JOINT TRANSPORTATION COMMITTEE

WASHINGTON STATE AIR CARGO MOVEMENT STUDY

FINAL REPORT:
Appendix C – Evaluate How to Use Existing Capacity Across Washington State

June 20, 2018

Note: *Minor revisions were made to this document, but the original analysis and data have not changed.*

Submitted by

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1 Introduction

The purpose of this white paper is to evaluate how to use existing capacity across Washington state. In doing so, the strengths, weaknesses, opportunities and threats will be assessed at selected airports related to their ability to attract air cargo. This white paper evaluates the potential for Washington airports to attract the following:

- International air freighter operators
- Non-integrator/belly cargo airlines
- Integrator/express all-cargo carriers
- Third-party logistics companies

International air freighter operators provide international air freight services to and from origins around the world for import or export shipments requiring expedited service.

Non-integrator/belly cargo airlines provide below-deck cargo services.

Integrator carriers (e.g., FedEx, UPS, and DHL) provide single-vendor door-to-door time definite service.

Third-party logistics companies (or freight forwarders/indirect carriers) provide outsourced logistics services and can offer value-added services such as custom packaging or product

This paper is organized in the following manner:

- Comparison of competitive airports to Washington state airports
- Basic components needed to attract and maintain air cargo air service
- Comparison of select airports to meet basic air cargo facility and market requirements for air cargo service
- Identification of key air cargo airports
- Evaluation of potential to attract air cargo service
- Conclusions and recommendations
- Summary of strengths, weaknesses, opportunities and threats for select airports.

2 Comparison of Competitive Airports to Washington State Airports

As identified in the *Market, Facilities and Forecast Technical Report: Section 2.3.1*, the U.S. air cargo market is dominated by the integrator/express airline hub airports of Memphis and Louisville and by the international passenger gateway airports of Miami International, Los Angeles International, Chicago O'Hare, and New York JFK.

The dominant air cargo airport on the West Coast is Los Angeles International Airport with around 45 percent of the West Coast air cargo market share. Ontario California International Airport is a distant second followed closely by Oakland International, San Francisco International and then Seattle-Tacoma International Airport (Sea-Tac). Both Oakland International and Ontario International Airports are regional gateway airports for the integrator/express airlines and therefore report a high volume of air cargo transferred between aircraft that never leaves the airport rather than cargo destined for the local market.

Los Angeles International Airport dominates the West Coast in air cargo due to a number of important factors, which generally promote operating efficiencies, economies of scale, and profitability. The most significant of these includes the size of the local Southern California economy, number of wide-body aircraft, both passenger and freighter, in service, the variety of destinations served, the frequency of departures and arrivals, the large investment in infrastructure and facilities, and the network of air freight forwarders that has developed in the immediate vicinity of the airport.

Air cargo demand and the economy are inextricably linked. In 2017, the gross domestic product (GDP) for Los Angeles and Orange counties, the location of Los Angeles International Airport, was $1.002 trillion. If all five counties that make up Southern California are included, the regional GDP exceeds $2.6 trillion, larger than most of the countries in the developed world. The GDP for Washington state is $452 billion.

Table 3-1 of *Air Cargo Congestion* reproduced in Table 1, reflects the impact of the size of the Southern California economy on airport air-service demand.

Table 1. Average Number of Outbound Flights Per Week

Origin Airport	Belly Wide-body (flts/wk)					Freighter (flts/wk)				
	Asia	Eur.	N. Amer.	S. Amer.	TOTAL	Asia	Europe	N. Amer.	S. Amer.	TOTAL
SEA – Seattle	100	44	39	0	**182**	15	0	94	0	**110**
GEG – Spokane	0	0	0	0	**0**	0	0	87	0	**87**
BFI – Seattle	0	0	0	0	**0**	0	0	48	0	**48**
LAX – Los Angeles	454	154	188	27	**824**	70	17	201	2	**290**
ONT – Ontario	0	0	0	0	**0**	17	0	200	0	**217**
SFO – San Francisco	254	119	160	0	**533**	23	0	24	0	**47**
OAK – Oakland	17	6	1	0	**23**	10	0	173	0	**183**
PDX – Portland	13	8	9	0	**30**	0	0	132	0	**132**
SLC – Salt Lake City	7	16	13	0	**36**	0	0	100	0	**100**

As shown in this table, Los Angeles International Airport generates over 1,100 wide-body aircraft flights per week, as opposed to the 292 weekly flights at Sea-Tac. By comparing the number of wide-body aircraft flights per week, it is clear that other than special purpose charters, no other airports on the U.S. West Coast can compete with Los Angeles International Airport on capacity, frequency or number of destinations that can be serviced by shippers or freight forwarders. Similarly, within the state of Washington, no other airports can provide the level and extent of air service provided by Sea-Tac.

Within the state of Washington, no other airports can provide the level and extent of air service provided by Seattle-Tacoma International Airport.

The following sections of this paper provide more guidance as to the basic components necessary to attract air cargo service to individual airports.

3 Basic Components Needed to Attract & Maintain Air Cargo Air Service

There are certain basic factors, or components, that airports need to satisfy to attract and maintain air cargo service. These components can be divided into five distinct areas:

- Airport Market Area Requirements
- Airport Location Requirements
- Airport Infrastructure Requirements
- Financial Environment
- Operational Freedom

All five criteria are interrelated and are important to cargo carriers and forwarders, although priorities vary among different airline types.

3.1 AIRPORT MARKET AREA REQUIREMENTS

While the size of a local market area is important to all carriers, the threshold at which a carrier can initiate service in a particular market differs significantly among types of air carriers.

Airport market area thresholds tend to be more of a concern to the combination carriers operating freighter aircraft, and non-integrated all-cargo carriers providing airport-to-airport service, than to the express/integrator operators. Integrator carriers, by the nature of their hub-and-spoke networks, have more flexibility in assigning the appropriate level of resources to serve a particular market.

A typical **integrator**, such as FedEx Express, has the option, depending on the size of the market, to serve that market by a combination of modes at different scales. The smallest size market—particularly one located on the periphery of a larger market, with a population base of approximately 15,000 (such as Anacortes)—might be served by an integrator with one or two small package vans that are based out of sort center some distance away. Or, a market of approximately 45,000 to 65,000 population (such as Pasco) might be served by 10 to 15 small delivery vans based locally, and supported by one or two 53-foot over-the-road tractor trailers twice a day from a regional distribution center.

Integrator carriers, by the nature of their hub-and-spoke networks, have more flexibility in assigning the appropriate level of resources to serve a particular market.

Another market of similar population, but with more of a manufacturing and service base, might be served with a small feeder airplane for overnight express shipments, supplemented by over-the-road trucks for two- and three-day products. An even larger market, in the range of a 500,000 population base, may be served by a combination of trucks, feeder

utility airplanes and larger jet aircraft. Integrators have a lot of options when deciding on how to serve a market.

The **combination carriers**, such as Alaska Airlines and Delta Air Lines, and the traditional all-cargo carriers, such as Cargolux or Polar Air Cargo, do not have as many options in serving a market as the integrators. The combination carriers, and traditional non-integrated all-cargo carriers, typically provide only line-haul airport-to-airport service. They rely extensively on a network of freight forwarders, consolidators, and trucking firms to generate, or move, the shipment between the customer and the airport. To be successful, these carriers must rely on a large market to take advantage of economies of scale. This fact applies even more so for the traditional all-cargo carriers.

For the combination carriers, most or all of the cost of operating a passenger aircraft is paid for by revenue generated by the passengers. Belly cargo is considered the gravy. Typically, if the cargo volumes are unbalanced (i.e., there is more volume in one direction than another), the imbalance is not critical to the total yield of the flight, since an imbalance in cargo revenue can be absorbed by the passenger side of the business.

This is not the case for the **all-cargo carriers**, or for the combination carriers operating **freighters**. A traditional all-cargo freighter operator does not get as much utilization out of an aircraft as a passenger carrier, and shipments must be balanced in both directions to maintain a sustainable yield in order to be able to offer a competitive price to the customer. Therefore, the traditional all-cargo carrier is always concerned about the back-haul potential of any market that they are considering service to.

Understanding how the **freight forwarder** operates is also important to understanding the dynamics of how or why an air carrier chooses to serve an airport. Freight forwarders generate almost 70 percent of the world's air cargo shipments. Serving a dual role, the air freight forwarder is, to the shipper, an indirect carrier, because he receives freight from the shippers under his own tariff, usually consolidating it into larger units that he tenders to the airlines. To the all-cargo carriers and belly hold carriers, the air freight forwarder is a shipper.

The forwarder typically consolidates packages from a variety of shippers, all going to the same general destination, into one container that he will then tender to an airline for carriage. By containerizing, the freight forwarder can get a lower rate from the airline than an individual shipper who ships packages to the airlines. The forwarder makes his operating profit on the difference between what he can charge the individual shipper and what the airlines charge for the use of a container. To make this business model work, the forwarder must be able to draw from a large enough population of businesses to generate enough shipments to fill a lot of containers.

The more destinations and frequencies of service a forwarder can offer to his customers, the more business he can generate. By locating his operation in a large metropolitan city such as Los Angeles, San Francisco or Seattle, the freight forwarder has access to both a large business population and an international gateway airport.

The benefits that a large gateway airport can offer a freight forwarder cannot be overstated. At a large gateway airport such as Los Angeles International Airport, Chicago O'Hare or Seattle-Tacoma International the forwarder has access to a wide variety of choices for air lift related to type of aircraft

available, destinations, frequencies, pricing, and government inspection services. They will direct cargo from numerous origins to these locations to obtain operating efficiency.

