased – both compared to the 1990s levels and in recent years, is in the inter-island air mail shipments. Even though shipments classified as air mail fell to very low volumes in 2002, 2004, and 2005, they have recovered, and increased to levels well above those for both inbound and outbound Hawaii air mail. But inbound and outbound Hawaii air mail shipments have both fallen sharply, stabilizing in the recent few years to around 10,000 tons a year on average.

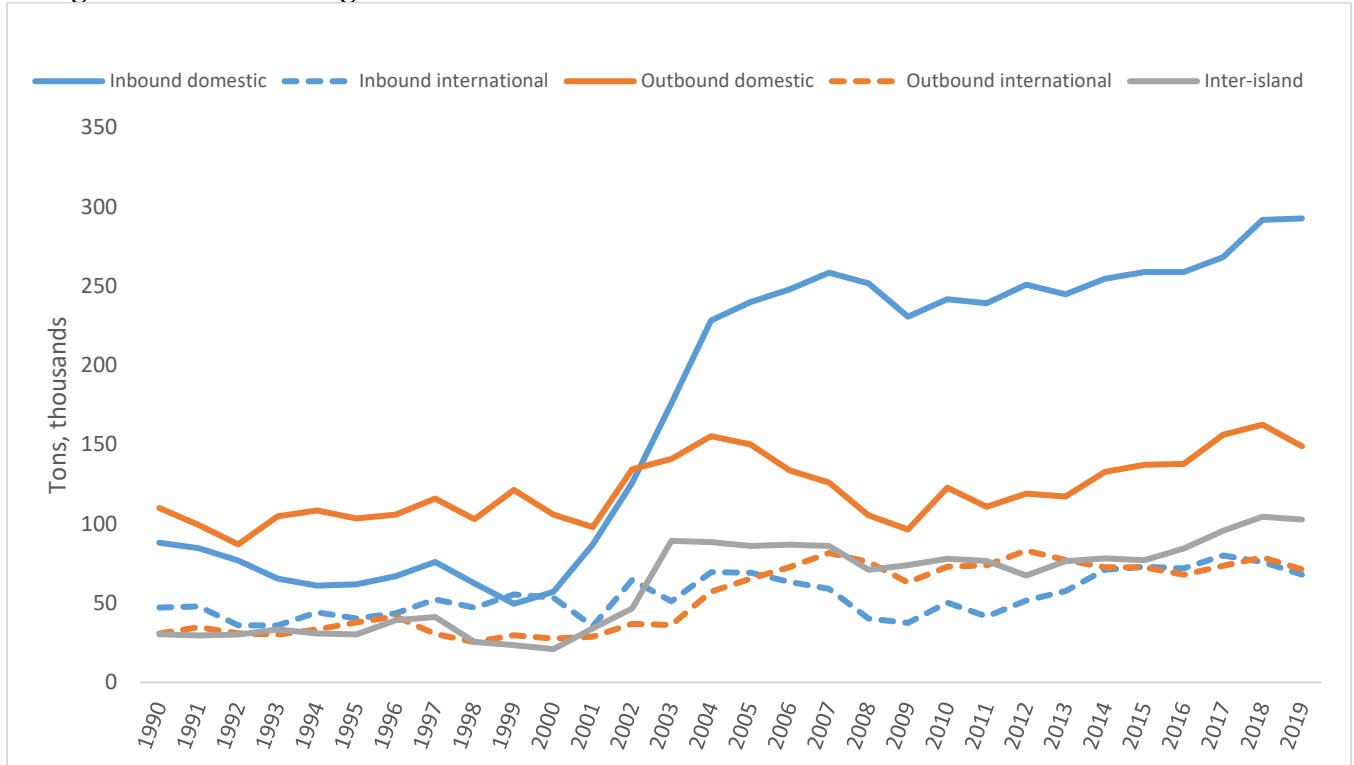
**Figure 3. Air Mail in Hawaii: Total Tonnage – Inbound, Outbound, Inter-Island, 1990 – 2019**



Source: DBEDT calculations based on data from the United States Department of Transportation, Bureau of Transportation Statistics, *Air Carrier Statistics (Form 41 Traffic)- All Carriers*

**B. Domestic and International Air Cargo.** Separating Hawaii air cargo flows further into *domestic and international origin and destination*, the largest changes took place in early 2000s, with domestically-originating cargo bound for Hawaii increasing the most. As Figure 4 shows, since 2000, Hawaii-bound air cargo from international destinations increased on average at about 1.4 percent per year, and air cargo from Hawaii to international destinations increased on average at about 8 percent per year. Air cargo originating from domestic destinations bound for Hawaii, however, has increased by over 9 percent per year since 2000. This is not reflected in air cargo volumes leaving Hawaii bound for domestic destinations, which increased roughly at the same pace as international inbound air cargo. The rate of increase for air cargo leaving Hawaii bound for domestic destinations was at about 2 percent, however, as Figure 4 shows, the volumes in domestic outbound air cargo are larger than those in international flows.

