AIR CARGO GUIDE

ACI-NA Air Cargo Committee

September 2019

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AIR CARGO COMMITTEE

CHAIR'S GREETING

September 2019

As the 2019 Chair of ACI-NA's Air Cargo Committee, I am proud to present this newly updated version of the Air Cargo Guide. The original document, published in 1995, quickly became an imperative tool for many airports learning about this important segment of the air transportation industry. This updated version continues its focus on meeting the needs of airports of all sizes and types that are interested in understanding, supporting, and growing their air cargo business. It reflects input from air cargo professionals from airports, academia, and consulting firms, and incorporates the most useful and up to date information available.

The Air Cargo Guide consists of ten chapters covering a range of important cargo issues confronting airports today. In several chapters there is an overlap of similar issues in order to address important topics from different perspectives. This is consistent with the intent of the original document – to provide airports with an understanding of different strategic issues fundamental to air cargo, with which the reader may not have previous experience. The Guide is not intended to provide all of the answers, rather it has been written to help users develop the right questions.

Originally, Air Cargo was a Subcommittee of ACI-NA's Economics Committee dating back to 1991, and has matured and grown full Committee status. Through the active participation of its airport and associate members, the Committee delves into a broad spectrum of cargo related issues and their effect on airports the intermodal transportation of goods, and associated land development. The Committee addresses important subjects including security and other regulatory mandates, international air service, U.S. freight policies, and financial and management strategies relating to cargo operations. The Air Cargo Guide is an enduring and modern tool encompassing the Committee's efforts to provide a comprehensive understanding of the important issues touched on here. This work is supplemented and updated through periodic conferences, forums, and monthly webinars exchanging information among the membership and with other air cargo partners including airlines, integrated carriers, forwarders, shippers and others in the global supply chain community.

I would like to formally acknowledge the individuals who contributed their time and effort to this updated version of the Guide, and to those who worked so diligently on the original edition and the previous updates, as they show clear examples of the energy, commitment, and breadth of knowledge and experience of the Air Cargo Committee members.

We believe the Air Cargo Guide is an ideal instrument to expand the knowledge base of interested air cargo professionals at airports and throughout the industry. With this resource, we believe airports can benefit, and in so doing enhance local and regional economies through growth in their supply chain and trade-related sectors. However, the air cargo industry constantly evolves and creates new issues and challenges for airports to confront. To that end, it is our hope that you will continue to participate in the exchange of ideas contained within this updated edition of the Air Cargo Guide and with the ongoing activities of the Committee.

I welcome your thoughts on the guide and on ways that ACI-NA can better serve your air cargo related needs. I look forward to working with you as we continue to develop the relationship between airports and others in the air cargo industry over the coming years.

Bryan Schreiber
Chair (2018 – 2019)
ACI-NA Air Cargo Committee

Guide Acknowledgements

This Air Cargo Guide is the fourth edition of the document. It represents a collaborative effort by member airports and associate members that has produced a high-quality product offering a solid balance of viewpoints from different industry elements. Our sincerest thanks go to the talented individuals who worked on the original project and subsequently updated versions. We hope all those who have previously used this Guide recognized the value of their contribution.

This Guide builds on those earlier efforts. As was the case with the original, the chapters were reviewed, revised, or (in the case of new sections) edited to reflect the experience and knowledge the industry has gained over the past five years and the changes that have impacted the global dynamics of air cargo. Once again, the finished product demonstrates the quality and hard work of our members.

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1. AIR FREIGHT – HISTORICAL PERSPECTIVE, INDUSTRY BACKGROUND AND KEY TRENDS

1.1 Introduction

What is air freight? Air freight/cargo can be defined as all cargo moved by air except for mail and passenger baggage. The two options for air cargo transport are dedicated freighters and belly capacity in passenger aircraft. Air freight accounts for about 1 percent of total freight by weight transported worldwide, but some 35 percent of total freight value. From this statistic, it is tempting to say that only high-value commodities move by air, and that relatively low-value products are inherently more likely to travel by truck, train, or ship. Indeed, many analysts focus on a value-per-pound component when discussing the air cargo prospects for a particular product or geographic market. However, there is more to it.

Various academic papers published since the early 1980s have identified and analyzed other factors which have an equal, if not greater, influence over whether a particular commodity is transported by air or by a less expensive, slower and often less reliable surface mode of transportation. Most industry professionals and members of the academic community agree upon a number of factors that are believed to have the broadest and most significant influence on the *air- eligibility* of specific commodities. The historical relationship between a value per pound and air penetration rates, the percentage of total weight moving by air, is an important factor. However, the relationship is changing, and may break down, as non-value factors become more significant determinants of modal choice. The changing relationship is important because it affects everything from macro-level air cargo demand forecasts to the micro-level design and pricing of specific freight transportation products. Each transportation mode offers different costs and benefits. To establish the proper context for this chapter, an examination of how and why shippers chose modes of transportation before assessing the most important non-value factors governing air-eligibility must be undertaken. However, first a little history.

1.2 History of Air Cargo

Even before the aircraft, mail was moved by balloons, dirigibles and carrier pigeons. The first cargo moved by aircraft occurred on 7 November 1910 when a few bolts of silk were transported by air from Dayton to Columbus, Ohio. The following year in 1911 experimentation with the movement of post was started, and by 1914 regular air service began in the United States. In Germany, the first official air mail flight occurred in 1912. However, it was not until 1925 before a comprehensive airmail service was available in the U.S. On October 7, 1925 the first five Contract Airmail (CAM) routes were issued by the U.S. Postal service to fly airmail between designated points. For example, CAM 1 flew the New York to Boston route and was managed by Juan Trippe, who would later start Pan American Airways. By 1931 85% of airline revenue was from domestic airmail contracts, with 14.8% from passenger service and only 0.2% from freight. If it had not been for the postal service CAM routes, the development of the U.S. commercial aviation section would have been hampered.

World War II caused a rapid expansion of the aviation industry and for the first time, large scale movements of freight were carried out to support the war effort. For example, in support of the Nationalist Chinese over 650,000 tons of cargo was transported over *The Hump* between India and southern China between 1942 and 1945. Later, between 1948 and 1949, the largest airlift in history occurred to support the blockaded city of Berlin, Germany.

In the early 1970's door-to-door express package services came into being. Dalsey, Hillblom and Lynn started DHL in 1969, and Fred Smith started Federal Express in 1971. The leadership role of Fred Smith in building FedEx is a classic study of entrepreneurship.

The era of the wide-bodied jets started in 1970 when the first Boeing 747 entered service. This was the first time in history that the aviation industry chose size over speed to increase performance. Soon afterwards, Douglas and Lockheed started production of three engine wide-bodied aircraft, the Douglas DC-10 and Lockheed 1011. In the beginning, only the passenger market was serviced by these new wide-bodied aircraft until the first Boeing 747 freighter was flown between Frankfurt and New York in April 1972 by Lufthansa. The much larger wide-body aircraft represented an increase the volumes carried by narrow body aircraft by a factor of almost 3.

In 2018, there were 1870 freighters in operation worldwide. Thirty- percent of these were large wide body (>80 tons) aircraft, 33% where medium wide-bodied aircraft (40 to 80 tons) and 37% were standard bodies with carrying capacities of less than 45 tons. Boeing projects the demand for the world freighter fleet to increase to 3260 airplanes by 2037. This expected demand will be met through new freighters and conversion of passenger airlines to cargo aircraft.

1.3 Airline Industry Deregulation

In 2018, the 40-year anniversary of passenger air carrier deregulation in the U.S. was marked. Often, people forget that freer movement of air cargo was actually implemented 1 year earlier, in 1977. This was the *enabler* for companies like FedEx to use overnight shipping over any route rather than depending on limited belly space via passenger aircraft. The benefits became apparent for concepts including *just in time* shipments, investment in accurate tracking systems and, of course, today's e-commerce.

U.S./Canada deregulation has been part of a greater global airline liberalization trend, especially in Asia, Latin America, and the European Union.

Network industries, which are critical to a modern economy, include air travel, railroads, electrical power, and telecommunications. After deregulation, the passenger airlines quickly moved to a hub-and-spoke system, whereby an airline selected some airport (the hub) as the destination point for flights from a number of origination cities (the spokes). Because the size of the planes used varied according to the travel on that spoke, and since hubs allowed passenger travel to be consolidated in *transfer stations*, capacity utilization (*load factors*) increased, allowing fare reduction. The hub-and-spoke model survives among the legacy carriers, but the Low Cost Carriers (LCCs)—about 28 percent of the world passenger market—typically fly point to point. The network hubs model offers consumers more convenience for routes, but point-to-point routes have proven less costly for airlines to implement. Over time, the legacy carriers and the LCCs will likely use some combination of point-to-point and network hubs to capture both economies of scope and pricing advantages.

Open Skies agreements (discussed in greater detail in Chapter 6) are bilateral agreements between the United States/Canada and other countries to open the aviation market to foreign access and remove barriers to competition. They give airlines the right to operate air services from any point in the United States/Canada to any point in the other country, as well as to and from third countries. Open Skies agreements have been successful at removing many of the barriers to competition and allowing airlines to have foreign partners, access to international routes to and from their home countries, and freedom from many traditional forms of economic regulation. A global industry would work better with a globally minded set of rules that would allow airlines from one country (or investors of any sort) to establish airlines in another country (the right of establishment) and to operate domestic services in the territory of another

country (cabotage). However, these agreements still fail to approximate the freedoms that most industries have when competing in other global markets.

The air cargo industry has directly benefited from the environments created by airline deregulation and further liberalization of international trade agreements. These changes have helped to create a global, interconnected economy where the efficient movement of goods by air is not only convenient for consumers, but critical to today's business models.

2. AIR CARGO INDUSTRY BACKGROUND

2.1 Benefits of Air Cargo

Why is there a relationship between a product's value and its propensity to be shipped by air transportation? There is no single answer, but it is safe to say that relatively high-value commodities tend to go by air, despite the much higher cost, for one or several of the following reasons:

Small shipment size

Due to their cost, these commodities tend to move in relatively small lot sizes, which make them suitable for air transport. To use an extreme example, no one buys gold in quantities sufficient to fill a twenty-foot sea container. While less costly than gold, electronics, precision instruments, sophisticated industrial machinery and other high-value commodities also tend to be smaller in size and weight.

Time sensitivity

Certain products are extremely time sensitive. These could include a wide range of perishables, medical products, and seasonal products that must meet very specific delivery deadlines and whose production offers limited options other than by air.

Security

High value commodities, by definition, require more security from loss, damage or theft than lower-value goods. Aircraft generally offer not only the fastest but also the most secure way to move cargo from point to point.

Cost of Capital

High-value commodities consume large amounts of capital and impose high interest costs on their owners. Thus, the time-savings achieved through air cargo are worth more when high-value commodities are involved. Collectively, these value-driven factors are at work, although their impact on transport decisions depends on changing shipper perceptions of their relative importance. Moreover, other factors unrelated to commodity value increasingly influence shippers' modal selection process. To better understand each factor, and how it interacts with the others, it is necessary to first explore how transportation modes are selected and recognize, in general, that shippers do not care about transportation mode. They care about the consignment reaching its intended destination, on time and in good condition, and the cost of the transportation.

Inventory cost

Because air cargo operations can offer a shipper the benefit of speedy, constant resupply, inventory levels can be reduced. This element of speed allows a producer to ship select products to their customers just in

time instead of having to operate large warehousing facilities. By reducing inventory levels, a firm can free up more capital, reduce inventory holding costs, and reduce obsolescence cost.

In summary, air cargo provides the benefits of speed, reliability, security, and reduction of inventory cost.

2.2 Modal Choice

There are a number of academic publications on the subject of modal choice. Unsurprisingly, there is also a great deal of disagreement within the literature and industry. However, most of the academic research incorporates some form of a total distribution cost (TDC) framework, in an effort to quantify the effect of transportation decisions on the total costs of manufacturing and distributing a product. The academics argue that companies can maximize their profitability by correctly quantifying and then managing their total distribution costs, as opposed to focusing only on certain highly visible components of TDC, such as transportation expense. Accordingly, this section will present the most important factors governing modal choice, and discuss how each factor operates and interacts with the others. Generally, the following factors as have the most influence on modal selection:

Value

High-value products have a greater propensity to be shipped by air. The speed of air transport allows companies to reduce their capital tied up in in-transit inventory and provides for greater security.

Physical Characteristics

Extremely bulky or low-density products are not suitable for air transport, either because they cannot be accommodated on an aircraft or the resulting cost per pound would be uneconomically high.

Perishability

The perishability of a product is an important determinant of the choice of transport mode. Products can "perish" in terms of economic utility (value), physical degradation, or both. An example of economic perishability would be Christmas cards, which have a small retail-selling window. On December 26, unsold Christmas cards have little value to consumers until the following year, even though the physical characteristics of the cards are unchanged. An example of physical perishability would be strawberries, which spoil (even with refrigeration) within two weeks of harvesting. Thus, strawberries would not survive the ocean voyage from California to Japan, leaving air cargo as the only viable transport option. The same is true for fresh seafood and meat. Some products suffer both types of perishability: consider red roses, which are in tremendous demand (at premium prices) during the week before Valentine's Day. Even with pre-cooling and other preservation techniques, roses and other cut flowers cannot be stored long-term, and therefore must be transported swiftly from growers to consumers. More recently, pharmaceutical products have become a major element in air cargo growth.

Demand predictability

The more predictable the demand for a particular product is the more advance planning can be done and the more flexibility a shipper has to ship via less expensive, but slower, surface modes. Products with less predictable demand characteristics afford less flexibility in transportation decisions. If shippers want to avoid lost selling opportunities (called *stock-outs*), they must either expand inventories, which increases carrying costs and potentially exposes the company to write-downs, or utilize air cargo to respond more quickly to demand surges. An example of a product with extremely predictable demand is infant formula, which (for

obvious reasons) does not experience significant seasonal or cyclical fluctuations in demand. An example of a product with extremely unpredictable demand is children's toys: will the “reptile-invaders-from - Mars” toy be a top seller during the Christmas season? If so, the manufacturer has to swiftly manufacture and distribute the products to take advantage of the fad to increase sales.

Geographic market transportation factors

A number of factors unique to particular geographic markets can significantly impact the viability of different transport options. Geographic market characteristics which could affect the choice of transportation mode include: lack of modern ground transportation infrastructure; poor security controls; long customs and brokerage cycles; harsh or unusual terrain; and distance from seaports, airports or rail heads. The existence of any one or a combination of these factors limits transport options and can therefore materially affect modal choice. For example, many interior cities in the former Soviet Union are not efficiently served by road or rail, leaving air freight as the only viable option. Also, markets with sharp directional imbalances in air cargo demand can have unique and sustained airlift pricing distortions. Consider, for example, the fact that westbound traffic and yields in most transpacific markets are multiples of eastbound volumes and rates. In other words, carriers fly from the U.S. to Asia in order to take advantage of the lucrative return trip. Accordingly, the airlines offer steep discounts on the positioning flights. Such "backhaul" pricing can upgrade commodities which otherwise would not move by air.

Based on the above factors, many academics have identified certain commodities as being *captives* of a particular mode. For example, it would be impossible to sell California strawberries in Japan without using airfreight, so strawberries are considered *air captive* commodities, along with other highly perishable products, such as seafood, fashion garments, and cut flowers. Other commodities are considered *sea captive* --that is, their only economically viable mode of transport is by ocean. Bulk commodities, such as lumber, grains and oil, fall into this category. Most freight traffic is not *captive* to one mode or the other, but rather could use either air or surface transportation depending on the cost-speed-reliability-security tradeoffs discussed earlier. Of course, not all of these factors can be quantified. Moreover, individual shipper choices are not always grounded in quantitative analysis of alternative transportation products. But if shippers attempt to quantify the tradeoffs between different transport options, and if the commodities are not captive to a particular mode, then a total distribution cost analysis can be a powerful decision-making tool. Pricing on containerships is 10 to 20 times cheaper (by weight) then shipping goods by aircraft. In addition, containership capacity, with enhanced refrigeration and climate control amenities, continues to grow, improving the reliability issues and reducing transit time of good shipped. These two factors are putting pressure on the air cargo industry.

On a final note, keep in mind that “just in time” manufacturing does not immediately imply the involvement of air shipments. All it means is that the production of a product will be timed to allow for the optimum transport mode to deliver the product to the consignee at the designated delivery date and time.

2.3 Air Cargo Business Models

There are several business models used in the air cargo industry: the predominant ones include the all-cargo carriers, the integrators (operators that deliver cargo from point to point rather than airport to airport), belly only cargo carriers, or mixed carriers that operate a fleet of both passenger and freighter aircraft. It is business worth pursuing. Sourced from published IATA findings, total North American GDP supported by aviation was $844 billion in 2017, part of which comprised 19.2 million metric tons of air freight. The discussion below will describe each of these business models.

All cargo

The all-cargo carriers operate a dedicated fleet of freighter aircraft. Some examples of all cargo carriers are Cargolux and Atlas Air. These carriers seldom deal directly with individual shippers, and instead typically work with intermediaries called freight forwarders. Forwarders consolidate many small shipments from their customers into pallet size loads in essence buying cargo space wholesale from the air carriers and selling retail to their customers. Working with freight forwarders, all cargo carriers often will enter into long-term contracts, which provides some stability in demand. These long-term contracts provide economies of scale for the airlines enabling them to lower purchasing price and hedge against price uncertainty. *Belly cargo carriers*

Belly cargo carriers are passenger-only airlines that carry cargo in the holds of their aircraft as an additional revenue stream. Between 40 and 50% of global airfreight is moved as belly cargo. Belly cargo is largely accommodated by the unrelated market demand of passenger air transport making it difficult for airlines to match supply and capacity with demand. However, for the belly cargo only carriers, since their capacity is fixed and demand is unrelated, fluctuations in supply tend to be less of an issue, and have a low marginal cost, but can provide welcome incremental revenue to increase profitability on marginal flights.

Integrators (door to door)

The integrators, also known as express carriers are firms that provide door-to-door service such as UPS, FedEx, and DHL. E-commerce has exploded since the last revision of this guide, driven by now familiar names like Alibaba and Amazon. SF Express and Amazon Air have fleets of freighters of 50 aircraft each, astonishing growth in a small period of time. Many of these firms operate dedicated all cargo aircraft, delivery vehicles, and cargo hubs. The cost for express services is much higher than for other modes of transportation. This is because the express carrier typically owns and operates the entire transportation network from aircraft and delivery vehicles to hubs (both ground and air) and the downstream transportation network to deliver the cargo to its final destination.

Combination carriers

Combination carriers fly both passenger and freighter aircraft. Like the all-cargo carriers, combination carriers work almost exclusively with freight forwarders to provide the pickup and delivery service to the ultimate customer. Airlines such as Lufthansa, KLM/Air France, Cathay Pacific Airways, and Korean Air operate fleets of both passenger and dedicated cargo aircraft and are therefore considered combination carriers. Combination carriers can earn up to one-half of their gross revenues from cargo on some routes.

3. KEY TRENDS IN AIR CARGO

3.1 E-commerce Growth

The explosive growth of e-commerce over the last 10 years has greatly increased the demand for air cargo. This demand is projected to grow at 20 percent over the next five years. This high level of activity in e-commerce has provided the integrated express carriers with a faster growth rate than the overall air cargo growth rate. The integrated express carriers grew at a rate of 11.5 percent in 2017, whereas the world air cargo traffic grew 10 percent. Of course, this type of growth signals opportunity which often leads to new entrants. In the case of e-commerce, the new entrant challenging FedEx and UPS is Amazon Air. Amazon's deep pockets and proven ability to innovate has led to an impressive nationwide network of

markets served by contracted freighter aircraft carrying Amazon packages. In 2019, it is clear that we are still in the early chapters of the e-commerce story and its impacts on air cargo, but so far, the impact has clearly been positive and resulted in a larger market for the industry's services.

3.2 Non-traditional Cargo Airports

Air cargo activity in North America has long been dominated by major international gateway airports such as New York (JFK), Los Angeles (LAX), Chicago (ORD), Miami (MIA) and Toronto (YYZ) as well as integrator hubs like Memphis (MEM) and Louisville (SDF). In recent years, airports that were previously not known for large cargo operations have experienced tremendous growth.

Much of this growth is due to e-commerce and the expansion of Amazon Air. Now, non-traditional cargo airports like Lehigh Valley (ABE), Baltimore-Washington (BWI) and Charlotte (CLT) are handling thousands of annual operations by Amazon Air. Airports like these, are relatively free of congestion and located near consumers who demand the speed and convenience of e-commerce. This development in the North American air cargo industry is truly transformational. Prior to Amazon Air, the large, but mature U.S. domestic air cargo market had been led by the duopoly of FedEx and UPS (with participation to a lesser extent by DHL). As Amazon Air and, potentially, other new cargo airlines build their networks to accommodate e-commerce volumes, it is likely that even more non-traditional cargo airports will see their freighter operations grow exponentially.

Growth at non-traditional cargo airports has not been limited to e-commerce activity. General freight has led to new international freighter services at airports like Greenville-Spartanburg (GSP) and Pittsburgh (PIT). In many cases, carefully crafted niche strategies help attract freighter services to airports that are not large gateways. Typically, these strategies involve elements such as financial incentives, promises of low airport costs and no airside or landside congestion, and large local shippers committing to use the airport's new freighter services. While these non-traditional cargo airports may never challenge the major gateway airports in terms of total tonnage, it is increasingly evident that smaller, non-gateway airports can effectively serve certain segments of the air cargo market.

3.3 Belly Cargo

Cargo is transported by airlines in two primary ways – via dedicated all-cargo freighter aircraft and via the bellies of passenger aircraft. While freighter aircraft carry the majority of air cargo worldwide, the continued growth of passenger air services has naturally led to more belly capacity available for cargo. Widebody aircraft are particularly suited for carrying cargo because they accommodate containers and pallets which makes loading and unloading much more efficient. Further, because belly space is a by-product of passenger service, it is often marginally priced and, therefore, can be an economical alternative for many shippers. Cargo adds important revenue streams to passenger services and many airline managers will concede that cargo is often the difference between profitable and unprofitable international routes. New aircraft such as the B787 and the A350 include specific design elements which maximize their cargo carrying capabilities. Not only are these aircraft cargo-friendly, they are increasingly being deployed on long, thin routes where nonstop passenger services could never have been offered before. Thus, international routes that started with new technology aircraft like Austin, Texas - London and Charleston, South Carolina – London benefit through direct passenger service as well as attractive belly cargo service.

3.4 Temperature Controlled Goods – Perishable Foods and Pharmaceuticals

As noted in Section 2, air cargo is particularly useful when perishability is an issue and where strict temperature controls are required. Accordingly, air cargo is being employed more in the transportation of items such as fresh foods and pharmaceuticals.

In recent years, demand for fresh foods has been on the rise in developed countries. This is driven not only by trends toward healthier lifestyles, but also by population increases and higher personal incomes. Along with improved supply chains and innovative technologies, air cargo has been effective in serving the growing market for fresh food. This has included the development of specialized shipping containers, real-time temperature monitoring devices and purpose-built air cargo facilities. Further, fresh food deliveries to individual consumer addresses via e-commerce channels has brought more investment into the sector and more demand for air cargo services.

The healthcare needs of an aging global population are also driving air cargo demand leading to additional requirements by users. Early in the 21st century it was becoming apparent that air cargo was losing significant market share in the international carriage of pharmaceuticals to the ocean carriers, primarily due to poor temperature control over the various sectors of our cool chain. Brussels Airport recognized this and initiated a commitment to pharma quality with their airline and handling partners. Successful development drove an evolution of process and standards which was recognized and adopted by IATA. Certification is now offered globally by IATA, with over 160 companies certified at different locations.

Some of ACI-NA's member airports in the U.S. and Canada are among those certified or going through the process. The certification process is arduous and expensive but is a "tool" which can be valuable presuming there is a fit with either your current or prospective air carrier customer base. If nothing else, it is a tremendous opportunity to get involved with the key components of your airport community.

3.5 Global Trade

Liberalization of transportation and other regulations has enabled global trade to proliferate. Open skies, airline alliances and relaxed airline ownership rules have benefited the air cargo industry by providing better access to markets while allowing for economies of scale. In recent years, some world leaders have questioned the value of globalization citing negative impacts on employment and economies in their home countries. In North America, the North American Free Trade Agreement (NAFTA) was renegotiated in 2018 leading to the United States-Mexico-Canada Agreement (USMCA). The United States and other countries have also imposed sanctions and tariffs on selected countries and industries to achieve a stated goal of ending unfair trade practices.

While the appropriateness and necessity of these changes to international trade agreements can be debated, there are certainly impacts to the air cargo industry – especially if the new trade environments lead to protectionist regimes. The ongoing experiences between the United Kingdom and the European Union over Brexit are an indication of the complexity and potential negative consequences of unwinding decades-old international trade agreements. From an air cargo perspective, any restrictions to global trade will likely be viewed negatively with the specific consequences being unknown, but undoubtedly far-reaching.

3.6 Emerging Technology: Blockchain

Blockchain is a secure decentralized peer-to-peer network where all of the stakeholders can view and share data. Think of it as a type of database. Unlike legacy Electronic Data Interchange (EDI) systems that are

centralized, therefore giving power to the owner of the data, blockchain is decentralized. Blockchain verifies transactions and provides a history of transactions to ensure that the data has not been altered. Therefore, Blockchain technology can be used to send secure digital documentation (such as air waybills, and letters of credit). The benefits of block chain technology are the elimination of redundant data and enhanced visibility and transparency for all stakeholders. In addition, the data stored in blockchains can be used to provide real time analytics.

The use and applicability of blockchains with aviation is still being hotly debated. In addition to the obvious benefits of being able to send and secure digital documents blockchains could also be used in maintenance operations to digitize maintenance logs, provide an unbroken chain of every part on an aircraft and provide traceability of who handled the part.

There are high expectations on the possible uses of blockchain but there are still many unanswered questions.

3.7 Emerging Technology: Drones

Advancements in Unmanned Aerial Vehicle (i.e. drone) technology have natural applications to the air cargo industry. Transporting products and packages via drones clearly entails less risk than transporting people and there are immediate commercial applications in the form of e-commerce shipments. Companies like Amazon, Alphabet (Google's parent company), China's JD.com and numerous start-ups are currently developing and testing drones. These companies are particularly optimistic that using drone technology in remote locations and urban environments can help overcome infrastructure constraints which challenge efficient deliveries. Governments in North America continue to grapple with the appropriate form of regulating this burgeoning industry, but this appears to be a temporary obstacle – especially as other countries already allow liberal use of drones. In Spring 2019, Alphabet's Wings Aviation division received the first U.S. authorization to operate a fleet of drones for consumer-goods deliveries, starting in a rural area of Virginia. For larger metropolitan areas, there are obvious air space issues. However, this is surely the first of many approvals by the FAA of drones used for deliveries, thereby paving the way for future innovation and growth.

CHAPTER 2

DEVELOPING AN AIR CARGO MARKET

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1. INTRODUCTION

The air cargo industry is being dramatically impacted by the rise of e-commerce. This evolving trend has put pressure on sales channels for faster delivery and optimum supply chain services. We are seeing growth and specialization of door-to-door services offered by the all-cargo express carriers and greater attention and services offered to air cargo customers by the passenger carrying airlines as larger cargo-friendly passenger aircraft come onto the aviation market.

As the prospect of global markets becomes more and more of a reality, the demand for air cargo movements will continue to grow as part of an expanding logistics system that will emphasize higher processing speeds, greater efficiency, more specialized customer services, time-definite delivery, and reduced costs.

How can an airport climb aboard this air cargo growth train?

This chapter focuses on successful marketing and facility development strategies to overcome the obstacles an airport may find in its path to take advantage of the potential for this future growth in the air cargo industry. The purpose of combining a discussion of marketing, infrastructure and facility development in one chapter is the belief that they cannot be successfully pursued separately. They must be unified under one policy or focus to achieve the best results. Many well-intentioned marketing plans end up gathering dust on shelves because they were either not grounded in reality or were not supported by the entire organization. What happens when the marketing side of an organization is permitted to freely pursue field-of-dreams type development? What are the prospects for future success if the commercial development and financial side of an organization are so risk averse that possible air cargo opportunities are not even recognized and go to other airports?

It should be emphasized that the marketing and facility development strategies discussed below represent a snapshot of a moving target. The dynamic changes underway in the air cargo industry require constant attention to adjusting these strategies, discarding some, and developing new ones to keep pace and take advantage of the future growth that will surely come to this industry. It is important to remember that development is always subject to the cost of money.

How can an airport participate in future air cargo growth?

To successfully participate in the growth of air cargo, every airport needs a clear set of objectives and a comprehensive air cargo marketing and business development plan. The first step in the process is to identify the strengths and weaknesses of the regional market, the air cargo facilities, and the service infrastructure. Although market potential is the driving force that attracts air carriers and a wide range of supporting businesses to an airport, a combination of other factors including government agencies, the availability of roadway access, warehousing, aeronautical infrastructure, and ramp space also influences the decision to establish an operation in a given area. Thus, it is essential that the marketing effort be closely coordinated with a comprehensive plan for the development of cargo facilities (if needed). The second step is to establish specific objectives, identify your target audience and design a marketing strategy that will reach your customers and achieve your goals.

2. IMPORTANCE OF AIR CARGO TO THE REGION

The existence of a well-developed air cargo infrastructure benefits not only the airport, but a region's economy as well. A solid infrastructure consists of a good roadway system, a strong forwarder community,

sufficient lift to meet the needs of the region's shippers, and other services particular to your community. The region becomes more attractive as a location for a manufacturing plant if, for example, air service exists to expedite products or components to the marketplace. However, as an airport evaluates its potential for air cargo, it is important to remember that for cargo service to work, there usually needs to be a balance between inbound and outbound tonnage.

Airports are magnets that attract major industry to an area. In 2009 Kia Automobiles opened up a new car plant in West Point Georgia just 50 miles Southwest of Hartsfield-Jackson Atlanta International Airport. The close proximity of the airport and its cargo operations offered just-in-time shipments to this new car assembly plant and the 4,000 workers. The addition of this car assembly plant not only had a $4 billion dollar economic impact on the state of Georgia, it also added new cargo capacity to the Atlanta market when Korean Airlines added additional frequencies along with ASIANA Airlines beginning service to Atlanta with daily all-cargo flights.

3. ASSESSING THE MARKET

Many airports assume that because they have a runway they can serve the air cargo segment of the industry effectively. This is not necessarily true. There are many variables that will determine the potential success of an air cargo operation. These include, but are not limited to, the physical capacity of the airport and its landside and aeronautical infrastructure, regional consuming and producing markets, roadway access, redistribution capacity by air or land, aircraft capacity, and competing airports. Even with several of these attributes, many airports will still be very challenged to successfully implement air cargo service.

When people discuss logistics, they typically refer to shipping chains. Simply stated, a shipping chain is the number of firms that it takes to move a product from its point of origin to the ultimate consumer. Given the relative cost of trucking cargo versus flying cargo, shippers and manufacturers are more than willing to put their products on trucks to be taken to the most economical and efficient airport from which to ship by air. Many airports throughout the United States experience a loss of cargo volumes or leakage due to excess capacity at other airports where cargo markets may not be as strong, or that particular airport is a destination airport where airlines have high volumes of flights and not enough cargo to fill them. Much of the air cargo traffic is driven by freight forwarders who typically consider when determining cargo bookings:

Availability of Air Service

The primary factor in the routing decision is the availability of direct airlift to service points. The majority of shippers and air freight forwarders prefer delivery to the final flight's origination point instead of using connecting flights from local airports.

Compatibility of Aircraft Capacity

Depending on the commodity, a shipment may be restricted to certain aircraft types, so a shipper may require wide-body lower deck or all-cargo configuration for oversized cargo, hazardous materials, or live animals. Shippers and agents also indicated a preference for backup airline services to a particular destination.