In conclusion, the non-integrated all-cargo carriers rely primarily on freight forwarders to generate much of their business, and freight forwarders rely on the non-integrated all-cargo carriers to provide lift. Freight forwarders consider integrator carriers to be their direct competitors. Only when integrator carriers have the only service to a point will freight forwarders use their service.

Not all cargo carried in freighter aircraft is generated by freight forwarders. Some traditional all-cargo freighter operators generate their own list of shippers to whom they provide custom service. For freighter operators to service their own clients, however, their rate must be competitive with the forwarder. The forwarder has somewhat of an advantage over the direct freighter operator in pricing, because the forwarder can negotiate rates with a variety of airlines, and many belly carriers (or all-cargo carriers without adequate back-haul) sell space well below cost. Freighter operators are more competitive than forwarders in being able to guarantee lift at a specific time and can be competitive on rates when they know that they can fill their airplane on both legs of a trip.

MARKET CRITERIA FOR NON-INTEGRATOR AIRLINES

Some of the market-oriented criteria considered important to air carriers operating wide-body passenger aircraft and the all-cargo freighter airlines providing airport-to-airport service are as follows:

- Strong local production and consumption (up to 100 miles) of air-eligible commodities
- An additional secondary market within 400 miles
- Interlining[1] capabilities with connecting passenger carriers, charters, and motor carriers
- A strong presence of freight forwarders in the local market place
- Warehouse distribution services for both local and long-distance distribution

These criteria are basic market guidelines as to the reasonableness of attracting air cargo service to an airport.

Strong local production and consumption of air-eligible commodities refer to a 75- to 100-mile radius around the airport. This radius represents the distance that can typically be serviced by truck in one day. Over 200 hundred miles from an airport usually represents either multiple drivers or multiple days. Once service is initiated, it is not unusual to be able to draw from a secondary market of 400 to 600 miles.

The level of production and consumption of air-eligible commodities required to attract service will vary by carrier. The integrators have a much smaller market threshold than do the non-integrated

[1] Interlining is the movement of cargo between different transportation companies on its journey from origin to consignee.

freighter operators. At a minimum, it is estimated that approximately 7,000 annual tons of outbound international shipments to a single overseas market would be needed to support a once-a-week freighter flight by a non-integrated freighter operator. A similar load factor has to be generated for the back-haul.

Approximately 7,000 annual tons of outbound international shipments to a single overseas market would be needed to support a once-a-week freighter flight by a nonintegrated freighter operator.

It is unusual for non-integrated traditional airlines to operate in isolation and connectivity with other carriers is somewhat important. Interlining capabilities with connecting passenger carriers, charters and road feeder trucking companies is important to the non-integrators, as opposed to the all-cargo integrator airlines, since they must rely on other modes and carriers to provide, or extend, the service they themselves cannot provide.

The presence of freight forwarders who are actively developing an air cargo market is extremely important to attracting air carriers. Many carriers and shippers depend on the freight forwarder to provide the warehousing and distribution needs they require.

In summary, the main market area criteria are the following:

- Distance from significant population
- Interlining opportunities
- Presence of multiple freight forwarders
- Availability of distribution services

3.2 AIRPORT LOCATION REQUIREMENTS FOR INTEGRATORS

For integrator carriers, the most important considerations are the actual physical location of an airport in relation to the carrier's distribution network as well as proximity to shipping and receiving customers. This contrasts with non-integrator carriers, which depend primarily on a sizable regional market.

As opposed to the non-integrator carriers that fly shipments airport to airport involving multiple segments handled by multiple parties, the **integrator carriers** (such as FedEx, UPS, and DHL) provide single-vendor door-to-door time-definite service. Operations by the integrators can be segmented into two categories: ground operations and airport operations.

The airside efficiency of the integrators is possible through the utilization of an extensive hub-and-spoke network system. Flights are fed from the originating city to hubs throughout the United States. At the hubs, the freight is sorted and redistributed to other flights for carriage to dozens of destination cities.

The integrator carriers typically operate three levels of hubs:

- A primary hub, which can generate up to 300 flights per day (e.g., Memphis, Louisville)

- Secondary hubs, which typically generate up to 30 to 50 flights per day (e.g., Oakland, Newark, Indianapolis, Ontario)
- Regional hubs, which typically generate 4 to 12 flights per day (e.g., Sea-Tac, Boeing Field, Spokane, Denver, Rockford, IL, Alliance, TX.)

It is not coincidental that all the air cargo integrators (except FedEx) have located their primary hubs in the Ohio Valley region. Within approximately 600 miles of each hub is about 60 percent of the industrial population, employment, and retail purchasing power of the United States. These areas also represent the economic center of a national distribution system, meaning that point which minimizes total system flying expenses.

All the air cargo integrators (except FedEx) have located their primary hubs in the Ohio Valley region. Within approximately 600 miles of each hub is about 60 percent of the industrial population, employment, and retail purchasing power of the United States.

Secondary and regional hub locations are also geographically driven. The West Coast secondary hubs for FedEx and UPS are located in Southern and Central California to be closer to the population and economic centers in the West This is because of the important and narrow operating envelopes at hubs all along the line for sorting. Secondary hubs in the Eastern time zone tend to operate between 1:00 and 4:00 a.m. Others in the Midwest operate approximately one hour earlier.

The time of the hub sort operation is critical. Because the United States covers four time zones, it is essential that the carriers offer pickups at least until 5:00 or 6:00 p.m. on the West Coast and 8:00 to 9:00 p.m. on the East Coast hubs and to maintain early morning delivery at the destination. The hub connecting schedules must accommodate these marketing and service requirements. Shippers on the East Coast require late pick-up times to fill orders until 8:00 or 9:00 p.m. Many of these orders originate from the West Coast, where it is three hours earlier in the work day.

On a ground operation level, fast and affordable delivery is predicated on the integrator's location relative to its customers. Local ground operations (1) pick up freight from stationary drop boxes and variable customer pick-up locations and then transport it to the airport on or ahead of schedule; and (2) pick up freight from the airport and deliver it to customers at variable locations before delivery deadline. The variability of either the pickups or dropoffs makes efficient routing and scheduling difficult. For these reasons, the integrator must be located at an airport that is physically close to its local market.

Measures of accessibility for the integrator airlines include the following:

- Percentage of businesses within X miles or Y minutes of a particular airport
- Percentage of population (as "markets") within X miles or Y minutes of an airport
- Percentage of population residing within 10-minute or 2-mile radius of pick-up and drop-off facility
- Percentage of businesses, by industry/commodity, that have satisfactory access to preferred/relevant mode or to preferred suppliers/market

- Percentage of package goods shippers within X miles of an airport
- Percentage of shipments (ton or package miles) to just in time industries

Depending on the actual city size and the demand size, the airport used by an integrator may serve as the only center of ground operations for the whole city. For example, FedEx has both airport and ground operations at Bellingham centralized at the same airport cargo facility. However, the UPS ground operations in Seattle King County International (Boeing Field) area has a two-tier structure. To serve the area, the freight is first distributed to local distribution centers by large trucks; smaller vans from the distribution centers then deliver the freight to the individual or corporate customers. There is no direct delivery from the airport to customers, except for some recently offered new services which provide earlier delivery time and later pick-up or drop-off deadlines for customers located near the airports used by the integrators.

In summary, airlines consider the following key airport location factors:

- Fit of the existing transportation network to the specific carrier
- Proximity to customers
- Quality of the local roadway network
- Connectivity to interstates/highways

3.3 AIRPORT INFRASTRUCTURE REQUIREMENTS

Regardless of the suitability of the local and regional market and geographical location requirements, basic airport infrastructure requirements must be met for an air carrier to select a particular airport. Some of the most important of these requirements include adequate runway length and pavement strength to accommodate wide-body aircraft, 24-hour air traffic control operations, de-icing capabilities, aircraft rescue and fire-fighting facilities, adequate fuel availability, a precision instrument approach landing system, and an acceptable number of days that the airport could be closed because of poor weather conditions.

Beyond the basics mentioned above, the airport should also have the following:

- Adequate facilities and space for:
  - Cargo storage
  - Cargo build-up and breakdown
  - Forklift maneuverability
  - Container storage
- Adequate ramp space
- Access for aircraft and extensive trucking operations
- Ability to handle special cargo
  - Perishables

  - Live animals
  - Dangerous goods
  - High-value items
  - Outsized cargo
- Support services:
  - Cargo terminal handling
  - Aircraft handling (e.g., maintenance, repair, fueling)
  - Security
  - Ancillary services (e.g., catering, crane operations)
  - Container stations
- On-airport regulatory authorities:
  - U.S. Customs
  - Federal Aviation Administration
  - U.S. Department of Agriculture
  - U.S. Postal Service

Other airport-related criteria may include the following:

- Adequate communications infrastructure and sufficient power, sewer, and water
- Adequate local labor supply
- Acceptable truck delivery times to major cities
- An environmental program to deal with such issues as noise, drainage, recovery of deicing fluid runoff, etc.
- Employee parking
- Long-term lease commitments, contributions of capital investment for new facilities, competitive rates, local financial incentives, and a positive community attitude.

In summary, the following key airport infrastructure factors influence carrier decisions:

- Runway characteristics
- Aircraft parking and ground-handling capabilities
- Landside facilities and services
- Interstate highway access

3.4 FINANCIAL ENVIRONMENT

The financial requirements for carriers analyzing potential airport locations vary considerably depending on carrier, regional location, market and anticipated hub size. In its simplest form, the financial requirements of carriers relate primarily to the reasonableness of operating costs, known future costs, transparency of accounts, and non-discriminatory treatment.