**Figure 4. Hawaii Air Cargo Total Volume – Inbound, Outbound, and Inter-Island: by foreign and domestic origin and destination – 1990 - 2019**



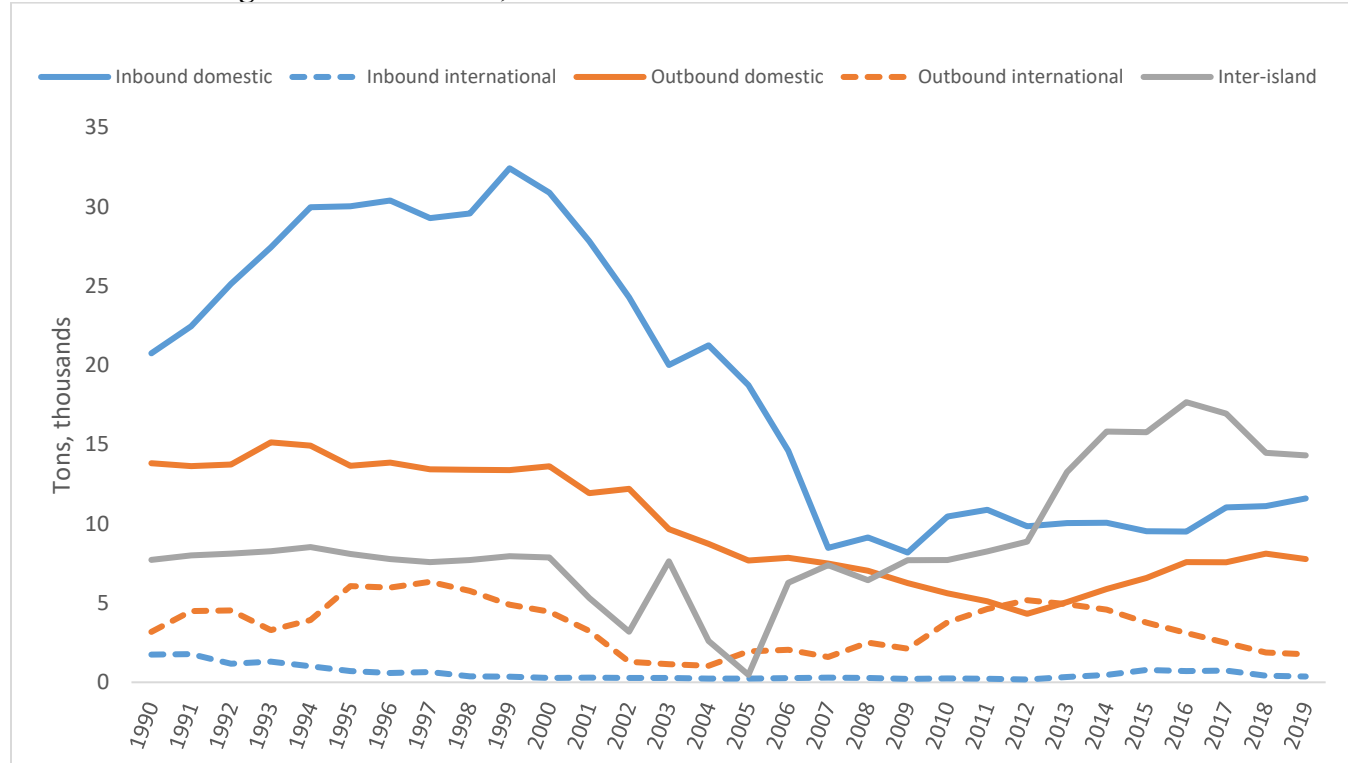
Source: DBEDT calculations based on data from the United States Department of Transportation, Bureau of Transportation Statistics, *Air Carrier Statistics (Form 41 Traffic)- All Carriers*

Hawaii air mail volumes (separated into domestic and international flows) show a near complete and consistent contraction since 1990, with the exception of inter-island air mail volumes, as Figure 5 highlights.

It is also notable that international air mail bound for Hawaii dropped from just over 1,750 tons in 1990 to about 176 tons in 2012, at the lowest level, recovering somewhat in the recent five years. Since 2000, domestic air mail bound for Hawaii dropped by over 3 percent, whereas inter-island air mail rose by over 4 percent.



**Figure 5. Hawaii Air Mail Total Volume – Inbound, Outbound, Inter-Island: by foreign and domestic origin and destination, 1990 - 2019**



Source: DBEDT calculations based on data from the United States Department of Transportation, Bureau of Transportation Statistics, *Air Carrier Statistics (Form 41 Traffic)- All Carriers*