Economies of Consolidation

Many large international forwarders employ the "gateway" concept, consolidating regional air cargo shipments at a single gateway airport, thus enabling the forwarder to negotiate favorable rates with air

carriers for large shipments. In addition, the forwarder is able to optimize the utilization of unitized capacity by mixing dense and light cargo.

Total Cost and Time Efficiency

Within the range of air freight commodities, certain items such as fresh seafood, cut flowers, pharmaceuticals, emergency parts for a grounded aircraft or plant assembly line, or parts to supply a JIT (Just-In-Time) manufacturing schedule, are more time sensitive than others. Similarly, global competition in the world market may create price sensitivity for the commodity. For these reasons, shippers of commodities in these categories may place a greater emphasis on total cost and time efficiency when routing shipments via an airport.

Service Market Information

In the fast paced air cargo environment, shippers and forwarders have a need for up-to-date and accurate service information. Although a particular airport may in fact have a number of advantages or strengths such as service availability ease of access and/or superior infrastructure and facilities, the shipping community may be unaware of these factors. It is very important therefore, that shippers understand the competitive advantages of your airport.

4. SETTING OBJECTIVES

Most airports have established a general plan that sets out a strategy for the development of air services. The plan typically establishes priorities for near, intermediate, and long-term implementation. These priorities are designed to meet the needs of the traveling and shipping constituents in the region. Within the overall plan, the cargo marketing plan is a subset and serves to establish objectives and goals specific to the airport's air cargo business, ensuring participation in future growth opportunities.

An assessment of the regional market area, combined with an assessment of the airport's strengths and weaknesses should be the basis for an important question in the marketing plan design: "What is my product?" For example, the plan should provide answers to questions such as "Are we promoting an international gateway because of a heavy concentration of European, Asian, or South American air services?" "Is our airport a domestic hub with a strategic location and excellent domestic air and road feeder (RFS) connections? Or are our airport's services and facilities conducive to a trans-shipment operation such as that which typically occurs at Ted Stevens Anchorage International Airport to and from the Far East? You also need to outline those steps that are necessary to overcome weaknesses that have been raised, and determine how these factors are addressed in the plan. Keep in mind that the plan should have a clear strategic focus such as: a) addressing deficiencies over which the airport may have some influence, such as building up service to a particular region, or increasing the presence of all-cargo airlines at the airport, or b) capitalizing on a unique strength or niche such as a regional perishables market.

Keep in mind that the plan should concentrate on the deficiencies or advantages over which you have some influence.

Once these factors are determined, it is time to formulate a set of general objectives, which establish the basis for all subsequent actions, justify future expenditures, and drive the cargo marketing plan. These objectives should be aggressive but attainable, such as:

- Increasing the cargo throughput handled by the airport for a given year

- Focusing on increasing the number of air freight carriers
- Increasing the amount of perishable business handled by airport carriers (percent by year)
- Attracting additional integrator/express carriers
- Promoting the airport services to attract new manufacturing companies to the region

A more detailed discussion of potential air cargo performance measures is included in Chapter 8.

Once the objectives are formulated, the design of a cargo marketing plan sets forth specific actions necessary to achieve these goals.

5. THE CARGO MARKETING PLAN

The cargo marketing plan maps out the specific strategies for achieving the general objectives. Each strategy should seek to promote the airport's and the region's strengths. In order to achieve the objectives, a well-defined marketing plan should be targeted at decision makers in key segments of the industry. Generally speaking, the two primary targets (or customers) are:

- Air Carriers (all-cargo and passenger)
- Air Freight Forwarders

Key decision makers of air carriers must be made aware of a region's and airport's advantages as a location to do business. In many instances, the potential passenger market will be the major factor for a combination carrier in determining a service location, but the cargo market potential is becoming increasingly important.

The presence of a large and diverse base of air carriers is one of the key factors fueling air cargo activity from a particular region.

The air freight forwarder is another key player in the air freight process. The forwarder assembles shipments from a large number of shippers, to form a consolidated shipment for a specific destination. Typically, the forwarder selects the airline service, prepares the airway bill/airbill and other required shipping documents, and delivers the consolidation to the airline for transport. Also, since the incorporation of the E-AWB (electronic air way bill) there is no longer a need to print, handle or archive the paper, largely simplifying the air cargo process. In the case of international shipments, the forwarder will arrange for customs clearance at the destination, and if required delivery to the consignee. According to recent cargo studies "routing responsibility was primarily attributed to the forwarders and brokers in the cargo industry survey, with the shippers and consignees having little input."

Each of these customers (airlines and forwarders) is important to the successful cargo operation of an airport. They share a close relationship and are dependent upon one another. With the notable exception of integrated/express carriers, the majority of an airline's air cargo revenues are derived from air freight forwarders, and a forwarder's decision to establish a gateway operation depends in large part on the availability of air service at a given gateway airport.

In some instances, where actual air cargo flight operations are a longer-term goal, marketing may be focused on developing a manufacturing complex on, or proximate to the airport. With a concentration on industry that produces air eligible products, an airport and region can begin to develop part of the broader business dynamic that may eventually attract cargo operations.

The marketing plan design should also seek input and participation from partner organizations such as trucking companies, the local air cargo association, U.S. Government agencies such as Customs and Agriculture, state aviation agencies, and state and local economic development agencies. The exchange of information among these groups support expansion efforts and helps foster the region and the airport's development.

6. AWARENESS

In the initial phase, the marketing plan should seek to highlight the advantages of using the airport by raising awareness among the cargo constituents. This can be achieved through a series of programs aimed at selling the airport to air carrier and air freight forwarder decision makers at the local, regional, and head office level. These selling programs usually take the form of cooperative or informational presentations focusing on the competitive advantages of the airport's services and facilities. Keeping in mind those factors, which influence shippers' routing decisions, some airports highlight their strategic location and extensive international and domestic air service connections. Others cite the large manufacturing base within close proximity, combined with an extensive road feeder network and well-developed interstate highway system. The availability of modern well-designed and cost effective cargo facilities remains a key advantage in highlighting the airport's benefits and attracting additional air service or forwarder consolidations. Such facilities however, should be developed within the context of a strategic development plan that allows for both expansion and the integration of critical ancillary and supporting services.

7. TARGETING

As the cargo marketing plan matures, an appropriate strategy may be to target specific carriers or forwarders by providing detailed analytical information that supports the viability of the establishment of an operation in your region. By doing research such as reading a carrier's most recent annual report or Securities and Exchange Commission’s Form 10-K, the airport will be able to become more familiar with the company's operation and determine their goals and philosophy for future expansion. Armed with this information, the airport can prepare a report and present it to the airline's senior management. Regional and/or state economic development agencies are often willing to lend assistance in preparing such a report as the prospect of new business to/from the region is consistent with their mission.

The availability of modern well-designed and cost-effective cargo facilities remains a key advantage in highlighting the airport's benefits and attracting additional air service or forwarder consolidations.

8. MARKETING PROGRAMS

Initial marketing programs can take several different forms depending on the target audience. The programs can be grouped into two categories; (1) cooperative, and (2) informational. The cooperative programs are centered on a social gathering, typically a luncheon or evening cocktail hour. The informational program takes the form of a business meeting held in the office. Both programs should focus on the competitive advantages of conducting business at your airport.

9. COOPERATIVE PROMOTION PROGRAMS

9.1 Overseas Forwarders

The overseas forwarders' joint promotion program targets air freight forwarders in markets outside the home market. This program is typically organized in conjunction with selected airlines that wish to stimulate business from/between a particular region(s). The objective of the program is for the airline and airport to tell their story to the people who are most responsible for routing air cargo. The promotion may take the form of a slide presentation about the airport and airline services, followed by a luncheon. The value of this type of program is that it reaches a large group of influential current and potential customers at one time, in a friendly relaxed atmosphere. All costs associated with the program are divided equally between the airline and airport hosts.

9.2 Shippers

The shippers' program mirrors the overseas joint promotion program but with two important distinctions: it targets shippers in the U.S. market, and an air freight forwarder is the co-host of the event. The forwarder extends luncheon or evening cocktail invitations to current and potential customers and explains through a slide presentation the advantages of doing business with the forwarder via the airport. It is a prime opportunity to update current customers on services such as a new consolidation schedule, and appeal to potential shippers for a share of their business. Once again, costs are evenly divided between the co-hosts.

10. INFORMATIONAL PROGRAMS

10.1 Airline

The airline program is targeted primarily at U.S. headquarters of American and foreign flag carriers. The program's objective is to raise awareness of the airport's cargo product to senior management as a first step to promote the viability of the airport and attract additional combination or freighter service. As discussed above, this program involves a smaller audience, and may take the form of a business meeting. However, a variation of the cooperative slide presentation can be adapted to this program so that the airport's advantages are highlighted.

Programs should focus on the competitive advantages of conducting business at your airport

10.2 Freight Forwarder

Once again, a similarity exists between the airline and forwarder informational programs; the difference being that the latter is designed to encourage additional consolidation activity. A market and services presentation given to senior management at the head office should stress the airline and road feeder service (RFS) connections at the airport as well as the availability of warehouse facilities.

These programs can and should be varied to fit the particular market, marketing objective and target audience. It is helpful if a basic slide presentation is developed which can be adapted to each audience.

11. ADVERTISING AND CARGO EXPOSITIONS

Two essential elements to the overall marketing program are advertising and cargo expositions. A well-designed advertising strategy allows you to target a wider audience, raise awareness of your product, and influence the target audience. Over time, the advertising campaign will reinforce your message. Basically, advertising allows you to deliver the right message to the right people, the right number of times.

Participation in cargo expositions and conferences is an important part of the cargo marketing plan as well. Several levels of participation are available:

- Conference Attendance
- Exhibiting (display booth)
- Participation on a Speaker Panel
- Event Sponsorship (luncheon, happy hour)
- Partnerships with local Chamber of Commerce and State Organizations

With each level of participation you will get a different degree of visibility for your airport's services. Active participation in a speaker role or sponsoring a conference special event affords the highest visibility to the largest audience. However, it is important to note that not every cargo conference is focused on airports. Staff should research the intent of and typical participating business elements in a conference, before committing to attend.

12. CONCLUSION

The concept of aggressively marketing an airport's cargo services should be part of your airport’s marketing and business development plan. .. Most major airports recognize the importance of air cargo to their overall development plan and have committed financial resources and professional personnel to the task of enhancing their cargo product.

The strategies suggested here represent one approach to the cargo marketing effort. The message is to recognize the dynamic nature of air cargo and through coordination with facilities development, meet the needs of a more demanding and sophisticated air cargo customer. Capture your airport’s uniqueness to your air cargo marketing approach.

13. AIR CARGO MARKETING AND DEVELOPMENT – A PARADOX FOR THE NEW CENTURY

Aggressive development years in the 1980's was possible because financial institutions, insured by the United States taxpayer, offered real estate loans based on an appraisal of a property's future potential! When 100 percent financing was possible and tenants ready, willing, and able to pay the rents were always assumed to be in plentiful supply. Speculative building was considered by some as a rational development strategy: things have changed.

The industry operates under a different financial paradigm, the era of cost pressures and reduced credit availability. Today, the tightening of credit requirements combined with the volatile condition of the airline industry has made it difficult in many cases to secure financing and proceed with development of air cargo

facilities without a guarantee up front on the debt by either a pledge of the overall revenues of the airport itself, or by the credit of an individual airline or group of airlines; by the security of a group of tenant leases assembled under a private developer; or by the credit or equity contribution of a private developer. Speculative development is far more limited.

Potential air cargo tenants have also witnessed this changing financial landscape. They may be financially less able today to construct their own facilities and may be hesitant to commit to a lease sponsored by a private developer if there is uncertainty as to when a sufficient number of leases can be assembled and/or an equity contribution made to secure the financing and then proceed and erect the facility. This can be a challenge and the airport should seriously consider all aspects of your individual air cargo tenant's needs. Today's financial realities with the goals of an air cargo marketing program should be constantly reviewed and evaluated based upon our changing industry.

Combine today's financial realities with the goals of an air cargo marketing program and you have identified a paradox for air cargo marketing and developments.

How can an airport conduct an air cargo marketing program and yet be confident that it can deliver the necessary facilities for new tenants on a timely basis? An airport cannot ask air cargo tenants that want to expand or move onto the airport to sign a lease and sit tight for a couple of years while attempts are made to secure the financing and erect facilities. If an airport cannot deliver the necessary facilities in a timely manner, in response to the new demand evolving from its marketing efforts, those efforts will be frustrated and the potential new tenants might go elsewhere. What can be done to unravel the paradox? What strategies can an airport undertake to provide the necessary facilities required by tenants responding to an air cargo marketing program?

14. REASSESSMENT OF RISK – STEP ONE FOR A CARGO DEVELOPMENT STRATEGY

What may be required is a more refined allocation of risk and/or a pooling of risk among the different parties that develop and lease air cargo facilities in order to identify development strategies. These strategies must be more timely and responsive to market demands and yet consistent with an airport's airline operating agreement and overall commercial goals and objectives. Any reappraisal of risk among the various parties involved in air cargo development must first be viewed through the airport's master business agreement with the airlines; that itself allocates or influences the allocation of risk among the parties (i.e., the airport; the signatory airlines; and indirectly, private developers). These operating agreements are broadly classified as either residual or compensatory ratemaking methodologies but in practice many of the newer airline operating agreements may be hybrids that contain features of both methodologies.

14.1 Influence of a Residual Ratemaking Methodology

An airport under a pure residual ratemaking methodology pledges its revenues to ensure a breakeven operation with the airlines. Airports under this ratemaking structure theoretically have the signatory airlines carrying the risk to make up the residual or remaining amount necessary to service the debt and operate and maintain the airport, after the pledge of the airport's revenues (i.e., concession revenues). This risk may be considered more illusory today under deregulation as the strength of an airport's origin and destination market may have more of an influence on the airport's financial security than the individual airlines that use it. Given the pledge of its revenues, airports under this ratemaking methodology are generally not blessed with large amounts of discretionary revenues to pursue air cargo development goals.

Moreover, an airport interested in pursuing the development of air cargo facilities with general airport revenue bonds will first be required to gain majority-in-interest approval from the signatory carriers. This can prove to be difficult as the signatory carriers may have their own list of priority development projects that may not include air cargo.

Airports with residual ratemaking agreements are generally not blessed with large amounts of discretionary revenue to pursue air cargo development goals.

If approval is granted, it will typically be contingent on having long-term leases in place to guarantee the debt. The signatory carriers will not care to be the backstop in ultimately securing the debt on facilities, which many of them may not use. Individual airlines, on the other hand, are less likely today to add to the existing debt on their balance sheets by guaranteeing the financing for their own exclusive-use air cargo facilities. It is far more attractive for them to commit only to a lease of the space they require and have another party guarantee the debt for an entire facility.

Finally, given the limitations placed on airports by a residual ratemaking structure and the current debt and profitability constraints placed on individual airlines, airports often do look to a new form of business relationship with third-party or joint venture partners to pool risk in order to be more responsive to an air cargo marketing program.

14.2 Influence of a Compensatory Ratemaking Methodology

The pure compensatory ratemaking structure will have rates and charges set to fully recover costs, with any excess revenues or deficiencies accruing to the airport account. An airport operating under a compensatory ratemaking structure has assumed a large share of the risk for the airport and therefore has the opportunity for the reward of discretionary revenues that may then be invested in or used to pursue airport air cargo development goals. It is the presence of these discretionary revenues that may give an airport the added flexibility it needs to be responsive to an air cargo marketing effort. While a residual or blended residual ratemaking structure may have a negotiated discretionary revenue set aside for the airport, the more the agreement is compensatory in nature the greater the propensity to generate discretionary revenues that are limited only by the financial performance of the airport rather than a predetermined negotiated amount.

It is the presence of discretionary revenues that may give an airport the added flexibility to be responsive to an air cargo marketing effort.

A limitation with this ratemaking methodology is that the airport now carries a large measure of the financial risk for the airport. It must balance decisions regarding debt for air cargo facilities with the overall impact on the debt structure for the entire airport. Moreover, there may be competitive demands placed on these discretionary revenues that can place air cargo development in a subordinate position to other unmet development needs (e.g., terminal, airfield, roadways, etc.). Individual airlines, as discussed above are less likely to guarantee the debt to build entire facilities for their own exclusive use. They will look to others to back the debt for facilities in which they lease space.

Finally, third-party or joint venture partners may present more flexibility under this ratemaking methodology if there is a pooling of funding among the parties, with the airport's share coming from its discretionary revenues.

15. AIR CARGO DEVELOPMENT STRATEGIES

What follows are three air cargo development strategies that may help an airport to be more responsive to facility needs identified through an air cargo marketing program.

15.1 Airport Discretionary Revenue Development Strategy

This development strategy would have the airport develop air cargo facilities based on the availability of its discretionary revenues. Here the airport has assumed the risk for air cargo development and has the opportunity for the reward of discretionary revenues that may help it to further pursue its air cargo development goals. This strategy is far more feasible under a compensatory rather than a residual structure.

The strategy first divides the development of a facility into two phases with the first phase being the facility infrastructure design and construction and the second and later phase being the design and construction of the air cargo warehouse facility and (as appropriate) aircraft parking apron. The purpose is to make a limited infrastructure investment up front and in advance of the construction of the air cargo warehouse and aircraft apron in order to limit risk and shorten the development time for the completion of the facility once prospective tenants have been identified through the marketing program. This development phasing may be further shortened if the airport retains a design-build contractor to complete both phases rather than complete the project under its own public bidding process.

Both phases in most cases cannot be developed simultaneously. One must precede the other and both together may require approximately 12 or more months to complete. Limiting risk by timing the development of the infrastructure phase early enables the second phase to be completed in about six months, especially with a design-build contractor, to better match the needs of prospective tenants responding to a marketing program. In other words by accepting a small measure of risk (in a reasonable market) the airport can position itself to respond to tenant facility-needs within six months instead of 12 or more: (i.e., an early investment of 1/6 of the facility cost can save l/2 the development time once tenants are identified).

A limited early investment in facility infrastructure can position an airport to respond on a timelier basis to respond to a marketing program.

Once the first phase infrastructure has been completed and an airport marketing program has identified one or more tenants ready, willing, and able to commit to a lease, the second phase of this strategy attempts to leverage the discretionary revenues to provide as much air cargo space as possible under defined levels of risk. The approach here is to satisfy both the needs of the first tenants going into the facility and to provide and continue to make available a residual amount of vacant space to meet the needs of subsequent new tenants.

Under an acceptable level of risk, an airport can have a residual amount of vacant space available to respond to a marketing program.

15.2 Other Risk Considerations

The guarantee of the debt for an air cargo facility may extend over a number of years and should therefore be evaluated from both a micro and macro perspective.

First, in a micro-sense, it would be ideal to have leases from tenants that fully match the term of the debt on an air cargo facility. Such an outcome would enhance the security of an airport's discretionary revenues in future years, as the initial leases would service the debt until its retirement. However, in today's less than

ideal world, airlines and air cargo tenants may seek shorter-term leases (e.g., 10 years or less). Leases of 15 or more years are considered capital leases and as such are carried as a liability on a company's balance sheet. Leases of 10 years or less are considered operating leases and are not shown on the balance sheet. Given the debt on most airline balance sheets, it is considered a significant advantage to carry operating leases instead of capital leases. Therefore, the airport employing this strategy will need to assess the risks to its discretionary revenues for it will eventually be faced with the re-leasing of space in an older and perhaps dated air cargo facility.

In a macro-sense, an airport will need to evaluate its strategy in relation to its ability to influence the future competitive direction and inventory of air cargo facilities on the airport.

The airport, with its discretionary revenues at risk, must now view itself as a competitor with other air cargo facility operators leasing space both on and off-airport.

The airport must carefully evaluate what rights it grants for the development of competitive air cargo facilities and the conditions it places on approving tenant leases and subleases in competitive facilities. It will need to maintain a market based rental structure in its facilities instead of a cost recovery structure in order to safeguard and expand its discretionary revenue base. It must control the access of air cargo movements to the airfield to ensure that the tenants of off-airport competitors are not able to by-pass the on-airport facilities and subsequently weaken the on-airport rental base and place the airport's discretionary revenues at risk. Often the off-airport competitor can offer air cargo space at a rental rate less than the prevailing on-airport rental structure because of a variety of reasons including: (1) the off-airport competitor may have title to property (land and improvements) that can be pledged to the financing of subsequent improvements resulting in a lower rental structure, and (2) the off-airport competitor often receives the infrastructure investment for the property (i.e., roads, utilities, etc.) at a lesser cost than what occurs on the airport. The point here is that the on-airport tenant pays a premium for direct airfield access and this should not be diminished by also granting this right to tenants of off-airport competitors.

For financial reasons, all air cargo should pass through the on-airport air cargo facilities under a handling agreement if necessary, but for security purposes should not be permitted to by-pass the on- airport facilities and gain direct ramp access. Finally, the airport will need a business plan that considers the future market for air cargo; the land available to develop and the ability to finance additional facilities; and the competitive condition of the existing inventory of air cargo facilities, including the average age of facilities, vacancy rates, prevailing rental and expense rates, feasibility of remodeling existing facilities, and a profile of existing tenants and the remaining term for tenant leases in all facilities.

One significant event that could place the feasibility of this strategy in doubt is the Department of Transportation (DOT) Airports Rules and Charges Policy. The effect of the Policy is to dilute an airport's discretionary revenues from its air cargo facilities by forcing those revenues into covering airfield costs or by requiring a change from a market to a cost recovery based rental structure in airport owned air cargo facilities. Chapter 5, Financial and Management Strategies, provides more information concerning the possible impacts of this Policy.

Air cargo security guidelines have also dramatically impacted physical planning considerations. The extent of those impacts varies largely on the levels of inspection and screening of cargo that is required, and on the physical improvements (if any) necessary to provide screening capacity and to secure the perimeters of air cargo facilities both on and off the airport property.

16. THIRD-PARTY DEVELOPMENT STRATEGY

This development strategy would have the airport become more of a risk partner with a private developer. It differs from the first strategy in that instead of undertaking the development itself, the airport reduces its risk and relinquishes some of the possible financial rewards by employing a private developer.

Here the airport and the developer become partners in a long-term venture.

Air cargo developers are typically granted a lease of airport land with the right to construct, finance, operate air cargo facilities, and offer space for lease to tenants. The airport in most cases has no financial exposure with this type of venture. It derives land rental and/or percentage rental payments from the developer over the term of the lease and receives title and control to the developer's property improvements at the expiration of the land lease. The developer arranges the financing; contracts for the design and construction of facilities; maintains and operates facilities and improvements; negotiates, prepares, and administers tenant facility leases and conducts overall property management functions; and must make its' return on investment within the term of the airport land lease.

Many airports solicit for a private developer as the need for facilities arises. An airport may have a varied mix of air cargo properties (e.g., properties developed and operated by the airport or a carrier, properties developed and operated by private developers, and still others originally developed by private developers but now operated by the airport following the expiration of the developer's lease).

Typically, the rights granted to a developer are non-exclusive in that a single developer has not been granted exclusive control over all air cargo development on the airport. The developer will seek to assemble a sufficient number of leases from tenants, perhaps in combination with a pledge of its own credit or equity, to gain the financing for the facility. This returns us to the paradox of marketing for air cargo tenants and yet being possibly frustrated with the inability to gain financing to erect facilities. What are some possible approaches to modify the airport/developer risk balance to enable financing to be arranged and facilities erected in a timelier manner? Some candidate approaches are as follows:

16.1 Approaches to Modify the Airport/Developer Risk Balance

Developer Loan Approach

The airport may make the first phase infrastructure investment from its discretionary revenues in the form of a loan to the developer if those revenues can be made available for this purpose. The effect of this approach is to lower the developer's debt service requirement and therefore the amount of the building space that must be under lease to secure the financing.

Subordination of the Fee

The airport and developer could both subordinate their fee interest in the venture to the financing. Essentially, the debt is serviced first and the airport and developer proceed with development of the facility once sufficient leases are assembled to secure the financing, perhaps in combination with the infrastructure loan approach above and an equity contribution by the developer. Both the airport and the developer will not collect their fees until additional leases are signed to provide the sufficient revenues. Again, the effect is to proceed with the facility once the debt is secured and in advance of the amounts due the airport and developer.

Extended Term Lease

The airport can grant the developer a longer-term lease coupled with the developer's ability to obtain private sector financing that can be internally amortized over the longer lease term. The effect again is to lower the annual debt service requirement that enables the developer to secure the financing with a correspondingly lesser amount of space initially under lease. As this approach delays the transfer of the developer's property improvements to the airport, some change to the financial terms of the lease will need to occur to reflect the longer lease term granted the developer. While airports tend to resist the longer-term lease provided by the developer, a substantial side benefit of a longer amortization period is the possibility of lower rents for tenants.

Debt Guarantee

The airport can guarantee a portion of the debt from its discretionary revenues. As an example, assume the developer has made an equity pledge to the venture and has secured some leases but still requires a $200,000 per year guarantee in order to secure the financing. The airport can make this pledge until sufficient additional leases are secured to cover this guarantee. The actual amount paid out by the airport under the guarantee would be considered a loan as above. Again, the effect is to enable the facility to be developed with a lesser amount of space initially under lease and to have the remaining un-leased space available to support the airport's marketing program.

Pledge of Credit or Equity

The airport can assemble any combination of the above approaches but must always have an understanding of its overall risk exposure. It is highly recommended that the airport first receive a pledge of credit or equity from the developer before it employs any of the above approaches to help the developer secure its financing.

One approach is to have a pledge of equity or credit be part of the evaluation criteria the airport uses to select its developer.

In other words, in addition to the customary evaluation criterion such as experience of the developer, proposed facility design, and financial terms, an additional criterion could be included that has proponents make a pledge of credit or equity to help guarantee the financing.

Finally, regarding any of the loan approaches discussed above, the airport may wish to secure that loan by ultimately being able to reduce the term of the developer's lease in proportion to the loan amount outstanding to the developer's amortized investment. As an example, assume the developer will not repay $500,000 of an airport loan. The loan will be carried at 7 percent over 25 years resulting in approximately $1.0 million due the airport at the end of the 25-year lease term. The proportion of the $1.0 million loan amount outstanding to the total amortized air cargo facility investment of $16.6 million is approximately 6 percent.

Applying this percentage to the 25-year lease term reduces it by 1.5 years. In other words, the developer's lease would expire in 23 and one-half years instead of 25 years and the airport would gain the additional air cargo facility revenues by taking control of the facility earlier. Finally, the airport should also require that any refinancing by the developer or assignment of the developer's lease first be conditioned on the immediate and full repayment of any outstanding loan due the airport. A loan should not convey to any successor of the developer.

17. JOINT VENTURE DEVELOPMENT STRATEGY

This is perhaps the newest approach in an airport/private developer collaborative venture. It differs from the private developer strategy discussed above by its potentially much larger scale and diversity. It is the antithesis of the airport discretionary revenue strategy discussed first. While the first strategy has the airport developing and operating its own air cargo facilities, this strategy can go as far as contracting out or privatizing the entire air cargo function. This strategy is better suited for airports under residual ratemaking structures or that have requirements of such scale and complexity that the airport is unable to marshal the necessary resources to accomplish it by any other means.

Joint ventures are better suited for airports under residual ratemaking structures or that have requirements of such scale or complexity that the development cannot be accomplished by any other means.

In private industry, a pure joint venture is a form of partnership in which two or more organizations agree to pool designated assets to form an independent third organization to pursue a specific limited goal or development. This new organization typically has a corporate structure; staffing; assets; operating rules and procedures; and of most importance, ready access to private capital for investment. The joint venture parties agree to share in the "cash flow" of the venture based on the value of assets committed.

Public institutions (i.e., airports) by their very public purpose and structure are limited in their ability to freely engage in this type of unrestricted entrepreneurial activity. There are however some examples of public institutions engaging in a public/private version of a joint venture.

The Washington Metropolitan Area Transit Authority (WMATA) practices a joint development strategy with the development of commercial and residential properties in the vicinity of its stations. Here it is important to have a balanced and diverse scale of development mostly completed and operating when the stations open for public use. WMATA grants long-term leases, up to 99 years, for a wide variety of commercial development. As with the joint venture, both parties contribute assets and receive "cash flow" from the venture. WMATA does not view itself as an eventual operator of these properties and is willing to therefore grant significant long-term rights to develop its property in return for the receipt of a continuous stream of revenues from its venture partners. The venture partner is given rather liberal development rights as compared to what can be done today at an airport. However, within certain bounds this approach may have appeal, especially for large-scale developments at airports that are unable or unwilling to commit airport resources to the project. Here the ready access to private capital overcomes the timing problem of having facilities ready for tenants. The real question is what will be the overall price for engaging this strategy. An airport will need to carefully consider what rights it must relinquish and what guarantees it must make for this strategy to work for both parties.

18. CONCLUSION

The air cargo industry has matured from a disaggregated aviation support activity into a more integrated and sophisticated logistics operation with a clear customer service focus. As long as the dynamic growth in global markets continues, airports will need to understand the changes that have taken place, and will take place, in this industry and focus their resources to take advantage of the future growth that is at each of their door steps. Marketing programs will not lead to many successes if conducted in isolation. Efforts to develop air cargo facilities without a marketing focus may lack direction and miss opportunities or result in the development of facilities that do not meet the air cargo customer's needs. Both programs need a single

focus to provide the best possibility for success. If an airport has identified the need to pursue air cargo growth goals, it will need to pursue its customers, understand their needs, provide a vision of what opportunities are available to them, and develop the facilities that satisfy those customer needs. Finally, the marketing and facility development strategies discussed above represent a snapshot of a moving target. These strategies will continue to evolve to match the dynamic changes that will occur in this industry in the coming years.

CHAPTER 3

DEMAND FORECASTING TECHNIQUES

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1. INTRODUCTION TO FORECASTING

Cargo forecasts are important to airports for many reasons including master planning and budgeting. Airports that accurately forecast their future traffic will better anticipate the needs of their customers, and thus will be in a better position to develop to their full potential. This chapter provides insight into how to best plan for increased cargo activity.

The forecast prepared for a master plan or similar study should represent market-driven demand for air cargo service. To the extent possible demand forecasts should be unconstrained and as such not take facility constraints or other outside limiting factors into consideration. In other words, for purposes of estimating future demand, forecasts should assume facilities can be provided to meet demand. After determining what facilities are needed to accommodate the forecast aviation activity, alternatives can be identified and evaluated in order to provide any physical improvements.

Forecasts provide critical input to airport management and planning. Cargo forecasting is not just a theoretical exercise. It must consider underlying market forces based on market assessments and economic theory, as well as an airport's physical capabilities and constraints. Every airport is unique and while every cargo operation has some common elements, the translation from best practices to planning metrics will require a careful review of current and past activities.

It is important to remember that air cargo is a high-volume, low margin business that is driven by time, service, and cost control. The physical planning extends beyond the parameters of the on-airport buildings to a wide range of business and regulatory interests both on- and off-airport.

Forecasting is an inherently uncertain activity simply because past experience can be only a hint about future performance. Thus, even the most sophisticated forecasters find that the actual results are often higher or lower than their predictions. The purpose of this guide is to describe techniques for forecasting air cargo activity for individual airports that can help define and minimize the range of uncertainty, or "forecast error."

The best source of *customized* inputs to a forecast derives from a detailed market assessment. Carriers, their business partners, and all of the supporting entities in the air cargo community (including federal agencies) can provide meaningful input to ensure that the forecast is anchored in reality and adds clarity to the planning requirements.