- Typical operating costs are landing fees, aircraft parking fees, fuel and fuel flowage fees, and building and ground rentals.
- Transparency of accounts refers to the carrier's ability to know the basis of costs for which they are charged by the airport. This is important to any business with thin operating margins such as the air cargo business.
- Non-discriminatory treatment refers to the airline not being charged fees over and above the cost of actual services used.

Less definable financial requirements include various economic incentive packages that may be the ultimate deciding factor between two potential airport locations with similar qualities. In the United States, economic incentive packages have become the norm for airlines in locating new station operations. Incentive packages can range from temporary exemption of landing fees and deferred property taxes to multimillion dollar tax breaks.

When UPS was deciding whether to relocate or expand its Louisville, Kentucky, primary hub operation, it was offered an incentive package that included a $35 million income-tax break and a $3 million annual benefit from a new $1 million cap on the state sales tax on jet fuel. Another key component of the package for UPS was a program called the Metropolitan College Plan. This plan was designed to provide workers for UPS in the tight local labor market. It promises workers at the air hub free college tuition for as long as they work at UPS. Workers can get free tuition at the University of Louisville, Jefferson Community College or Jefferson Technical College, and they can pursue a two- or four-year degree.

Another consideration that can become important to airline location decisions, is the airport approach to allocating costs. Some airport operators assume the entire financial risk of the operations and charge airlines the actual cost of the operations. This is called compensatory because the airlines are compensating the operator for actual costs. In another approach, the airlines assume some financial risk by agreeing to pay the costs not covered by non-airline sources of revenue. This approach is called residual because the airlines pay only the residual costs that aren't covered by others. Depending on the situation, these two approaches can result in quite different costs to the airlines.

In summary, the key financial factors that affect air cargo carriers at airports relate to the following:

- Operating costs
- Transparency of accounts
- Economic incentive packages

3.5 OPERATIONAL FREEDOM

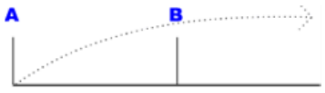
Operational freedom is a broad term for a variety of important factors related primarily to national policy issues. The freedoms of the air are a set of commercial aviation rights granting a country's airlines the privilege to enter and land in another country's airspace. Included in this category are the necessary permissions related to routes, frequencies, pricing, operational flexibility, intermodal services, and self-handling. Perhaps the most important of these freedoms is the schedule of agreements related to available routes that an air carrier can fly.

The route schedule of a bilateral airline agreement determines the points that may be served in carrying traffic between bilateral partners' countries and between these countries and third countries. The most desirable for the freighter carriers—called an open route—permits airlines to operate from points "behind" their homelands via their homelands and intermediate points to points in the bilateral partner's country and beyond. Restrictive agreements contain "narrow" route schedules that specify limited, named points that may be served and frequently limit the destinations that may be served intermediate to and beyond the bilateral partner's country.

Figure 1 presents the various levels of operational freedom.

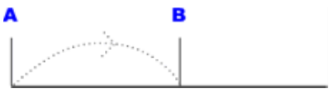
Figure 1. Different Levels of Operational Freedom

First Freedom
The right to fly across the territory of a foreign country. without landing (e.g. United Airlines flies from the United States (A) over Ireland (B) en route to Germany.)



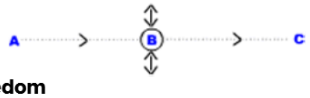
Second Freedom
The right to land in a foreign country for technical or non-traffic purposes, such as for re-fueling or maintenance. (e.g. American Airlines flies from the United States (A) and lands to refuel in Ireland (B) en route to Germany

Third Freedom
The right to deplane traffic in a foreign country that was enplaned in the home country of the carrier. (e.g. United Airlines carries passengers from the United States (A) to France (B).)



Fourth Freedom
The right to enplane traffic in the foreign country that is bound for the home country of the carrier. (e.g., American Airlines carries passengers from the United Kingdom (B) to the United States (A).)

Fifth Freedom
The right to enplane traffic at one foreign point and deplane it in another foreign point as part of continuous operation also serving the airline's homeland (e.g., Northwest Airlines has "fifth freedom" rights to carry traffic between Tokyo (B) and Hong Kong (C), on services that stop at Tokyo (B) en route between Los Angeles (A) and Hong Kong (C).



Seventh Freedom
This term is applied to an airline's operating turn around service and *carrying traffic between points in two foreign countries* without serving its home country (e.g., Lufthansa operates between New York (A) and Mexico City (C) without serving Germany (B)).

Other issues related to freedom to operate include the ability of airlines to transfer cargo between aircraft for "onward" flights, conditions under which airlines can transport cargo once it is on the ground, and the ability to self-handle their own aircraft ground-handling operations or be able to select among competing agents.

An example of how an airport can leverage operational freedoms is Ted Stevens Anchorage International Airport. The Alaska state government, operators of Ted Stevens Anchorage International Airport and Fairbanks International Airport have acquired both U.S. Department of Transportation Exemption Authority and legislative actions (the Stevens Amendment) granting a limited exception to the cabotage prohibition for certain cargo operations at Alaska. It allows non-U.S. airlines to carry international cargo between U.S. points as part of an interline itinerary if and only if the interline connection occurs in Alaska.

In terms of operating freedom at an airport, airlines must consider the following key factors:

- Permissions
- Operating flexibility
- Ability to use intermodal services

3.6 CONCLUSION

Depending upon the type of air carrier, the relative importance of the five decision choice factors (Market Requirements, Location, Infrastructure, Financial Environment, and Operational Freedoms) to determine the feasibility of introducing air cargo service to an airport will vary significantly.

For the non-integrated, traditional freighter operator having a large local and secondary market is important in choosing which airport to serve. The integrators must first consider an airport's geographic location relative to their existing hub-and-spoke network and distance from the airport to their customer base. Both types of carriers must also consider runway length, taxi distances, availability of aircraft parking, storage for ground service equipment, truck marshalling areas and other basic infrastructure needs.

There are, of course, a few exceptions to the decision factors outlined above. For example, Panalpina (a large international freight forwarder) has established all-cargo freighter operations at Huntsville, Alabama (a non-hub airport) with little or no local market. The all-cargo operations primarily support a major customer but also serve Panalpina's existing U.S. Southeast and Mexico distribution network.

In another example, an all-cargo freighter operator with an established customer base distributed throughout a multi-state region may choose to locate at an uncongested airport on the outskirts of a large metropolitan area. Since the average time for an international air freight shipment is six days, locating at an airport with good interstate highway access and away from congested airspace and crowded local highways, and offering low operating costs would give the carrier adequate access to both the local and regional markets. An example of this type of situation is Columbus Rickenbacker International Airport, which—by positioning itself as a cargo friendly, uncongested airport with an adjacent logistics park, located on the outskirts of both the Chicago and New York hinterland markets—has attracted Cargolux, Cathay Pacific and Emirates Skycargo freighter operations.

3.7 BEYOND THE BASICS

Beyond the basic factors discussed in the previous paragraphs, there are certain qualities that go into making a competitive air cargo airport:

- A successful local cargo industry:
  - Thriving home based-carrier and their alliances with other airlines
  - An independent and adequate choice of ground-handling agents
  - A business-oriented Customs, smooth operations and adequate IT infrastructure to support e-freight operations and Cargo Community Systems.
  - Presence of an Express/Integrator hub with an extensive spoke system
- A balanced global and continental network with:
  - Connections to key economic centers in the world
  - Extensive freighter networks to most global hubs
  - Excellent connections to secondary markets
  - Connections between Sea-Air transport
- Ample long-term capacity
- A strong market position and strategy

The next section evaluates select airports within Washington state that were identified in *Air Cargo Market, Facilities and Forecast* (Section 6.6) that could physically accommodate air transport aircraft to perform air cargo operations with the five criteria outlined in Section 3.3.

4 Evaluation of Select Washington State Airports

This section of the report contains a subjective evaluation of select Washington state airports that have shown the propensity for attracting air cargo airlines, both belly and freighters, to relieve perceived air cargo congestion at Sea-Tac, which is used as a baseline standard to which other Washington state airports are measured. Were Sea-Tac to be compared with Los Angeles International or New York JFK Airport, then Sea-Tac scores would reflect a different outcome.

Figure 2. Seattle-Tacoma International Airport: Factors Influencing Airline/Airport Choice

Market Area	**Distance from significant populations:** *Primary = up to 100 miles Secondary = within 400 miles Tertiary = >400 miles*	
	Connectivity/Interlining *(airline, road feeder service, regional pickup and delivery)*	
	Freight Forwarders *(multinational, local, specialty)*	
	Distribution Services *(warehouses/distribution centers, cool chain, foreign trade zones)*	
Location	**Fits Existing Network** *(different for integrator, belly and line-haul freighter airlines)*	
	Close to Customers *(percentage of population [markets] within X miles or Y minutes of airport)*	
	Local Surface Access	
	Interstate Highway Connectivity	
Infrastructure	**Runways** *(length, strength, redundancy, approaches, minimums)*	
	Aircraft Parking and Ground-Handling Capabilities	
	Landside Facilities and Services *(terminals, flight information service, customs brokers, temperature control)*	
	Interstate Highway Access	
Financial Environment	**Operating Costs** *(landing fees, aircraft parking, facility leasing, fuel service charges)*	
	Transparency of Accounts *(paying only for services utilized)*	
	Economic Incentive Packages	
Operational Freedom	**Permissions** *(related to routes, frequencies, pricing, slot controls, curfews)*	
	Operational Flexibility *(aircraft change of gauge, self-handling or ability to select among competing agents, ability to transfer between aircraft, 24/7 operations)*	
	Ability to Use Intermodal Services	

Note: For a given criteria, four filled squares are best then diminishing from three, two, etc.