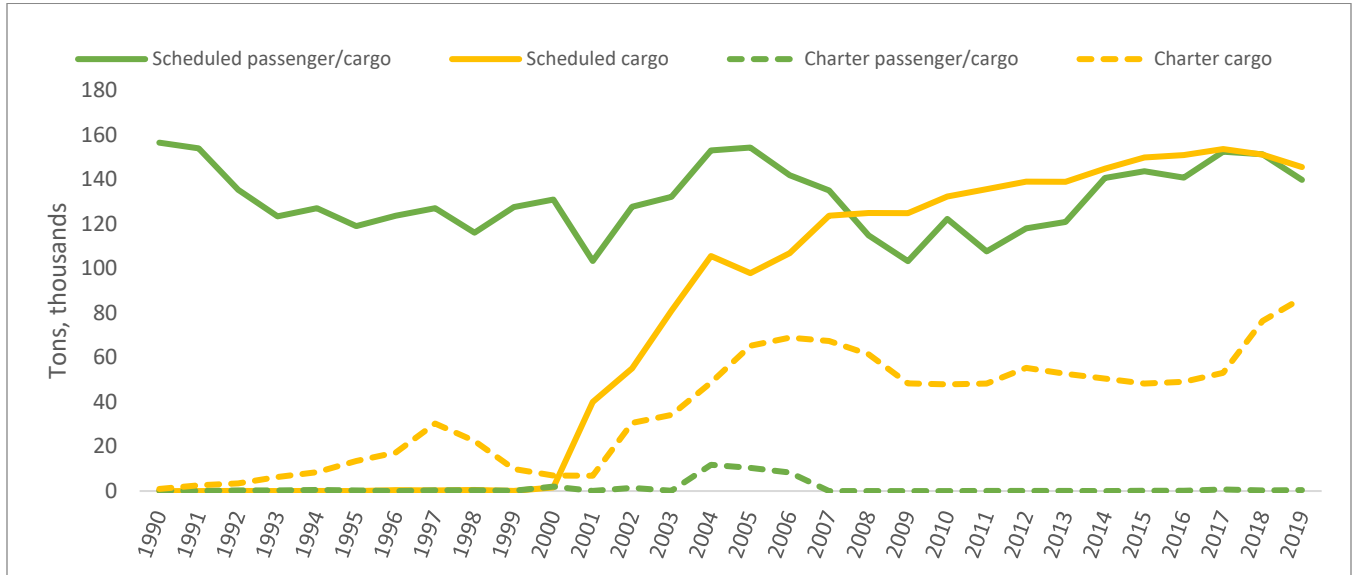
**C. Air Cargo Transported by Type of Carrier.** Analyzing the data further to see how air cargo delivery to Hawaii or shipped from the state to destinations around the world changed, there is a growing specialization in handling air cargo. There is a shift away from the 1990s, when most of the cargo was transported along with passengers to more freight being handled by cargo-only carriers, such as Atlas Air, UPS, FedEx, Kalitta Air, Asia Pacific, ABX Air, along with Aloha Air Cargo, and Rhoades Aviation (Transair and Transair Express), with the latter two being more active in the inter-island air cargo transportation. In addition to these carriers, there are other cargo-only carriers, who specialize in either scheduled cargo delivery or chartered cargo (sometimes both).

Growing volumes of air cargo, especially the ones originating from the US mainland airports and delivered to Hawaii, explain much of this shift to cargo-only carriers. In addition to larger volumes, specific requirements, such as refrigeration or space for larger items, which regular civilian passenger aircrafts may lack, contributed to the growth in cargo-only carriers.

Note that, as a result of using a different data set, data on military carriers are missing (though these values are small). Further, this data splits between charter passenger and charter cargo carriers; it is unclear if the 2016 report data had such a distinction, particularly for cargo carriers

(the bump in charter cargo carriers in the late 1990s, along with the essentially-zero cargo for scheduled cargo, is suggestive that these two types of carriers were combined in the 2016 report).

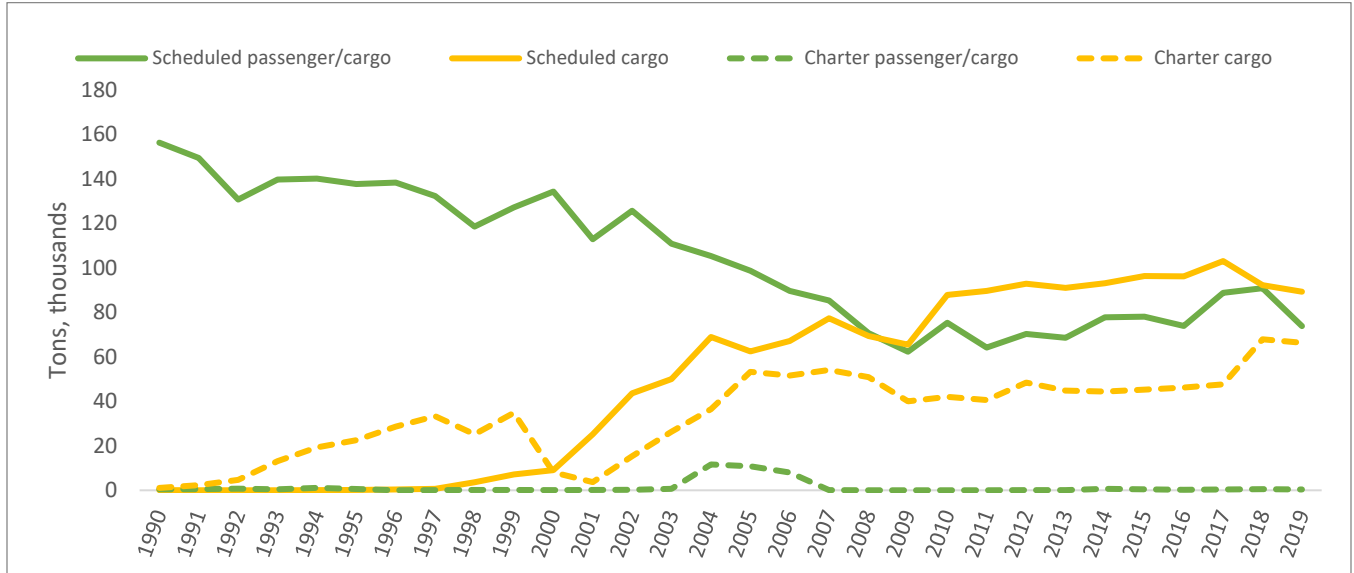
**Figure 6. Inbound (Deplaned) Total Air Cargo and Mail in Hawaii by Type of Air Carrier, 1990 - 2019**



Source: DBEDT calculations based on data from the United States Department of Transportation, Bureau of Transportation Statistics, *Air Carrier Statistics (Form 41 Traffic)- All Carriers*

Comparing total air cargo volumes for goods shipped to Hawaii with those shipped from the state, there is also an increase in the volumes shipped by the air cargo carriers (although a more gradual one), but a larger comparative decrease in the volume of cargo transported by the passenger carriers. Figure 7 highlights these differences.