Reliable forecasts provide critical input to airport management and planning. Although forecasting is a challenging task, the production of more dependable traffic forecasts can be guided by a set of principles that have been judged to be effective. These principles of forecasting are:

- It is essential to understand the issues and events driving the forecasts and to communicate with users regarding the nature of the forecasts and their application
- Sound judgment is always an integral part of the forecasting process; however, impartiality should be maintained through the process
- Use the most reliable and current data – A correct and solid traffic base is essential. If not available, different data sources should be consulted to establish the best possible estimates
- Use the most appropriate forecasting methodology and technique. Different traffic component forecasts require different forecasting technique(s) due to data availability and completeness as well as the forecast requirements such as the level of details

- Consistent assumptions should be applied through the forecasting process, both for input variables and forecast adjustments, to ensure internal and external consistency
- Uncertainties surrounding the forecasts should be identified and dealt with, not ignored

Forecasting is as much about common sense as it is about math. You cannot forecast effectively without using your judgment. Even the simplest trend analysis --that is, traffic grew by 5% last year, so the forecast calls for 5% growth this year --entails a judgment about whether it is reasonable to assume that past performance will be repeated. At the other extreme, complex econometric models, with dozens of independent variables, basically extrapolate observed historical relationships into the future. The problem is, and always will be, that the world keeps changing, often faster than the historical numbers can keep up. Therefore it falls to the forecaster to make educated guesses about the future development of key factors, -such as economic growth, currency rates and fuel prices, which influence air cargo traffic growth.

The forecaster should also consider the use of the Planning Activity Level (PAL) concept. This approach reflects that the need for any necessary improvements will not be driven by a set point in time but rather by the arrival of future demand levels. Therefore, while a master plan forecast might tie forecast demand levels to specific years for the purpose of providing context, forecasts are rarely able to predict exactly when activity levels will be reached. Rather, forecasts are most useful in predicting future trends. The actual realization of predicted activity levels will likely differ from the forecast in terms of what year that activity occurs. The PALs represent activity based milestones that can be used to make future expansion and development decisions, focusing on specific volumes of activity that trigger the expansion requirement, rather than the timing identified in the forecast. The FAA's guidance on master plans supports the concept of PALs, stating "…planners should identify what demand levels will trigger the need for expansion or improvement of a specific facility. In this way, the sponsor can monitor the growth trends and expand the airport as demand warrants".[1]

Typically, at least two forecast scenarios are developed to provide a range of potential future activity levels. The baseline forecast represents a continuation of the airport's current role in the region and in the national transportation system. The baseline forecast represents the most likely scenario and will be used for future planning. An alternative scenario(s) can be used as a sensitivity analysis to assess the ability of the airport to respond to optimistic demand factors that depart from the baseline forecast.

The following sections will provide an understanding and familiarity about the need for air cargo forecasting, the elements that are incorporated, data sources, and forecasting techniques and models. Periodic updates of the forecast ensure that the planning recommendations remain consistent with the characteristics of the actual activity and reasonable expectations of future activity levels.

2. IMPORTANCE OF AIR CARGO FORECASTING

While it is sometimes difficult to predict an exact activity level for a specific time in the future, properly preparing a forecast is a necessity in today's business environment. Traffic forecasts are important in understanding an airport's demand growth, assessing market risk, and predicting financial gains/losses to develop management strategy. Often, forecasting is mandated in master plans to secure funding for future capital improvement projects, particularly under federal grants and bond issuances. Airports that accurately

[1] FAA Advisory Circular 150/5070-6B, *Airport Master Plans*, page 48

forecast their future traffic will better anticipate the needs of their customers, and thus will be in a better position to develop to their full potential.

2.1 Market Demand

The air cargo industry has experienced many changes since the turn of the century. The general U.S. economic downturn that began in 2000 adversely affected U.S. air cargo activity. After the terrorist attacks of September 11, 2001, cargo activity in the U.S. was immediately impacted. Critical impacts included an increased use of trucks, an escalation of insurance costs, consolidation among smaller firms, failure of many small cargo airlines and smaller support firms, higher security costs, longer processing time because of security, and increased available freighter capacity which drove down rates. The cargo industry recovered by 2003 and posted strong growth for several years.

Growth in U.S. air cargo activity began to slow down in 2006 as the price of oil surged to record high levels (ultimately peaking above $140 per barrel in July 2008), causing shipping by other modes to become more attractive. While oil prices declined significantly in the fourth quarter of 2008, economic activity deteriorated in late 2008 and the resulting global recession that followed limited the positive impact of the lower oil prices.

While China remains as the cargo demand giant for many other countries, emerging trade patterns in recent decades (i.e., the Middle East and Latin America) present new opportunities. Although airports will continue to market for further expansion in Asia, a forecast should also consider and highlight the opportunities in emerging markets that are available to them.

Evolving carrier route structures and increased passenger aircraft capacity also add to the demand dynamics. A number of carriers have shifted from dedicated freighters to passenger aircraft. Freight forwarders have also taken advantage of this shift as they capitalize on underutilized belly capacity. The diversion of international passenger routes to various secondary airports and improved ground infrastructures will continue to pull cargo volume away from mature gateways.

Despite the introduction of new international routes from various airports, not all airports will receive air cargo in high volumes. Domestically, the two major integrators (FedEx and UPS) will continue to drive cargo routing patterns. While some airports have benefitted as regional hubs in the integrators' networks in the past, other airports will continue to serve local metropolitan areas, often as drop centers, connecting to air services at other airports.

In stimulating local air cargo activity, airports geographically positioned for freight have developed trucking drop centers located near major highways to efficiently pull air traffic away from gateway airports. Marketing these routings as cheaper alternatives for shipping freight, airports have provided drop centers near major gateways for freight to be transported to the alternative airport at no additional cost to freight forwarders. While these drop center facilities continue to expand at alternative airports, volume that has been diverted remains limited.

While airports continue to develop, redevelop, and expand to adapt to anticipated air cargo growth, the forecaster must understand the revolving changes and trends in the industry to accurately assess potential capacity and infrastructure needs.

2.2 Facility and Infrastructure Demand

The global economic slowdown resulted in cargo volume dropping at most airports, making facilities demand forecasting much more difficult. Adding to the complexities are modal shifts, airport accessibility,

regulatory and security compliance issues, fuel pricing, environmental issues, changing aircraft configurations, and shifts in supply chain business strategies.

Air cargo growth patterns often combine one or more countervailing trends. For example, international freighter services have continued to concentrate at the major U.S. gateways for efficiency and cost purposes. At the same time, shifts in business and supply chain locations have created a need for new facilities at secondary gateways. A forecast plays a fundamental part in emphasizing demand growth; it also needs to align demand with the infrastructure and facility requirements. Within these requirements are desires for newly built air cargo facilities, easier airport access, warehousing sorting and storage space, smoother customs policies, secure airside access, and shorter taxi-time.

While some airports continue to market vacant facilities to new cargo tenants, other airports have converted such excess facilities to alternative uses. In some cases, logistics providers have taken leases on such vacancies and converted them to office and trucking distribution facilities.

As costs continue to dictate business directions, many forwarders have decided to relocate their distribution facilities to off-airport locations. Developers can own off-airport property rather than leasing from the airport, thus allowing for long-term financing and residual property value. Additionally, off-airport property construction costs are often cheaper and the facilities more quickly developed. The less strict security requirements of off-airport property also provide another key benefit to off-airport real estate. Under the Transportation Security Administration's (TSA) Certified Cargo Screening Program (CCSP), the 100 percent screening requirement can be met by allowing off-airport facilities to certify and screen cargo.

The elements of doing business are constantly changing and business decisions will evolve to achieve optimal financial efficiency and influence facility development. It is key that forecasts reflect industry changes and allow airports to adjust facility development, modernization, and lease agreements to demand, and thereby become successful. It will enable management to change operations at the appropriate time to attain the greatest benefits and prevent losses.

3. ELEMENTS OF AIR CARGO FORECASTING

Future levels of air cargo traffic and related activity for a particular airport (or system of airports) will be affected by various demand and supply elements as they apply for a specified forecast period. An air cargo forecast requires some understanding of how these factors determined activity levels in the past and how changes in those factors may affect the future. Trend forecasts implicitly assume that past trends in demand and supply elements will continue into the future, while econometric forecasting attempts to explicitly measure the influence of specific factors. In either case, it is important that a forecaster be cognizant of how demand and supply characteristics produce an aggregate level of cargo and aircraft traffic.

Air cargo markets combine cargo flow demand with the available air cargo service supply sector to create airport activity levels. In simple terms, cargo flow demand for a particular airport is an aggregation of all the various shipments that transit that airport, each with a unique timing, origin and destination points, commodity type, packaging, shipment size and service requirements (e.g., desired transit time or perishability). Air cargo services (supply) encompass the available routing options for those shipments and typically should include that of competing airports and modes of transportation. Air cargo services include airport-to-airport transportation as well as supporting ground services (e.g., trucking, handling and storage), and can be compared in terms of cost, transit time and level of service. The air cargo supply sector also includes on- and off-airport facilities and infrastructure (e.g., runways and access roads).

This section will describe the key elements that can be used to describe and measure cargo demand, service supply, and the resulting airport cargo activity.

3.1 Air Cargo Demand

The demand for air cargo services is driven by the highly diverse needs of shippers and consignees including the overnight delivery of a document, time-sensitive items such as the transport of donor organs to hospitals, or the managed distribution of components and products for multi-national high tech manufacturers. Some key characteristics that can be used to describe air cargo demand are:

Origin/Destination

Most air shipments do not originate or terminate at an airport, so industrial and demographic location patterns drive flow patterns. The origin and destination of a shipment determine the range and cost of routing and service options that may be available.

Commodity

Commodity type affects both the desirability of, and requirements for, air services. Key characteristics include perishability (time or physical), value, weight, and physical dimensions. There are thousands of distinct commodities that move in air trade markets, each with distinct shipment characteristics.

Desired Level of Service

The optimal level of air cargo service typically involves a trade-off between the cost and the quality of service as determined by transit time, reliability and security (including maintaining perishable goods), often compared to the same characteristics for available surface options.

Shipment size

For the most part, air shipments are small and typically must be consolidated into pallets or containers for handling to and from the aircraft. Larger sized shipments may require special handling or aircraft types, but are also more susceptible to diversion to another mode of transport.

Cargo demand for an airport is primarily determined by the location and volume of air commodity production, consumption and/or distribution[2] within that airport's catchment area (or market hinterland). The demand for any particular airport is also affected by the location and competitiveness of alternative airports or modes of transport. The domestic and international catchment areas for an airport differ as follows:

U.S. Domestic

The integrated carriers (FedEx and UPS) dominate the handling of domestic air cargo shipments and therefore the domestic catchment area is determined by the ability to meet next-day morning delivery schedules for those carriers. The size and scope for any particular airport's catchment area is primarily based on the location of alternative airports and relative drive times to the primary pickup/delivery areas.

International

[2] Some outbound items may be produced outside of an airport's catchment area and trucked to a distribution center where the air shipment would originate with a similar pattern for inbound commodities.

U.S. international air trade is dominated by a few large gateway airports that draw cargo from large regional markets via both truck and air connecting services. Primary gateways also attract cargo based on their proximately to particular world regions. For example, Los Angeles (LAX) will attract cargo bound for Asia from the U.S. East Coast, and New York Kennedy (JFK) will similarly handle Europe-bound traffic from the West Coast. There are advantages of direct service to smaller gateway airports, particularly for traffic from a more constrained primary area as defined by same day pickup/delivery time by truck (typically 50 to 100 miles from the airport, depending on the location of other gateway airports).

Within an airport's catchment area, the key demand factors that would affect cargo forecasts are general economic trends as well as specific regional demographic and industrial trends including:

Regional Demographics

The demand for inbound air shipments is affected by population and income levels (as is outbound demand for shipments generated by individuals).

Regional Employment and Production

Demand for outbound air services is determined by air commodity production volumes within a region, which also affects inbound demand to the extent that machinery, parts and components are shipped in by air in support of that production.

Regional Industrial Location Patterns

Industries make location and expansion decisions based on a variety of cost and efficiency factors. Accordingly, future growth in particular air cargo movements depends on non-transport factors that drive those decisions.

Shifts in Commodity Demand

Economic, industrial and demographic factors affecting the destination markets that trade with a particular regional market will also affect future air cargo growth.

Shifts in Distribution Practices and Patterns

The importance of logistics in both manufacturing and final product distribution drives intermediate demand for air and other cargo transportation. The development of regional distribution centers serving large geographical areas has created new air cargo for some airports based not on local demand, but on the efficiency of transferring cargo to satisfy other regions' demands.

The impact of demand on air cargo forecasts for an airport can typically be measured using general economic forecasts in concert with some consideration of trends in commodity and origin/destination mix. But it is also important to consider some of the other factors, especially for markets that are highly dependent on a single industry that may relocate, a commodity that may lose popularity or suffer environmental problems, or a foreign economy that may experience extreme variations.

3.2 Air Cargo Services and Other Supply Factors

Air cargo service providers include airlines, airports and support service firms. Airlines provide the air transport segment of air shipments, but may also provide ground handling or pickup/delivery services. Air carriers are primarily categorized as either (1) direct airport-to-airport carriers that mostly concentrate on air transport (including both passenger and freighter aircraft operators), or (2) integrated all-cargo carriers

who maintain single entity responsibility for shipments on a door-to-door basis (and therefore supply most of the ground support services). Airports facilitate the transfer and handling of air cargo by providing infrastructure, facilities and support services. Other firms provide services to the airline or the shipper/consignee including:

- Freight forwarders act as agents for the shipper or consignee in managing, providing or securing air, ground, and other handling services;

- Customs brokers are primarily responsible for marshaling inbound international shipments through local customs and inspection requirements and may also handle ground services at the destination airport;

- Trucking firms assist in the transportation between the airport and origin/destination points when not directly provided by the airline or forwarder; and

- Specialized service firms including warehousing, airport ground handlers, and third-party logistics (3PL) or distribution firms.

Some of the service factors that will influence cargo forecasting include:

- Unlike other modes, air cargo flight capacity is significantly affected by passenger demand and service patterns, particularly for international markets. Future shifts and growth in passenger services will drive cargo routing patterns.

- The emergence of the U.S. integrated carriers has resulted in a significant decline in the need for general all-cargo and passenger capacity in the U.S. domestic market, and has also affected the express segment of international cargo markets. Future changes in how integrated carriers structure and operate their networks will greatly affect routing patterns, particularly for their hub and gateway airports.

- General all-cargo freighter service typically provides flight capacity on routes where passenger flights cannot satisfy demand either in terms of capacity or capabilities (e.g., oversized shipments). While limited in the U.S. domestic market, non-integrated freighters continue to have a strong role in the international market, and shifts in the use and routing of freighters greatly affects traffic levels particularly for smaller secondary gateways. Freighter capacity may also be the first to be reduced in a downturn, adversely affecting certain airports.

- The pattern of air cargo routings is affected by the range and payload characteristics of both passenger and freighter aircraft and future fleet trends should be considered in forecasts.

- Another aircraft-related factor is the level of future fuel prices that will not only affect operating costs, but will drive many fleet decisions. Fuel price increases disproportionately affect air relative to other modes often leading to increased rates and mode shifts.

- Increased post-9/11 security has affected the air cargo market significantly based on the reduced ability to handle cargo on passenger flights, and time/cost impacts from increased screening and security review. This is particularly true in the U.S. domestic market where trucking services have significantly less restrictions.

- Air cargo routing patterns are not driven entirely by cost and time factors as experienced by the shipper, but also depend on internal efficiency strategies for the airline and forwarder industries. The concentration of international air cargo at a limited number of U.S. gateways is partially caused by airlines wanting to use common airports for their passenger and freighter flights or by efficiencies related to airline partnerships. Forwarders also have a major influence on routing decisions as their gateway systems concentrate international traffic at a limited number of airports based on internal efficiency and profitability.

- International regulation may also affect cargo service and routing patterns as a limited number of U.S. markets are still controlled by bilateral agreements that limit carrier entry and routes. The availability of federal agencies for clearance may also impact decisions on the routing of international freight.

- On the environmental side, the key issues are noise and emissions. Future noise and emissions restrictions could affect the ability to use certain airports or the cost of operating all-cargo fleets, many of which are heavily populated with the older aircraft targeted by the regulations.

In terms of cargo forecasting, the most important supply consideration is whether existing patterns and trends can be expected to continue, or whether some of the key supply factors should be incorporated into the forecast process.

3.3 Airport Traffic and Other Activity

The airport traffic and activity levels that are measured and forecast are based on the interaction between air cargo demand and supply patterns, the details of which are not easily discerned from airport-level statistics. Traffic patterns reflect the underlying demand for shipping between various geographic regions, the type of commodities involved, and the way individual providers tailor their services to meet demand.

In terms of forecasting, the key activity measures include:

- Shipment weight and value
- Number and capacity of aircraft operations by category (passenger, all-cargo, integrator), type (passenger, freighter) or aircraft size category.
- On- and off-airport truck activity
- On- and off-airport facility/infrastructure utilization.

For short-term forecasts or those for relatively stable markets, it may be possible to forecast one of those statistics (e.g., traffic tons) and apply ratios for any others that are required. However, such simple assumptions may obscure fundamental shifts in the demand and supply sectors and lead to inaccurate or unreasonable forecasts.

4. AIR CARGO DATA SOURCES

This section discusses the various sources of data that can be useful in forecasting cargo demand.

4.1 General Sources for Traffic and Activity

Data sources include:

- Individual airport statistics

- Airline industry sources (Airports Council International (ACI), International Air Transport Association (IATA) and Airlines for America (A4A; formerly known as Air Transport Association of America))
- U.S. Department of Transportation (DOT) aviation statistics (Form 41/T-100)
- Flight schedule data (Official Airline Guide (OAG) and other)

The level of detail available from airports varies but typically includes carrier-level totals for enplaned and deplaned tonnage and the number of flights on a monthly basis. Airports collect this information directly from the airlines so there may be additional information available internally.

ACI collects domestic and international traffic statistics (freight and mail) from member airports that are roughly equivalent to statistics produced by individual airports. The ACI data does not include any details on commodity, airline or routing. IATA also collects international freight statistics from its member airlines that is available in aggregate form by region and airline. Detailed international data collected through the IATA billing system (CASS) is available to submitting airlines and forwarders only.

The U.S. DOT T-100 statistics provide airport-to-airport traffic statistics by airline, service type (cargo/passenger and scheduled/non-scheduled) and aircraft type (all-cargo, passenger, and combi) on a monthly basis. The data covers both U.S. and foreign carriers and includes flights, capacity, and freight and mail weight by direction. The data is available in two primary sets. The segment data covers all onboard traffic moving on non-stop flights between two airports and includes details on service and aircraft type (including capacity and flights). The market data covers all on-flight traffic between two airports based on the airports where the cargo is enplaned and deplaned[3]. The release of international data occurs approximately six months after the measured time period (with domestic data released after three months).

Current and historical scheduled flight data can be used to profile cargo and passenger flight schedules by carrier, aircraft type/capacity, and origin/destination market, but often does not include the integrated carriers and may exclude some international cargo flights as well.

4.2 International Cargo Flow Sources

The primary source of U.S. international air trade data is the U.S. Bureau of the Census commodity series that provides weight and value for air imports and exports (based on mode to/from the point of entry/exit) by commodity (10-digit harmonized schedule with concordances to other codes), foreign country of origin/destination, and U.S. Customs District of entry or unlading (for imports) or Customs District of exit (for exports). In recent years, port-level detail (for unlading or exit) has been made available, although there is some suppression to protect the identity of integrated carriers.

Export data with additional origin detail is available in the U.S. Bureau of the Census state of export series in two primary formats:

- Commodity: State of origin by destination country by commodity (6-digit Harmonized Schedule (HS) or 3-digit North American Industry Classification System (NAICS) code)

- Port of Exit: State of origin by destination country by airport of exit

[3] This distinction only affects traffic that moves on a multi-stop flight. For traffic on a flight from A to C that stops at B, the segment data would show the traffic for the A-B and B-C airport pairs, while the market data would register the traffic on the A-C airport pair. Note that the data is collected based on airlines' flight numbering system and a one-stop flight that changes its number at the intermediate stop will show up for two separate market pairings.

To the extent that foreign-to-foreign cargo flows are of interest, some countries maintain similar trade statistics (although few with air-specific data) and there are also air-specific traffic statistics (e.g., IATA and Seabury).

4.3 Domestic Cargo Flow Sources

The data available for U.S. domestic traffic is extremely limited, particularly in regard to commodity detail and include:

- Commodity Flow Survey (CFS) data – provides some highly aggregated data, commodity and other details that are mostly obscured for air traffic by confidentiality restrictions; distinguishing domestic vs. international is also a problem.

- Transearch/Freight Analysis Framework (FAF) – Weight and value by origin/destination region and commodity group is available for Air and truck mode. FAF is derived from the CFS, provides international flow statistics and includes long-term forecasts.

4.4 Other Sources

Other sources include:

Commercial Airline Fleet Databases

Detailed world fleet databases (e.g., ACAS or BACK) provide statistics on individual aircraft's historical patterns of ownership and use. This data source can be used to identify and describe the current fleets of cargo carriers by aircraft type/capacity, and then track the historical use of those aircraft in terms of annual block hours.

U.S. Carrier Form 41/T-100 U.S. DOT Financial Statistics

U.S. carriers file operating and financial statistics with the U.S. DOT identified by aircraft type and domestic/international use. These statistics can be used to profile aircraft operating costs and profitability at the aggregate market level (U.S. domestic and general world region).

Cargo Forecasts

A review of benchmark industry trends, regional market data, and shipping patterns will increase the reliability of a cargo forecast. Several forecasts including the FAA Terminal Area Forecast, FAA Aerospace Forecast, Boeing Current Market Outlook and the Airbus Global Market Forecast are reasonable forecasts that can be used as benchmark data and are discussed below.

FAA Terminal Area Forecast

The FAA publishes its own forecasts annually for each U.S. airport. The Terminal Area Forecast (TAF) system is the official forecast of aviation activity at FAA facilities. These forecasts are prepared to meet the budget and planning needs of FAA and provide information for use by state and local authorities, the aviation industry, and the public. The TAF includes enplanement and aircraft operations forecasts for: FAA towered airports, federally contracted towered airports, and nonfederal towered and non-towered airports. Detailed forecasts are prepared for the major users of the National Aviation System including: large air carriers, air taxi/commuters, general aviation, and military. The TAF includes forecasts for active airports in the National Plan of Integrated Airport System (NPIAS).

FAA Aerospace Forecast

The FAA Aerospace Forecast can be used as a tool to look at the FAA's overall expected outlook of the air cargo industry and the FAA's projected domestic and international growth in terms of revenue ton miles on a system-wide basis.

International Market Forecasts (Boeing/Airbus/Other)

At a macro level, institutional forecasts such as those made by Boeing and Airbus are helpful in considering international volume growth, but should only be applied as a means of comparison to airport-specific forecasts, rather than used as a rote source for growth rates. The Boeing Current Market Outlook and the Airbus Global Market Forecast can also be consulted for their assumptions and freighter fleet growth projections. The use of these consensus forecast cargo growth rates and an outlook of future aircraft orders can be used as a metric to better understand the potential growth and prospect of cargo operations in the future. These forecasts include an inherent bias for future aircraft demand.

Regional/National Economic Forecasts

Historically, air cargo activity tracks with gross domestic product (GDP). An example of a dependable national economic forecast would be the Congressional Budget Office's Budget and Economic Outlook.

Cargo Carriers, Brokers, Freight Forwarders

Depending on the scope of the forecast and the nature of the activity at the subject airport, the best source for both historical data and an idea of future plans will be the companies handling and transporting the cargo. Carriers, their business partners and all the supporting entities in the air cargo community can provide meaningful input to ensure that the forecast is anchored in reality and adds clarity to the planning requirements.

5. FORECASTING TECHNIQUES AND MODELS

Forecasting methods range from applying simple growth rates to market-specific detailed modeling. This chapter demonstrates appropriate techniques for users.

5.1 Collecting and Understanding the Data

Forecasting aviation demand is not an exact science where the same approach can be applied at all airports. Each airport presents its own unique set of variables that need to be considered.

In order to project aviation demand, many factors need to be analyzed including current aviation industry and cargo trends (particularly those appropriate to the airport), catchment area socio-economic data, historical air service and cargo traffic trends, benchmark data, and competing air services at alternate airports.

5.1.1 Current Aviation Industry and Cargo Trends

A review of industry trends, regional market data, and shipping patterns will supplement the forecast. As the airline industry undergoes major changes, the basic ingredients of an airport's successful air cargo operation have remained essentially intact. However, as airports mature, regional growth and

evolving dynamics in goods movement may negatively impact the region's ability to meet the needs of the air cargo industry, and eventually force operations to shift to alternate facilities or modes. The challenges create opportunities to be explored regarding more efficient utilization of existing airport assets, as well as the development of new facilities and infrastructure, and enable airports to review financing options.

5.1.2 Catchment Area Socio-economic Data

Catchment area is the area and population from which a facility or region attracts business. The catchment area is determined by the level and type of air services offered at an airport relative to competing airports. It is also influenced by connecting road networks.

The intrinsic links between the level of aviation activity and economic growth in the catchment area are well documented. Simply put, growth in population, income, employment, and business activity in the catchment area typically lead to increased demand for cargo traffic. For example, an increase in population drives an increase in the consumption of products, many of which are transported by air. As a result, an increase in population can lead to an increase in air cargo demand. The same holds true for personal income and employment. Economic output (gross domestic or regional product) has been found to have a high degree of correlation to air cargo traffic. This is because as economic output grows, the amount of raw materials and finished goods that must be transported also increases.

5.1.3 Historical Air Service and Cargo Traffic Trends

Historical data factors show how an airport's traffic has evolved and will serve as the starting point for the development of comprehensive forecasts. A review of recent trends also identifies those factors, which have, or in the future might, influence future traffic volumes. It is suggested that at least the same number of years of historical data be used as the time horizon of the forecast. Evaluating a longer historical time frame can make it easier to distinguish true trends from short-term aberrations, and thus enhances the accuracy of the projected relationships between independent and dependent variables. The historical analysis of aviation activity is one of the key factors in developing assumptions underlying the forecast. However, the forecast assumptions should also be based on broader industry trends, economic analysis, and review of peer forecasts such as those published by the FAA, Boeing, and Airbus.

5.1.4 Benchmark Data

Benchmark data and growth trends for a similar airport(s) can provide a guide for what level of growth an airport can expect in the future. It is important to benchmark to airports with a similar role (cargo hub vs. non-hub vs. international gateway, domestic vs. international cargo, freighter vs. belly cargo) and/or geographical location (West Coast vs. Midwest vs. East Coast). A review of historical growth trends, markets served, and aircraft size at benchmark airports can be useful in identifying factors that will influence future growth in cargo volumes.

Benchmarking can be particularly useful when an airport's role in the cargo market is changing. For example, when an airport loses its hub cargo carrier it can be useful to look at other airports without cargo hubs to see what type of growth trends can be expected. Conversely, if a forecast is considering the establishment of a cargo hub at an airport, the evaluation of historical cargo volumes after the

creation of a cargo hub at a benchmark airport can provide invaluable data on potential future cargo demand.

5.1.5 Competing Air Services

In order to forecast air cargo demand at an airport, it is first important to identify other competing airports that exist within the region and determine an airport's historical market share of air cargo. It is necessary to understand the level of cargo currently being transported through nearby airports, the role of these airports, and whether or not the competing airports can accommodate future growth. The proximity of an international gateway or cargo hub to an airport can be an influential force in determining the cargo volumes that can be expected at a particular airport. Capacity constraints at a nearby hub can mean opportunities for an airport with excess capacity.

5.2 Benchmarking Analysis

Analysis of the data collected is the next step of the forecasting process. The data collection results should be analyzed to determine whether there are any gaps between the airport's records and those that have been gathered for benchmarking purposes. From this information, strategic planning can be employed to make improvements to the airport's data reporting processes.

If the performance of the selected benchmarks is superior, it is important to understand the reasons why in order to determine whether there are problem areas, whether the benchmarks used were not the best comparisons, and to provide input into subsequent modification and improvement.

This analysis can be conducted within various time frames, depending on whether an airport is looking for short-term or long-term trends. For example, an airport would normally select a short-term time frame if it was considering a new route, and a long-term time frame if considering facility development.

5.3 Common Forecasting Techniques

There are many forecasting techniques ranging from applying simple growth rates to market specific detailed modeling. The most appropriate forecasting methodology is typically determined based on the available data. The most common techniques include a simple growth rate model, time series, and an econometric approach. These models can be specified at the individual airport level, at a multi-airport level, or at a regional/national level. The models can also be combined with a market share forecast.

Each of these techniques has its own set of advantages and drawbacks, and they may be used independently or in combination. No one approach is always the best. The following sections demonstrate appropriate forecasting techniques for various uses.

5.3.1 Simple Growth Rate Model

The simple growth rate model does not rely on an analysis of historical data. It merely applies an externally produced growth rate to a single cargo statistic such as tonnage transported. The growth rate used could come from sources such as the FAA Aerospace Forecast or the Boeing/Airbus annual forecast. The simple growth rate model assumes that the broader base of the external forecast growth rate will apply to the subject airport.

5.3.2 Time Series

Time series analysis projects historical trends into the future using time as the primary independent variable. As time series forecasts are one-variable models, they require only the data for the variable to be forecast.

Frequently while forecasting, the forecaster has observations on only a single data series and has to develop forecasts without being able to include other explanatory variables. In such a case only the past values of this single variable are available for modeling and forecasting.

In general, time series data can be described by trends, seasonal effects and cyclical effects. The first step in putting together a time series forecast is to analyze a time series of historical data for the specific airport or market in order to determine the growth trend. The easiest procedure for isolating the trend in a time series is to plot the historical data in graphic form on an x and y axis. The traffic data is plotted on the vertical (y) axis. Time, the independent variable, is plotted on the horizontal (x) axis. It is then possible to draw a curve or trend line which minimizes the total distance of the plotted points. In simple forecasts, it is possible to extend this line into the future to estimate future traffic. Growth rates, positive or negative, can be calculated from the slope of the line. Generally, expressing growth in terms of CAGR (compound average growth rate) is recommended. Growth rates can then be applied to the base year (or last year in the time series in order to project traffic into the future). Many popular computer software programs, such as Microsoft Excel, automate the process of developing the historical trendline.

The primary drawback to this technique is that it fails to take into account how the economic, demographic, and industry factors that existed during the historical period are likely to be different in the future.

The time series technique is useful for the following situations:

- When detailed data is not available
- When the financial and technical resources required for a more rigorous forecast are not available
- When the anticipated growth is expected to be relatively stable
- When the operating and economic environment is expected to be relatively stable.
- For short term forecasts (less than 5 years)

5.3.3 Econometric

Econometric analysis is a form of multivariate analysis utilizing the relationship between the dependent variable (i.e., cargo traffic) and a set of independent economic, demographic, and operational variables (i.e., price, personal income).

Economic forecasting is used to show how predicted changes in the independent variables would affect future cargo traffic. The following steps are used when developing an econometric forecast:

1. Specify independent variables for testing
2. Data collection
3. Select a statistical model
4. Determine the model's ability to accurately predict historical values.

5. Use model to derive forecast traffic values

6. Evaluate results in context of historical traffic patterns

7. Compare with benchmarks (i.e., FAA Aerospace Forecast and TAF)

Specify Independent Variables

Prior to selecting a model, a forecaster must determine what independent variables should be considered in the forecast. Proper independent variables can be selected by determining which factors are likely to have the greatest effect on traffic growth. Typically, these variables include:

- Population
- Economic output (gross domestic or regional product)
- Personal income (total or per capita)
- Employment
- Similar statistics for destination markets

Data Collection

Once the forecaster specifies the independent variables, credible data (historical and forecast) for each of the variables must be collected, including the dependent variable cargo traffic. The data should be collected as a time series. Historical cargo traffic can typically be provided by the airport. Economic data sets, including forecasts, can be obtained from a number of sources such as the Bureau of Labor Statistics, U.S. Census Bureau, the National Bureau of Economic Research, or independent institutions such as Woods & Poole Economics.