Sea-Tac is scored to reflect its position as the primary air cargo airport within the Washington state from which we will compare and contrast other Washington state airports. Financial incentives is the only area that did not rank as 100 percent for Sea-Tac, since incentives for air cargo airlines at Sea-Tac are minimal.

Figure 3. King County International (Boeing Field) Airport: Factors Influencing Airline/Airport Choice

Market Area	**Distance from significant populations:** *Primary = up to 100 miles Secondary = within 400 miles Tertiary = >400 miles*	
	Connectivity/Interlining *(airline, road feeder service, regional pickup and delivery)*	
	Freight Forwarders *(multinational, local, specialty)*	
	Distribution Services *(warehouses/distribution centers, cool chain, foreign trade zones)*	
Location	**Fits Existing Network** *(different for integrator, belly and line-haul freighter airlines)*	
	Close to Customers *(percentage of population [markets] within X miles or Y minutes of airport)*	
	Local Surface Access	
	Interstate Highway Connectivity	
Infrastructure	**Runways** *(length, strength, redundancy, approaches, minimums)*	
	Aircraft Parking and Ground-Handling Capabilities	
	Landside Facilities and Services *(terminals, flight information service, customs brokers, temperature control)*	
	Interstate Highway Access	
Financial Environment	**Operating Costs** *(landing fees, aircraft parking, facility leasing, fuel service charges)*	
	Transparency of Accounts *(paying only for services utilized)*	
	Economic Incentive Packages	
Operational Freedom	**Permissions** *(related to routes, frequencies, pricing, slot controls, curfews)*	
	Operational Flexibility *(aircraft change of gauge, self-handling or ability to select among competing agents, ability to transfer between aircraft, 24/7 operations)*	
	Ability to Use Intermodal Services	

Note: For a given criteria, four filled squares are best then diminishing from three, two, etc.

King County International (Boeing Field) Airport is the second-ranked airport within the state with the propensity to attract air cargo airlines. It primary advantages are its access to a primary and secondary market area and, for the integrator/express airlines, its inner-city location and nearness to major customers, allowing early delivery times and late pick-up times. The weaknesses of King County International (Boeing Field) as compared to Sea-Tac is the lack of available land for expansion and the lack of airside connectivity to wide-body passenger airlines and traditional freighter airlines.

Figure 4. Spokane International Airport: Factors Influencing Airline/Airport Choice

Market Area	**Distance from significant populations:** *Primary = up to 100 miles Secondary = within 400 miles Tertiary = >400 miles*	
	Connectivity/Interlining *(airline, road feeder service, regional pickup and delivery)*	
	Freight Forwarders *(multinational, local, specialty)*	
	Distribution Services *(warehouses/distribution centers, cool chain, foreign trade zones)*	
Location	**Fits Existing Network** *(different for integrator, belly and line-haul freighter airlines)*	
	Close to Customers *(percentage of population [markets] within X miles or Y minutes of airport)*	
	Local Surface Access	
	Interstate Highway Connectivity	
Infrastructure	**Runways** *(length, strength, redundancy, approaches, minimums)*	
	Aircraft Parking and Ground-Handling Capabilities	
	Landside Facilities and Services *(terminals, flight information service, customs brokers, temperature control)*	
	Interstate Highway Access	
Financial Environment	**Operating Costs** *(landing fees, aircraft parking, facility leasing, fuel service charges)*	
	Transparency of Accounts *(paying only for services utilized)*	
	Economic Incentive Packages	
Operational Freedom	**Permissions** *(related to routes, frequencies, pricing, slot controls, curfews)*	
	Operational Flexibility *(aircraft change of gauge, self-handling or ability to select among competing agents, ability to transfer between aircraft, 24/7 operations)*	
	Ability to Use Intermodal Services	

Note: For a given criteria, four filled squares are best then diminishing from three, two, etc.

Spokane International Airport is largest commercial service airport in eastern Washington and is ranked third in the state for air cargo. The most challenging hurdle for Spokane International is its relatively distant location to the population and economic centers in western Washington. Nevertheless, the airport has well maintained infrastructure, significant air cargo activity by FedEx and UPS that carries with it the capability to ground handle wide-body aircraft, access to Interstate 90, its centralized location for the inland Pacific Northwest market, and the availability of developable land.

Figure 5. Snohomish County Paine Field: Factors Influencing Airline/Airport Choice

Market Area	**Distance from significant populations:** *Primary = up to 100 miles Secondary = within 400 miles Tertiary = >400 miles*	
	Connectivity/Interlining *(airline, road feeder service, regional pickup and delivery)*	
	Freight Forwarders *(multinational, local, specialty)*	
	Distribution Services *(warehouses/distribution centers, cool chain, foreign trade zones)*	
Location	**Fits Existing Network** *(different for integrator, belly and line-haul freighter airlines)*	
	Close to Customers *(percentage of population [markets] within X miles or Y minutes of airport)*	
	Local Surface Access	
	Interstate Highway Connectivity	
Infrastructure	**Runways** *(length, strength, redundancy, approaches, minimums)*	
	Aircraft Parking and Ground-Handling Capabilities	
	Landside Facilities and Services *(terminals, flight information service, customs brokers, temperature control)*	
	Interstate Highway Access	
Financial Environment	**Operating Costs** *(landing fees, aircraft parking, facility leasing, fuel service charges)*	
	Transparency of Accounts *(paying only for services utilized)*	
	Economic Incentive Packages	
Operational Freedom	**Permissions** *(related to routes, frequencies, pricing, slot controls, curfews)*	
	Operational Flexibility *(aircraft change of gauge, self-handling or ability to select among competing agents, ability to transfer between aircraft, 24/7 operations)*	
	Ability to Use Intermodal Services	

Note: For a given criteria, four filled squares are best then diminishing from three, two, etc.

Snohomish County Paine Field is unique among most of the airports reviewed in this study. It shares the same market area as Sea-Tac, but has traditionally operated as an industrial general aviation airport that supports the assembly of aircraft for the Boeing Company. In this role, the airport has not developed the facilities and services to attract scheduled air cargo service. As Paine Field begins its transition to a scheduled service passenger airport, its attractiveness to freight forwarders and air cargo airlines may change.

Figure 6. Grant County International Airport: Factors Influencing Airline/Airport Choice

Market Area	**Distance from significant populations:** *Primary = up to 100 miles Secondary = within 400 miles Tertiary = >400 miles*	
	Connectivity/Interlining *(airline, road feeder service, regional pickup and delivery)*	
	Freight Forwarders *(multinational, local, specialty)*	
	Distribution Services *(warehouses/distribution centers, cool chain, foreign trade zones)*	
Location	**Fits Existing Network** *(different for integrator, belly and line-haul freighter airlines)*	
	Close to Customers *(percentage of population [markets] within X miles or Y minutes of airport)*	
	Local Surface Access	
	Interstate Highway Connectivity	
Infrastructure	**Runways** *(length, strength, redundancy, approaches, minimums)*	
	Aircraft Parking and Ground-Handling Capabilities	
	Landside Facilities and Services *(terminals, flight information service, customs brokers, temperature control)*	
	Interstate Highway Access	
Financial Environment	**Operating Costs** *(landing fees, aircraft parking, facility leasing, fuel service charges)*	
	Transparency of Accounts *(paying only for services utilized)*	
	Economic Incentive Packages	
Operational Freedom	**Permissions** *(related to routes, frequencies, pricing, slot controls, curfews)*	
	Operational Flexibility *(aircraft change of gauge, self-handling or ability to select among competing agents, ability to transfer between aircraft, 24/7 operations)*	
	Ability to Use Intermodal Services	

Note: For a given criteria, four filled squares are best then diminishing from three, two, etc.

Grant County International Airport has the infrastructure to accommodate most large all-cargo freighter operations, but lacks a supportable primary and secondary origin/destination market area to attract scheduled air cargo service. The airport also lacks the necessary air cargo services and equipment to ground handle wide-body freighter aircraft.

Figure 7. Bellingham International Airport: Factors Influencing Airline/Airport Choice

Market Area	**Distance from significant populations:** *Primary = up to 100 miles Secondary = within 400 miles Tertiary = >400 miles*	
	Connectivity/Interlining *(airline, road feeder service, regional pickup and delivery)*	
	Freight Forwarders *(multinational, local, specialty)*	
	Distribution Services *(warehouses/distribution centers, cool chain, foreign trade zones)*	
Location	**Fits Existing Network** *(different for integrator, belly and line-haul freighter airlines)*	
	Close to Customers *(percentage of population [markets] within X miles or Y minutes of airport)*	
	Local Surface Access	
	Interstate Highway Connectivity	
Infrastructure	**Runways** *(length, strength, redundancy, approaches, minimums)*	
	Aircraft Parking and Ground-Handling Capabilities	
	Landside Facilities and Services *(terminals, flight information service, customs brokers, temperature control)*	
	Interstate Highway Access	
Financial Environment	**Operating Costs** *(landing fees, aircraft parking, facility leasing, fuel service charges)*	
	Transparency of Accounts *(paying only for services utilized)*	
	Economic Incentive Packages	
Operational Freedom	**Permissions** *(related to routes, frequencies, pricing, slot controls, curfews)*	
	Operational Flexibility *(aircraft change of gauge, self-handling or ability to select among competing agents, ability to transfer between aircraft, 24/7 operations)*	
	Ability to Use Intermodal Services	

Note: For a given criteria, four filled squares are best then diminishing from three, two, etc.