**Figure 7. Outbound (Enplaned) Total Air Cargo and Mail from Hawaii by Type of Carrier, 1990 - 2019**



Source: DBEDT calculations based on data from the United States Department of Transportation, Bureau of Transportation Statistics, *Air Carrier Statistics (Form 41 Traffic)- All Carriers*

However, the sharpest change happened on the inter-island flights, where there has been an almost complete switch from carrying cargo along with passengers on most inter-island flights (between 1990 to about 2001) to air cargo increasingly being freighted almost entirely by the cargo-only carriers.

Figure 8 shows this growth in air cargo being transported on flights with no passengers.

**Figure 8. Inter-Island Air Cargo in Hawaii by Type of Carrier, 1990 - 2019**

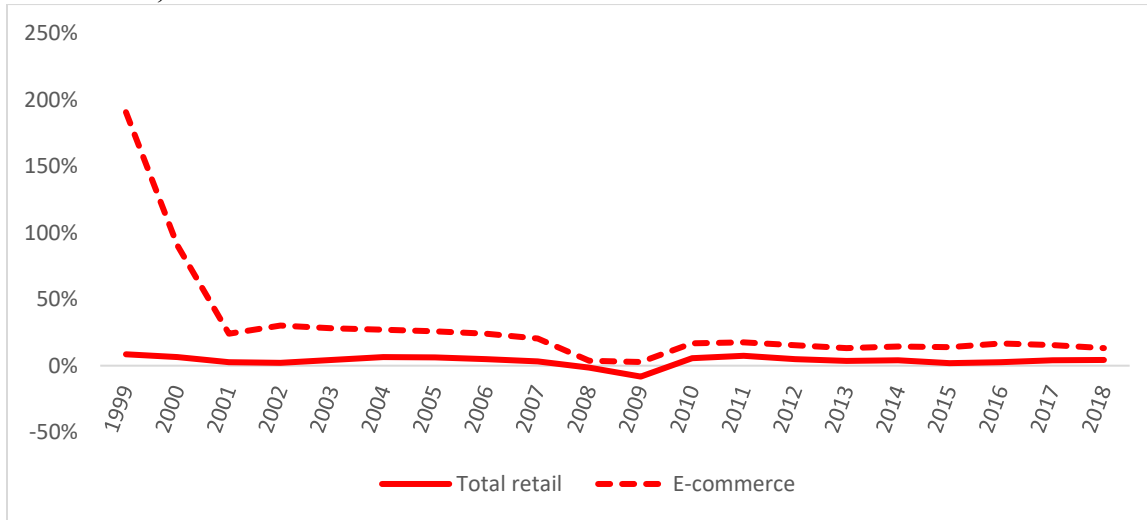


Source: DBEDT calculations based on data from the United States Department of Transportation, Bureau of Transportation Statistics, *Air Carrier Statistics (Form 41 Traffic)- All Carriers*

**What could explain the air cargo shipping trends in the graphs above?** The shift to and increase in the use of specific air cargo carriers (non-passenger planes) could be contributed to the rise of the **online shopping and internet commerce (e-commerce)**. E-commerce is relevant to Hawaii, because even though there is little firm and reliable state-specific data on online shopping, *Business Insider* quoted a 2012 study, which estimated that Hawaii online shoppers spend on average the third highest in the nation, at \$140 per order, although Hawaii accounts for roughly 0.5 percent of America’s total online shopping (Business Insider, 2012).

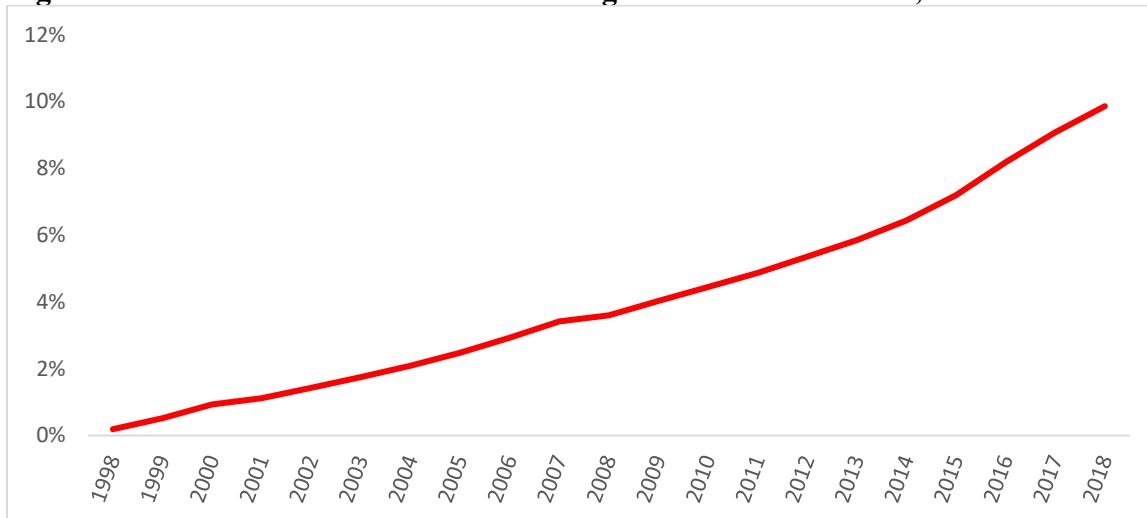
E-commerce has grown exponentially in United States since late 1990s, with the rise of online shopping giants, such as Amazon, Ebay, along with the “brick-and-mortar” retailers’ own websites. Figure 9 and Figure 10, based on US Census data, shows how e-commerce compares with total retail in the United States.