Select a Statistical Model

Once data for each of the independent and dependent variables is collected, the forecaster must determine which model best describes the relationship between the dependent and independent variables. Typically, one of the following models are used:

$$Linear: \ Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2$$
$$Multiplicative: \ \log(Y) = \log(\beta_0) + \beta_1 \log(x_1) + \beta_2 \log(x_2)$$
$$Linear - Log: \ Y = \log(\beta_0) + \beta_1 \log(x_1) + \beta_2 \log(x_2)$$

For each model, there is a single set of constant coefficients (β) which provides a best fit of the equation to the data.

Determine Model's Ability to Accurately Predict Historical Values

Once the forecaster determines the model to be used, the forecaster should apply the data to the specified model. It is then possible to determine whether the model is accurately assessing each of the variable's relationship to cargo traffic. This is done by entering the independent variables into the model and determining if the resultant is in close proximity to the historical dependent values. Should the resultants not reflect the historical values, the forecaster should choose a different model. If no model results in accurate historical results, one or more of the independent variables should be removed from the model.

Use Model to Derive Forecast Traffic Values

By entering the predicted values for the independent variables in the model, the forecaster will derive the forecasted cargo traffic.

Evaluate Results in Context of Historical Traffic Patterns

Once the results are developed, they should be compared to historical traffic patterns to ensure reasonability. For example, if there is a close relationship with the independent variables, the future independent variables should have the same type of pattern.

Compare with Benchmark Forecasts

As a final step to ensure reasonability, benchmark forecasts can be used as a comparison to confirm the projected growth is realistic.

5.3.4 Market Share Forecasts

Market share forecasts project airport activity as a percentage of a larger, more readily available aggregate forecast (i.e., state, regional or national level forecast).

This approach involves a review of recent forecast results in terms of annual growth rates and determining which can best be applied over the forecast horizon. A market share forecast is prepared when compiling growth rates and the outlooks of national forecasts, such as the FAA Aerospace Forecast, the Boeing Current Market Outlook, and the Airbus Global Market Forecast. This type of forecast is developed by applying these collected consensus growth rates used in these forecasts to historical data.

Stakeholder input is then taken into account for consideration of factors that might not be present in prior forecasts, such as changes in market behavior due to the economy. Special consideration must be given to the state of the industry during the forecast, as well as additional due diligence to fully understand the airport's current and potential future role in order to fine-tune each airport forecast.

6. EXAMPLE FORECAST

This section presents an example forecast for which a single approach did not yield reasonable results. As a result, a combination approach was applied, using trend analysis, industry forecasts, and an econometric regression approach. This example illustrates the need for professional judgment in the forecasting process.

Airport Cargo Forecast

This air cargo tonnage forecast was conducted using several sources of economic and traffic data such as Boeing World Air Cargo Forecast 2008-2009, Airbus Global Market Forecast 2009-2028, the Federal Aviation Administration (FAA) Aerospace Forecasts 2010-2030, the International Monetary Fund (IMF), and Moody's Economy.com.

A linear regression against the Real Gross Domestic Product (GDP) was used as a basis for the air cargo tonnage forecast at the Airport. Although this methodology provided reasonable results in the long term, near-term trends appeared to be underestimated and more reflective of a mature market. As a result, a two-step process was used to develop the cargo tonnage forecast:

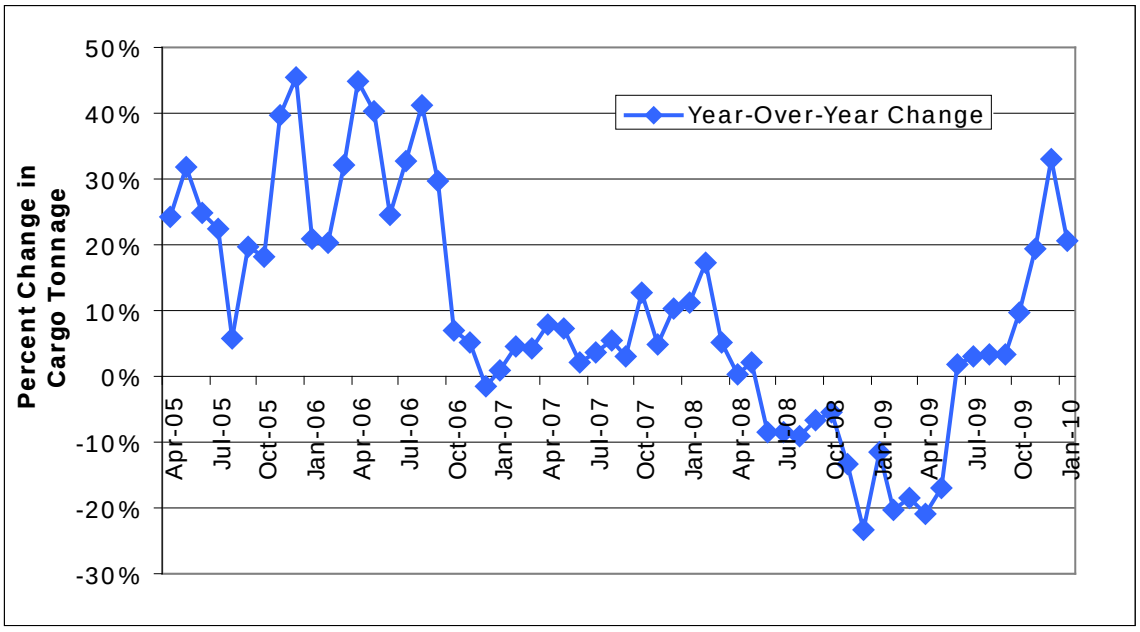
- A near-term approach considered recent trends in air cargo tonnage at the Airport which provided the opportunity to incorporate a more appropriate year-to-year estimate of the impact of the current economic crisis and subsequent recovery on cargo traffic levels.

- Air cargo tonnage was correlated to the Real GDP from 1998 through 2010. This statistical relationship was used as a long-term approach (2010-2030). The long-term approach also focuses on the major forecast trends for the air cargo industry provided by Boeing and Airbus.

Near-Term Forecast

According to tonnage records provided by the airport, Airport cargo volumes were down 10.3 percent in 2009. The months of December 2008 through May 2009 saw air cargo volumes at the airport drop 13 to 23 percent compared to the same months a year before. After a period of somewhat stable cargo tonnage levels (June 2009 through September 2009), air cargo volumes at the airport increased sharply, showing growth of 19 to 33 percent in November 2009 through January 2010 compared to the same months a year earlier.

MONTHLY AIR CARGO TRENDS



Sources: Airport records; Consultant analysis

Year-over-year growth in air cargo tonnage at the airport from 1998 through 2010 was compared to the growth in Real GDP over the same time period. From 1999 through 2010, air cargo tonnage at the airport grew 2.0 times faster than GDP. Cargo tonnage growth at the airport was affected by the current economic crisis as reflected in years 2009 and 2010. If the past two years were excluded, air cargo volumes at the airport would appear to have grown 2.5 times stronger than GDP.

GDP multipliers at the airport were also compared to benchmark airports. Air cargo data for two similar airports were analyzed from 2000 through 2008 and compared to growth in Real GDP over the same time period. The average GDP multiplier over the past nine years was estimated at 2.1 for cargo tonnage at both benchmark airports.

Based on these analyses, it was assumed that a multiplier of about 2.1 would be appropriate in 2011 as air cargo volumes at the airport would continue to recover from the recent economic downturn. The GDP multiplier is expected to decrease through the recovery period to about 1.6 by 2015.

Long-Term Forecast

A statistical regression analysis was conducted between cargo tonnage back to 1998 and Real GDP. Overall, this forecast expects Real GDP to grow 7.1 percent per annum from 2010 through 2030. The air cargo tonnage forecast derived from the regression analysis shows an average growth of 8.4 percent per annum through 2030, resulting in a long-term GDP multiplier of about 1.2.

Therefore, as the airport's cargo market becomes more mature, it was assumed that the GDP multiplier would continue to decrease from 1.6 in 2015 to 1.1 by 2018. It is expected that the multiplier would slightly decrease to 1.0 by 2026 and remain constant through the remainder of the forecast period.

Air Cargo Tonnage Forecast Summary

As a result of the forecasting process, air cargo volumes were expected to grow 9.1 percent annually from 170,900 tons in 2010 to 975,700 tons in 2030.

AIR CARGO TONNAGE FORECAST

YEAR	AIR CARGO TONNAGE	ANNUAL % CHANGE	REAL GDP	ANNUAL % CHANGE	GDP MULTIPLIER
Actual					
1998	44,549		17,188		
1999	43,745	-1.8%	18,223	6.0%	-0.3
2000	52,152	19.2%	19,520	7.1%	2.7
2001	58,026	11.3%	20,307	4.0%	2.8
2002	68,481	18.0%	21,367	5.2%	3.5
2003	87,143	27.3%	22,171	3.8%	7.2
2004	94,203	8.1%	24,027	8.4%	1.0
2005	112,374	19.3%	26,016	8.3%	2.3
2006	140,922	25.4%	28,420	9.2%	2.8
2007	165,488	17.4%	31,189	9.7%	1.8
2008	177,712	7.4%	34,023	9.1%	0.8
2009	159,386	-10.3%	36,094	6.1%	-1.7
2010	170,900	7.2%	38,412	6.4%	1.1
Forecast					
2015	326,600	12.9%	56,216	8.6%	1.5
2020	528,600	7.7%	84,180	7.0%	1.1
2025	744,000	6.7%	114,985	6.1%	1.1
2030	975,700	5.2%	150,799	5.2%	1.0
CAGR					
1998-2010	11.9%		6.9%		
2010-2020	12.0%		8.2%		
2020-2030	6.3%		6.0%		
2010-2030	9.1%		7.1%		

CAGR = Compound Annual Growth Rate
Sources: Airport records; IMF; Moody's; Consultant analysis.

Air Cargo Tonnage By Segment

Airbus and Boeing forecasts were reviewed in order to segment the air cargo tonnage forecast into domestic and international categories. For purpose of this forecast, it was assumed that the dedicated cargo freighters would continue to drive growth in domestic cargo tonnage at the airport in line with the Boeing growth rate. Therefore, domestic cargo tonnage was expected to grow 10 percent annually through 2030. International air cargo volumes would grow at a slower rate of 8.4 percent per year.

As a result of the increase in express freight volumes at the airport, domestic belly cargo tonnage was expected to account for a decreasing share of total domestic cargo volumes at the airport. Accounting for about 73 percent of total domestic air cargo tonnage in 2010, domestic belly tonnage share was expected to decrease to about 60 percent by 2030. Both domestic and international belly cargo tonnage was assumed to benefit from the robust growth in domestic and international passenger movements forecast. Therefore, international belly tonnage was expected to grow at a stronger pace than international freighter tonnage. International freighter tonnage was, however, assumed to remain at about a third of international cargo tonnage as combination carriers were expected to continue to deploy all-cargo flights in and out of the airport.

AIR CARGO TONNAGE FORECAST BY SEGMENT

	YEAR					CAGR 2010-
SEGMENT	2010	2015	2020	2025	2030	2030
Domestic						
Belly	49,636	94,700	151,800	211,800	275,200	8.9%
All-Cargo	18,358	40,500	76,400	123,400	183,400	12.2%
Total	67,994	135,200	228,200	335,200	458,600	10.0%
International						
Belly	69,461	131,000	209,100	289,400	372,300	8.8%
All-Cargo	33,444	60,400	91,300	119,400	144,800	7.6%
Total	102,906	191,400	300,400	408,800	517,100	8.4%
Total						
Belly	119,097	225,700	360,900	501,200	647,500	8.8%
All-Cargo	51,803	100,900	167,700	242,800	328,200	9.7%

CAGR = Compound Annual Growth Rate
Sources: Airport records; Consultant analysis.

Freighter Movements Forecast

All-cargo tonnage was forecast to grow 9.7 percent per annum from 51,803 metric tons in 2010 to 328,200 tons in 2030. Over this period, all-cargo carriers were expected to increase available capacity and load factors as a response to increasing demand. However, some of the cargo carriers at the airport operate on multi-stop itineraries, stopping at the airport to unload and load only a portion of their overall tonnage. Therefore, it was assumed that the carriers currently operating on multi-stop itineraries would not materially change their operational practices over the forecast period. The forecast projected some increase in tonnage per flight and load factors to account for a portion of the routes that were operated on a non-stop basis.

The following carrier specific assumptions were considered in the development of the cargo movements forecast:

- The six all-cargo carriers would compose the main core of all-cargo traffic at the airport over the forecast period.

- The largest domestic all-cargo carrier at the airport accounted for 39 percent of all-cargo tonnage and 51 percent of all-cargo movements in 2010, using mainly Boeing B757 and B737 aircraft. This carrier was expected to remain the largest domestic all-cargo carrier at the airport over the forecast period. The airline would continue using Boeing B737 but would focus most of its growth on the larger Boeing B757 aircraft.

- A cargo carrier that specializes in express freight with service to its hub currently operated ATR-72 aircraft at the airport (Code C)[4]. Based on current fleet plans, it was assumed that the airline would continue to use primarily Code C aircraft at the airport with the addition of some Code D aircraft such as the Airbus A310. Destination focus was expected to remain on round-trips to its hub.

- A regional carrier recently switched to all-cargo activity using Boeing B737-200 aircraft. The airline was expected to increase its frequency at the airport using Code C aircraft composed of Boeing B737-200 and ATR-42 aircraft.

- In addition to these three carriers, new entrants would likely emerge in the domestic market focusing on express freight services in line with Airbus and Boeing forecasts. The new domestic all-cargo carriers were assumed to focus on point-to-point service using small Code C aircraft such as the ATRs.

- Current international all-cargo carriers operated mainly non-stop service using Code E aircraft. It was assumed that these airlines would continue to deploy Code E aircraft between their hubs and the airport over the forecast period. Asia and Europe would remain the main trade partners at the airport; however, cargo flows to and from Middle East were expected to grow faster than these two regions. Code F aircraft such as Boeing B747-800 were assumed to be deployed starting around 2020. Code E aircraft such as the Airbus A330 would progressively replace aging Airbus A300s and A310s.

As a result of these assumptions, all-cargo movements were expected to increase from 3,621 movements in 2010 to 19,960 movements in 2030, averaging growth of 8.9 percent per annum. Tonnage per movement was forecast to grow from 14.3 in 2010 to 16.4 by 2030. International all-cargo movements would grow at a slower rate than domestic all-cargo traffic due to the use of larger aircraft over the forecast period.

[4] ICAO Aerodrome reference code is defined in ICAO Aerodrome Design and Operations Manual –page 17: http://legacy.icao.int/fsix/_Library/Manual%20Aerodrome%20Stds.pdf

FREIGHTER MOVEMENTS FORECAST BY SEGMENT

SEGMENT	YEAR 2010	2015	2020	2025	2030	CAGR 2010-2030
Domestic						
Tonnage	18,358	40,500	76,400	123,400	183,400	12.2%
Movements	2,615	5,060	8,490	12,340	16,670	9.7%
Tonnage per Movement	7.0	8.0	9.0	10.0	11.0	
International						
Tonnage	33,444	60,400	91,300	119,400	144,800	7.6%
Movements	1,006	1,590	2,280	2,840	3,290	6.1%
Tonnage per Movement	33.2	38.0	40.0	42.0	44.0	
Total						
Tonnage	51,803	100,900	167,700	242,800	328,200	9.7%
Movements	3,621	6,650	10,770	15,180	19,960	8.9%

CAGR = Compound Annual Growth Rate
Sources: Airport records; Consultant analysis.

Code C and Code D aircraft would constitute most of the growth in domestic all-cargo traffic at the airport. Code E aircraft would be introduced in 2020 to account for about 4.0 percent of domestic all-cargo movements by 2030. On the international side, Code E aircraft would account for an increasing share of international all-cargo movements from 81.5 percent in 2010 to 86 percent in 2030, progressively replacing Code D aircraft. To respond to increasing cargo tonnage levels, Code F aircraft would be deployed starting in 2020 and would account for about 10 percent of international all-cargo movements by 2030.

FREIGHTER FLEET MIX FORECAST

AIRCRAFT CODE	YEAR 2010	2015	2020	2025	2030	CAGR 2010-2030
Domestic						
Code C	1,009	2,330	3,740	5,180	6,340	9.6%
Code D	1,606	2,730	4,640	6,910	9,660	9.4%
Code E	-	-	110	250	670	n.a.
Total	2,615	5,060	8,490	12,340	16,670	9.7%
International						
Code D	186	320	320	320	320	2.8%
Code E	820	1,270	1,910	2,370	2,640	6.0%
Code F	-	-	50	150	330	n.a.
Total	1,006	1,590	2,280	2,840	3,290	6.1%
Total	3,621	6,650	10,770	15,180	19,960	8.9%

CAGR = Compound Annual Growth Rate
Sources: Airport records; Consultant analysis.

7. CONCLUSION

Cargo forecasts are important in understanding an airport's demand growth, assessing market risk, and predicting financial gains/losses to develop management strategy. Often, forecasting is mandated in master plans to secure funding for future capital improvement projects, particularly under federal grants and bond issuances. Airports that accurately forecast their future traffic will better anticipate the needs of their customers, and thus will be in a better position to develop to their full potential.

Forecasting cargo demand is not an exact science where the same approach can be applied at all airports. Each airport presents its own unique set of variables that need to be considered. A variety of forecasting approaches were presented in this guide. Each of these techniques has its own set of advantages and drawbacks, and they may be used independently or in combination. No one approach is always the best. The application of professional judgment is critical.

Because forecasting cargo demand is an inherently uncertain activity, the use of PALs and continuous monitoring of actual cargo activity can be critical. The use of PALs reflects that the timing of any necessary improvements will not be driven by a set point in time but rather by the timing and arrival of future demand levels. The actual realization of predicted activity levels will likely differ from the forecast in terms of what year that activity occurs. The PALs represent activity based milestones that can be used to make future expansion and development decisions, focusing on specific volumes of activity that trigger the expansion requirement, rather than the timing identified in the forecast.

Reliable forecasts provide critical input to airport management and planning. Although forecasting is a challenging task, the application of the principles in this guide can allow for the production of more dependable and useful cargo forecasts. It is important, however, to remember that forecasting is a tool, and that it remains the responsibility of management to review the end products with a critical eye and check against the airport's core strategies and beliefs.

CHAPTER 4

AIR CARGO FACILITY ANALYSIS

CHAPTER 4

AIR CARGO FACILITY ANALYSIS

1. INTRODUCTION

The purpose of the Air Cargo Facility Analysis section is to identify trends in the air cargo industry that have had an impact on facility development, identify what those impacts are, and recommend changes to the standards for developing facilities. Many of the changes may result in the demand for additional land, which is a scarce commodity at many airports. As such, this section also describes techniques for better utilizing existing airport land. Finally, this section addresses operational and capacity management issues relating to facility development.

Like passenger terminals, parking garages, and runways, the development of air cargo facilities generally follows a process. Due to the somewhat unique nature of the air cargo market, this process can be more complicated than that for other airport facilities, however, the development process can be generally defined for an airport operator by answering six questions.

What is the cargo market at my airport?

The first phase of any cargo development program should include a market assessment to establish geographic market size and growth. If the results are favorable, subsequent phases would include selection of target markets and market surveys. The term cargo market does not just refer to the potential for the flow of goods (the operating market) but also pertains to the potential for cargo facilities at an airport (the leasing market). It is very important for an airport operator answering this first question to develop a strategy for determining air cargo facility capacity.

How do I develop the market?

Once the cargo market is identified, the next step is to determine a strategy to develop that market. The best way to develop the market is to survey the people who are involved in the movement of goods into and out of the community. This includes in addition to the carriers, air cargo associations, freight forwarder and customs broker associations, trucking, major manufacturers, Chambers of Commerce, and Economic Development organizations, which are all very good sources of information about what is entering and exiting the local marketplace. Due to competitive concerns, the information will be somewhat general but it will still provide the necessary input to determine the existing market and areas of potential growth. Developing the market brings into play the “chicken and egg” scenario. The forwarders say that they will generate the cargo if the service is available and the carriers say that when the cargo exists they will provide the service. To develop the market requires bringing the two elements together to overcome this barrier.

How do I sell the Market?

Selling the market requires convincing the airlines and other cargo operators that there is a profitable opportunity for them to commence service to your market. Preparation of presentations showing volumes of existing cargo along with growth potential, the benefits of using your airport, the availability of facilities and infrastructure, andthe support of the forwarder community is important. Some airports are offering incentives to new entrants but keep in mind thatthe FAA requires that incentive programs be offered in an equitable manner available to all carriers.

What are the facility requirements?

Once an airport operator has a general understanding of the cargo market and how to develop it, the next step is to identify the location, type and size of facilities needed to satisfy the market demand. This should include existing and projected future demand.

Do I have the right facilities?

Having the right types of facilities means:

- Having an adequate supply of cargo buildings, staging, storage areas, landside infrastructure, and apron in the optimal location.

- Understanding the mix of carriers, and the support services required by the entity to which the facility could be leased, and the warehousing, office, and GSE space as well as the landside and aeronautical infrastructure they require for cost-effective operations.

- Determining the appropriate throughput for the potential tenants and users of the facility.

- This phase of the development process usually includes a site selection study for future air cargo facilities. Once a site has been selected, the best layout of facilities on the site is determined. Cost estimates are then developed for the final cargo facility layout.

How do I develop the right facilities?

This phase of the facility development process involves determining whether the airport operator undertakes the project itself or contracts the development to the private sector, including the financing of the proposed development and the design/construction of the facilities. The airport also must decide how the new cargo facilities will be managed and operated.

Two figures are provided to show the general air cargo facility development process. Figure 1 is a summary of the six questions identified above, and also outlines the marketing aspects of air cargo facility development. The marketing process is covered in detail in other sections of this Guide. The facility development process is covered in this section. Figure 2 depicts the facility development process in more detail. The air cargo facility analysis provided in subsequent sections follows the development flow outlined in Figures 1 and 2.

Figure 1

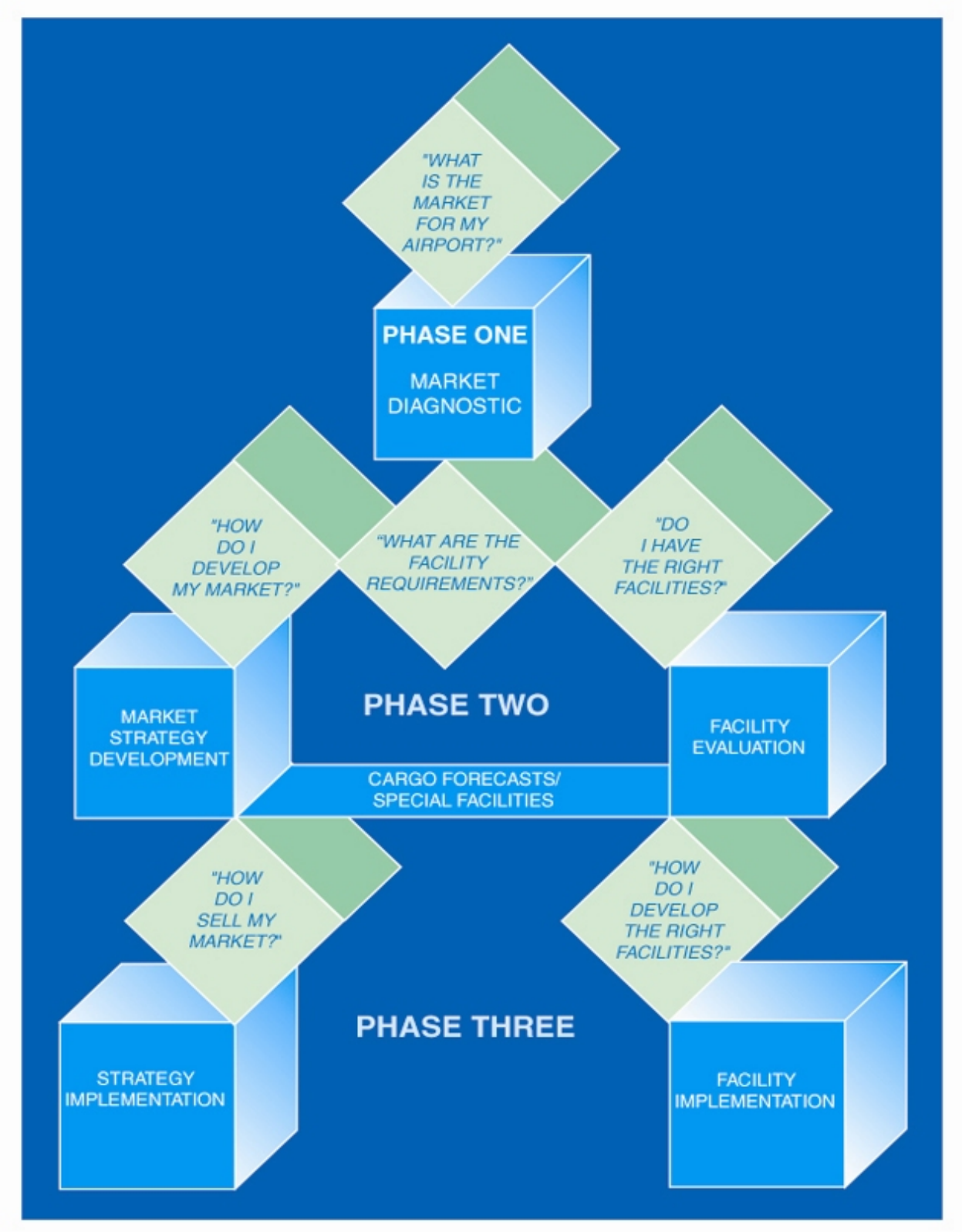
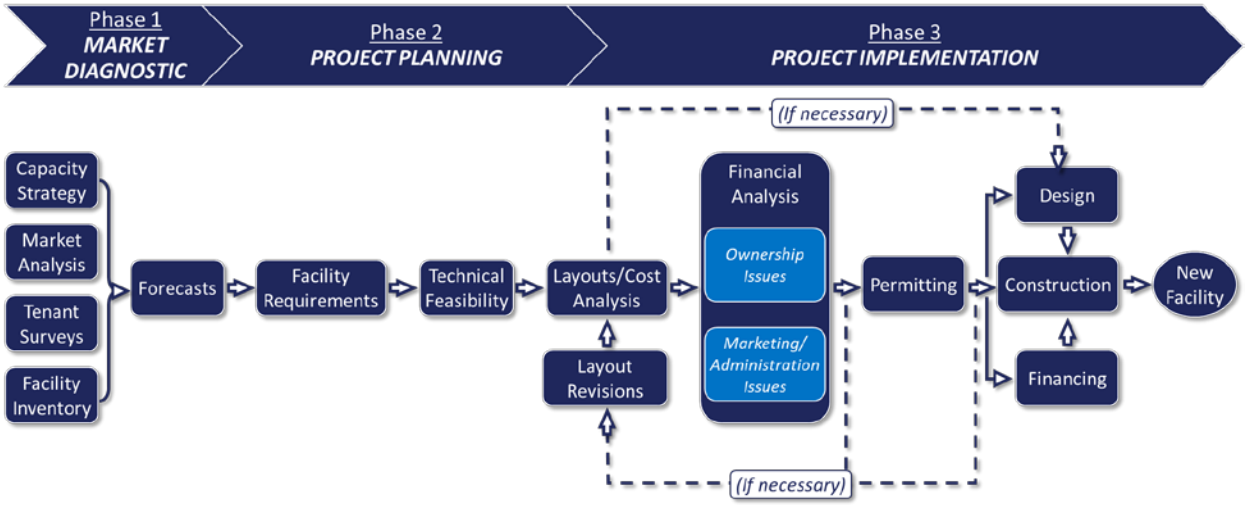

"WHAT IS THE MARKET FOR MY AIRPORT?"
PHASE ONE
MARKET DIAGNOSTIC
"HOW DO I DEVELOP MY MARKET?"
"WHAT ARE THE FACILITY REQUIREMENTS?"
"DO I HAVE THE RIGHT FACILITIES?"
PHASE TWO
MARKET STRATEGY DEVELOPMENT
FACILITY EVALUATION
CARGO FORECASTS/ SPECIAL FACILITIES
"HOW DO I SELL MY MARKET?"
"HOW DO I DEVELOP THE RIGHT FACILITIES?"
PHASE THREE
STRATEGY IMPLEMENTATION
FACILITY IMPLEMENTATION

Figure 2



2. CAPACITY CONCEPTS

In the past, airports have been consistently late in anticipating and meeting air cargo facility demand. This delay created a very predictable infrastructure crisis. In case after case, a shortage of efficient, properly located, air cargo facilities is preceded by a carrier or carriers expressing a serious unmet need for greater and more efficient space. Efficiency is the key – a cargo facility should be the right size and configuration for the potential market. Today, there is a shortage of air cargo infrastructure and facilities at many airports: at the same time, as the markets shift, it also appears that an overcapacity situation exists at other airports around the country as well. The following discussion outlines various issues to consider depending on individual circumstances.

In the past, airports have been consistently late in addressing cargo infrastructure demand while today overcapacity might be more the norm.

Almost any airport has the ability to reduce the potential for a capacity crisis. This does not pertain to *every* airport because there are other factors that can lead to capacity problems. These factors will be discussed later.

Cargo facility shortage historically has been more of an issue than excess capacity situations by a significant margin. However, beyond the sheer numbers, shortages create much more severe problems for an airport. Marketing to potential new cargo customers, retaining existing cargo customers and managing operating costs are impacted negatively by facility shortages. These problems will be addressed in more detail later in the analysis.

Returning to the earlier comment about the predictability of a crisis resulting from the lack of airport infrastructure to meet growth, it is the "*wake-up call*" upon which the industry has relied that is the culprit. This call is originated by an anonymous cargo customer and the message is clear: "Our needs greatly exceed available infrastructure at the airport and we seriously require more building space, ramps, truck docks, vehicle parking, GSE and container storage and maintenance areas." The alarm continues to ring with revelations the cargo customer has already explored all available options and has decided to divert lift

capacity or cargo shipments to another airport. Once the first call is received, it normally signals the beginning of similar calls.

This early warning system the industry has adopted is akin to a wind-shear detection system. Such a system is of no value if it is installed after a decision has been made. One would also question the leadership of a department store embracing an inventory reorder policy dependent upon customer complaints of merchandise unavailability. Yet, because of issues related to limited availability of market intelligence and/or concerns regarding speculative development, the industry has long utilized current carrier demand to determine and act upon future infrastructure requirements. This method has numerous shortcomings and should only be utilized as a segment of a much more comprehensive planning and action effort. The situation is exacerbated by the concern of developing on a speculative basis, space that might go unleased.

The purpose of this section is to identify approaches that may be employed to reduce the potential for air cargo infrastructure capacity problems. These problems can take two basic forms, each of which can create significant economic and political difficulties for an airport. Both infrastructure overcapacity and under capacity represent substantial challenges.

2.1 Capacity Impact

This analysis focuses on reducing potential capacity problems, whether it is a shortage or a surplus of facilities. A few words on the impact of these problems will help establish the urgency of preventive measures. Excess air cargo facility capacity, which appears to be the case at a number of airports today, is a serious problem. A multitude of factors have contributed to this particular situation, including building facilities without a thorough understanding of the market and failure to recognize inevitable fundamental changes in the industry such as shifts in routes, shifting distribution patterns, etc. The key to avoiding overcapacity is to build facilities with flexibility in mind.