The advantages of Bellingham International Airport are its I-5 corridor location and closeness to both the Vancouver and Seattle markets. However, being in the shadow of two large international gateway airports, and its limited runway length, restricts the ability of Bellingham International to attract scheduled air cargo service by the non-integrator airlines.

Figure 8. Pasco-Kennewick Tri-Cities Airport, Wenatchee Pangborn Memorial, Walla Walla Regional Airport, Yakima Air Terminal: Factors Influencing Airline/Airport Choice

Market Area	**Distance from significant populations:** *Primary = up to 100 miles Secondary = within 400 miles Tertiary = >400 miles*	
	Connectivity/Interlining *(airline, road feeder service, regional pickup and delivery)*	
	Freight Forwarders *(multinational, local, specialty)*	
	Distribution Services *(warehouses/distribution centers, cool chain, foreign trade zones)*	
Location	**Fits Existing Network** *(different for integrator, belly and line-haul freighter airlines)*	
	Close to Customers *(percentage of population [markets] within X miles or Y minutes of airport)*	
	Local Surface Access	
	Interstate Highway Connectivity	
Infrastructure	**Runways** *(length, strength, redundancy, approaches, minimums)*	
	Aircraft Parking and Ground-Handling Capabilities	
	Landside Facilities and Services *(terminals, flight information service, customs brokers, temperature control)*	
	Interstate Highway Access	
Financial Environment	**Operating Costs** *(landing fees, aircraft parking, facility leasing, fuel service charges)*	
	Transparency of Accounts *(paying only for services utilized)*	
	Economic Incentive Packages	
Operational Freedom	**Permissions** *(related to routes, frequencies, pricing, slot controls, curfews)*	
	Operational Flexibility *(aircraft change of gauge, self-handling or ability to select among competing agents, ability to transfer between aircraft, 24/7 operations)*	
	Ability to Use Intermodal Services	

Note: For a given criteria, four filled squares are best then diminishing from three, two, etc.

Due to their distance from the major markets in western Washington and limited infrastructure and services, it is unlikely that Pasco-Kennewick Tri-Cities Airport, Wenatchee Pangborn Memorial, Walla Walla Regional Airport, or Yakima Air Terminal have the propensity to attract scheduled or charter air cargo service from the Sea-Tac market.[2] Nevertheless, there are opportunities for these airports to leverage the growing Washington state air cargo market to the benefit of each individual airport and to the Washington state freight transportation system as a whole. These opportunities will be discussed in the next section of this report.

[2] Note that because these airports were reviewed together, the overall score on indicators represents an average. For example, Walla Walla Regional Airport would score lower on Interstate Highway Connectivity, if it were scored individually.

4.1 SUMMARY

As shown in the various tables, each of the select airports was evaluated in regard to airport market area requirements, location requirements, infrastructure, financial environment and operational freedoms. The evaluation against key market and infrastructure requirements demonstrated that each airport has its own individual strengths and weaknesses.

King County International (Boeing Field), Spokane International, Snohomish County Paine Field, and Bellingham International airports meet to some degree the need to have access to a primary service market, while Grant County Moses Lake has significant airfield infrastructure.

The other, smaller state airports that were assessed do not have the local market size or infrastructure to attract airlines other than the type of regional airline that they currently serve. That is not to say that they have no role in relieving some of the air capacity congestion being experienced in the Puget Sound. The next section of this paper will evaluate various opportunities that may be available to the individual airports based upon their individual strengths and weaknesses.

5 Assessment of Opportunities

This portion of the report evaluates the opportunities of Washington state airports to support varying types of air cargo based businesses based on the synthesis of information summarized in the previous sections. As described in Section 1, each airport is evaluated as to its the potential for Washington state airports to attract the following key markets:

- International non-integrator freighter operators
  - Charters
  - Scheduled service
- Scheduled Non-Integrated Traditional airlines
- Integrator/express all-cargo carriers
- Third-party logistics companies

As described previously, Sea-Tac is a successful and growing air cargo airport owned and operated by the Port of Seattle. Current peak-period congestion issues aside, the airport has a well-developed infrastructure, a mature airline and forwarder base, and the management expertise to successfully chart its future course in the air cargo market. Therefore, the focus of this section is to provide some insights as to opportunities the State of Washington and the various individual airport sponsors and operators of other Washington state airports could pursue growing their own air cargo and logistics services markets. Various air cargo market segments that will be discussed include air cargo charters; non-integrator (or traditional) airlines, which includes scheduled passenger belly carriers and freighters; the integrator airlines; and airport logistics parks. Some specific examples of market opportunities, such as cherry charters and e-commerce logistics, are described.

This information provides input for the next task, which will take the opportunities and develop an Air Cargo and Logistics Business Development Strategic Plan for the state. The strategy will be statewide and will not detail plans for individual airports. In general, it will identify things the state could do (e.g., establishing a grant program or task force). It may also recommend strategies that groups of airports could undertake (e.g., joint marketing). It could suggest general approaches that multiple airports could use to develop logistic parks, for example.

5.1 INTERNATIONAL AIR FREIGHTER OPERATORS

5.1.1 Air Charters

The international and domestic charter business is growing, and a number of air carriers and airports are capitalizing on charters for increasing their share of the air cargo market. Charters do not rely on passenger service or integrator service. Therefore, they present an opportunity for smaller, non-hub airports that have the appropriate facilities and are proximate to a significant air cargo product.

Air charters are used by importers and exporters to supplement scheduled freighter capacity during peak times of the year—for providing needed capacity for certain seasonal exports such as perishable commodities and for missed production schedules—and by importers for holidays such as Christmas. International charters are also important because they allow service by a foreign flag carrier that does not enjoy an Open Skies agreement[3] with the United States, or is limited in the cities it may serve under a bilateral agreement.[4] Charters are a way of branching out to alternative cities and offer a way for a carrier to test a cargo market without committing its own resources. As described previously, a good example of an airport that is currently accommodating specialized international air charters (for Boeing) is Snohomish County Paine Field.

5.1.2 Competitive Factors

The primary drivers of the air charter market are the freight forwarders and third-party logistics-service providers (3PLs). Freight forwarders and 3PLs consider the following three factors when choosing an airport for both domestic and international charters, as well as international scheduled service:

- Convenience
- Pricing
- Consistency

First, to be competitive, it must be convenient for freight forwarders to utilize a secondary or non-metropolitan or rural airport rather than a large metropolitan gateway airport. Second, and most importantly, is pricing. The freight forwarder community will not move from their traditional lanes unless there is a price incentive in the form of lower distribution costs, lower liability costs, labor and lower airport fees. Thirdly, the service must be consistent and adhere to promised schedules.

[3] The EU–US Open Skies Agreement is an open skies air transport agreement between the European Union (EU) and the United States. The agreement allows any airline of the European Union and any airline of the United States to fly between any point in the European Union and any point in the United States.
[4] Bilateral air transport agreements cover the basic framework under which airlines may engage in international commercial air transport services between two countries.

Regarding pricing, one of the main advantages of most Washington state airports is the lack of congestion. The congestion factor at Sea-Tac may have an impact on fuel requirements and add to the flight operating cost. Delays at inland Washington state airports are almost non-existent. Other relevant costs that can be competitive with Seattle, Portland, and Vancouver BC include ground-handling fees, on-site storage, and hotel accommodations for the flight crews.

Consistency of service is something over which the airport will have little control, other than to ensure that the airport operates 24 hours a day, seven days a week. From the forwarder's perspective, consistency relates more to the ability of the airline servicing the airport to adhere to published schedules. Plaguing the all-cargo airline industry are some air carriers who operate less than the most modern freighters or who have a limited number of aircraft and do not have replacement aircraft in the case of a mechanical problem. Inland Washington state airports can have some influence in this area by promoting themselves to top tier air cargo airlines.

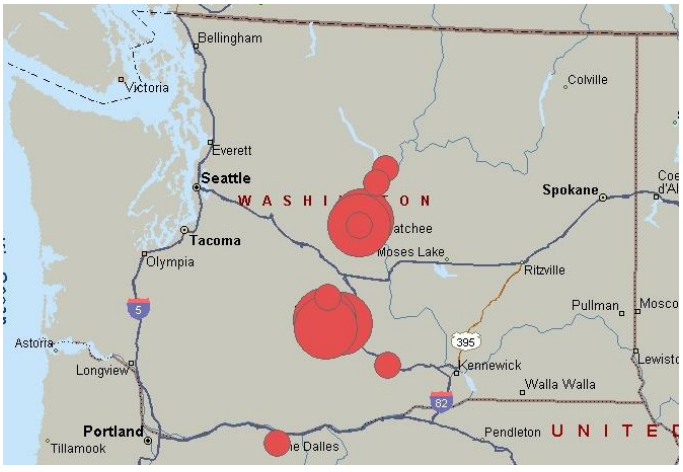
Inland Washington state airports can have some influence on service consistency by promoting themselves to top-tier air cargo airlines.

5.1.3 Assessment

Several Washington airports may compete well for the air charter business based on convenience and geographic proximity to important Washington products as well as access to growing markets. These include Spokane International, Grant County International, Paine Field in Snohomish County, King County International (Boeing Field) and Bellingham International.