**Figure 9. Growth in Retail Trade: Annual Percent Change in Total Retail and E-Commerce, 1999-2018**



Source: US Census Bureau, Annual Retail Trade Survey, 2019

**Figure 10. E-Commerce Sales as a Percentage of Total Retail Sales, 1998-2018**



Source: US Census Bureau, Annual Retail Trade Survey, 2019

However, as Hawaii residents have experienced, many online shops do not ship to Hawaii. Sometimes Hawaii residents will order goods regardless of the shipping charge, through special order, but often the shipping charge to Hawaii is a deterrent in online shopping. So how is the rise in air cargo shipments to Hawaii and e-commerce related? The answer was found in Amazon’s 2002 annual report. 2002 was chosen because that the year that recorded the largest increase in air cargo shipments to Hawaii. In 2002, the change in Hawaii-bound air cargo from the US mainland airports, compared to 2001, was 63.4 percent.

According to Amazon, “In January 2002, we introduced a new shipping option at [www.amazon.com](http://www.amazon.com), offering everyday free shipping for certain orders that exceed a specified amount, and we lowered this threshold several times throughout the year. We offer similar shipping options for our internationally-focused Web sites and may offer other free or reduced-fee shipping options over time. These shipping offers reduce shipping revenue as a percentage of sales and cause our gross margins on retail sales to decline. We view these shipping offers as an effective marketing tool.” (Amazon, 2002).

**D. Air Cargo – Top 5 Origins and Destinations (Domestic and International).** Figure 11 shows the top 5 domestic and international airports that sent and received air cargo in Hawaii in 2019.

**Figure 11. Top Airports of Origin and Destination for Hawaii Air Cargo, 2019**



Source: DBEDT-created map; calculations based on data from the United States Department of Transportation, Bureau of Transportation Statistics, *Air Carrier Statistics (Form 41 Traffic)- All Carriers*

It is notable that many of these airports do not generate the products that are shipped to Hawaii. For example, airports in Memphis, TN (MEM) and Louisville, KY (SDF) are home hubs for some of the largest cargo carriers, such as FedEx and UPS. In addition, third-largest sending airport of air cargo to Hawaii, Ontario, CA, is a predominantly cargo handling airport: there are very few passenger flights in 2016 from the Ontario, CA airport to Hawaii.

The top receiving airport of international air cargo from Hawaii is Sydney, Australia. However, according to Qantas Airlines, very little air cargo actually originates in Hawaii. So Honolulu airport also acts as a regional hub for the goods from the US mainland and elsewhere to Australia and the Pacific. In addition to Sydney, the top 5 for internationally bound air cargo from Hawaii are Auckland, New Zealand; Hong Kong; Seoul-Incheon, South Korea; and Tokyo-Narita.

Table 2 shows the domestic and international routes with the most cargo transported in 2019. Due to the size of Honolulu, the routes the transported the most cargo translates to the origins and destinations that sent and received the most cargo from the state. There are two notable exceptions: the Honolulu-to-Guam route ranks fifth for international outbound cargo, whereas Guam ranks sixth in total international outbound cargo send from Hawaii; and Honolulu-to-Dallas/Fort Worth has a similar relationship (fifth ranked route, sixth ranked in state total).

**Table 2. Air Cargo in Hawaii Ranked by the Airport of Origin and Destination, 2019**

<b>Top 5 Airports of Cargo Origin in 2019 - International, Inbound</b>			
	Origin Airport	Route	Freight, tons
1	Tokyo - Narita, Japan	NRT-HNL	20,584
2	Osaka - Kansai, Japan	KIX-HNL	9,043
3	Tokyo - Haneda, Japan	HND-HNL	8,526
4	Seoul - Incheon, South Korea	ICN-HNL	8,324
5	Nagoya - Chubu Centrair, Japan	NGO-HNL	5,525
<b>Top 5 Airports of Cargo Origin in 2019 - Domestic, Inbound</b>			
	Origin Airport	Route	Freight, tons
1	Los Angeles, CA	LAX-HNL	84,312
2	Memphis, TN	MEM-HNL	40,846
3	Louisville, KY	SDF-HNL	35,797
4	Ontario, CA	ONT-HNL	29,070
5	Oakland, CA	OAK-HNL	17,546
<b>Top 5 Airports of Cargo Destination in 2019 - International, Outbound</b>			
	Destination Airport	Route	Freight, tons
1	Sydney, Australia	HNL-SYD	43,788
2	Auckland, New Zealand	HNL-AKL	8,558
3	Hong Kong, Hong Kong	HNL-HKG	5,310
4	Seoul - Incheon, South Korea	HNL-ICN	2,760
5	Tamuning, Guam	HNL-GUM	2,180
<b>Top 5 Airports of Cargo Destination in 2019 - Domestic, Outbound</b>			
	Destination Airport	Route	Freight, tons
1	Los Angeles, CA	HNL-LAX	58,839
2	Oakland, CA	HNL-OAK	12,147
3	Ontario, CA	HNL-ONT	7,244
4	San Francisco, CA	HNL-SFO	6,365
5	Dallas-Fort Worth, TX	HNL-DFW	5,116

Source: DBEDT calculations based on data from the United States Department of Transportation, Bureau of Transportation Statistics, *Air Carrier Statistics (Form 41 Traffic)- All Carriers*

*E. Top Air Cargo Carriers in Hawaii.* Table 3 ranks the airlines and provides their market share in the air cargo market in Hawaii for 2016.