On-airport cargo facilities are designed differently to accommodate combination carriers (both passenger and cargo) versus freighter operations. Excess capacity often occurs in combination carrier facilities, which are not typically contiguous to aircraft parking aprons. This removed location is acceptable provided tug access via a restricted service road is available. Freighter operators however, will seek to locate in a facility with contiguous parking apron, which offers operational and cost efficiencies. For these carriers, cargo facilities removed even a short distance from the airplanes are problematic. It is ill-advised for an airport to try to force carriers to operate from facilities that are removed from the parking ramp. With increasing frequency, these airports are discovering that rather than accepting a less efficient facility location, the carrier will find alternatives, which often negatively impact the airport. These alternatives include utilizing another airport completely or shifting some lift capacity to another airport or mode of transportation. Carriers and cargo customers have choices.

The key to avoiding overcapacity is to build facilities with flexibility in mind.

On the other hand, a level of overcapacity can produce some benefit for an airport's carriers and supporting businesses. In some instances, based on lease requirements, a level of facility vacancy can help control or drive down rental rates. Surveys reveal that as facilities on an airport reach capacity, rental rates increase. The higher the rental rates, the higher the operating costs to users and the more incentive for them to explore alternatives. A second benefit of excess capacity is the ability to accommodate demand generated by successful marketing. Once a customer has decided to serve a new market or increase service to a regional market area, it is normally too late to tell the customer that facilities can be ready for occupancy within a year. More than one opportunity has been lost in this circumstance when the customer

went down the road 250 miles to an airport that had infrastructure available immediately. Cargo customers are not solely dependent on passenger preferences and, therefore, have greater flexibility in selecting an airport.

Another factor that can lead to overcapacity, particularly in small and medium sized airports is the downsizing from larger passenger jet aircraft to smaller regional passenger jet aircraft. Although the trend has reversed in the last several years and regional jets are larger, they still do not have significant cargo capacity. As a result, the trend towards greater use of integrated carriers and trucking cargo to larger airport markets will continue. Carrier cargo handling consolidation and carrier consolidation in general, including code sharing, can also lead to overcapacity at an airport. Carriers are increasingly replacing their own employees with third-party cargo handlers. In some cases, the third-party can also be another carrier. It is not uncommon to now see third-party cargo handlers processing cargo for multiple carriers through the same facility (a “common-use” facility), making more efficient use of the space, and thereby increasing the effective capacity of the facility. In addition, airports are developing open floor plan buildings (no partitions) which enable the same building to be used throughout the day to accommodate various peaks.

Regardless of the reason for overcapacity at an airport, it is an appropriate time to plan for the next wave of demand, which will come sooner or later. Closely monitor individual carrier demand by building. If appropriate, use this time to upgrade existing facilities to make them more efficient, incorporate the latest technology, or demolish obsolete facilities and replace them (subject to market demand) with modern, state-of-the-art facilities built to current standards.

2.2 Infrastructure Strategy

It appears the most successful approach, from a macro-analysis, is to develop a strategy for infrastructure development, evaluate the strategy frequently for effectiveness, modify the strategy to reflect the changing environment and implement the strategy in a timely manner. The rhetorical question would be, "*Who could argue with that statement?*" The macro-analysis is of little help unless broken down into components with which everyone can deal.

Strategy Development

As discussed in the Introduction, the first step is to determine the market of cargo customers for a particular airport. This entails two population elements. The first is the customer base that the airport would like to attract. Since this is the most obvious population element, it usually receives a great deal of attention. Marketing brochures, personal visits, trade shows and a multitude of promotional materials are developed and utilized each year by airports trying to entice potential cargo customers. In comparison, fewer marketing resources are expended on the second element, the cargo carriers already utilizing the airport. An equally important part of the strategy should be retention and growth of current users. A realistic assessment of potential users is essential but the first priority is to ensure your existing customers are well served.

Significant resources are expended each year to attract new cargo customers; however, the first priority should be to ensure your existing customers are well served.

Once the existing and potential user-base is identified, the second step is to generate an inventory of the airport's strengths and weaknesses, develop strategies to maintain those strengths (advantages) and eliminate or mitigate the weaknesses (disadvantages). This phase requires an objective examination of the airport’s cargo infrastructure. This must be evaluated to determine whether it provides an appropriate level

of efficiency for the existing cargo volumes and projected short-term growth and also whether the resources exist to support additional cargo customers.

First, ensure that existing users are being served by meeting their needs at the local level. If local cargo managers are concerned about tug distances to aircraft, tight warehouse space, poor truck access or maneuvering areas or any other infrastructure problem, even though these types of concerns may appear less pressing to the airport, it will provide an early clue of larger problems to come. These local managers will be passing the same concerns along to regional and national decision-makers and link inefficiencies, budget overages, delays and poor performance to inadequate infrastructure.

There is no substitute however for frequent and meaningful personal contact with local, regional and national decision-makers in the planning and operations areas of the carriers and other cargo customers. They will share concerns, ideas and observations that are invaluable in attracting and retaining cargo customers. This process will warn of evolving infrastructure issues and is the single greatest source of identifying potential opportunities.

Using qualitative information gathered from industry sources, combined with quantitative measures, an inventory of existing infrastructure can be compared with the targeted improvements. If the existing infrastructure does not meet current and short-term growth needs, that problem should be addressed immediately. A breakdown at this planning level indicates a potentially serious customer retention problem. In the event existing infrastructure efficiently supports current cargo volumes and projected short-term growth, it is time to compare infrastructure potential with the long-term strategy. If the long-term growth scenario requires land for facility development, which is not available, a revision in strategy is obviously necessary. In other words, the airport should perform a matching of business goals with capacity potential.

There is no substitute for frequent and meaningful personal contact with local, regional and national decision-makers of the carriers and other cargo customers.

Strategy Evaluation

Normally, those responsible and accountable for a strategy know whether it is producing the desired results. It is not enough to know whether the plan is working effectively or has failed to produce the desired results. Simply assuming the strategy worked because the targets are being achieved may overlook the potential that the success was attributable to other factors or that greater success could have been achieved. If the success was the result of other factors, it is important to identify and capitalize on these attributes. If the strategy failed to achieve the targeted objectives it is equally important to understand the weaknesses in order to make adjustments.

Evaluation should also be timely and frequent. Clear and defined evaluation points should be established as part of the strategy. This allows for mid-stream corrective action and adjustments.

Strategy Modification

Although the strategy to provide infrastructure cannot anticipate every possible scenario, it can incorporate a process that makes modification part of the strategy itself. Expect change and factor it into the process. Remember, change can have either a positive or negative impact on a facility. Identify potential sources of change and monitor those sources.

Security Requirements

Security requirements will continue to play a major role in how cargo facilities are built and operated. Cargo security requirements incorporate a level of increased cargo screening. This can occur at the point of origin with the shipper or forwarder, within individual cargo facilities, or at a Certified Central Cargo Screening Program (CCSP) facility.

In general, most air cargo transported on passenger aircraft is screened at off-airport facilities through the CCSP administered by the Transportation Security Administration (TSA). However, technological advances may make on-airport screening more efficient and more prevalent. CT technology is one such screening method that may become more commonplace in air cargo facilities. However, these machines (as with many other viable screening technologies) require a large footprint.

Currently, there are no regulations requiring screening of cargo prior to being transported on freighter aircraft. However, lawmakers continue to explore options to implementing regulations that would require on-airport screening. If new regulations are implemented, this could result in increased space requirements within air cargo buildings. Therefore, air cargo facility layout considerations should be made to include space within an air cargo building can be flexibly modified to meet changing security screening standards.

U.S. Customs and Border Protection (CBP) uses the Air Cargo Advance Screening (ACAS) Program to perform risk-based screening of all air cargo. In some cases, CBP may request that shipments be held at air cargo facilities for inspection. Air cargo facilities should have enough space to hold shipments should additional screening or review be required.

Employees with access to the Air Operations Area (AOA) are subject to a greater level of security background checks and screening. Access to the AOA is more limited today, and the number of access points to the AOA has been reduced.

Change in Technology

Technology change can rapidly make a facility inefficient. There are numerous examples of this occurring and one glaring impact is the next generation of air cargo fleets. Tail heights of wide-body aircraft over narrow-body aircraft create parking problems and inefficiencies for many facilities due to airspace and airfield clear area setback requirements. Even some facilities designed and built within the last few years have failed to anticipate the next generation of aircraft with increased separation requirements. Another negative impact is the need for increased clear heights in newer facilities. A 22-foot clear height was often efficient. Now a 22-foot clear height can lead to obsolescence. Not all technology has negative impact. A facility sponsor (airport, private sector, carrier) can create more space with automated technologies such as new stacking systems. The key is to examine evolving technology and, where feasible, make allowances for accommodation in the infrastructure at a later date.

Industry Growth

Air cargo is the mode of transportation most impacted by globalization. Consider the effect this phenomenon has on physical planning. Until recently, gateways and large coastal metropolitan areas were synonymous. Evaluate the potential impact (positive or negative) industry growth and technology changes have on the airport and the region. Factor in code sharing, mergers, and international agreements.

Vertical and Horizontal Integration

Carriers, in an intensifying effort to strengthen market position, are integrating the services offered to customers beyond rapid and safe delivery of cargo. A growing segment is either providing or exploring warehousing, inventory management, order processing and other customer services. These trends and the next generation of services should be introduced to the infrastructure equation.

Operational Concepts

Carriers are constantly seeking, and rapidly implementing, new operational concepts designed to reduce costs and deliver cargo more efficiently. Once thought to be the ultimate in efficiency, hubbing operations can be impacted by changing distribution patterns and could be replaced by other concepts or modes.

Multi-Modal Transportation

Despite existing shipping preferences among modes, insightful planning will include multi-modal transportation aspects in any cargo infrastructure strategy. Anticipate the evaporation of the clear distinctions between land, sea, and air cargo transportation. Air carriers are becoming truckers and vice-versa. Envision at some level, the integration of rail and sea and the impact on any strategy. Access to and from cargo areas on-airport must consider the geometric roadway and staging layout requirements of trucks.

New Generation of Larger Wide-body Aircraft

Boeing and Airbus have created a new generation of wide-body aircraft that have had a dramatic impact on cargo capacity, particularly at primary international gateways. Expanded belly capacity is reducing the need for freighters on some routes. This also creates the need for additional combination carrier cargo facilities at these international gateways.

Local and Regional Economic Development

Any infrastructure strategy communicating and coordinating with local and regional economic development personnel has a much greater chance to achieve its objectives. The airport may represent one of the most important resources available to the local and regional economic development effort. Conversely, the economic development resources can prove a valuable economic and political ally to the airport. Capital resources available for infrastructure creation and improvement are often difficult to secure and having support from the economic development team can facilitate raising capital.

In summary, air cargo infrastructure development must be carefully integrated with the process of attracting and retaining air cargo carriers. Air cargo carriers have much more flexibility in selecting an airport and determining the magnitude of operations at an airport. Although an airport has little control over cargo volumes available to the carriers, it can create the infrastructure to support efficient operations. If the cargo volumes are available, you want them flown out of and into your airport. If the airport does not supply the necessary infrastructure, your competition will.

Cargo infrastructure can actually, and often does, lead the successful process of attracting and retaining cargo operations.

Air cargo carriers now transport freight more rapidly, further, and more safely than at any time in the industry's history. This trend will continue, and if the airport cannot contribute to the above equation it will be at a competitive disadvantage.

3. FACILITY REQUIREMENTS

Due to the wide range of variables that could impact the operational efficiency of an air cargo facility, a clean and simple formula does not exist to project facility infrastructure needs at any given airport. Nevertheless, there are other tools available, which can assist in measuring current utilization and comparing the result with industry norms. A brief word of caution on using norms in any analysis is in order. Since a norm is derived from a wide population of examples, it often lacks characteristics present in any single element within the population. Nonetheless, it can reveal a range of reasonable expectations.

"Norms" are only measurement devices and the only thing they measure is reasonableness of a very general population.

This section of the Air Cargo Facility Analysis addresses quantitative methodologies currently employed to approximate cargo facility requirements for airports. These techniques should be employed in conjunction with qualitative methods discussed in the Capacity Concepts section.

3.1 Total Land Area Requirements

One key factor that may be important to consider at the outset is understanding the total land area requirements for an air cargo facility.

At the macro, master plan level it is important to understand the total land area required to accommodate a typical air cargo facility. Total land area refers to the combined footprint of all functional areas that are associated with the operation of an air cargo facility (e.g., cargo building, aircraft apron, auto parking, truck trailer storage areas, etc.). Understanding the quantity of land associated with typical air cargo facilities can help planners and airport operators identify sufficient amount of land areas to accommodate this demand.

This type of analysis can serve two purposes – 1) it can help determine the amount of space that should be allocated to accommodate an air cargo facility based on anticipated cargo volume; or 2) it can help determine the approximate anticipated air cargo volume that can be achieved at that site based on a quantification of available land. The second analysis type is particularly helpful for land constrained sites and/or airports.

Airport planners can use a high-level cargo site utilization rate in cases when detailed cargo site information is not available. For example, a good rule of thumb planning factor for total cargo facility land area is 100,000 annual tons of air cargo per 700,000 square feet of land area for a typical integrated freight facility with a modest level of cargo volume. In this case, the cargo facility site is comprised of cargo building, aircraft apron, airside GSE storage/staging, and landside. This utilization rate was established through benchmarking several cargo operations at US airports and can be used to support higher level planning analyses.

This total site utilization ratio can support preliminary land use planning for new cargo facilities, particularly for master plan level of analysis and/or greenfield sites. However, that airport planners will need to coordinate the with the cargo tenant(s) as soon as practicable to understand the anticipated volume of truck-to-truck cargo volume and desired allocation of functional uses within the facility. Airport planners should also consider if the tenant plans or the airport needs to use a multilevel cargo building (instead of the traditional single-level facility) because this can result in a more efficient site utilization rate since more cargo can be processed within a smaller building footprint. More detailed information is required to size and layout the site accurately.

3.2 Functional Area Space Requirements

Applying functional area space metrics can be useful to determine the amount of space within a total site that should be allocated to achieve a balanced air cargo facility.

This can be helpful to understand if the desired or identified site is generally suitable to accommodate an air cargo facility. These metrics can support consideration of facility size and/or generalized functional area layouts to preliminarily evaluate internal and external site compatibility. The site that generally can be allocated to accommodate the three primary functional areas of an air cargo facility. The general site allocations are as follows:

- 15% for the air cargo building
- 25% for the landside
- 60% for the airside

Note that this does not apply to belly cargo facilities as those facilities do not require airside apron, only airside connectivity to the passenger terminal.

The subsequent sections address the various components of an air cargo facility which may or may not be familiar to the reader. As a reference, Figure 3 represents a generic air cargo facility layout and identifies its individual components. The indicated dimensions are representative only and should NOT be considered as planning guidelines. In many instances, adjustments must be made to reflect available site size and configuration as well as the nature of the cargo, e.g. an integrator building or mini hubbing operation may be more square to allow for sortation functions.

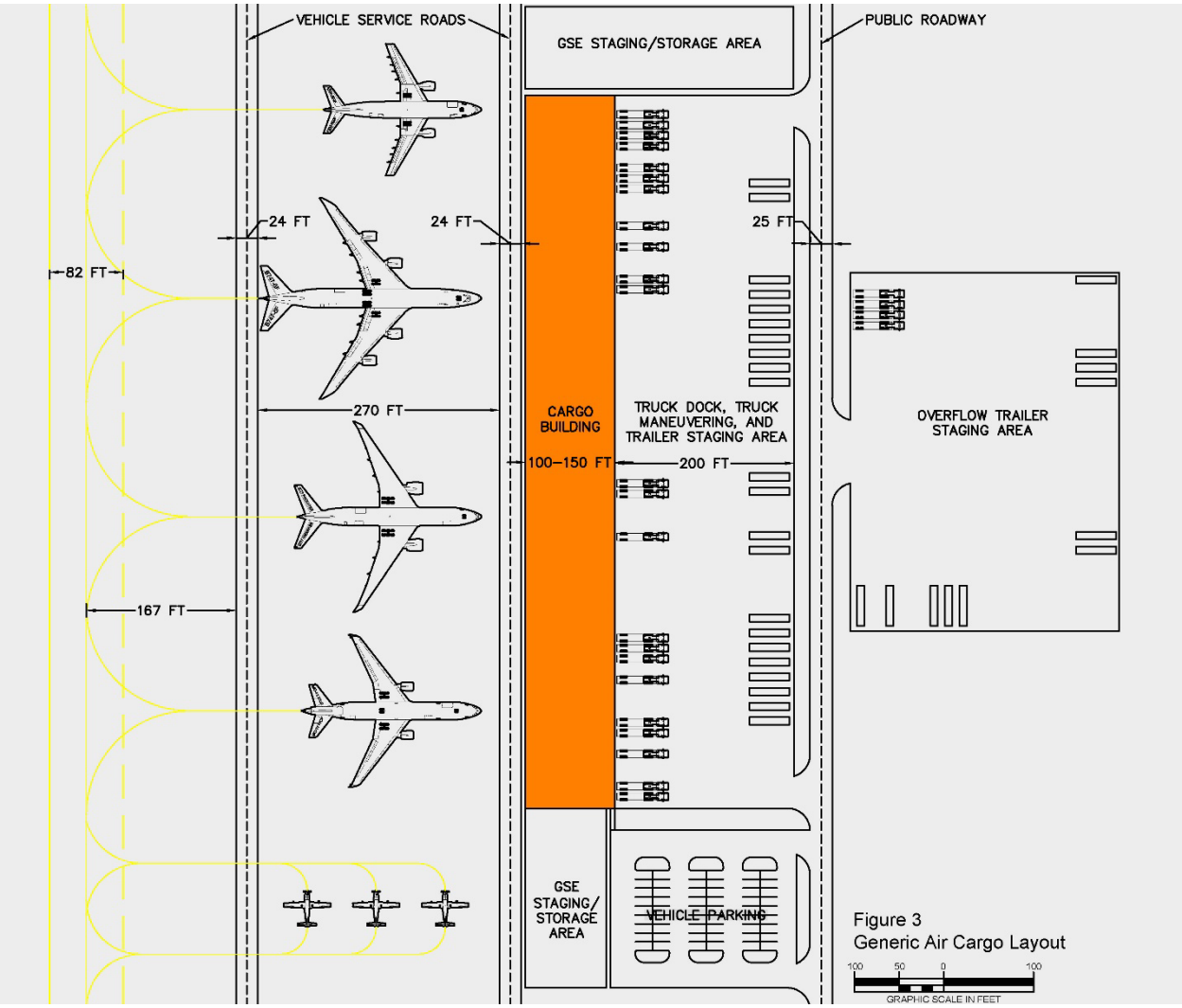


Figure 3
Generic Air Cargo Layout

3.3 Cargo Operator Type

It is important to understand common characteristics associated with the different cargo carrier type is key to appropriately planning air cargo facilities. This is because the facilities associated with each carrier type tend to be configured differently based on the operational characteristics associated with each.

Integrated Cargo Facility Considerations

Air cargo carried exclusively on freighters by carriers specializing in providing full-service logistics operations (handling cargo from shipper to delivery points) is known as integrated cargo. Integrated cargo facilities include an apron for aircraft parking, the cargo building, and landside area. In general, the industry average cargo building utilization ranges from 1 to 2 tons per square foot. Cargo utilization can vary from airport-to-airport and facility-to-facility for a number of reasons, including the nature and time sensitivity of the cargo, market share, space inefficiencies inherent in repurposed buildings, level of truck-to-truck activity, international activity, or the level to which automated sortation is used.

A key characteristic of integrated cargo facilities is highly efficient buildings. These facilities tend to achieve greater space and processing utilization since a single entity controls all elements of the operation; therefore, integrated cargo facilities are generally able to process larger volumes of cargo in less space.

The integrated cargo carrier category can be further classified into two subcategories based on operational model – Integrated Cargo Carrier Type 1 and Integrated Cargo Carrier Type 2.

A key differentiating characteristic of Integrated Cargo Carrier Type 1 is that this operator type tends to process most, if not all, cargo on-airport, which generally results in a larger on-airport facility compared to Type 2. It may be common to achieve utilization rates such as 0.95 tons of air cargo per square foot with this operational model. Figure 3 depicts a generalized layout of an Integrated Cargo Carrier Type 1 facility.

A key differentiating characteristic of Integrated Cargo Carrier Type 2 is that this operator type tends to process cargo on the apron or at off-airport facilities, which generally results in a smaller building than Type 1. This operational model tends to mathematically achieve a higher level of cargo processing efficiency since relatively lower cargo volumes are processed within the building. It may be common to achieve greater utilization rates such as 1.35 tons or air cargo per square foot with this operational model. Figure 4 depicts a generalized layout of an Integrated Cargo Carrier Type 1 facility.

Note that these utilization ratios only consider air cargo volume. Integrated cargo carriers may also conduct truck-to-truck cargo operations at their on-airport facility which would increase the utilization rates for their facilities. Airports should coordinate with cargo operators to understand the anticipated truck-to-truck cargo volumes to more accurately size the cargo building. Space requirements for other support areas within the building (e.g., office space, storage areas, and security processing space) will also need to be considered. A good rule of thumb for high-level space planning is 10 percent of the total warehouse area for office, five percent of the total floor area for storage area, and five percent of the total floor area for security. In buildings of 100,000 square feet or more, the use of mezzanine office is preferred for operational and security purposes.

Freight Cargo Facility Considerations

Freight cargo carriers are similar to integrated cargo carriers because cargo is carried on all-freighter aircraft; however, freight cargo carriers do not provide full-service logistics operations and are reliant upon ground handlers to process the cargo and potentially additional third-party companies responsible for the ground transportation. Freight cargo facilities include an apron for aircraft parking, the cargo building, and landside area. In general, freight cargo facilities are not as efficient, in terms of space utilization or cargo processing, when compared to integrated cargo carrier facilities.

Belly Cargo Facility Considerations

Air cargo carried on passenger aircraft is also known as belly cargo. Belly cargo facilities typically include a truck apron and docks for the loading/unloading of cargo, a warehouse and office area for the processing, break-down/buildup, inspection, and storage of cargo, and a container staging area. Belly cargo is usually tugged from the passenger terminal area where the aircraft is parked. These facilities therefore required access to the airside and efficient connectivity to the terminal.

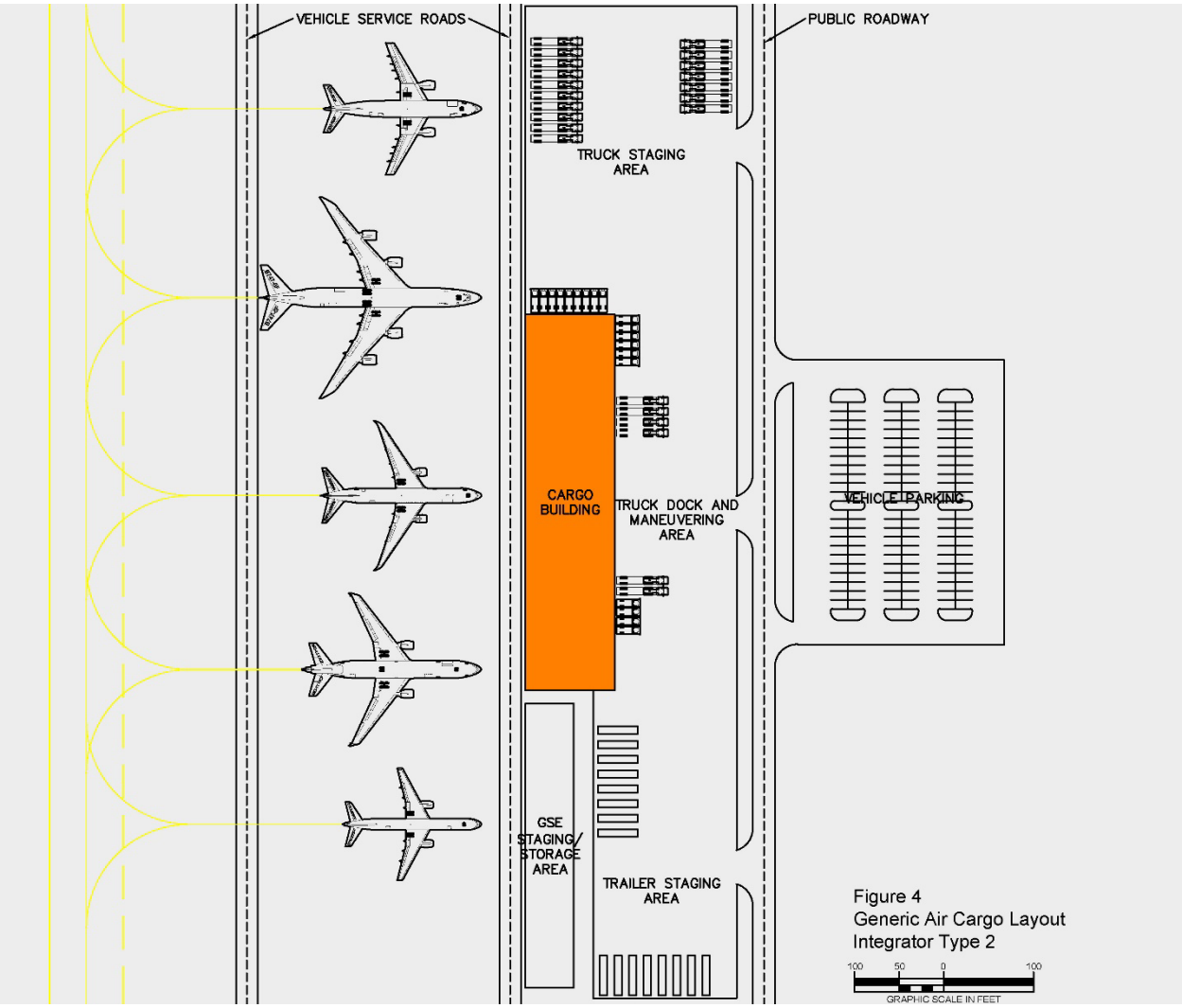


Figure 4
Generic Air Cargo Layout
Integrator Type 2

3.4 Air Cargo Buildings

There is considerable variability in the utilization rates in facilities depending on a number of factors that include, amount and type of cargo facilities needed at an airport, size of the airport, whether the airport serves as a hub, the type of cargo to be moved, the characteristics of the cargo operators, the average length of dwell time, and various other factors. Utilization rates are measured by tonnage per square footage. Because of the frequency of flights and volumes of cargo, it is not surprising that utilization rates at smaller airports are often less than at larger airports. The average utilization rate for small airports is approximately 0.5 tons to 1.0 tons per square foot while the utilization rate at large airports is usually in excess of 1.0 tons per square foot. Facility planning for any airport needs to consider both the utilization rates at comparable airports and input from the carriers before determining the rate for long-term facility requirements. For general planning purposes, it is recommended that a utilization rate of one ton per square foot be used as a macro benchmark, subject to the specific requirements or circumstances of an airport. However, when dealing with an individual carrier, and particularly an integrator, you should develop a careful estimate of their actual physical requirements. For individual carriers, that utilization rate could widely vary. For example, a carrier that does more sortation on the ramp or off-airport could result in a utilization rate that is higher than 1 ton per square foot. Throughput will also be much greater for a facility

with an automated cargo handling system. Also note that international cargo will typically have a lower throughput than domestic freight because of the higher clearance requirements to release the cargo.

3.5 Aircraft Parking Positions

Air cargo ramps vary considerably more in relation to cargo volumes than buildings, and, in part, are a function of available land and the airport layout. Due to the variability among airports, the best approach to determining aircraft ramp requirements appears to be an average-day/peak-hour methodology. This approach to assessing capacity involves examination of the ramp chart for the most recent periods. When specific gates/parking positions are not occupied, there may be time slots available to accommodate additional aircraft, depending on the ramp use strategy at the airport. Typical turnaround times at airports that do not serve as cargo hubs for cargo aircraft (i.e., Memphis, Louisville) are longer than for passenger aircraft, which results in a greater requirement for parking positions.

The forecast of air cargo tonnage can sometimes serve as a basis for the projection of all-cargo hardstand position requirements. The projection uses a ratio of tonnage to departures, recognizing changes in average aircraft size and continued use of an airport's parking ramp use strategy. This ratio is assumed to increase at the same rate as the ratio between a macro forecast of revenue ton-miles and airfreight aircraft size. Both Boeing and Airbus provide these macro forecasts. Hardstand positions then are projected to increase at the same rate as the ratio of tonnage to departures.

When developing a projection of required hardstand positions, it is important to make allowances for and consider variables such as:

- Aircraft mix
- Exclusive versus common use hardstand
- Time buffers between aircraft departures and arrivals
- Use of hardstand positions by non-cargo aircraft
- Peak month activity

Use of this methodology will result in more modest growth in all-cargo hardstand positions as compared to the projected growth of building area, because it recognizes projected increases in average aircraft size and air carrier scheduling practices. Carriers tend to deploy larger aircraft into a market instead of adding aircraft. This enables carriers to link several markets together with one aircraft. Carriers will then put a dedicated aircraft into a market as that market grows. From the airport's perspective, there may be no additional apron requirement.

The trend for all cargo carriers is towards larger aircraft, not more aircraft.

Aircraft ramp space can vary based on the type of aircraft being operated. For purposes of air cargo, most aircraft fall into one of four categories determined by the FAA's Airport Reference Code ("ARC"). Code C aircraft, a Boeing 737, requires 2,300 square yards of ramp space. Code D aircraft, a Boeing 767 or Airbus A300, requires 3,900 square yards of ramp space. Code E aircraft, a Boeing 747, requires 6,500 square yards of ramp space. The Boeing 747- 8F is a Code F aircraft and requires 8,650 square yards of ramp. These criteria should be considered when determining future aircraft ramp space.

Despite the industry trend towards large aircraft, aircraft operators continue to rely on smaller aircraft for regional feeder transport operation. This regional transport role is commonly filled by turboprop aircraft such as the Cessna Caravan, Cessna SkyCourier, and ATR. There is also a growing interest in use of narrow-

body jet aircraft (e.g., Boeing 737) used as freighter aircraft to supplement a carrier's fleet of wide-body jets. Where practicable, airports should plan more apron space for these smaller cargo aircraft.

Currently, there are a number of information sources, which can assist the forecaster in benchmarking aircraft parking positions. The Official Airline Guide (OAG) can provide critical macro information on cargo operations at a particular location.

A forecast of air cargo tonnage can form the basis of a forecast for all-cargo hardstand position requirements at almost any airport. The methodology involves deriving all-cargo aircraft operations from the forecast of air cargo tonnage and then deriving hardstand requirements from all-cargo aircraft operations. It is however, essential to look at the contemplated size of the aircraft, and projected turn-times. It is also important to understand any potential issues with backhaul on a particular route.

Airbus Industries provides forecasts of revenue ton-kilometers and freighter aircraft. According to these forecasts, the ratio of revenue ton kilometers per all-cargo aircraft will continue to increase. The forecast takes into account both changes in average aircraft size and shifts in cargo tonnage between all-cargo aircraft and mixed-use aircraft. It can be assumed that the ratio of tonnage per all-cargo aircraft departures would increase at the same rate as the ratio of revenue ton kilometers per all-cargo aircraft. All-cargo aircraft departures can then be derived from the forecast of air cargo tonnage. It should also be noted that Airbus and Boeing are in business to sell aircraft.

Changes in air carrier schedules may alter the relationship between all-cargo aircraft operations and hardstand position requirements in the future. These schedule changes would be a function of individual airline marketing and routing decisions. Nevertheless, it cannot be assumed that all-cargo hardstand position requirements will increase at the same rate as all-cargo aircraft operations. For general purposes, a very rough rule of thumb for estimating apron requirements assumes 4.5 square feet of apron for every one square foot of available cargo building area. This must also consider the fleet mix of the potential tenants and users. This number includes aircraft marshalling areas and aircraft parking positions.

3.6 Landside Effectiveness

The biggest change in the air cargo industry over the past several years has been a modal shift to trucking. As such, it is important to have a set of planning parameters to measure landside effectiveness. These benchmark measures for truck docks, truck maneuvering and staging areas, employee parking, customer parking, and access roadway capacity are provided below.