Spokane International Airport and Grant County International Airport are the two closest airports to cherry exporters in central Washington state (Figure 9) and have the runway length and pavement strength capable of handling wide-body freighters. As discussed in Section 3.2.1 of Working Paper 1, Washington state exported by air approximately 20,000 metric tons of cherries in 2016. This volume resulted in approximately 100 international air charter flights at Sea-Tac. As can be seen, air charters already provide some additional capacity needed for seasonal peaks of shipping perishable commodities.

Figure 9. Cherry Exporter Locations in Washington State



However, a good location must be weighed against the availability or lack of cargo handling service available at these two airports. Spokane International Airport has the ability to ground handle a large B747 or MD 11 freighter, but and Grant County International Airport recently acquired ground handling equipment to accommodate widebody aircraft. Beyond ground

handling, each airport must also consider the need to develop warehouse services and 3PLs that will allow forwarders to break down containers that are off-loaded from charter aircraft, or to consolidate shipments for outbound service.

Snohomish County Paine Field accommodates specialized large aircraft charter operations related to Boeing Company's 787 airplane manufacturing and assembly program. Due to the airport's I-5 location and access to the Puget Sound market, there is potential to expand its charter business into other markets.

Bellingham International Airport is similarly located on the I-5 corridor and is only minutes away from the United States–Canadian border, and could take advantage of this opportunity in a couple of ways. Firstly, in the past, niche players in the cross-border small-package business utilized air taxi charters to deliver time-sensitive shipments between Bellingham and Victoria, British Columbia, to avoid the high cost of international commercial air shipments. Secondly, as the cross-border e-commerce business grows, there may be potential to further develop this market.

5.2 SCHEDULED NON-INTEGRATED/TRADITIONAL AIR CARRIERS

The non-integrator (or line-haul) category of airline comprises the all-cargo carriers that provide airport-to-airport service as well as the scheduled passenger airlines that carry air cargo in the lower hold of the aircraft (belly cargo carriers). In this section, we discuss the non-integrated, traditional carriers that are supported by an established structure of freight forwarders, consolidators, and trucking services located on or near the airport.

There are no non-integrator freighter airlines or wide-body passenger airlines providing regularly scheduled service to Washington state airports other than Seattle-Tacoma International. Small feeder airlines (e.g., ABX Air, Airpac, Ameristar, Swift Air) support FedEx, UPS, DHL and Amazon Air operations at smaller airports within the state. Alaska Airlines provides belly cargo service to Bellingham, Pasco/Tri-Cities, Pullman, Spokane, Walla Walla, Wenatchee, and Yakima. To airports other than Spokane and Bellingham, air cargo shipments are limited to 150 pounds per piece. No outbound belly cargo is accepted by Alaska Airlines at Walla Walla or Pullman due to aircraft capacity and limited runway length at these airports.

Domestically, there are a very limited number of non-integrator U.S. carriers, if any, outside of Alaska that provide scheduled line-haul freighter service between points in the United States using transport-size (Boeing 737 or larger) aircraft. Most of this market shifted to trucks starting in 2005.

5.2.1 Competitive Factors

A primary consideration for non-integrated all-cargo carriers and combination carriers flying freighters is to locate at an airport with strong local production and consumption of air-eligible commodities within 75 to 150 miles, with an additional market within 400 to 800 miles.

5.2.2 Assessment

Washington state has a growing manufacturing base, but when outside the Puget Sound region, it is mostly small specialized markets. Nevertheless, the inland locations of Spokane International and Grant County International Airports have positive attributes that can provide opportunities for niche markets for the traditional international air cargo airlines.

The inland locations of Spokane International and Grant County International Airports have positive attributes that can provide opportunities for niche markets for the traditional international air cargo airlines.

Spokane International Airport is located 25 miles west of the Washington-Idaho border and 110 miles south of the United States–Canadian border. It is the primary air carrier airport serving a 36-county region encompassing eastern Washington, northern Idaho, western Montana, northeastern Oregon and the southern portions of British Columbia and Alberta. As the economic and cultural center of eastern Washington state, Spokane is an important point for serving the regional inland Northwest market with excellent access to the Seattle metro region, the Intermountain region (defined as the Rocky Mountains and eastern slopes of the Cascade Mountains, including Denver and Salt Lake City) and Northern California.

Grant County International's competitive advantage is its significant airfield infrastructure that can accommodate large wide-body freighters and its driving times to most major cities on the West Coast. Located in the center of eastern Washington, Moses Lake is positioned at the crossroads of the emerging "Cascadia" transshipment region that encompasses Washington, Oregon, Montana, Idaho, and British Columbia.

As potential freight gateways, Spokane International and Grant County International can offer the benefit of uncongested surface access, uncrowded interstate highway systems, available and easily developable land for warehouses and distribution centers, and more consistent weather for aircraft operations than Puget Sound airports.

5.3 INTEGRATOR/EXPRESS CARRIERS

Integrator/express companies are the dominant U.S.-based all-cargo carriers. The two top U.S. freight carriers in the nation in 2017 were all-cargo integrated airlines FedEx and UPS. Also included within this category are DHL Aviation and Amazon Air.

In general, there are only two opportunities available to airports relative to the integrator market. The first is to research and reach out to the integrators to establish basic operations at the airport. Most commercial service airports within Washington state—including Bellingham, Burlington, Pasco, Yakima, Moses Lake, Friday Harbor, Spokane, Wenatchee, Pullman, Sequim, Port Angeles, etc.—are already serviced by FedEx and/or UPS.

The second opportunity is to develop the integrators presence to the next level by establishing the airport as a part of the integrator carrier's regional hub network. This strategy may take the form of the airport marketing itself to the integrator carriers as a sort center for both ground and air operations by providing sufficient and affordable co-located facilities to accommodate both air and ground operations, or in the case of Spokane International, to develop the airport into a regional transshipment hub.

Due to the nature of their business model, the integrators are adept at being able to allocate the appropriate resources to fit a specific market. The integrators may choose to serve a particular market exclusively by truck; or by truck, small feeder aircraft, and large jet freighters, or by whatever combination of equipment most effectively fits their needs. The level of service an integrator carrier provides at an airport will also shrink or expand with varying market conditions.

5.3.1 Competitive Factors

The key to integrator growth at a particular airport is the size of the local market and the airport's physical location in relationship to that market, or to other growing markets that can be served from that particular airport.

Essential to the integrator carriers is the ability to provide to their customers the earliest possible delivery time and the latest possible pick-up time. The limiting constraint to these times is the need to meet sorting schedules at their primary Midwest or local regional hubs. The size of the geographic service area that an integrator will serve from a specific airport is determined by the ability to offer competitive drop-off and pick-up times for outbound shipments and the earliest delivery times on the inbound shipments. Combining this priority service with a second- or third-day delivery product will expand market penetration.

5.3.2 Assessment

Retention and expansion of existing service is the best option open to most Washington state airports related to the integrator market.

For Spokane International, the strong integrator airline presence at the airport also presents an opportunity for the airport to attract high-level logistics and distribution service companies to the

airport and vicinity. The high levels of air freight service associated with the integrator carriers are attractive to companies that depend on having access to reliable, secure, time-definite and extensive global air coverage as a part of their business models. Examples of these types of businesses would include companies such as bio-tech and life-science companies, high-tech repair facilities, and other companies engaged in reverse logistics, spare-parts distributors, and e-commerce fulfillment centers.

5.4 LOGISTICS/DISTRIBUTION SERVICE CENTERS

Logistics/distribution centers (or airport logistics parks) can provide the basis for an indirect strategy of attracting air cargo service as part of this larger multimodal distribution concept. This is an opportunity requiring a long-term outlook.

> Airports should not think of themselves as only airfields, but as potential economic centers that extend beyond the airport fence and embrace partnership opportunities to help enhance and create new logistical services. The overall goal is to enhance both aeronautical and non-aeronautical activities at the airport and increase air cargo capacity and efficiencies in Washington state.

Contract logistics/distribution services are typically 3PLs providers that manage all, or particular segments, of the following various functions that comprise a company's logistics system: transportation, inventory, materials handling, warehousing, customer service, order processing, or any other activity that creates value. Contract logistics services are usually spinoffs of transportation companies that have added global electronic data interchange networks, imaging and bar-coding systems, and computerized inventory management systems to their own information systems capabilities. Distribution management, including warehousing, is the most profitable logistics-service business. Target markets include the automotive, aerospace, alternative energy, advance materials, and biotechnology/pharmaceuticals.

The rationale behind marketing to the logistics/distribution industry, with the initial focus on surface distribution, is to build up the business and forwarder infrastructure in the airport region. Attracting surface-based logistics/distribution services to an airport would provide the basic freight forwarder and trucking network needed to attract air cargo and give the airport more exposure in the freight distribution industry. Certain airports within the state can position themselves as a cost-effective supply/distribution chain distribution point. Beginning with truck-based distribution, an airport-related "Inland Port and Logistics Service Center" could also accommodate air cargo charters with the long-term strategy of attracting scheduled air cargo service.

5.4.1 E-Commerce Fulfillment Centers

A variation on logistics/distribution centers, e-commerce fulfillment centers may also offer an opportunity for certain Washington state airports to attract regional and cross-border e-commerce. The growing phenomenon of internet shopping and the resultant Business to Consumer (B2C) interactions should be of particular interest to airports in Washington state. While most business transactions and logistics services taking place in the world economy are between and among businesses, B2C e-commerce is distinct because of its B2C model of interaction. That is, a consumer shops online directly with an e-tailer (rather than a brick and mortar retailer) who then ships the purchase from his warehouse to the consumer's residence, or facilitates shipment under the e-tailer's brand from a vendor warehouse to the residence.