**Table 3. Top Air Cargo Carriers in Hawaii, 2019**

<b>Top 5 Air Cargo Carriers: Inbound to Hawaii</b>			
	Airline	Cargo Freighted, tons	Market Share
1	United Parcel Service	90,919	19.63%
2	Federal Express Corporation	71,584	15.45%
3	Hawaiian Airlines Inc.	64,621	13.95%
4	Atlas Air Inc.	36,474	7.87%
5	Kalitta Air LLC	31,962	6.90%
		Top 5 total market share - inbound	63.80%
<b>Top 5 Air Cargo Carriers: Outbound from Hawaii</b>			
	Airline	Cargo Freighted, tons	Market Share
1	Federal Express Corporation	54,651	16.93%
2	United Parcel Service	52,383	16.23%
3	Hawaiian Airlines Inc.	35,422	10.97%
4	Rhoades Aviation dba Transair	31,522	9.76%
5	Aloha Air Cargo	30,295	9.38%
		Top 5 total market share - outbound	63.27%
<b>Top 5 Air Cargo Carriers: Inter-island</b>			
	Airline	Cargo Freighted, tons	Market Share
1	Rhoades Aviation dba Transair	31,522.4	30.69%
2	Aloha Air Cargo	30,295.3	29.50%
3	United Parcel Service	17,224.5	16.77%
4	Hawaiian Airlines Inc.	10,842.6	10.56%
5	Northern Air Cargo Inc.	6,325.2	6.16%
		Top 5 total market share - inter-island	93.68%

Source: DBEDT calculations based on data from the United States Department of Transportation, Bureau of Transportation Statistics, *Air Carrier Statistics (Form 41 Traffic)- All Carriers*

As seen in Table 3, while both Hawaii inbound and outbound air cargo markets are somewhat competitive, the inter-island air cargo market is largely served by two Hawaii-based airlines: Transair (Rhoades Aviation) and Aloha Air Cargo. Fedex, the top airline for Hawaii outbound and second ranked carrier for inbound air cargo, is a relatively small player in the inter-island air cargo market, accounting for under 2 percent of the market. Interestingly, UPS, the top airline for Hawaii inbound and second ranked carrier for outbound air cargo, is ranked third among inter-island air cargo carriers.

It is also worth noting that the volume of air cargo freighted to Hawaii is significantly higher than going from Hawaii. Another point worth mentioning is that the Hawaiian Airlines reports cargo along with passengers (in the planes' belly), while the other carriers report no passengers, only cargo.

### III. Jobs in Air Cargo Industry in Hawaii

The tremendous growth in air cargo volumes in Hawaii between 2001 and 2019 is reflected in jobs in the air cargo industry throughout the state of Hawaii. Table 4 lists below the changes in jobs growth in the scheduled freight and nonscheduled chartered freight air transportation.

**Table 4. Top Jobs in Air Cargo Industry in Hawaii, 2019**

<b>Occupation</b>	<b>Number of Jobs</b>	<b>Job Growth (2001-2019)</b>	<b>Median Hourly Wage</b>
Flight attendants	106	1,225%	\$26.86
Aircraft mechanics and service technicians	88	700%	\$31.15
Ticket agents and travel clerks	82	531%	\$21.69
Commercial pilots	82	1,540%	\$39.41
Airline pilots, copilots, and flight engineers	58	867%	\$113.46
Laborers and movers	53	1,225%	\$16.16
Airfield operations specialists	43	4,200%	\$17.64
Cargo and freight agents	37	1,750%	\$14.64
Aircraft service attendants	25	178%	\$18.89
Customer service representatives	22	1,000%	\$17.44
First-line office supervisors	18	1,700%	\$27.57
First-line mechanics supervisors	18	1,700%	\$36.64

Source: EMSI

Large increases in jobs number in the scheduled and nonscheduled freight air transportation categories point to the vast growth in this industry, which supports the growth of air cargo volumes in Hawaii.

Working in the air cargo industry is also a relatively well-paid endeavor. The median pay ranges from the low of about \$14 an hour for cargo and freight agents, to the high of above \$113 an hour paid to air cargo pilots.



#### IV. Value and Composition of Hawaii Air Cargo

While it is fairly complicated to compute the *value of air cargo* to and from Hawaii, mainly because of the lack of data (and the differing estimate from the few existing sources of data) on the precise nature of goods and their value to consumers and producers, there is analysis done at the US Department of Transportation, the Freight Analysis Framework (FAF4), based on data from the Bureau of Transportation Statistics. FAF4 incorporates data from a variety of sectors to estimate tonnage and value of cargo by origin/destination, commodity type, and transportation mode. Using FAF4 data analysis toolkit, Table 5 and breaks down the value of air cargo to and from Hawaii, based on total tonnage from the FAF4 database.

**Table 5. Value of Air Cargo Shipments to, from, and in Hawaii, 2018**

	per ton	per kg	per lb
<b>Inbound to Hawaii</b>	\$20,175.90	\$22.24	\$10.09
<b>Outbound from Hawaii</b>	\$12,457.57	\$13.73	\$6.23
<b>Inter-Island</b>	\$9,297.03	\$10.25	\$4.65

Source: Data from the Freight Analysis Framework Version 4.4, US Dept. of Transportation, calculations by DBEDT

Table 6 summarizes the total values for air cargo freighted in and out of Hawaii, as well as inter-island shipments. Note that these volumes are lower than the ones calculated using Bureau of Transportation Statistics data, as in II. Hawaii Air Cargo Flows and Patterns. Table 7 adjusts the last 3 columns based on the actual volumes calculated above using BTS data. The most recent FAF4 estimates are for 2018, so 2018 air cargo data is used from BTS.