Truck Docks, Maneuvering and Staging Areas

Integrated carriers are expanding their ground networks, which entails the construction of additional surface hub or cross-dock facilities at or near strategic airport locations throughout the U.S. Many cargo carriers in older facilities have indicated a severe shortage of truck docking facilities. Previous planning parameters indicated a requirement of 0.3 truck dock spaces per 1,000 square feet of cargo building area. Current development of cargo buildings include doubling the number of truck dock spaces due to the enhanced truck utilization mentioned earlier, and use a planning factor of 0.6 spaces per 1,000 square feet of building. This factor is an estimate and is not a substitute for obtaining more systematic data. It is imperative that the individual carrier operations are considered during this benchmarking exercise. The variability of truck operations among carriers is extensive.

The landside truck fleet ranges from the standard 53-foot-long freight trailer and tractor to smaller parcel delivery vehicles. The landside area of air cargo buildings (and truck docks) should have the flexibility to accommodate a range of landside vehicles to support flexibility for the cargo operator. This may include

provisions for accommodating the different cargo deck height for the range of vehicles. The high utilization of smaller parcel delivery vehicles can often result in faster turnover of each truck dock resulting from faster load/unload times since each vehicle has a lower volume capacity compared to the standard freight trailer. Larger vehicle staging areas and/or more truck docks may be required to support this type of operation.

In addition to more trucks operating at airports in the future, which will likely require more truck docks, trucks will also be getting larger. Where possible, it is recommended that future planning provide at least 150 feet from the face of the cargo building to the access roadway for truck maneuvering areas and incorporate more truck docks in the facility design. Also, the ability to stage trucks near the facility has become a necessity. As a result, additional consideration needs to be given to providing adequate truck staging and queuing areas in future designs.

Employee Parking

Greater use of automation and mechanization within cargo buildings will have a dampening effect on employee growth at airports. Typically, a minimum of two to eight employee parking spaces should be provided for every 1,000 square feet of warehouse and two to eight spaces for 1,000 square feet of office even if local building codes allow less. Where the development area is limited, alternative locations for employee parking will have to be considered. This includes remote lots that utilize shuttle services and rooftop parking. Typically plan on allocating 300sf per parking position. If space permits, these positions should be separated from the truck apron and maneuvering areas.

Customer Parking

On-airport cargo buildings are not typically high customer activity areas. Existing planning parameters indicate a requirement of 1 space per 10,000 square feet of cargo building. If the facility is broken into numerous small tenants, a higher ratio is prudent. These positions should be located away from active truck bays.

Access Roadway Flow and Capacity

The capacity of airport roadways is based on a Level of Service (LOS) methodology found in the *Highway Capacity Manual*. Airport roadways are typically planned to accommodate LOS C. This level of service, a unit of measure of operations for a highway/street, represents a zone of stable flow in which speed and maneuverability are closely controlled by higher volume. Under LOS C, most drivers are restricted in their freedom to select their own speed, change lanes or pass. However, a relatively satisfactory operating speed along a particular section can still be maintained.

The projected volume of truck, employee, and customer traffic is based on a planning ratio of 0.95 peak hour vehicles per 1,000 square feet of cargo building space. This represents the volume in one direction. Most airports with dedicated cargo access roadways should have a minimum of two lanes, one in each direction, and provide the capability to expand to four lanes.

As with any rule-of-thumb methodology, benchmarking should be utilized cautiously and with an understanding it is not a precise measurement of any single situation. Benchmarking is most effective in preliminary planning and determining a range of reasonableness. It is not a substitute for detailed planning or examining factors that generate results outside a range of reasonableness.

4. OPERATIONAL CONSIDERATIONS

Given the rapid changes common to the air cargo industry, airports are now being forced to take both an immediate and more long-term view of air cargo operational issues. Some of these operational issues include the capabilities of air cargo facilities to meet current and future needs, the need for more air cargo infrastructure investment support for users, the provision of new and enhanced cargo processing services and the role of the airport in regional intermodal/multimodal planning and investment. While airports will be affected in varying ways and degrees by current and future changes to the air cargo industry, it is safe to conclude that the magnitude of future changes necessitates more attention on air cargo operational issues.

One of the best ways to emphasize the need to focus on the future is to look at the past decade and consider the significant changes that have had a large impact on airport air cargo operations. Two of the most significant are the rapid growth in the cargo-carrying capacity of airline fleets with the corresponding increase in the number of larger, wide-bodied aircraft in cargo operations and the continuing shift to trucking of domestic air cargo activity.

Express carriers now account for a majority of domestic air cargo activity and will require more specialized airport facilities to match their highly time dependent processing operations.

The introduction of wide-bodied aircraft in significant numbers has driven the need for larger and more specialized airport facilities, infrastructure, and services to match the carrying capacity of these aircraft. The air cargo operation for many carriers has matured to become an independent profit center and has gained greater attention within these companies when investment and resource allocation decisions are considered. The express carriers, to an even greater extent, require more specialized airport facilities and infrastructure support to match the highly time-dependent package processing capability of their operations. These two changes have significantly influenced the investment decisions made on airports in responding to a growing air cargo industry.

Given what has occurred in the past decade, what trends are emerging that will again drive changes in the way airports must provide for the operating needs of the air cargo industry?

There is almost universal agreement that the demand for worldwide cargo movements will continue to grow given the expansion of the global economy and the maturation of emerging global trading partners. Just-In-Time inventory management, continual marketing of new products and services, competitively priced service in relation to other transportation modes and the elevation of the logistics management function in corporate structures will be important. Continual growth in air cargo movements using passenger fleets with larger belly capacity and through a logistics system that emphasizes higher processing speed, greater efficiency, enhanced customer service and a continual effort to reduce costs, should again drive significant changes in airport cargo operations.

Some of the key operational issues that airports should consider and evaluate include:

More Specialized Air Cargo Facilities

There will be a need for greater specialization in airport cargo facilities. This includes specialization that meets the individual operating needs of the carriers, cargo tenants, airport and the cargo industry will be required. Efficiencies to keep costs down while accelerating cargo processing and improving customer service will be the key. This may include the development of more sophisticated and automated facilities. Some are becoming multi-story at the larger cargo gateway airports, such as the Japan Airlines (JAL) facility at John F. Kennedy Airport (JFK), designed to serve the needs of multiple tenants in the same facility. The

airport gains in providing facilities and supporting infrastructure that conserves land, capital, and building space; increases handling efficiencies; and lowers unit costs. The carriers and other cargo tenants benefit by having the use of a highly efficient facility that processes cargo rapidly and lowers costs due to shared facility expenses and use of the facility only as required. At some point in the future, continuing cargo growth will force the vertical development of facilities at space constrained airports.

Many air cargo operators and ground handlers have some desire to keep items cold or frozen as a means of gaining market share on specialized air shipments. This operation is often dependent on the capability of a cargo facility to store perishables in-building or within stand-alone facilities. These are specialized facilities designed to handle goods that require refrigeration such as flowers, fruits, vegetables, seafood, and pharmaceutical products. These facilities are often refrigerated or contain large coolers capable of maintaining the desired temperature. The goods are transported within special unit load devices (ULD) capable of maintaining cold temperatures during flight.

Collocated Air Cargo and Fulfillment Centers

In recent years, the air cargo industry has experienced a growing trend in collocating air cargo facilities with nearby fulfillment centers or on-airport when space permits. By nature, these types of facilities look and operate differently but some operators have embraced this concept to suit their operation.

The most significant difference between these two types of facilities is their function. Typically, air cargo facilities are designed to process cargo efficiently with limited expectation that goods will remain within the building for any significant amount of time. This operational model differs from that of a fulfillment center which tends to function more like a storage warehouse where goods are stored onsite until such time the goods are ready for distribution. By function, fulfillment centers tend to be quite large facilities which can pose challenges in accommodating these facilities on airport.

Demand for on-airport fulfillment centers is driven by the growth of the e-commerce industry. E-commerce is a growing market segment that increases the demand for air cargo, particularly integrated carriers. McKinsey & Company, a management consulting organization, estimate that e-commerce will account for 20% of total air cargo volumes by 2022. This presents several challenges for the air cargo industry and on-airport facilities – namely, flexibility and efficiency required to transport goods to consumers within a guaranteed delivery window that is typically 48-hours (or shorter). One solution is to create on-airport fulfillment centers where goods can be stored until such time it needs to be delivered regionally by ground delivery vehicle or shipped domestically (or internationally) via aircraft in response to a consumer purchase.

Based on a limited number of known new collocated air cargo and fulfillment center facilities, it is fair to assume that collocated fulfillment centers could be up to 300% larger than a traditional air cargo building. It may be possible to accommodate the fulfillment center space in a multilevel facility (e.g., above the air cargo warehouse) which could result in the same or similar building footprint as a traditional cargo building. Early coordination with the cargo/fulfillment center tenant should occur to understand how the fulfillment center can be accommodated on-airport in the most efficient manner.

On-airport fulfillment centers usually results in significantly more employees than needed to operate a standalone air cargo facility. Therefore, collocated fulfillment centers usually require larger employee parking areas. A larger work force may unduly impact the surface transportation network and adjacent land uses. Therefore, planners and airport owners should consider the possibility that implementation of a fulfillment center may require additional environmental analysis and/or traffic analysis, depending on several factors including peaking characteristics.

Air Cargo Infrastructure Support

New air cargo infrastructure that includes aircraft parking ramp, truck operating and staging area, container and ground service equipment, warehousing space, and tenant/customer automobile parking will in many cases require more common use among airport tenants to ensure optimization. Greater numbers of larger capacity aircraft, operating in narrow scheduling windows at both domestic and international airports, plus separate and distinct peaking of the growing express carrier operations absorb significant amounts of capital and property to satisfy infrastructure support needs.

Enhanced Processing and Federal Inspection Services

Carriers and air cargo facility tenants in the immediate future will require enhanced processing and customer services to match the speed and efficiency of their new cargo handling operations. This may include centralized and less paper-intensive federal inspection services to clear cargo as rapidly as possible as well as responsive fueling, deicing, and ground service handling that can accommodate the scheduling requirements of the carriers as they attempt to increase the utilization of fleets that result in aircraft spending less time on the ground.

Regional Intermodal/Multimodal Planning and Investment

The need to make the entire air cargo handling operation as efficient and cost effective as possible may draw airport management into participating more in regional intermodal/multimodal planning and investment decision-making. Cargo distribution practices are currently maturing from separate and distinct multimodal functions into integrated seamless logistics pipelines. Airport management can no longer view the investment impact and operating decisions solely within the confines of the airport boundary. The speed, efficiency, and costs of the on-airport portion of this logistics pipeline have a direct influence on the regional cargo distribution system.

Logistics Parks are an important consideration for many airports. Airports will need to view the air/land/sea interface of the cargo operation in a much broader regional service context with an active sharing of information between regional public and private agencies and organizations concerning service and investment opportunities. One of the looming prospects brought on by the continual deregulation of the trucking industry will be the development and location of intermodal terminals. These will serve as a regional sorting and distribution centers for cargo coming from multiple locations including the airport. The location, operation and access to the airport of such intermodal terminals will be of keen interest to airport management.

The escalating change occurring within the industry exemplifies the need to pursue flexible design and construction of cargo facilities and infrastructure. The ability to reconfigure facilities without massive redevelopment will save substantial capital investment as technology and operating procedures evolve. This should be high on the list of priorities for airports.

5. LAYOUT PLANNING ISSUES

The dynamics of the air cargo industry, a function of industry growth and changing technology, force the cargo facility planner to be even more innovative. Planning and design of air cargo infrastructure using current conditions as a guide assumes a static environment that does not exist. Change is the current condition and it must be factored into the process at every step.

The traditional single-level warehouses with truck docks on one side and aircraft parking apron on the opposite side can no longer be assumed as the standard. This analysis defines a cargo facility as

encompassing a warehouse/office structure, aircraft parking apron, truck maneuvering/docking area and employee/customer vehicle parking. The industry is changing geometrically and carriers are re-evaluating operational methods daily. A great deal of the cargo infrastructure planning and design over the past ten years has failed to recognize change. Consider how many cargo facilities developed over this time span fail to accommodate next-generation cargo aircraft. The simple issue of 5-10 more feet of tail height can make a facility obsolete or, at a minimum, much less efficient in the not-too-distant future due to setback requirements. This is just one example among many where planning and design seems to be done in a static environment.

The "traditional" single-level warehouses with truck docks on one side and aircraft parking apron on the opposite side ignore the evolution of the past decade and this supports the need to develop facilities that are flexible.

The purpose of this section is to identify recent trends in the air cargo industry that have had an impact on facility development, identify what those impacts are and recommend changes to the standards for developing cargo facilities. For example, two evolving industry trends is multi-level air cargo buildings and buildings with landside truck docks on multiple building faces. Multi-level buildings provide flexibility for use by a single tenant or can support use by multiple tenants. Similarly, planning and designing facilities that provides truck docks on multiple faces provides the tenant(s) more flexibility in how the facility can be operated. Some of the changes may result in the demand for additional land, which is a scarce commodity at many airports. Therefore, this section will also describe techniques for better utilization of existing airport land.

As a first step to determining the activities that need to be accommodated, the airport must identify the potential tenants or user groups as well as their market segment and product. The target market may include passenger airlines (belly cargo), integrated carriers (small packages, overnight and just-in-time service), all-cargo carriers (medium to heavy weight goods, time sensitive, specialty items), ground handler (air-to-air, air-truck, air-sea interface), custom brokers (documentation service for the above) and specialized handlers (perishable products, livestock and quarantine items, high security/valuable goods).

Determining the market for air cargo at a particular airport should be an ongoing exercise. A market analysis is a picture of demand at one particular point in time plus an informed estimate of the future trend. It is important to remember that a market analysis in a dynamic industry is almost out of date when it is completed. This is not to imply a market analysis is meaningless. Rather, the market is changing again as the final draft is being prepared. Therefore, the analysis provides a starting point.

Once a starting point is established, it will be necessary to update that information on a regular basis. The updating process will significantly reduce the probability an infrastructure shortage will occur at the airport. This process involves, at a minimum, regular surveys of cargo carriers currently on the airport and those not presently using the airport. This survey process is conducted at the local, regional and national levels.

The survey is focused on the planning and operational elements of a carrier's organization. In most cases, the facility and property resources of a carrier are usually involved once a need has already been identified by the planning and operational functions.

The objective of the ongoing survey process, which can be accomplished by competent airport staff, is to ensure that not only are current carrier needs being satisfied but that future needs are addressed before those needs become problems. Regular quarterly contact with key planning and operational personnel at the local, regional and national levels will accomplish this objective and produce numerous other benefits.

Regular contact with the key planning and operational personnel of the carriers, at all levels is essential to determine the appropriate facilities.

Once the target markets, potential user groups, and level and type of infrastructure demand are identified, the next step in the cargo facility development process is to determine the appropriate facility or facilities. The airport must undertake a thorough analysis of existing and proposed infrastructure to support short-term and long-term master plans for the development.

The purpose of this section is to provide an overview of the cargo facility development process and describe ways to ensure the effective use of airport land for cargo facilities. The development process broadly covers two areas: land use issues and facilities issues. Both of these components can be broken down further into numerous dependent subsets.

5.1 Land Use Issues

One of the most significant responsibilities of an airport operator is to ensure the effective and productive use of all airport property. In managing airport land, airport management must both optimize-ensure that the highest and best use of airport property is achieved through proper placement of facilities--and maximize--develop facilities in a way that most efficiently uses the available property. This is very important with the development of cargo facilities since, unlike passenger demand, the shipper, ground handler, and airlines have a great deal of influence over the flow of cargo through an airport. A well-designed cargo facility promotes the efficient flow of goods through an airport and gives an airport an advantage over competitor airports.

Development Area

The air cargo development areas should be located in airport sectors of compatible uses (i.e., industrial zones) such as aircraft and Ground Support Equipment (GSE) maintenance facilities, yet have reasonably good access to the passenger terminals particularly when there is an emphasis on belly cargo. The air cargo zone and the surrounding compatible zones should each have sufficient area to permit long-term growth without unduly restricting the growth of the neighboring land use. The positioning of the development area should also take into consideration current and future airfield capacity requirements, allowing sufficient room to construct new runways, taxiways and ramp areas without encroaching on the cargo area. Short-term, mid-term and long-term infrastructure requirements must be taken into account in order to allow for an orderly and timely expansion of the zone.

All-cargo carriers, including the integrated carriers, do not have to be located adjacent to the terminal building. More important to the all-cargo carriers is good access to the regional highway system. Often the integrated carriers will conduct their sort operation at the airport. This means that many of their on-road delivery vans and trucks enter and exit the airport several times a day, making direct access very important. The following are some general site considerations for all-cargo carriers.

- The site should have easy access to the regional highway system. Where possible, the site should have a separate access route from the terminal access system, including a separate highway interchange.

- To minimize aircraft taxi distances, the site should have direct airfield access to a primary runway. The airport is part of the team to help the carrier achieve time definite delivery. Any delays, regardless of magnitude, should be considered.

- The site should not have other aviation users such as general aviation located on it. Mixing general aviation and cargo activity on a ramp creates a potential for operational and safety violations and may be further constrained by future security guidelines

Carriers will generate increased volumes of on-road delivery vehicles and trucks… segregate this traffic from the passenger roadway access system if at all possible.

Since many of the integrated carriers interline (use passenger carrier lift capacity), and the freight forwarder will use both the passenger and all-cargo carriers, the ideal site is one that allows all service segments to be located together. This means identifying a site that balances the passenger carriers' desire to be located as close as possible to terminal and the all-cargo carriers' desire to be located adjacent to the regional highway system. In addition, having cargo operations located in one area will help to reduce truck traffic on the airport access system. A reduction in truck movements can have a substantial impact on emissions and ground traffic levels. The site should not be so close to the terminal that it precludes future terminal expansion options.

Site Constraints

Site constraints may include topography, line of sight, poor or unusual soil conditions, environmental contamination, proximity to land uses outside the airport which are sensitive to noise generated by the facilities and a general lack of regional infrastructure such as water supply or sewage treatment facilities. It is also possible for older, established airports to become completely surrounded by a community that is resistant to expansion constraining the airport (physically or politically) to a very limited land inventory with which to develop new facilities. In these instances, land use efficiency is a paramount consideration.

Several construction issues impact the viability of a proposed site. The site should be relatively flat and well-drained. Earthwork should be balanced on site or balanced with earthwork requirements of other airport projects. Having to import soil for a site is costly and could make a potential project cost -prohibitive. Utilities should be readily available to the site. Permitting requirements should be identified well before the site selection process.

Environmental mitigation is often costly and difficult to achieve; water quality and wetlands are common concerns. Both require extensive permitting before implementation. Whenever possible, environmentally "*clean*" sites should be selected. Environmental clearances are often obtained either as part of or immediately after a master plan process. Adherence to an airport master plan may reduce potential environmental impacts.

Facility Location

The nature of the business will have a significant bearing on the relative locations of particular facilities. Integrated and all cargo carriers may be located in remote areas provided there is sufficient taxiway and ramp facilities to service their dedicated aircraft. Air cargo facilities require good access to the regional road network if an air-truck and/or sea-air interchange is to be a target market.

The service segment has a significant bearing on facility location but the key is to keep the facilities close to the aircraft.

The guiding principle for locating cargo facilities is very simple: keep the cargo buildings very close to the aircraft. For the passenger airlines, this means locating their facilities near the terminal building. Airline cargo facilities require efficient access to the passenger terminal for the purpose of handling belly cargo. Tug distances have cost and other competitive implications for the carriers. The shorter the tug distance,

the later in the day a carrier can accept an outbound shipment. This competitive situation exists not only between airlines at the same airport, but also between airlines at different airports. For example, shippers close to one airport have been known to use a more remote airport because it has a later cargo acceptance time. Ideally, tug access roadways should not cross any active taxiways.

Compatibility of Uses and Potential Conflict

The airport must assess the complete spectrum of potential users in order to establish a development plan that would minimize conflicts associated with incompatible operating characteristics.

- Airline tenants that predominantly handle belly cargo would be better suited to areas closest to the passenger terminal in order to improve handling efficiencies of their consignments.

- Freight forwarders are generally closely associated with the airline carriers to take advantage of competitive rates offered by carriers having surplus cargo lift in their fleet. They should however, have a secondary priority to any and all carriers.

- If possible, postal operations should be proximate to passenger terminals but away from air cargo aprons, except where mail is handled by an all-cargo or integrated carrier.

- Integrated and all-cargo carriers are more independent in their operational characteristics by virtue of their fleets of dedicated aircraft. However, these aircraft require specialized infrastructure such as ramps and taxiways to support their routine activities.

- Animal care facilities may be affected by the noise generated by surrounding uses or alternatively, the facility may generate odors that are offensive to other airport users, local communities and contiguous cargo tenants.

- Custom brokers may provide services for all of the above and, therefore, should be located at a central location.

- For international airports, access to customs and the provision of customs facilities are important components that should be readily available to all users.

From the landside circulation perspective, it is important to create a clear distinction between vehicles destined for the passenger terminal and the vans, tractor-trailers and generally heavier vehicles servicing the air cargo complex.

In regard to airside circulation, many different business segments may require access to airside service roads. Depending on the type of tenant, the requirement for airside apron (marshalling areas) will vary. Ground handlers, mail facilities, and airline tenants (belly freight) are generally compatible and typically do not require airside apron space in a facility. However, the aircraft ramp requirement and intense use of ground service equipment by integrated and all-cargo operators may create conflicts with the traditional cargo handlers.

As stated previously, airline tenants and ground handler must accommodate a variety of vehicles in their daily routines. Some tenants have a greater interface with the general public as customers and will require access and parking that are clearly differentiated from the everyday commercial traffic, as well as the employee parking facilities.

5.2 Space Optimization Solutions

Efficient facility layouts tend to maximize the use of land within the given leasehold area. These are not only considerations for a land-constrained airport but for any airport striving to achieve both efficiency and effectiveness. This section provides three basic solutions for this optimizing a given area of land to support an efficient air cargo operation.

Multi-level Cargo Buildings

Multi-level cargo buildings are ideal for achieving greater land use efficiency. One of the largest and most technologically advanced cargo buildings in the world is the HACTL facility at Hong Kong International Airport. HACTL's facility is five-stories with 3.5 million square feet of floor space and 313 truck docks. Its design capacity is 3.5 million metric tons of air cargo. The building footprint of the HACTL facility is 19 acres and the total land area footprint is 42 acres.

By comparison, the HACTL facility is capable of processing approximately 95% of the 2018 total cargo volume at Memphis International Airport (the second busiest cargo airport in the world as measured by cargo volume).

While a facility of this magnitude may not be viable for implementation at a North American airport based on height constraints and/or cost, the concept still holds true. Great land efficiency and space optimization can be achieved by constructing vertical buildings.

Multi-Tenant, Open Floorplan Facilities (Common Use Facilities)

Multi-tenant facilities with open floorplans can be used to optimize land efficiency for land constrained airports. Cargo carriers are increasingly employing third-party handlers to process cargo and operate cargo facilities on their behalf. The air cargo industry is also trending towards large, multi-level facilities that are more space efficient than traditional single-level facilities. Tenants and cargo carriers also benefit because the large multi-tenant facilities support economies of scale and consolidation benefits at an earlier point in time.

These facilities can be configured as open space without walls where cargo is processed in an efficient manner. These facilities can usually also be configured with demountable walls or partitions to easily adjust the internal building layout and separate tenants, if desired.

These facilities are an effective option to optimize cargo processing capacity for operations that occur during differing peaks. For example, if Cargo Carrier A has peak processing times during the morning hours and Cargo Carrier B has peak processing times during the afternoon hours, this type of facility can help reduce building redundancy and maximize utilization by allowing cargo to be processed throughout the day.

These types of facilities are becoming more common at all airports: the base tenant is a handling company and covers its costs through the imposition of handling fees.in the United States, like JFK and LAX.

Facility Orientation

Cargo facilities can either be arranged in the traditional configuration, where the buildings and apron area are positioned parallel to the runway/taxiway system, or arranged such that buildings and apron area are positioned perpendicular to the runway/taxiway system, or some combination of the two methods. In

general, a perpendicular orientation will result in a configuration that maximizes the building and apron area for a given leasehold area along the airfield frontage.

As an example, an airport has an approximately 30-acre site available for cargo facility development. Historically, the airport has developed cargo facilities in the traditional runway parallel configuration. As shown in Figure 5, if the available site is developed in the same manner, the site could accommodate 180,000 square feet of cargo building space and sufficient apron area to park seven B757 aircraft. Also shown in Figure 5, if the buildings were oriented perpendicular to the runway/taxiway system, the same site would accommodate an additional 30,000 square feet of building space and three additional B757 parking spaces. Ramp management and airside operations are more challenging but where land is scarce this becomes a solid approach.

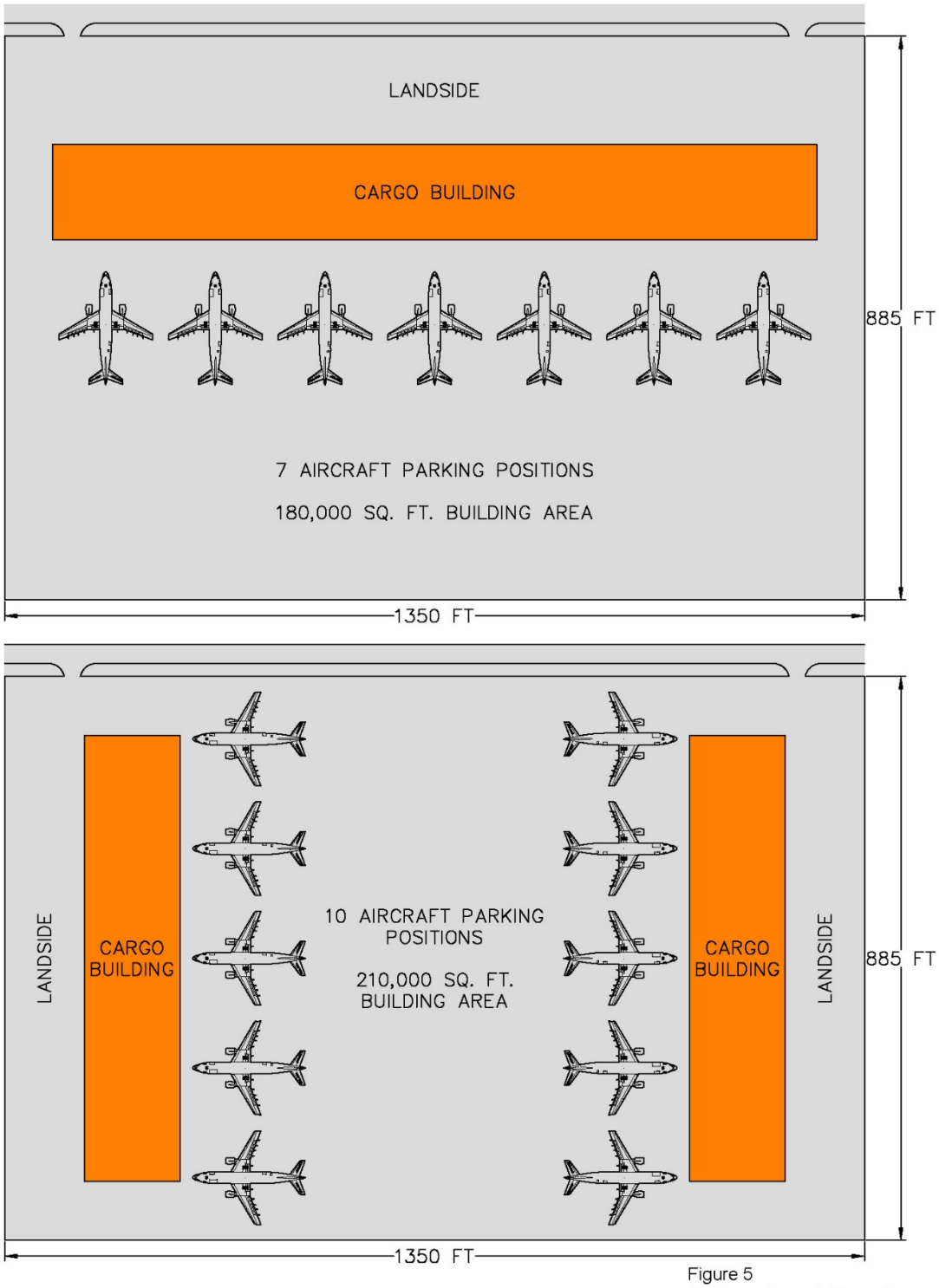


Figure 5
Air Cargo Layout Alternatives

The actual design phase is probably the simplest of the entire development process. By the time the design phase is reached, the airport should have a firm grasp of the potential users and uses, the current and future demand estimates, the available resources, and development constraints. Therefore, the design phase is a creative process of harnessing ideas to a design. This does not imply the design phase is unimportant or does not require a high level of skill. Instead, it recognizes the time-consuming and labor-intensive effort needed to gather the correct information before design can be considered.

An evolving strategy is the common or shared use cargo facility. Although the concept is not new, it has gained popularity due to the significant cost savings to carriers. The concept recognizes that a great deal of warehouse space within a cargo facility is utilized during limited periods throughout the day and evening. The remainder of the time the space is idle. Specifically, it is the space used to build or breakdown pallets/containers and where cargo moves through the facility versus actual storage areas.

If this space is used by multiple carriers with proper scheduling, it increases the productivity of the space and reduces costs for all concerned. Staff, scales, freight equipment, loading docks, and a host of other assets can be kept productive for more hours of each day. Individual carriers can reduce total space dedicated to them through this arrangement.

One of the driving factors in the building design is the developer's desire to achieve economies of scale through the issue of repetitive modules. The tendency for tenant turnover, as well as tenant operational characteristics, requires buildings to be flexible in terms of configuration. At one time, the facilities acted more as warehouses than clearing depots and there was a strong desire by the tenants to store shipments in pallet racks. In these instances, a reasonably high, clear ceiling height was desired-on the order to 20-30 feet.

Buildings recently designed for use by all-cargo or integrated carriers have become highly specialized in nature and configuration. They are usually larger single-purpose structures having access from numerous sides. These buildings may be 100-300 feet deep (depending on sortation versus throughput focus) and 500-600 feet long in the case of large hub locations. In addition, facilities may need to be designed tall enough to take into account any requirement for multi-tiered sorting devices.

Some all-cargo buildings are equipped with nose docking wings with sophisticated container handling conveyors, such that the aircraft can be parked with the cargo door adjacent to the dock, thus allowing shipments to be efficiently loaded and unloaded directly from the building to the aircraft. This is highly specialized and has only a select tenant base.

An important planning and design consideration of all-cargo and integrated carrier buildings is the relationship between the buildings and adjacent aircraft ramp and associated taxiways. The facility's configuration and orientation will often be driven by this relationship. The cost of constructing airside aprons, aircraft ramp and taxiways usually far exceeds the cost of constructing landside facilities such as access roads and parking lots. Consequently, the final planning and design solution will often depend on existing or proposed airside conditions.

5.3 Design Consideration

The purpose of this section is to identify existing planning parameters, identify trends that will impact these planning parameters, and recommend changes to these parameters to meet future cargo facility needs at airports.

Building Dimensions and Configuration

There are no hard and fast rules regarding the dimensions and configurations of air cargo buildings. Over the past 40 years, general approaches have been adopted depending on the specific user group. However, in the final analysis, the configuration of the building will depend on the operational characteristics of the user. For instance, multi-tenant airline and ground handler buildings have tended to be long, narrow structures having one of the long dimensions facing an airside apron or aircraft ramp. These buildings are in the range of 100-150 feet deep and may be up to 1,200 feet long, depending on the general airport configuration and the availability of land. There are no "rules" regarding configuration of air cargo buildings.