E-commerce sellers need a way to deliver online purchases to customers, often known as fulfillment. At a store like Walmart fulfillment is automatic. The customer picks up the item of desire, pays for it and walks out the door. The e-commerce B2C model cuts out the traditional visit to a store. Rather, the

seller of the merchandise delivers directly to the consumer. This "last mile" or "to the door" delivery model is changing the face of the logistics-service industry.

A typical e-commerce facility needs three times as many employees as a traditional regional distribution center. The density of people is needed to package individual orders versus shipping cases or pallets to a store. To accommodate more employees, companies establishing dedicated e-commerce centers look for properties with plenty of parking. E-commerce facilities also need more electrical, heating, and cooling infrastructure than traditional distribution centers to power automated systems and keep large workforces comfortable and safe.

A company opening an e-commerce fulfillment center must also choose the right location. Like a regular distribution center, a fulfillment center needs to be close to as many customers as possible. The same-day and next-day delivery options offered in e-commerce for a growing number of markets heighten the importance of proximity. Because direct-to-customer fulfillment generally relies on package carriers, it's best to locate in an area that offers good service from UPS, FedEx, DHL and the U.S. Postal Service.

With the right conditions in place (foreign trade zone status, port of entry status, available developable land, etc.), for certain Washington state airports, an opportunity exists for attracting regional and cross-border e-commerce fulfillment centers.

5.4.2 Assessment

The option of developing airport-related logistics/distribution centers, airport logistics parks or inland ports, is an ideal way for small and non-hub commercial service airports to generate non-aviation revenue while building up the facilities and services necessary to attract additional air cargo to the airport, or attract it in the future. A principal benefit to the Washington state freight transportation system is that having logistics facilities and services located strategically within the state may be able to take some of the pressure off the Port of Seattle and Sea-Tac, by accommodating activities that traditionally take place at, or near, the Port of Seattle, Sea-Tac, or in the Kent Valley. It also helps develop the basic logistics infrastructure needed to attract more business to smaller metropolitan regions of the state.

This concept is not new in Washington state. As early as 2003, Spokane International Airport developed the concept of creating a logistics park as a part of an East Side Cargo Complex (Figure 10).

The core of the development scheme was the utilization of the airport business park, located eight minutes from downtown Spokane via Exit 276 from I-90. The business park has a variety of buildings supporting different uses, ranging from the Geiger Correctional Facility to business incubator operations. The business park is served by full utilities sized to accommodate industrial needs, as well as high-speed fiber optic line access. The proposed "Logistics Park" (as well as the airport as a whole) enjoys Foreign Trade Zone status (FTZ No. 224) with the authority to establish subzones elsewhere throughout the Spokane area.

Figure 10. Spokane International Airport Business Park

To show the potential of the Spokane International Airport business park to the airport, an application has just been submitted to the Spokane County Building and Planning Department for a four-story 2.5-million-square-foot warehouse space to be constructed within the park. The user of the facility has not been identified, but it will be used as an e-commerce fulfillment center.

5.5 CONCLUSIONS

Options exist for developing an air cargo and logistics services market for Washington state airports.

The three most immediate air cargo development opportunities for Washington state airports are 1) maintaining and expanding the existing integrator operations; 2) attracting cherry air charter operations to central and eastern Washington airports; and 3) developing non-hub airports into centers for regional ground-based logistical operations, including e-commerce.

In the longer term, wide-body scheduled freighter service becomes a more realistic goal for some airports such as Spokane International, Snohomish County and, possibly, Moses Lake International. Spokane International Airport may almost certainly begin to see wide-body passenger service, bringing with it the potential for them to grow their belly cargo potential. Also, with the emergence of e-commerce as a force in the new economy, the State of Washington should be proactive in courting e-commerce fulfillment centers highlighting the state's airports, Pacific Rim location, developable land and growing perishables and life-science industries.

One of the most effective approaches Washington state airports can take with the integrator carrier potential is to be knowledgeable about each individual integrator carrier's business model, since each carrier is different, and to be attuned to both the national and local market dynamics for each individual integrator carrier. An example is a recent report that UPS is considering getting into the e-commerce fulfillment business of delivering furniture and other oversize items. Currently, these types of items do not fit into their fast-moving parcel operation and will require special facilities.

Development of the air cargo charter market will hinge on an airport's ability to provide ground-handling and cargo-handling services for both narrow-body and wide-body freighter aircraft at a competitive price. This could be a challenge for an airport that may be attractive to airlines only on a part-time seasonal basis.

To attract the logistics/distribution market, individual airports should consider the "inland port" model used by Rickenbacker International Airport and Huntsville International, leveraging their designations as U.S. ports of entry and foreign trade zones, and branding themselves "Global Logistics Centers" and actively recruiting intermodal business in the ocean cargo and motor carrier markets.

6 Strengths, Weakness, Opportunities, and Threats for Select Airports

This section highlights and summarizes the various strengths, weaknesses, opportunities and threats for each of the airports reviewed as a part of this paper. It is based on the analysis of criteria needed to attract airlines as detailed in Section 3.4 and the assessment of opportunities performed in Section 3.5. It provides a bit more detail for individual airports than was presented in the previous sections. Note, however, that it is beyond the scope of this study to provide market strategies for individual airports.

Air cargo grew by 9 to 10 percent year-on-year in 2017, the strongest calendar-year of growth since 2010. Air cargo grew more than twice as fast as global trade volumes during the year as a whole—the widest margin of year-to-year growth since 2010. According to most industry analysts, worldwide air cargo is expected to rise 3 percent to 5.5 percent per year over the next 20 years.

A number of factors are likely to contribute to the growth of air cargo in Washington state, including the impact of the growing sectors of e-commerce, pharmaceuticals, and perishables. Additionally, the popularity and growth of e-commerce is causing major structural changes to supply-chain management and the physical movement of commodities and products between suppliers, manufacturers, distributors, warehouse operators, and consumers. These changes in the way shippers, freight forwarders, and airlines conduct business opens opportunities to airports that are not traditionally thought of as air cargo airports.

It is within this framework that the following summaries of the various strengths, weaknesses, opportunities and threats for each of the airports reviewed as a part of this paper were constructed. The opportunities represent conditions that the airport could exploit to increase their market. They might be geographical (e.g., proximity to the Canadian border or the cherry farms). In others, they are a product of current market conditions. For example, Sea-Tac is already serving as a Pacific Rim gateway, and this presents opportunities in terms are expanding its air cargo position. In some cases, the airports are taking advantage of these opportunities now. In some cases, however, more could be done. This information could be used by the airports as they develop their own business plans.

Table 2. Seattle-Tacoma International Airport: Strengths, Weaknesses, Threats and Opportunities

Strengths	Weaknesses
▪ Existing air field infrastructure ▪ Developed landside infrastructure ▪ Existing scheduled air cargo service ▪ Existing wide-body aircraft service ▪ Direct and through international service ▪ Existing air cargo buildings ▪ Dominance of regional market ▪ Interstate highway access ▪ Growing local manufacturing base ▪ Access to primary manufacturing/retail markets ▪ Existing all-cargo carrier operations ▪ Good airline and truck connectivity ▪ Planned aircraft ramp capacity ▪ Size of local economic and population base ▪ Distance from large metro markets ▪ Existing air forwarder network ▪ Synergy with ocean port operations ▪ Pacific Rim location	▪ Limited relative economic and population base ▪ Limited air cargo terminals ▪ Inefficient cargo building utilization ▪ Limited land availability ▪ Competing resource demands ▪ Seasonally unreliable highway access to Eastern Washington ▪ Congested local roadways ▪ Relatively isolated U.S. Pacific Northwest geographic location ▪ Noise and land use compatibility ▪ Limited federal inspection services capacity
Opportunities	**Threats**
▪ Pacific Rim gateway ▪ Regional e-commerce hub ▪ Consolidation/distribution center for PNW ▪ Base for integrator airlines ▪ International freighters ▪ International charters ▪ Contract logistics/ distribution centers ▪ Sea-air intermodal opportunities ▪ Linkages with off-airport facilities ▪ Key link in the growing aerospace industry supply chain ▪ Alternative to Ted Stevens Anchorage International Airport for trans-Pacific tech stop	▪ Restructuring of FedEx/DHL/Amazon operations ▪ Competition from Vancouver International Airport, Portland International Airport ▪ Overly congested highway access ▪ Trucking vs. air service ▪ Economically weak airlines ▪ Oppressive air cargo security regulations ▪ Global trade war ▪ Global conflict ▪ Relocation of Delta Air Lines' Pacific gateway hub ▪ Change in international air bilaterals

Table 3. Spokane International Airport: Strengths, Weaknesses, Threats and Opportunities

Strengths	Weaknesses
▪ Existing air field infrastructure ▪ Uncongested airside and landside facilities ▪ Availability of cargo aircraft parking ramp ▪ Availability of developable land ▪ Existing joint use air cargo building ▪ New Eastside cargo area ▪ Existence of adjacent Airport Logistics Park ▪ Interstate highway access ▪ U.S. Customs ▪ Access to secondary manufacturing markets ▪ Access to high-value agricultural production ▪ Presence of integrated carriers ▪ Port of Entry/federal inspection services ▪ Availability of labor and community support	▪ Relatively small economic and population base ▪ No wide-body passenger aircraft service ▪ Limited direct or through international service ▪ No line-haul airport-to-airport cargo carriers ▪ Limited presence of freight forwarders
Opportunities	**Threats**
▪ Alternative to congested facilities at Sea-Tac and Boeing Field ▪ Regional e-commerce hub ▪ Expansion of the presence of integrators ▪ Perishables and high-value food products ▪ Growing Economy ▪ International freighters ▪ International charters ▪ Contract logistics/ distribution center ▪ Intermodal opportunities ▪ Master planned on-airport development ▪ U.S.-Canadian cross-border freight ▪ Inland port/Container Freight Station	▪ Competition from Sea-Tac, Moses Lake, Boise, Great Falls ▪ Restructuring of FedEx/UPS/Amazon operations ▪ Trucking vs. air service ▪ Economically weak airlines ▪ Oppressive air cargo security regulations ▪ Global trade war ▪ Global conflict