**Table 6. Value of Air Cargo Shipments to, from, and in Hawaii, 2018, FAF4 Modelled Data**

	Volume (tons)	Air Cargo as Percent of All Cargo in Hawaii*	Value	Value of Air Cargo as Percent of Total Cargo Value*
<b>Inbound</b>	120,618.8	3.6%	\$3,443,607,800	14.8%
<b>Outbound</b>	33,598.4	2.0%	\$418,554,400	19.5%
<b>Inter-Island</b>	55,384.6	0.1%	\$514,912,400	2.0%

\*Should not sum up to 100, values do not sum up across categories

Source: Freight Analysis Framework Version 4.4, calculations by DBEDT

**Table 7. Actual Value of Air Cargo Shipments to, from, and in Hawaii, 2018, BTS Adjustment**

	Volume (tons)	Air Cargo as Percent of All Cargo in Hawaii*	Value	Value of Air Cargo as Percent of Total Cargo Value*
<b>Inbound</b>	291,690.81	8.8%	\$5,885,123,477	25.3%
<b>Outbound</b>	162,505.63	9.7%	\$2,024,425,215	94.5%
<b>Inter-Island</b>	104,432.93	0.2%	\$970,916,267	3.7%

\*Should not sum up to 100, values do not sum up across categories

Source: Data from the Freight Analysis Framework Version 4.4 and Bureau of Transportation Statistics, *Air Carrier Statistics (Form 41 Traffic)- All Carriers*; calculations by DBEDT

As seen in the table above, while air cargo accounts for about 9 percent of Hawaii’s total inbound cargo and outbound cargo from Hawaii, it has a much higher value for the cargo as a proportion of all cargo, particularly for outbound cargo. Inter-island air cargo shipments account for 0.2 percent, but about 3.7 percent in value of the total cargo shipped within Hawaii.

Hawaii data is comparable with the world patterns in air cargo: world air cargo accounts less than 1 percent of all cargo tonnage, yet represents 35 percent of world trade value. Air cargo is a high value industry and it serves markets that demand speed and reliability for the transport of goods. The highest value commodities, including computing equipment, machinery and electrical equipment, account for the highest share of airborne trade tonnage versus their share of containership tonnage. Air cargo will remain a priority choice for shipping higher value goods, especially the ones are time-sensitive and perishable (Crabtree, et al., 2020).

Analyzing *the composition of air cargo goods* transported to and from Hawaii, Table 8 below list the top 10 categories of goods shipped to Hawaii by air, ranked by total value. The total market value for the top 10 categories of goods shipped to Hawaii during 2018 was a little over \$2.9 billion. However, the value of international goods shipped to Hawaii from international destinations was much smaller, at \$273 million in 2018. As noted in the section above on shipping volumes, the volume of international air cargo shipped to Hawaii was just under 76,000 tons, while the volume of domestic air cargo shipped to Hawaii around 4 times higher, at almost 292,000 tons.

According to Boeing, for air cargo moved from North America to East Asia, there are seven commodity categories accounting for 62 percent of the air cargo traffic: office and communication equipment, documents and small packages, machinery and electrical equipment, metal products, vegetable products, animal products, and chemical products (Crabtree, et al., 2020).

**Table 8. Top 10 Categories of Goods Shipped by Air to Hawaii, 2018**

Rank by value	Category of Goods, Domestic	Current \$	Category of Goods, International	Current \$
1	Precision instruments	\$567,212,800	Exports of repaired imports	\$106,726,064
2	Electronics	\$543,125,100	Exports charity	\$41,273,337
3	Miscellaneous manufacturing products	\$423,671,400	Jewelry	\$30,542,627
4	Machinery	\$363,462,500	Fish (no fillet or other meat)	\$22,180,301
5	Motorized vehicles	\$247,678,700	Travel goods, handbags, wallets, jewelry cases, etc.	\$20,981,895
6	Transport equipment	\$228,839,300	Turbojets, turbopropellers	\$16,141,491
7	Pharmaceuticals	\$185,911,400	Watches (wrist, pocket, etc.)	\$13,441,292
8	Textiles/leather	\$173,913,700	Data process machine	\$7,727,562
9	Meat/seafood	\$112,235,700	Parts of aircraft, spacecraft	\$7,103,016
10	Mixed freight	\$100,110,000	Fish fillets & other fish meat	\$6,571,504
	<b>Total Top 10 Domestic</b>	<b>\$2,946,160,600</b>	<b>Total Top 10 International</b>	<b>\$272,689,089</b>

Source: Data on Domestic Shipping is from the Freight Analysis Framework Version 4.4, US Dept. of Transportation, Bureau of Transportation Statistics; data on International Shipping is from the U.S. Census Bureau Foreign Trade Division

Comparing goods flown to Hawaii with what is going out of Hawaii to the rest of the world, the value of goods is a bit more balanced, but with a heavier reliance on Hawaii’s agriculture and aquaculture products.