Aircraft Handstand Positions

It is important to realize early in the master-planning process the importance of ramp frontage. This may be compared to waterfront real estate. It is a limited commodity and must be used very efficiently. Hence, those buildings which are dedicated to all-cargo, integrated carriers or any other operator with dedicated fleets of aircraft should take precedence to other operators when frontage is scarce. These users will want to maximize their frontage onto ramp areas. Conversely, airline, cargo operations, and ground handlers processing belly freight need very little ramp frontage but rely heavily on efficient airside access roads to the terminal.

Single-Access Taxilane

It is important to caution against planning air cargo facilities where two or more airlines have several aircraft parking positions accessed via a single access taxilane. This condition may result in airfield congestion. Cargo operators, especially integrated cargo carriers, want to avoid this condition. Integrated carriers tend to express greater concern from this condition since they have similar peaking characteristics which increases the likelihood of airfield congestion.

The recommended rule of thumb is that eight aircraft can operate without undue delay or airfield congestion. Multiple taxilane access points or ramp control are generally recommended when the aircraft parking position count exceeds 10.

Equipment Staging Areas

There is often debate on the amount of equipment staging area that should be provided adjacent to the building. Once again, the requirement is highly dependent on the operational characteristics of the users. However, there is the tendency for "*Murphy's Law*" to prevail, whereby tenants will occupy every square foot that is allocated to them and in the end, need more. There is a basic operational problem with airside equipment staging zones in that they tend to become collection areas for obsolete or broken-down equipment, as well as shipping debris that may create FOD. This becomes a supervision problem. Nevertheless, it is a design consideration.

"Murphy's Law" will prevail and tenants will use all allocated space and still need more.

For multi-tenant buildings, marshaling areas are often extensions of the sublease by virtue of license agreements that allow tenants to occupy aprons adjacent to their premises. The tenant gains access to the AOA via an airside service (tug) road, which is contiguous with the marshalling areas. Since many operators use the marshalling areas for breaking down and building up air shipments, it is important to consider the drainage characteristics of the area so as to prevent hazardous substances from entering the natural drainage system as a result of accidental spills within the marshalling zone.

Airside Vehicular Circulation -Tug Roads

The airside vehicular circulation network must be planned in consideration of the phasing of the air cargo complex as well as the proposed extension and additions to airfield components such as runways and taxiways. Belly cargo handlers are most affected by the efficiency of tug roads. Depending on the general airport master plan and airfield configuration, there is a potential for numerous conflicts between aircraft and GSE circulation routes. Therefore, it is important to identify these potential conflicts and address them early in the master planning process.

Planners should estimate the current and future traffic volumes, as well as the types of GSE that will be using the airside circulation routes to ensure adequate land area is dedicated to the roadway, and roads are constructed to withstand the anticipated load cycles.

Truck Docking and Maneuvering Area

Once again, these requirements will be highly dependent on the operational characteristics of the user. Since multi-tenant facilities should be planned and designed with flexibility in mind, sufficient area must be allocated on the landside of the facility to accommodate large tractor-trailer movements.

Some trucking companies require an area 150 or 200 feet wide adjacent to the building in which to maneuver rigs, depending on the frequency of movements as well as the spacing of dock doors. This large amount of truck maneuvering and queuing space often accounts for the relatively small cargo terminal facility in terms of total site requirement (i.e. floor-to-site area ratios of 20% or less). This is further aggravated by multi-tenant facility users.

An aspect that is often overlooked in the design of the cargo complex is the provision of adequate turning radii at intersections of cargo roads, as well as at the entrance to individual cargo lots. Primary access roads to various facilities within the complex must be designed in consideration of the types and volumes of vehicles servicing the facilities. It is advisable to design in consideration of an average peak scenario since it can be extremely disruptive to the overall operation of the complex if remedial repairs must be undertaken to the roadway as a result of inadequate initial standards.

Employee/Customer Parking

Scarcity of land and development economics often result in design solutions whereby developing customer/employee parking areas becomes challenging. Nevertheless, these should not be shared with landside areas that are also used for truck docking and maneuvering. This often results in circulation conflicts, especially between infrequent facility visitors unfamiliar with circulation patterns. If possible, planning and design solutions should separate customer/employee parking and truck maneuvering areas to improve the efficiency of operations and to promote safer conditions.

Access Roads

Access roads must be planned such that the long-term circulation characteristics of the complex are properly addressed. In conjunction with the conceptual subdivision plan, a system of local access, collector, and arterial roads must be identified and sufficient land area dedicated to provide efficient ingress and egress for the various types of vehicles accessing the facilities. Based on the classification of road, adequate design standards must be established to ensure uninterrupted operation for a reasonable cycle.

Future Considerations

Due to the growth of deferred express services and increasing focus on cost control in recent years, the integrated carriers are expanding their ground networks, which could entail the construction of additional surface hub or "*cross-dock*" facilities at strategic locations throughout the U.S (though most of these will be off airport). In other words, the biggest change in air cargo at airports will be increased trucking activity.

The biggest change in air cargo will be increased trucking activity requiring expanded planning parameters and more integration of the activity on airports.

Increased truck activity will require buildings that are much larger than would be indicated by typical planning parameters and activity records of an airport. Buildings that accommodate cross-dock activities tend to be wider to meet internal operational requirements of the carrier. Clearly, trucking will have to become more integrated within the overall air cargo activity at an airport. As such, there must be adequate area on the landside to accommodate large volumes of truck traffic and, maybe more importantly, truck storage area. Where possible, it is recommended that the distance from the building face to building face on the landside be increased from 200 to 400 feet. The additional 200 feet would provide an area to store trucks when not in use.

A cargo operation with a large truck component should also be located such that there is relatively direct access to both the highway system and the airfield. Roadway geometrics should also consider the potential for double-and triple-trailer truck configurations.

As indicated earlier, the use of multiple story buildings will greatly increase the productivity of a given land area. In addition, automation and mechanization is becoming more common at airports as the carriers attempt to improve worker productivity. Although these state-of-the-art facilities provide significant productivity gains, they tend to require greater capital investment and be larger in terms of both height and width than the traditional one-level warehouse type cargo building. Cargo facility planning should consider the development of these types of facilities at all airports. It is recommended that future planning provide for the opportunity to accommodate buildings that are 100-300 feet wide.

After the growth in trucking, airports must consider possible increased need for aircraft ramp to accommodate the potential growth in the global freighter fleet. For established more mature airports that are facing space constraints, this could become a serious issue that may eventually require a decision to manage aviation on a more regional basis. Depending on the airport and the region, the creation of dedicated all-cargo airports may become a much more realistic possibility than in the past. It is important however to consider the mix of potential tenants and users at a facility, the fleet mix of the carriers, and how those carriers utilize belly capacity.

FAA Design Standards

Runway clearances addressed in this section include Building Restriction Lines (BRL), aircraft parking limit lines, and runway safety areas. Each of these criteria provides clearances from potential hazards for routine operations for aircraft operating on the airfield. BRL's provide the necessary clearance between buildings or other fixed objects and the runway centerline. FAA criteria for a BRL recommend that it encompass the runway protection zones, the runway object free area, NAVAID critical areas, areas required for terminal instrument procedures and ATC tower line-of-sight. These factors should be applied to all new cargo facilities at airports.

Aircraft parking limit lines define the shortest distance that the tail of an aircraft can be to a runway, according to FAR Part 77 criteria. Aircraft parking limit lines are particularly useful, in developing cargo layout concepts. A 1,060-foot limit line from the runway centerline for A380 aircraft, a 954-foot limit line for

B747/B777 aircraft, a 907-foot limit line for A300 aircraft, and an 808-foot limit line for B757 or smaller aircraft should be used for planning aircraft parking positions.

For larger gateway airports, where possible, taxiway requirements for runway-to-taxiway, taxiway-to-taxiway, and taxiway-to- fixed or movable objects should be based on Aircraft Design Group VI, as defined in FAA Advisory Circular (AC) 150/5300-13, *Airport Design*. Where it is not practical to provide Group VI separations, Group V standards should be implemented as a minimum. The taxiway-to-fixed or movable object separation for the B747 is 160 feet.

CHAPTER 5

FINANCIAL AND MANAGEMENT STRATEGIES

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1. BUSINESS MODELS

In North America there are four main business models used by airport sponsors for developing and operating cargo facilities:

- Airport development -- development and management of the property by the airport sponsor.
- Tenant development -- development and management of the property by the carrier or handling company (i.e. GHA's / integrators) that subsequently occupies the facility.
- Third-party development -- development and management of the property by a third party, under contract with the airport sponsor, who subsequently leases the facility to others.
- Joint venture - shared development and management of the property by the public and private sectors or shared development and management by a combination or consortium of air carriers.

2. AIRPORT'S GOALS AND OBJECTIVES

Financing and related management alternatives for cargo development should be determined in the context of the airport sponsor's goals and objectives. Therefore, the airport sponsor should first determine and prioritize its specific goals and objectives. The following is a list of factors to be considered:

Potential to Generate Discretionary Cash Flow.

For airports with compensatory ratemaking methodologies, a cargo cost center that generates net operating revenues can contribute to the airport's net cash flow, thereby providing a source of funding for other aviation improvements.

Lowest Cost to Tenants.

Under certain circumstances, airport sponsors can provide tax-exempt financing for cargo development. Tax-exempt financing can reduce annual debt costs and is among the lowest cost financing options available. Some forms of conventional private sector financing can be structured to achieve lower annual cost to tenants than tax-exempt financing. For example, the private developer may elect to amortize the facility cost over the term of the ground lease, which is usually longer than the amortization period for the debt, in order to produce lower tenant rents. Also, if the private developer uses internal capital there may be greater flexibility over the length of the amortization period. The longer the amortization period, the lower the annual costs.

Preservation of Debt Capacity.

Airport sponsors that have major terminal and airfield requirements may need to preserve debt capacity for these more essential improvements that are typically financed by airports, and rely on private sector funding for cargo and other less essential development (e.g., general aviation, fuel systems, etc.). If the preservation of debt capacity is a concern to an airport, the use of debt financing should be prioritized in relation to the airport's long-term capital improvement program.

Reduce Passenger Airline Rentals, Fees, and Charges.

For airports with a residual airline rate methodology, cargo development that generates positive net cash flow can help to reduce passenger airline rentals, fees, and charges, provided that cargo net revenues are applied as a credit against airline rates and charges. In addition, landing fees paid by all-cargo carriers can also offset passenger airline landing fees at both residual and compensatory airports. Cargo net revenues can also be used to fund airport improvements, thereby reducing an airport's reliance on debt financing, resulting in lower airline costs.

Provide opportunities for privatization.

A number of communities have come under political pressure to privatize some or all of their airport operations. Private sector development of cargo facilities may be one means to address such political pressure while maintaining public sector control over other, more essential and critical aviation functions such as the airfield, apron and terminal complex.

Creation and/or Retention of Jobs in the Local Economy.

Recently, a primary impetus to cargo development has been to create employment opportunities for the local economy. This can be accomplished by serving as a hub in a cargo or express carrier's system or by simply providing sufficient capacity to accommodate the cargo demands of one's own community so businesses can expand and prosper without having the expense of trucking materials in from another nearby airport. This goal can be achieved under almost any financing scenario.

Maintain control over land uses and facilities.

An airport led development provides the greatest control over activities such as the determination of initial land uses and the flexibility to change land uses in later years in response to events or shifts in demand. If considering a third-party development, a significant amount of control in these areas may be retained with appropriate provisions and protections added to the ground lease.

Administrative Burden.

If an airport is considering cargo development, an assessment of the related administrative burdens should be incorporated into the decision-making process. Airport staffing responsibilities for facility financing, bidding, design, construction oversight, marketing, ongoing maintenance, administration and management are greater under airport development than tenant or third-party development.

Avoid unnecessary risks.

Cargo development can entail more financial risk for the airport sponsor than tenant or third-party development. Financial risks are determined by the local economic conditions, changing demand for cargo facilities, technology advances, on-going capital improvements to keep the facility competitive, industry volatility and the scarcity of cargo facilities at the airport or competing airports.

The following matrix provides a guide for selecting a business model based on an airport's assessment and prioritization of goals and objectives. Because the joint venture model is a hybrid between the airport development and private sector models, it may provide an appropriate "middle ground" position for an airport sponsor.

SELECTING A BUSINESS MODEL FOR CARGO DEVELOPMENT

Goals and Objectives	Airport	Tenant	Third-party	Joint venture
Generate discretionary cash flow	X			
Lowest cost to tenants	X			
Maintain/enhance coverage	X			
Preserve debt capacity	X	X	X	X
Reduce airline rates and charges	X			
Provide opportunities for privatization		X	X	X
Create and retain jobs	X	X	X	X
Maintain control	X			
Limit airport administrative burden		X	X	
Avoid unnecessary risks		X	X	

Note: **X** denotes the model that successfully addresses the specific objective.

3. FINANCIAL CONSIDERATIONS

3.1 Public Sector Financing

There are three main types of tax–exempt financing available for cargo development, all of which must be issued by the airport sponsor.

1. *General Obligation Bonds*

   General Obligation (G.O.) bonds are secured by the full faith and credit of the issuing governmental entity, including the general tax revenues of the governmental entity. The debt service requirements for G.O. bonds issued to fund airport improvements are most often paid from revenues of the airport, and not the other revenues of the issuing entity. However, if airport revenues are not sufficient to pay the debt service requirements, the airport owner may be required to use its general tax revenues as a back-up source to pay the debt service requirements.

   Because of the generally higher credit quality associated with this type of obligation, G.O. bonds carry the lowest interest rates of bonds. However, G.O. bond financings are usually preserved for public buildings such as passenger terminals and facilities providing broad access to an airport such as terminal ramps, runways, roadways, and parking rather than more restricted use facilities such as cargo buildings. Cargo buildings and ramps that serve the public by accepting and delivering cargo for shippers and consignees can be treated as public facilities (i.e., cargo terminals).

   Very few large airports have outstanding G.O. bonds. At those airports, the debt in most cases was issued many years ago to fund capital improvements. However, in general, governmental entities that own small airports are more likely to make this type of bond financing available. The main advantages of G.O. bond financings are that G.O. bonds usually carry lower interest costs than revenue bonds because they are backed by the full faith and credit of the city, county or state that owns the airport; bond issuance costs are often lower with G.O. bonds than with revenue bonds because it is not necessary to develop a separate indenture or ordinance, financial feasibility study, and other legal and financial documents; and there are usually no debt service coverage requirements related to a G.O. bond issue, due to the strength of the G.O. bond credit backed by the general revenues of the city, county, or state owner of an airport.

2. Revenue Bonds

Revenue bonds are the most commonly used financing mechanism for airport capital improvements. Revenue bonds are usually secured by the revenues of the entire airport (or, if the airport is owned by an authority, the revenues of the authority). Revenue bonds that are secured by the revenues of an airport are usually called General Airport Revenue Bonds (GARBs). The revenue pledge for GARBs include revenues from airline rates and charges, public parking, rental car concessions and other fees, terminal concession fees, other lease revenues, and other types of revenues generated by the airport. Revenue bonds issued by an authority (such as a port authority) that owns an airport are generally secured by all revenues of the authority, including all revenues generated by the airport. Revenue bonds are more frequently used to finance multi-tenant facilities rather than exclusive use cargo facilities.

The following examples illustrate the use of revenue bond financing for cargo development.

- The Massachusetts Port Authority (Massport) constructed several cargo buildings at Boston Logan International Airport (BOS), which were financed with revenue bonds secured by Massport revenues. Demand for the facilities continues to be strong given the scarcity of land and facilities at BOS. Massport adjusts the rental rates annually to recover all associated costs, including coverage on the revenue bonds.

- In 1992, Allegheny County, owner and operator of Pittsburgh International Airport, issued GARBs to construct a cargo facility for a single tenant, USAir. The County and USAir entered into a 30-year exclusive use lease for the facility. The issuance of GARBs for the USAir cargo facility required airline MII approval under the terms of the airline operating agreement and terminal leases.

- The Port Authority of New York and New Jersey has issued Consolidated Bonds, which are secured by the general revenues of the Port Authority, to fund capital improvement costs at all of its facilities, including its airports and the cargo facilities at its airports.

3. Special Facility Bonds

Special Facility Bonds are backed by the dedicated revenue stream of the particular facility financed with the bonds. The types of airport facilities usually financed with special facility bonds include rental car facilities; cargo buildings, hangars, and maintenance facilities; and passenger terminal buildings and ground equipment support facilities for the exclusive use of one or more airlines. In this type of financing, a governmental entity (usually the airport owner or a quasi-governmental entity such as an industrial development agency) typically issues the bonds, and the rent revenue from the facilities is pledged for the payment of the debt service requirements.

The airport sponsor is usually not at risk if the tenant cannot make debt service payments. The rating for these bonds is based on the financial strength of the tenant or guarantees of the third-party sponsor. Because the rating is not based on the financial strength of the airport or its owner, these bonds carry a higher interest rate than revenue bonds.

The strength of the pledged revenue stream may vary greatly from airport to airport depending on several factors, including:

- The number and financial strength of the facility tenants
- The strength of the market for cargo facilities

- The demand for cargo space on airport property

At the large express cargo hubs in Louisville International Airport (SDF) and Memphis International Airport (MEM), cargo processing facilities have been built primarily through special facility bond financing secured by United Parcel Service (at SDF) and Federal Express (at MEM). However, at both airports, revenue bonds were also issued for airfield, land acquisition and other related facilities. In both instances, the revenues received from the cargo carriers have contributed to the payment of debt service on the revenue bonds that financed cargo facilities. The presence of FedEx at MEM has resulted in lower landing fees, partly due to the airport's cost center residual ratemaking methodology.

3.2 Other Public Sector Funds

In addition to debt financing, an airport sponsor can dedicate internally generated funds (airport discretionary cash) to cargo development as well as Airport Improvement Program (AIP) grants and Passenger Facility Charges (PFCs) to non-exclusive use cargo aprons. In accordance with the DOT Policy on Airport Rates and Charges, an airport sponsor can recover the costs of its investment in such facilities, net of grants and PFCs.

i. Airport Improvement Program (AIP) Grants

The FAA issues AIP grants to construct and maintain infrastructure projects that increase the capacity, safety and security at airports across the United States. The FAA assigns the highest priority for AIP funding to safety and security projects. The grants are issued in the form of entitlement grants and discretionary grants.

Airfield projects, including aprons and taxiways connecting aprons to the runway system, are generally eligible for AIP funding. Aprons cannot be exclusively leased and cannot serve facilities exclusively leased to a single tenant. In addition, aprons and related taxiways constructed for the use of a tenant that does not serve the public are not eligible. Aircraft rescue and firefighting buildings and buildings for storage of snow removal equipment are eligible. Passenger terminals have limited AIP eligibility. Hangars and other buildings are generally ineligible, with one exception: non-revenue producing facilities or equipment owned by an airport and used for transferring passengers, cargo or baggage between aeronautical and ground transportation modes are eligible.

If cargo related capital improvements include airside projects such as taxiways and/or aircraft aprons, those project costs could be AIP grant eligible. Improvements, such as an aircraft parking ramp, could not be designed to serve a single tenant because then they would be considered by the FAA to be exclusive use facilities, and therefore ineligible for AIP grant funding. If an airport is contemplating significant future projects related to a passenger terminal complex and associated airfield improvements, it would not be advantageous to use AIP discretionary grant funds for cargo-related improvements, since it will likely want to preserve its AIP grant funding for eligible projects related to the passenger terminal and related airfield projects. The FAA encourages AIP cargo entitlements to be used for projects benefitting air cargo activity, and these funds could be used for airside projects to support air cargo activity, as long as the projects are not used by tenants on an exclusive use basis.

In summary, construction of aprons to support new cargo facility development would be eligible for AIP funding if the aprons are not leased on an exclusive-use basis and do not serve exclusive-use facilities.

ii. Passenger Facility Charges (PFCs)

PFCs are fees imposed by an airport, per enplaned passenger at commercial airports controlled by public agencies. Airports can use PFCs to pay for specific projects approved by the Federal Aviation Administration (FAA). According to federal statutes and regulations, PFC projects must (1) preserve or enhance safety, security, or capacity of the national air transportation system; (2) reduce noise or mitigate noise impacts resulting from an airport; or (3) furnish opportunities for enhanced competition between or among air carriers. In addition, to qualify for funding at the highest level, PFC projects must make a significant contribution to (1) improving air safety and security; (2) increasing competition among air carriers; (3) reducing current or anticipated congestion; or (4) reducing the impact of aviation noise on people living near the Airport.

An airport can use PFCs on a "Pay-as-you-Go" basis (PAYGO), it can leverage part of its PFC revenue stream, or it can do a combination of both. Leveraging PFCs can be advantageous to an airport when it has one or more PFC-eligible capital projects with significant capital outlays projected to occur during a short period of time. By issuing bonds backed by PFCs, an airport can obtain needed funding in the short term, and then pay the debt service on the bonds over time as PFCs are received by the airport.

There are several ways an airport can leverage its PFC revenues:

- Bonds secured solely by PFC revenues ("stand-alone PFC bonds"). In this type of bond financing, PFC revenues are not included in airport revenues, and are dedicated for the payment of debt service on the bonds. There have not been any stand-alone PFC bonds issued in recent years.

- GARBs, with PFC revenues included in the definition of airport revenues. Under this structure, PFC revenues are combined with other airport revenues for the purpose of paying eligible PFC debt service on the GARBs.

- PFC Bonds with a back-up pledge of general airport revenues. With this type of financing, the airport issues bonds secured by PFC revenues, with a secondary pledge of general airport revenues (often called "double barreled PFC bonds").

Depending on the scope of a cargo project, certain components could be eligible for PFC funding. However, as noted in the subsection on AIP grants, the Airport would likely want to preserve its PFC funding for airfield and passenger terminal project costs, especially in light of the potential redevelopment of the passenger terminal complex and related airfield configuration.

3.3 Private Sector Financing

There are numerous private sector financing alternatives due to the variety of entities that participate in the market. There is a wide array of lending sources, including commercial banks, pension funds, and insurance companies. Access to these sources is limited by the financial strength of the carrier or third-party developer seeking debt financing.

Several private firms have extensive experience in developing and leasing/managing air cargo facilities at airports. Projects included in these firms' portfolios range from the planning, construction, leasing, and managing of air cargo facilities on land leased from the airport owner, to the purchase and rehabilitation and/or renovation, leasing, and managing of existing air cargo facilities at airports.

A typical financing strategy for capital improvement projects will likely include the issuance of bonds by the airport owner or a development authority (usually referred to as "the Issuer"). In these types of transactions, the Issuer typically loans the bond proceeds to an entity established by the private developer (referred to

in this chapter as “the Company”), for the purpose of building the air cargo facilities. The Loan Agreement between the Issuer and the Company typically requires the Company to pay to the Issuer the costs associated with the bonds, including the principal and interest obligations of the bonds. The Airport typically retains title of the financed facilities, and the Company enters into a Lease Agreement with the Airport. The Company then subleases the air cargo facilities to various tenants. The Company’s obligations under the Loan Agreement and/or Lease Agreement are payable from the rents the Company received from the air cargo facility tenants. Often, the Company’s obligations under the Loan Agreement and/or Lease Agreement are secured by a mortgage given to the Issuer or a Trustee. A Ground Lease is usually executed for the land upon which the project is located, pursuant to which the Company pays to the airport owner lease payments for the land.

Examples of air cargo facilities financed through bonds issued by a development authority include the following:

- Connecticut Development Authority, Industrial Development Revenue Bonds, Series 2000 – for the financing of cargo facilities developed at Bradley International Airport
- Industrial Development Authority of the City of Kansas City, Missouri, Air Cargo Facility Senior Revenue Bonds and Air Cargo Facility Subordinate Revenue Bonds, Series 1995A and 1995B, and Series 1997
- Alaska Industrial Development and Export Authority Revenue Bonds, Series 2001
- Maryland Economic Development Corporation Air Cargo Revenue Bonds, Series 1999
- New Jersey Economic Development Authority

There are a number of active private developers of air cargo facilities in North America. They typically compete for development opportunities through competitive solicitation processes. These private entities have developed and/or manage cargo facilities at numerous airports including major gateways as well as small to mid-size facilities. Their diverse development experience can often bring new and creative approaches to project financing to a project.

The private financing of cargo facilities debt can be advantageous in several ways, including the following:

Flexibility

Often, private financings can be tailored to meet the specific objectives of a cargo development program. For example, the primary objective of an airport might be to create cargo infrastructure at the lowest possible rental rates, in order to be competitive in the marketplace. To achieve this objective, the developer could amortize the cost of the facility over the length of the ground lease (often 30 to 40 years) even though the debt is financed over a shorter period, resulting in reduced rental rates for the tenants. Note that with a longer ground lease, the developer can reduce the costs that flow through to tenants and users. Also, private developers often are better able to secure short-term financings, which typically carry lower interest rates. However, the risk inherent in using short-term financings is that the private entity could be exposed to significant interest rate fluctuations.

Expediency

In some instances, private financing can be secured more rapidly than public financing, particularly if the private entity has lines of credit already established.

Conserve Public Capital

Use of private sector capital conserves public capital for those areas where public funding is the only alternative. To preserve resources, more airports are exploring the use of private sector funding for cargo development.

3.4 Comparative Costs of Finance

The potential financial advantage of public sector development over other forms of cargo development is the access to tax-exempt financing at lower interest rates, particularly for GARBs and aviation facility bonds. However, public sector financing mechanisms have the following special requirements that can dilute the interest rate savings:

- *A debt service reserve* (equal to one year's principal and interest) and an operating reserve (usually equal to two or three months' operating expenses) requirement. Typically, the debt service reserve is funded from bond proceeds, thereby increasing the size of the issue. Interest earnings on the reserve while bonds are outstanding can be credited against annual debt service and the balance can be applied against the final year debt service.

- *Debt service coverage.* The bond issuer is usually required to demonstrate a specified level of debt service coverage typically equal to 1.25 times annual debt service. Depending on the terms of the airport's bond indenture and airline use agreements, this coverage either (a) can be funded once (in the first year of occupancy or prior to occupancy) and then rolled over to demonstrate coverage each year or (b) may have to be funded each year through cargo rentals.

3.5 Generation of Cash Flow

There are several ways for cargo development to generate cash flow for an airport, including:

- Land rentals (valued at "historical cost" in accordance with the DOT Policy on Airport Rates and Charges).

- Recovery of debt service coverage.

- Amortization charges if the cargo development is funded from airport discretionary funds. When an airport sponsor uses its own funds to construct cargo facilities, it can recover this capital through amortization charges over the expected useful life of the facilities.

- Landing fee and ramp fee revenue from all-cargo carriers.

- Percentages of vertical rent

- Percentages of service fees within the facility

3.6 Coverage Dilution/Enhancement

Compensatory airports typically need to demonstrate debt service coverage above 1.25 times to access municipal markets. Most investment bankers recommend maintaining coverage above 1.5 for these airports. Therefore, if a compensatory airport's coverage is relatively low it may not be advisable to finance cargo improvements with GARBs, particularly if cargo rentals are set to generate net revenue below the airport average coverage level (typically 1.25 times). Under these circumstances, the financing could jeopardize the credit rating of the airport as a whole. If so, other financing approaches such as special

facility bonds, tenant or third-party financing, should be explored. Compensatory airports that fund cargo improvements with capital account monies rather than through debt issues can enhance the airport's coverage through the recovery of amortization charges.

3.7 MII Approval

Residual cost airports typically must obtain airline majority-in-interest (MII) approval before proceeding with GARB-financing of cargo improvements unless the cargo cost center is outside the airline purview. To obtain MII approval, the airport sponsor must typically demonstrate long-term lease commitments and full cost recovery (and possibly incremental revenue).

4. RISKS OF DEVELOPMENT

There can be both economic and political consequences to developing cargo facilities in a changing and dynamic market.

If a facility is developed to accommodate expected long-term demand, it is unlikely to be fully occupied immediately after construction. Vacancies could generate pressure to accept tenants under lease conditions that are less than fully favorable to the airport sponsor. For example, the airport may not be able to set rentals to fully recover all costs if market rates are lower. If the expected demand does not materialize, it could result in permanently vacant space. On the other hand, if cargo facilities are developed to accommodate only near-term demand, future growth may render the facilities inadequate and result in revenue losses and dissatisfied customers.

When an airport sponsor develops a facility, it assumes these risks. When a tenant or third-party developer develops a facility, the risks are shifted from the airport sponsor in exchange for an expected profit, while the airport sponsor foregoes potential revenue to avoid the costs and risks of development.

Technology enhancements to the cargo handling process and carrier operational changes can quickly make a facility obsolete or, at a minimum, less efficient for carriers. The result is additional capital requirements to modernize the facilities.

5. RATING EVALUATION CONSIDERATIONS

In analyzing debt, a rating agency looks at general operations and management procedures, capital planning and expansion projects, airport utilization trends, security provisions, environmental issues, and the service area economy, as well as the airlines serving the airport. In rating debt of airports that have a major air cargo component, the rating agency also focuses on the financial, capital, and environmental planning issues associated with the development of air cargo operations.

Air cargo development can have an overall positive effect on the airport's credit rating, if the cargo development is anticipated to generate positive net revenues. An airport can often benefit financially through ground rents for cargo facility improvements, associated landing fees, and revenue from support functions. Revenues generated from air cargo activities at an airport can also demonstrate the diversity of the airport's revenue stream. The development of air cargo facilities can also be viewed as very positive to the extent it stimulates local and regional economic development, which strengthens the demand for, and potentially reduces the cost of air travel at the airport.

6. CARGO FACILITY DEVELOPMENT CONSIDERATIONS

When contemplating potential air cargo development, an airport sponsor should consider the compatibility of increased cargo operations with the airport's existing facilities and passenger airline operations. This includes long-term assessments of both physical and social environmental compatibility with the surrounding community.

Airports eager to attract cargo operators for their projected positive financial and economic impact should carefully weigh the costs in light of the anticipated benefits. This includes an accurate assessment of the cost of facilities needed, the impact of cargo operations, especially express package hubs, or mini-hubs on runway capacity and useful life, regional trucking activity, as well as the environmental impact of potential round-the-clock operations, and related maintenance and noise mitigation costs. Additionally, airports should look at the increased day-to-day management responsibilities and costs associated with growing cargo operations.

Other important considerations include:

- *The market for cargo facilities in the airport service area.*

- *The availability of infrastructure to serve cargo development or the ability to finance such infrastructure.* Site and infrastructure development refers to the development of areas such as airfield aprons, roadways, utilities, telecommunications and common parking. Infrastructure may also include container freight stations, ramp level offices with easy access to the airside, as well as road or rail access for ground distribution. Infrastructure also includes customs clearance capabilities for international cargo. Improvements such as cargo community systems (CCS) to provide visibility and real-time tracking are becoming more common. If not already in place, these components could prove very costly for the airport to develop.

  Approaches to site and infrastructure development vary widely depending on factors such as the philosophy of capital investment, the availability of land and capital, the extent of existing development, and the approach to cost recovery. Airports that wish to minimize risk tend to leave infrastructure development to the tenant or third-party developer. Airports that wish to maximize flexibility and control tend to provide the infrastructure development. The costs of infrastructure, other than aircraft aprons, are typically recovered through ground rents. The costs of the apron are usually recovered through aircraft parking fees. Cargo buildings with direct access to aircraft aprons typically have higher rental rates, reflecting the benefit of this access.

- *Compatibility of cargo operations with other airport uses and the surrounding community.* Traditional air cargo moves at night and potentially has higher noise impacts in residential areas than do daytime operations. Express cargo tends to move at the end of the business day, and this may complement an airport's role as a passenger hub. However, express cargo carriers may compete with passenger airlines and strain runway capacity, as well as ramp and road access, especially at major package sorting hubs. Levels of service on accessing roadways should also be carefully considered.