Table 4. King County International (Boeing Field) Airport: Strengths, Weaknesses, Threats and Opportunities

Strengths	Weaknesses
▪ Existing air field infrastructure ▪ Availability of cargo aircraft parking ramp ▪ Availability of developable land ▪ Existing air cargo buildings ▪ Port of entry status and federal inspection services ▪ Boeing Field International's central geographic location ▪ Interstate highway access ▪ Growing local manufacturing base ▪ Access to primary manufacturing market ▪ Existing all-cargo carrier operations ▪ Availability of labor ▪ Distance from large metro markets	▪ Congested airside and landside facilities ▪ No wide-body passenger service ▪ Lack of expansion potential ▪ Limited air cargo marketing program
Opportunities	**Threats**
▪ Base for integrator airlines ▪ International freighters ▪ Domestic and international charters ▪ Contract logistics/distribution center	▪ Restructuring of UPS operations ▪ Competition from Seattle-Tacoma International Airport, Vancouver International Airport, Portland International Airport ▪ Overly congested highway access ▪ Trucking vs. air service ▪ Economically weak airlines ▪ Oppressive air cargo security regulations ▪ Global trade war ▪ Global conflict

Table 5. Snohomish County Paine Field Airport: Strengths, Weaknesses, Threats and Opportunities

Strengths	Weaknesses
▪ Existing air field infrastructure ▪ Uncongested airside and landside facilities ▪ Availability of cargo aircraft parking ramp ▪ Availability of developable land ▪ Existing joint use air cargo building ▪ Schedule passenger service ▪ Interstate highway access ▪ U.S. Customs ▪ Access to primary & secondary manufacturing markets ▪ Port of Entry/federal inspection services	▪ No wide-body passenger aircraft service ▪ Limited direct or through international service ▪ Limited presence of freight forwarders ▪ Lack of community support
Opportunities	**Threats**
▪ Alternative to congested facilities at Seattle-Tacoma International Airport and Boeing Field ▪ Regional aerospace hub ▪ International freighters ▪ International charters ▪ Contract logistics/ distribution center ▪ Intermodal opportunities ▪ Master planned on-airport development ▪ United States–Canadian cross-border freight/Container Freight Station	▪ Competition from Seattle-Tacoma International, Bellingham ▪ Trucking vs. air service ▪ Economically weak airlines ▪ Oppressive air cargo security regulations ▪ Global trade war ▪ Global conflict

Table 6. Grant County International Airport: Strengths, Weaknesses, Threats and Opportunities

Strengths	Weaknesses
▪ Existing air field infrastructure ▪ Uncongested airside and landside facilities ▪ Availability of cargo aircraft parking ramp ▪ Availability of developable land ▪ Existing air cargo buildings ▪ Port of entry status and federal inspection services ▪ Moses Lake's central geographic location ▪ Interstate highway access ▪ Growing local manufacturing base ▪ Access to secondary manufacturing market ▪ Relatively low development costs ▪ Availability of labor ▪ Availability for clean slate development	▪ Size of local economic and population base ▪ Lack of scheduled airline service ▪ Lack of scheduled air cargo service ▪ Lack of wide-body aircraft service ▪ No direct or through international service ▪ Lack of scheduled Road Feeder Service ▪ Trucking vs. air service ▪ Limited local freight forwarder network ▪ Lack of recognition in the marketplace
Opportunities	**Threats**
▪ International cherry charters ▪ Inland Port/CFS ▪ Alternative to Seattle-Tacoma International for air cherry charters ▪ Consolidation/distribution center for state ▪ International freighters ▪ Domestic and international charters ▪ Contract logistics/ distribution center ▪ Intermodal opportunities ▪ Master planned on-airport development ▪ Container Freight Station ▪ Export consolidation	▪ Competition from Spokane International Airport, Yakima Air Terminal/McAllister Field ▪ Trucking vs. air service ▪ Economically weak airlines ▪ Oppressive air cargo security regulations ▪ Global trade war ▪ Global conflict

Table 7. Bellingham International Airport: Strengths, Weaknesses, Threats and Opportunities

Strengths	Weaknesses
▪ Existing air field infrastructure ▪ Uncongested airside and landside facilities ▪ Availability of cargo aircraft parking ramp ▪ Availability of developable land ▪ Existing air cargo buildings ▪ Port of entry status and federal inspection services ▪ Border location ▪ Interstate highway access ▪ Growing local manufacturing base ▪ Existing Port management structure ▪ Existing all-cargo carrier operations ▪ Distance from large metro markets	▪ Size of local economic and population base ▪ Lack of scheduled air cargo service ▪ Lack of wide-body aircraft service ▪ No direct or through international service ▪ Lack of scheduled Road Feeder Service ▪ Limited runway length ▪ Limited local freight forwarder network ▪ Lack of recognition in the marketplace
Opportunities	**Threats**
▪ United States–Canadian cross-border freight ▪ Domestic and international charters ▪ Contract logistics/ distribution center ▪ Intermodal opportunities ▪ Container Freight Station ▪ Export consolidation	▪ Restructuring of FedEx/UPS operations ▪ Competition from Seattle-Tacoma International Airport, Vancouver International Airport ▪ Overly congested highway access ▪ Trucking vs. air service ▪ Economically weak airlines ▪ Oppressive air cargo security regulations ▪ Global trade war ▪ Global conflict

Table 8. Yakima, Tri-Cities, Walla Walla and Pangborn Field Airports: Strengths, Weaknesses, Threats and Opportunities

Strengths	Weaknesses
▪ Existing air field infrastructure ▪ Uncongested airside and landside facilities ▪ Availability of cargo aircraft parking ramp ▪ Availability of developable land ▪ Existing air cargo buildings ▪ Port of entry status and federal inspection services ▪ Central Washington geographic location ▪ Interstate highway access ▪ Availability of labor	▪ Size of local economic and population base ▪ Limited scheduled air cargo service ▪ Lack of wide-body aircraft service ▪ No direct or through international service ▪ Limited runway length ▪ Limited local freight forwarder network ▪ Lack of recognition in the marketplace
Opportunities	**Threats**
▪ Inland Port ▪ Domestic charters ▪ Contract logistics/ distribution center ▪ Intermodal opportunities ▪ Master planned on-airport development ▪ Container Freight Station ▪ Export consolidation ▪ Domestic and international charters ▪ Contract logistics/ distribution center ▪ Intermodal opportunities	▪ Restructuring of FedEx/UPS operations ▪ Competition from Grant County International Airport, Spokane International Airport, Seattle-Tacoma International Airport ▪ Economically weak airlines ▪ Other local/regional logistics parks

7 Conclusions

The purpose of this white paper was to evaluate how to use existing capacity across Washington state to accommodate the forecasted future air cargo demand and to supplement the air cargo capacity at Sea-Tac. The white paper:

- Discussed basic components needed to attract and maintain air cargo air service.
- Identified key airports with the potential to attract air cargo.
- Evaluated each airport as to its potential to attract airlines to provide air cargo service.
- Summarized strengths, weaknesses, opportunities, and threats for the selected airports.

Each airport addressed as a part of this analysis has varying levels of strengths, weaknesses, threats, and opportunities. As suggested in the introduction to section 6, these summaries can be thought of as a starting point for the respective airports to begin to understand how they can fit into (or find their niche) in the air cargo/logistics market, and to think of logistics as a core component of their overall missions. A key premise to this concept is to recognize that airports should not think of themselves as only airfields, but as potential economic centers that extend beyond the airport fence and embrace partnership opportunities to help enhance and create new opportunities for logistical services. The overall goal is to enhance both aeronautical and non-aeronautical activities at the airport and increase air cargo capacity and efficiencies in Washington state.

New aeronautical revenues can be derived from increased air service though aircraft landing fees, air cargo parking fees, and fuel surcharges. Non-aeronautical activities can be derived from rent on land and non-terminal facilities, such as manufacturing, warehousing, cross-dock truck terminals, and freight forwarding. Non-aeronautical revenue may be used to reduce payments by airlines and may also be used to maintain and improve commercial services.

Some of the airports discussed in this white paper have the in-house resources necessary to engage in long-range strategic planning, (e.g., Spokane International Airport, King County International [Boeing Field] Airport, Sea-Tac) and have identified opportunities related to air cargo development, while other smaller airports intuitively recognize their unrealized potential, but need additional guidance on how to move forward to enter the market.

The next white paper will develop a Washington State Air Cargo and Logistics Business Development Strategic Plan. This will be a statewide strategy, based on the market assessment and evaluation of opportunities and constraints at the various airports around the state contained in this and previous white papers. While it will not present an individual strategy for any airport, which should be done by the airport operators, it will provide some examples. The strategic plan will identify the following:

- Ways to supplement air cargo capacity in Washington state.
- The role of other Washington state airports in air cargo capacity expansion. For example, FedEx uses Spokane International Airport as a hub to route products with origins and destinations east of the Cascade mountain range. A statewide strategy for air cargo, including guidance to regional airports for expanding their markets.