**Table 9. Top 10 Categories of Goods Shipped by Air from Hawaii, 2018**

Rank by value	Category of Goods, Domestic		Category of Goods, International	
		Current \$		Current \$
1	Meat/seafood	\$112,462,600	Civilian aircraft, engines,	\$36,697,472
2	Other agricultural products	\$54,339,200	Crustaceans	\$24,945,668
3	Precision instruments	\$43,807,000	Military apparel, equipment	\$17,202,476
4	Textiles/leather	\$36,517,100	Oscilloscopes, spectrum analyzers	\$8,270,811
5	Other foodstuffs	\$32,172,300	Melons and papayas, fresh	\$6,559,100
6	Pharmaceuticals	\$30,507,200	Coffee	\$6,059,168
7	Electronics	\$26,428,300	Paintings, drawings	\$5,916,472
8	Machinery	\$22,992,900	Jewelry	\$5,549,629
9	Miscellaneous manufacturing products	\$21,244,000	Chocolate & other cocoa products	\$3,415,418
10	Mixed freight	\$11,599,400	Medicaments of mixtures	\$2,976,562
	<b>Total for Top 10 Domestic:</b>	<b>\$392,070,000</b>	<b>Total for Top 10 International</b>	<b>\$117,592,776</b>

Source: Data on Domestic Shipping is from the Freight Analysis Framework Version 4.4, US Dept. of Transportation, Bureau of Transportation Statistics; data on International Shipping is from the U.S. Census Bureau Foreign Trade Division

Part of the explanation for this relatively closer value of outbound shipments to domestic and international destinations is the fact that there is also less of imbalance in volume. The total volume of air cargo shipped from Hawaii in 2018 to international destinations was slightly under 79,000 tons, while outbound cargo shipped from Hawaii to domestic destinations in 2018 was over 162,000 tons. Table 9 shows the top 10 categories of goods shipped from Hawaii to both domestic and international destinations, ranked by value.

## V. Future Outlook for Air Cargo

Hawaii is well positioned for the future to play an important role in the global air trade. Since Hawaii serves as link between the North American markets and the markets in Asia Pacific and Australia, Honolulu airport will continue rising in importance.

According to Boeing, air cargo is closely linked to global trade and industrial production. There has been slower worldwide growth in air cargo in the last decade, linked to a weak global economy, underperforming growth in world trade, tariffs, and the COVID-19 pandemic (Crabtree, et al., 2020).

However, *global e-commerce is expected to more than double over the next few years*, growing from \$3.0 trillion in 2018 to \$6.5 trillion in 2023 (Crabtree, et al., 2020). As noted earlier, according to the US Census Bureau data, e-commerce sales in the US have grown by nearly 18 percent per year on average since 2001; in 2019, online retail accounted for almost 10% of all retail sales in the US (US Census, 2017).

The region of the world that shows the highest potential in e-commerce growth is the Asia-Pacific, with China responsible for the largest part of this growth. Since 2001, the growth of online retail sales in the US was significantly lower than other regions in the world; in China, online sales rose by nearly 36 percent year-on-year over the past 9 years. The continuous increase in the number of online shoppers and the improvement of purchasing power have become the major driving force for continuous online retail sales growth in the Asia Pacific region (Crabtree, et al., 2020).

Once FedEx started its operations in 1971, it led to the profound changes in how express packages are delivered, beginning a nationwide door-to-door delivery of documents and small packages within one to two days. Late 1990s and early 2000s brought with them very high rates of growth in e-commerce demand for business to consumer (B2C) as well as business to business (B2B) deliveries of retail purchases. These developments will contribute to the radical changes in the freight transportation. The major express carriers, including UPS, DHL, and FedEx serve e-commerce flows. Amazon has begun building its own logistics network to augment capacity provided by others (Crabtree, et al., 2020).

Boeing notes in its forecast that over the next 20 years, world air cargo traffic will grow 4.2 percent per year, more than doubling in its size over the next 20 years. Air freight, including express traffic, will average 4.1 percent annual growth. Airmail traffic will grow more slowly, averaging 1.7 percent annual growth through 2035 (Crabtree, et al., 2020).

Air cargo markets linked to Asia, especially the Pacific Rim countries, with Hawaii serving as a link to these destinations, will lead all other international markets in average annual growth between 2020 and 2039. Markets in Asia will keep the lead in the world's average annual air cargo growth, with domestic China and intra-East Asia-and Oceania markets expanding 5.8 percent and 4.9 percent per year, respectively, notes Boeing. Hawaii benefits from being a link between North America and Asia Pacific.

Although economic activity is the primary influence on world air cargo development, other factors, often beyond the control of airlines include: inventory management techniques, modal competition, environmental regulations, globalization, market liberalization, national development programs, and the introduction of new air-eligible commodities. They play important role in air cargo growth. Constraints to economic growth, particularly related to the COVID-19 pandemic recession, which are outside of the airlines' control, can also reduce air transport activity (Crabtree, et al., 2020).

Another problem for air cargo industry is the unstable *fuel price*. Oil prices fluctuated very significantly over the past few years, but have been relatively stable recently. Lower fuel prices decrease operating costs and allow airlines to operate at a profit, even at low yields. Crude oil prices are forecast to exhibit volatility in the next few years (Crabtree, et al., 2020).

***Competition with other modes of transportation*** is another major issue for air cargo. Greater efficiencies in the containership industry have attracted more shippers to move their freight by water, instead of air. It is generally 10 to 20 times less expensive to ship a container by water than by air as measured in per unit weight, but transit times are longer and less reliable than air cargo. The goods that are shipped by air are high value, time sensitive, and perishable. To continue to compete effectively with containerships, the air cargo industry must ensure that the service benefits of air transportation warrant the price premium charged (Crabtree, et al., 2020).

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