- *The revenue pledge securing / supporting the debt and the financial resources of the tenants.*

7. PRICING OF FACILIITIES

7.1 Rate Base Elements

Costs that can be included in the rental rate base for cargo facilities include:

- *Debt service (and required coverage if applicable)*
- *Land rental (based on historical cost, net of grants and PFCs)*
- *Direct operating expenses (maintenance, repairs, insurance, cleaning, common area costs, etc.)*
- *Allocable indirect operating expenses (administration, ARFF, roadway, security, utilities, insurance, etc.)*
- *Infrastructure necessary to support the facility (tug roads, access roads, cargo ramps, employee and truck parking, equipment storage areas, fuel systems, deicing facilities, apron lighting, etc.)*

There are 4 types of rentals and fees typically charged for cargo facilities:

- *Building rentals to recover capital and operating costs associated with the cargo building, including allocable indirect operating costs.*
- *Utility costs if not directly billed by the utility company.*
- *Ground rentals to recover site and infrastructure costs, including truck docks and public vehicular parking areas.*
- *Apron fees to recover the costs of the cargo apron if not included in the landing fee rate base.*

7.2 DOT Policy on Airport Rates and Charges

DOT and FAA policy on airport rates and charges differentiate between the airfield, other aeronautical facilities and non-aeronautical facilities owned by an airport. For the airfield (runways, taxiways and cargo aprons), airport sponsors are limited to recovering historic costs for aeronautical use. Aeronautical uses include "services provided by air carriers related directly and substantially to the movement of passengers, baggage, mail and cargo. Persons, whether individuals or businesses, engaged in aeronautical uses involving the operation of aircraft, are considered aeronautical users". For other aeronautical facilities, fees may be set on the basis of market rates, rather than historic costs, but may also use historic costs. For non-aeronautical facilities, airports must set fees on the basis of market rates.

The distinction between the airfield and other aeronautical facilities was originally an element of the FAA and DOT Airport Rates and Charges Policy adopted in 1996. A court decision held that DOT had not adequately justified the distinction and ordered it vacated. Through a series of decisions on individual disputes over airport fees, DOT has restored the distinction, as reflected in the FAA's Airport Compliance Manual, Order 5190.6B (2009).

Many airport sponsors in North America price cargo facilities (building rentals, apron fees, ground rentals, truck dock and employee parking fees, etc.) on the basis of market rates rather than historical cost, particularly for older facilities, which are fully amortized or nearly fully amortized. In fact, third party or private operators typically price cargo facilities on the basis of what the market will accept. Therefore, private operators will not be constrained by the Policy while airport sponsors who develop or operate cargo facilities will be required to comply with the new pricing restrictions.

As a practical matter, the policy will constrain airport sponsors in setting rates only for cargo aprons and taxiways used to access cargo facilities. For other facilities, airport sponsors can (or must) use a fair market value basis. There are, however constraints. The DOT policy also provides that the progressive

accumulation of substantial amounts of surplus aeronautical revenue may trigger an inquiry into whether the sponsors rates and charges are consistent with the reasonableness requirement. The DOT policy does not preclude generation of any surpluses, and explicitly recognizes the need for airports to finance capital, as well as operating costs.

In addition, airport sponsors are subject to restrictions on the use of airport revenue. Airport revenue may only be used for the capital or operating costs of the airport, the local airport system or other facilities directly and substantially related to air transportation. This requirement means that although an airport sponsor can generate surplus revenue (revenue in excess of its operating costs), it can do so only to the extent that the surplus revenue is needed for current or future capital investment needs at the airport, the local airport system or other facilities directly and substantially related to air transportation. The policies on rates and charges and revenue use do not define precisely the extent to which airports may generate and hold surplus revenue in anticipation of future capital needs.

Taken together, the two policies can discourage an airport sponsor from developing cargo facilities on its own to enhance revenues and thereby generate surplus revenue. These restrictions apply even if a private developer generates profits and an airport sponsor participates in some of those profits. Third party developers typically are not in the business of transporting cargo or freight, and therefore, the development would be considered non-aeronautical. Thus, the fees charged by the sponsor, including any share of the developer's revenue or profits, could be based on fair market value. However, any revenue earned by the sponsor from the third-party development would be considered airport revenue, which is subject to the revenue use restrictions, and such revenue might be considered by the FAA in evaluating whether the airport sponsor was generating excess surplus revenue.

8. DEVELOPMENT TIMELINE/IMPACT ON SCHEDULE

The development of facilities by an airport sponsor usually requires more time than private development. Preparation and negotiation of a lease with a tenant or third-party developer can take six months or longer for airports that have no prior experience in such transactions, but can take less time for airports where the sponsor has prior experience. Leases to tenant or third-party developers (and sometimes attendant Development Agreements) are usually considerably longer and include detailed plans for development and use of the land. Therefore, the lease should contain the standard provisions of a tenant lease, plus a full range of additional provisions such as:

- *Facility design and construction*
- *Reversion of facilities to the airport sponsor*
- *Buyout of the remaining leasehold by the airport sponsor*
- *Development and performance standards*

The airport sponsor should also carefully research the development background, financial strength (capital, net assets, credit rating), and references of the specific developer given the long-term nature of the lease.

On the other hand, preparing and negotiating a lease under airport development usually has little effect on the development schedule and is less complicated. In addition, tenant and third-party leases must be negotiated before development can begin, while airport development can occur in parallel with construction if the airport is willing to take the risk that negotiations will be successful. The additional time required for implementing tenant or third-party development includes allowances for a competitive selection process if required.

It often takes longer to bid and design a facility under airport development than under private development. This is due to the time required to follow government procurement procedures. The magnitude of the time difference depends on the length of the airport's procurement process and the experience of the private entity. Additional time-savings can be realized if a tenant or third party uses a design-build process. Constructing the facility usually takes the same amount of time under each model.

9. CONTROL OF LAND USE AND FACILITIES

9.1 Land Use

An airport retains the most control over land uses occurring on property that it develops, in particular, the authority to determine initial land uses and the flexibility to change land uses in later years in response to events or shifts in demand. Under tenant or third-party development, an airport's control of land uses is frozen for the term of the lease unless appropriate protections are incorporated into the ground lease. Initial uses are set by the terms of the lease, but the airport loses its flexibility without proper ground lease provisions to change land uses in later years as necessary.

Specifying allowed and prohibited uses in the ground lease is essential to maintaining control of the use of airport land.

9.2 Lease Term

Tenant and third-party developers usually require long-term leases in order to finance and/or amortize their investment. In the case of long-term leases, the airport sponsor should include a buyout option so the use of the land is not frozen for the term of the lease. However, buyouts often require a substantial cash outlay, depending on the age of the facilities, to regain control of the land.

Most airport land leases, including land leases for cargo facilities, contain a clause providing that the leasehold improvements (buildings and other facilities constructed by the lessee/developer on the leased land) will transition (revert) to the landlord (the airport owner). Therefore, the length of the lease term is an important consideration for any private entity considering whether to enter into a land lease with the intent of constructing improvements on the land. The private entity will have to depreciate the full value of the improvements over the term of the lease. Therefore, the term of a lease must be long enough to enable the private developer to amortize or depreciate its capital investment.

A review of recent business deals for cargo facilities at airports indicates that a lease term of 25 to 30 years is common. However, it is not uncommon for a developer to seek a longer lease term in consideration for a better financial deal for the airport. For example, a developer often proposes a longer lease term in consideration for a greater financial return to the airport. It is noted that due to concerns about the potential short lease term for cargo facility development at JFK, the lease documents provided that in the event the Port Authority’s Master Lease with the City was not extended prior to expiration, the City would enter into a lease with the developer to extend the cargo facility lease for an additional 13 years so that the cargo facility could continue to operate. This was considered by the developer to be a critical provision to realize a reasonable return on its investment.

The issue of lease term length for cargo facility development has also been effectively addressed through the creative use of lease extension options. For example, Ted Stevens Anchorage International Airport (ANC) negotiated a lease agreement for the development of a cargo facility on a 20-acre parcel of land.

The lease term was 35 years, with four options to extend the lease, each option being five years, thereby resulting in a potential lease term of 55 years.

A creative approach to the challenges related to the reversion of leasehold improvements was implemented by the Monroe County Airport in New York (BMG). BMG negotiated a land lease with a private entity, which agreed to develop a 29,000 square foot hangar complex, which was completed in 1994. The lease has a 20-year term, with a 10-year option for renewal, after which the hangar complex will revert to BMG. However, the lease allows the tenant to retain a portion of ownership in the facility. BMG becomes vested in the facility at a rate of 2.5 percent per year. This means that at the end of 30 years (assuming the 10-year renewal option is exercised), the tenant will own at least 25 percent of the facility. BMG has since used this lease structure to attract other types of development, including a flight training center with seven offices, which was constructed in 1998, and a corporate flight complex, which was constructed in 2000.

Because most leases provide for the reversion of leasehold improvements to the airport at the end of the lease term, it is desirable to an airport to include in the lease, clear provisions regarding required facility upkeep and reversion requirements. Otherwise, the lessee may have limited incentive to perform maintenance and upkeep on the facilities during the term of the lease. The airport owner should ensure that the lease provides cure provisions for problems, and enables the airport owner or its representative to enforce required maintenance and upkeep schedules and standards.

9.3 Ground Rent During Construction

Normally, a land lease that involves the development of a cargo or other facilities will specify a certain time period during which the construction of the facilities must be conducted. To be effective, the lease should provide for the termination of the lease if the facility has not been constructed within the specified time period. This protects the airport owner from having land tied up under a ground lease for extended periods, without any facilities being developed.

From the developer's perspective, the land rent during construction should be at a reduced rate, or waived altogether. The developers argue that such a provision enhances the financial viability of the project because it reduces their cash outlay during construction, and increases their return on investment. Perhaps more importantly it reduces the costs that eventually flow through to the tenant.

9.4 Competition With Existing Facilities

An excess of similar facilities at an airport will have the effect of diluting the demand for those types of facilities. Private developers of air cargo facilities, for example, have an interest in ensuring that there will not be excess cargo facilities at the same airport that will compete with the new facilities to attract tenants. This can be problematic, particularly if there are other cargo facilities at the airport that are older and command lower rental rates. Some tenants will prefer to rent the older facilities, even if they are less efficient from an operational standpoint, if the rent is substantially less than the newly developed facilities. This type of situation can undercut the rent producing potential of the new facilities, and will negatively affect the developer's return on investment (and incentive to build). The creation of joint marketing agreements can mitigate some of these concerns.

9.5 Facility Use and Maintenance

An airport often has less control over the management and maintenance of privately developed facilities, compared to facilities developed by the airport. Therefore, it is important that specific standards be included in the agreement with the private developer and operator. In the case of privately managed cargo facilities,

the airport sponsor has to work through the developer rather than directly with the tenants. However, in a multi-tenant facility it may be easier to coordinate through a developer than with a multitude of small tenants.

For all cargo facilities, whether developed and operated privately or publicly, the legal agreements should include strict provisions regarding the handling of hazardous substances and compliance with rules, regulations, and local codes, including financial penalties. This is particularly important in obtaining compliance with local environmental rules and regulations and holding parties responsible for the costs of environmental remediation.

9.6 Tenancies

An airport sponsor's control of tenancies depends on the lease provisions negotiated and the degree to which this control is exercised. Approval of sub-tenancies by the airport sponsor should be part of the standard lease in facilities that the sponsor develops as well as those developed by tenants and third-party developers. Any such agreements should address the potential for a percentage of revenue sharing for the airport above a certain threshold.

9.7 Facility Design

An airport sponsor can control the design of a facility developed by a tenant or third party as closely as a facility it develops if it imposes stringent lease provisions, reviews the developer's design carefully, and enforces its design standards. The ground lease should include provisions on formal design guidelines, regular construction inspection, and approvals of all designs and modifications.

9.8 Guidelines for Airport Control of Commercial Rights

The following provisions are recommended to preserve the rights of an airport to direct and influence the commercial aspects of its air cargo program.

1. The right to develop air cargo facilities on the airport should be non-exclusive; unless there are extraordinary reasons, no third-party (airline or developer) should be granted exclusive control to develop or lease the entire or a majority of the inventory of an airport's air cargo facilities. The airport should maintain its option to either develop or lease cargo facilities itself and/or to award the right to a series of third-parties to develop cargo facilities on a non-exclusive basis.

2. The airport should maintain a market based rental structure in its leases for on-airport cargo facilities to either generate discretionary revenues under its airport operating agreement with the passenger airlines, if possible, and/or to maintain the financial viability for third-party developers to develop and lease cargo facilities (i.e., a cost based rental structure may preclude the option of attracting a third-party developer to develop and lease cargo facilities).

3. The airport should control the rate of commercial development to maintain market rates by timing the development or redevelopment of cargo facilities to minimize a shortage or excess of vacant facilities and cargo space.

4. The airport should establish and maintain the right to approve the rental rate structure charged tenants of third-party controlled facilities to ensure that discounting or artificially lower rates are not permitted that erode an airport's market rental structure. Rates should be comparable for like type facilities (i.e., age, size, utility, location, etc.)

5. The airport must control the commercial access to the airfield ramps to ensure off-airport cargo tenants are not able to by-pass the on-airport cargo facilities and deliver cargo directly to aircraft. Permitting such an activity by off-airport tenants may erode both the market rental structure and the financial viability of on-airport cargo facilities. In other words, the on-airport tenants have paid a premium for the direct access to aircraft while the off-airport tenants have not.

6. As the airport gains title to and control of third-party developed facilities at the expiration of the developer's lease with the airport, the term of that lease and financial offer made by the developer should be linked, perhaps as a bid item in the airport's solicitation, to optimize the best financial return for the airport over the shortest period of time. As the airport stands to gain significant increased revenues when it assumes title and control of these facilities (assuming they were well maintained), the term of the original developer lease needs to be linked directly with the developer's final offer (i.e., lease terms of 30 to 40 years should not be granted absent a quantified financial benefit).

7. The airport should establish and maintain the right of advanced approval of all tenant leases in third-party developed facilities and the activity to be conducted under the lease. All rights of such tenant leases should be subordinate to the lease between the airport and the developer.

8. The tenant activities on the cargo facility premises should be limited to the handling, storage, distribution, and forwarding of air cargo goods or activities expressly authorized by the airport such as fueling, ground handling, and/or servicing of cargo aircraft, subject to the airport's rules and regulations. No other commercial activities should be permitted without the written approval of the airport. The lease between the airport and the developer should obligate the developer to enforce these provisions on its own premises and allow the airport to audit at their discretion.

9. The lease or use of aircraft parking apron space should have a direct relationship to any adjacent cargo building space and such aircraft ramp should be made available on either a common use or preferential use basis and not on an exclusive use basis. Essentially granting a lease of apron space for non-tenant aircraft may harm the marketing of space in the building if a new tenant requires both building space and an aircraft parking position. Common or preferential aircraft parking provisions provide far greater flexibility to the airport in the use of this expensive and scarce resource and yet can be fashioned to support the needs of building tenants first (i.e., no storage of out of service aircraft or equipment).

10. The airport should guarantee access to tenant or developer-controlled aircraft ramps, without charge, to parties under contract to the airport to fuel and service aircraft or handle the air cargo of airport tenants, provided such parties have insurance acceptable to the airport and proper indemnifications have been provided.

11. The airport should establish and maintain its right to approve all assignments and leasehold mortgages in advance. The assignment or sale of a developer or tenant lease should be contingent on requiring the successor to be bound by all of the terms and conditions of the lease, require the conclusion of satisfactory negotiations with the airport, if necessary, and require some financial test of fitness.

10. COMMON USE - AN EVOLVING CONCEPT

Increases in cargo volumes due to e-commerce have changed the goods movement landscape. Forecasts for the next decade (barring anomalous activities or geopolitical conflicts) continue to indicate robust growth. Capacity at many airports will be challenged as consumer demand for next day delivery and global reach expands. To optimize throughput in a cargo building, the model of a common-use facility is becoming more prevalent. Under this concept the facility is developed or operated by a single entity and handles multiple clients on a fee for services basis. This differs from a multi-tenant facility in which different users have small leaseholds in the building. The single managing entity and elimination of internal separations for tenants creates a more efficient operation, increasing staff and equipment productivity, and extending the life of the facility.

Airports can improve their chances of handling high value verticals such as e-commerce and perishables by developing specialized nonaligned facilities with services available to all carriers and forwarders. Leading enticements to stakeholders are:

1. specialized facilities equipped to handle high value verticals
2. automated common use freight terminals
3. integrator facilities
4. availability of high-quality cargo handling services
5. truck marshalling / slot management system
6. ample freighter parking
7. hydrant fueling
8. cargo community systems to link stakeholder information
9. onsite CBP facility
10. access to highway systems

11. AIRPORT STAFFING REQUIREMENTS

Airport staffing to handle financing, bidding, design, construction oversight, marketing, management, administration and maintenance is greater under airport development than under tenant and third-party development. The number of staff needed depends on (a) the number and type (single tenant versus multi-tenant versus common use) of facilities developed, (b) whether the airport has a policy of constructing the particular types of building to expedite design and review processes, (c) the condition of existing infrastructure, and (d) the amount of work performed by others under contract.

There are three categories of staffing requirements:

1. *Tasks performed by airport sponsor regardless of who develops the property:*
    - *Design review and approval (initial construction and ongoing modifications)*
    - *Construction oversight*
    - *Lease development and negotiation (ground lease if tenant third party, tenant leases if airport developed)*
    - *Monitoring of leased sites*
    - *Revenue and cost accounting (for ground lease if third party developed or for all tenant leases if airport developed)*

2. *Tasks performed only if airport sponsor develops the property. If a tenant or third-party develops the facility, they perform these tasks:*
    - *Solicitation and review of construction proposals*
    - *Financing*
    - *Insuring functions*
    - *Marketing*
    - *Leasing*
    - *Facility operations and maintenance and related accounting functions*
    - *Tenant billing and collections*
    - *Capital improvements (scheduled and unscheduled)*

3. *Tasks performed only if tenant or third-party develops the property.*
    - *Solicitation and review of development proposals if a competitive bid scenario is required*

12. STANDARD LEASE TERMS AND CONDITIONS

The following standard lease terms and conditions should be included in cargo facility leases:

- Facility design and construction
- Activities permitted/prohibited/required (on land/buildings)
- Rental rate/rate base elements (procedures for adjusting)
- Ramp use and management (as appropriate)
- Payment provisions
- Subleasing/assignment
- Nondiscrimination
- Airport sponsor access and rights to inspection
- Taxes and licenses
- Improvements and alterations
- Reversion of facilities to airport sponsor (condition)
- Lease buyout
- Indemnity (airport held harmless)
- Insurance requirements
- Signage
- Use of demised premises
- Ownership of improvements
- Maintenance of demised premises
- Restrictions and regulations
- Default and termination
- Cure provisions
- Attorney's fees
- Hazardous and other regulated substances
- Airfield security
- Business tax registration
- Disabled access
- Section 308 exclusivity
- Rights of United States government
- War and national emergency
- Other agreements not affected

- Notices

Each airport typically has its own specific contract language that addresses these and other airport-specific provisions.

CHAPTER 6

BILATERAL AND REGUALTORY ISSUES FACING THE AIR CARGO INDUSTRY

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1. STATUS OF THE INDUSTRY

The air cargo industry began to see an uptick in 2016, with monthly cargo traffic at the end of the year surpassing the last peak before the 2008 recession.

Source: ACI-NA North America Traffic Report 2016

The growth continued more strongly in 2017, at the rate of 10.1% globally, more than double the long-term average growth rate of 4.2%. Key drivers of this growth have been the steady expansion in the global economy, increasing industrial production, and world trade growth. However, global air cargo growth slowed in 2018, with the trend continuing into 2019. This is was driven by the end of the inventory restocking cycle and weakness in global trade due to increasing geopolitical instability and trade tensions between the U.S. and China.

According to the most recent ACI statistics, the five largest U.S. cargo airports in North America are, in order: Memphis (MEM), Anchorage (ANC), Louisville (SDF), Los Angeles (LAX) and Miami (MIA) . All five were among the fifteen largest cargo airports in the world, with Asian airports such as Hong Kong (1st), Shanghai Pudong (3rd) and Seoul Incheon (4th)dominating the other top spots. In 2010, Federal Express and United Parcel Service were the largest freight cargo carriers according to IATA data. While the latest 2018 still puts Federal Express in first place, United Parcel Service is now number four, behind Emirates and Qatar Airways, and followed by Cathay Pacific Airways.

In the United States, FedEx and UPS together continue to fly the most freight domestically. These carriers accounted for approximately 75 percent of domestic air freight in 2018. In third and fourth place are Atlas Air and Air Transport International respectively. Combined, they carried more than 9 percent of domestic air freight in 2018, a threefold increase since 2013. Both carriers are the main carriers contracted to fly for Amazon Air, which has eroded the market share and challenged the dominance of FedEx and UPS as e-commerce has grown explosively.

As of mid-2019, the growth of e-commerce has helped the United States sustain overall cargo growth, as strong domestic freight volumes offset declines in international freight. Air cargo in North America, which is dominated by the United States, currently accounts for 30 percent of global freight compared to more than 36 percent for the Asia-Pacific region. Looking ahead, this discrepancy will only widen in the following

decades. Boeing's 2018-2037 World Air Cargo Forecast predicts that air cargo traffic will grow 4.2% annually in the next 20 years, primarily due to air cargo traffic within and to/from Asia. As a mature market, North America is forecast to have below-average air cargo growth.

2. REGULATORY CONSTRAINTS FACING THE CARGO SECTOR

2.1 Bilateral Air Service Agreements

International aviation is governed by an array of bilateral agreements and some multilateral agreements between and among governments that have evolved under the framework of the Chicago Convention of 1944.

Since 1992, the United States has been pursuing an Open Skies policy. The main components of an Open Skies agreement are:

- Open international routes between the parties including third, fourth, fifth and sixth freedom traffic rights,
- No limits on number of carriers that are allowed to operate
- No limits or on the number of flights they can operate,
- Liberal provisions on pricing and charters,
- Provisions on commercial opportunities (e.g. intermodal rights) and doing business issues (e.g. user charges and ground handling).

The United States also has optional provisions with respect to cargo that it seeks from its negotiating partners: intermodal code sharing and seventh freedom traffic rights for all-cargo scheduled and charter services. (Seventh freedom traffic rights allow an airline to carry traffic between two countries neither of which is its homeland e.g. right for Lufthansa to carry cargo between the United States and India without landing in Germany). Of course, the consent of the third country is necessary before the rights can be implemented.

(Please see the appendix at the end of this chapter for the definitions of traffic rights discussed in this section).

The United States has been successful in concluding Open Skies agreements with many countries in every region of the world. In 2010, the United States achieved the landmark of 100 Open Skies partners. As of 2019, it reached more than 125 Open Skies partners. Over half of these Agreements include seventh freedom traffic rights for all-cargo services and the U.S. government has made a concerted effort to revisit existing Open Skies agreements to add all-cargo seventh freedom traffic rights. All U.S. Open Skies agreements cover all-cargo services. In a few cases, such as Mongolia and Vietnam, U.S. partners have agreed to Open Skies for all-cargo services only.

Most of these Open Skies agreements are bilateral agreements. However, the United States has two multilateral agreements: 1) United States/European Union Air Transport Agreement and 2) Multilateral Agreement on Liberalization of International Air Transportation (MALIAT) which was started in 2001 and which primarily involves partners surrounding the Pacific---Brunei, Chile, Cook Islands, Fiji, New Zealand,

Samoa, Singapore, Tonga and the United States. The MALIAT also provides an option which allows countries to accede to a Protocol for Open Skies for all-cargo services only. Mongolia opted to agree to the all-cargo Protocol.

Some of the air transport agreements reached with major aviation partners since the 2005 issue of the ACI-NA Air Cargo Guide ---European Union, Brazil, China, Colombia, and Japan--- are discussed below.

U.S./European Union Agreement

The United States and European Union reached an Open Skies Agreement (Stage 1) in 2007 and concluded negotiations on amending the Agreement in 2010 (Stage 2). The Agreement governs aviation relations with the EU and its 27 Member States. Iceland and Norway have acceded to the U.S./EU Agreement even though they are not members of the EU.

The Agreement extended Open Skies to EU member states that did not have such bilateral agreements with the United States, such as the United Kingdom. It eliminated the legal restrictions on the number of airlines and which U.S. gateways are permitted access to London's Heathrow Airport.

The U.S./EU Agreement also includes some seventh freedom rights for all-cargo services. The EU airlines have open seventh freedom rights for all-cargo services between the United States and other countries. U.S. airlines are limited to those seventh freedom traffic all-cargo rights, which they already had under bilateral agreements with some Member States, such as France and Germany.

The U.S./EU Agreement is sometimes referred to as Open Skies plus because it contains additional liberalizing elements. For example, the United States agreed to the "EU carrier concept" which means the United States would accept any EU airline substantially owned and effectively controlled by nationals of any EU Member State or States to operate between any point in the EU (not just that airline's homeland) and the United States.

The Agreement also allows EU airlines to carry Fly America civilian government scheduled and charter cargo and passenger traffic in international markets that do not include the United States and in U.S international markets for which there is no General Services Administration contract. It provides that U.S. airlines can enter into arrangements for aircraft with crew for international air services that do not include the United States. (Previously, U.S. airlines were not allowed to wet lease from foreign carriers in any markets). The Agreement includes an emphasis on enhanced cooperation between the United States and EU on a variety of issues.

The Agreement also details how the ICAO balanced approach to aircraft noise management at airports should be implemented. The balanced approach requires a careful evaluation of costs and benefits before restrictions can be placed on aircraft operations. U.S. cargo carriers are concerned about EU airports proposing and implementing noise-based operating restrictions as these undercut the economics of their operations.

There are additional rights available to each party, but they are subject in the case of the United States to changing its law on U.S. airline ownership and control and in the case of the EU to changing its law on airport noise restrictions. For example, if the United States were to liberalize its law to allow majority ownership and effective control of U.S. airlines by EU nationals, then U.S. airlines would receive open seventh freedom rights for all-cargo services between the EU and other countries among other things.

U.S./Brazil Agreement

The United States and Brazil initialed a phased Open Skies Agreement during late 2010, which eventually entered into force in May 2019. The agreement includes unlimited number of carriers, open international routes, code sharing, pricing, and charters. However, the Open Skies agreement did not include seventh freedom traffic rights for all-cargo services, but the U.S. has approached the Brazilians about implementing these rights.

U.S./Colombia Agreement

Also in late 2010, the United States and Colombia reached a phased Open Skies agreement. Most of the Open Skies provisions applied immediately to all-cargo services. With the phasing completed at the end of 2012, full Open Skies for combination and all-cargo services is in effect. However, the Open Skies agreement does not include seventh freedom traffic rights for all-cargo services although the U.S. has approached the Colombian government about adding these rights.

U.S./China Agreement

Over the years, the United States and China have gradually liberalized their aviation relationship. Most recently in May 2007, the United States and China reached an agreement which substantially expanded rights for both sides. The provisions governing all-cargo services are more liberal than those on combination services. Effective March 2011, the agreement provides for unlimited designations, frequencies and open international routes including fifth freedom and sixth freedom rights for all-cargo services. Special provisions continue to provide seventh freedom traffic rights and enhanced change of gauge rights for a carrier which operates a cargo hub in the other country meeting the requirements stipulated in the Agreement. However, cargo charters like combination charters are generally subject to quotas in city-pair markets in which Chinese carriers operate scheduled all-cargo services except for charters involving China's Zone 3 as defined in the Agreement.

The Agreement continues to apply designation limits (U.S. carriers only), frequency limits and restrictions on fifth freedom rights with respect to combination services. It did provide for phased increase in those limits on designations and frequencies, but there are no more increases available after 2011.

The two sides have met periodically with the goal of reaching full liberalization as mentioned in the Agreement, but have yet to come to an understanding.

The U.S. and China have encountered some difficulties implementing the Agreement. For example, DOT has continued to condition its approval of China Southern's request to coterminalize U.S. points on its all-cargo services upon China's approval of U.S. carrier requests for additional coterminal all-cargo flights in China. Therefore, China Southern will not be allowed to coterminalize its cargo points in the United States until China permits additional coterminalization of cargo points in China by U.S. airlines.

U.S./Japan Agreement

The United States and Japan concluded an Open Skies agreement in late 2009 that became effective and was implemented in October 2010 when the fourth runway at Haneda International Airport became operational. The agreement removes the previous restrictions on routes, code sharing, designations, frequencies, and charters. It eliminates the legal distinctions between incumbent and nonincumbent carriers so that UPS, Polar and Evergreen have the same rights as Federal Express with respect to unlimited frequencies and fifth freedom rights. The Agreement does not include seventh freedom traffic rights for all-cargo services. The agreement allows Japanese carriers some access to Fly America along the lines granted to the EU.

In 2019, the U.S. and Japan negotiated expanded access for U.S. carriers to Tokyo Haneda International Airport as a result of the Japanese government's doubling of available slots at the airport. 12 new slot pairs for combination carriers at commercially viable times were made available, bringing the total slot pairs for U.S. carriers at Haneda to 16. No expansion of rights for all-cargo carriers were made available, although the Japanese did affirm all-cargo carrier fifth-freedom traffic rights and change-of-gauge opportunities.

2.2 Security Constraints

In the wake of the September 11th attacks, security of air transportation has dominated the industry as a whole and the cargo sector is no exception. Although officials are keenly aware of the need to preserve the critical role air cargo plays in the world and U.S. economies, security regulation will likely be the most prominent constraint on the industry in the foreseeable future and will certainly add costs to doing business.

Immediately after the attacks, the Aviation and Transportation Security Act (ATSA) was signed into law, creating the Transportation Security Administration (TSA), the federal agency primarily responsible for air transportation security. Although initially created as part of the Department of Transportation, the Homeland Security Act of 2002 transferred TSA to the Department of Homeland Security (DHS) in 2003. Customs and Border Protection (CPB), also part of DHS, enforces regulations that impact domestic and international air cargo security. While, the FAA's focus is on ensuring air cargo shipments do not present safety hazards, CPB focuses on regulating its import and export. Although their missions have converged somewhat in recent years, TSA is primarily responsible for promulgating regulations to ensure the security of air cargo. In ATSA, Congress established two primary mandates for TSA regarding air cargo security:

- Provide for the screening of all property, cargo, carry-on and checked baggage and other articles, that will be carried aboard passenger aircraft operated by U.S. and foreign air carriers

- Establish a system to screen, inspect, or otherwise ensure the security of freight that is to be transported in all-cargo aircraft as soon as practicable.
- In May 2006, TSA issued its Air Cargo Security Final Rule to implement a large part of its Strategic Plan and many of the recommendations submitted to the TSA Administrator by the Aviation Security Advisory Committee. The Final Rule established comprehensive measures to strengthen air cargo security designed to protect the cargo transported aboard passenger and all-cargo aircraft each day. The air cargo security requirements were the most significant modification to air cargo regulations since 1999, and represent a joint government-industry vision of an enhanced security baseline. Prior to this rulemaking, TSA had enacted regulations implementing its Known Shipper program and requiring adoption of security programs for certain types of carriers, which detail procedures to screen cargo, verify the identities of persons with access to planes and ensure the security of parked aircraft. TSA periodically issues security directives (SDs) and emergency amendments to security programs (EAs), to enhance these and other security measures. For example, TSA had required domestic and foreign carriers to conduct random inspections of passenger aircraft that carry cargo and all-cargo aircraft, and foreign all-cargo air carriers operating into and out of the U.S. to follow security plans approved by TSA. In addition, TSA has sought to develop canine detection teams and technology, including explosive detection machines, to enhance the effectiveness of its cargo security program. The Air Cargo Final Rule formally makes permanent some practices already in place and adds others. Major new security measures include: Require safety threat assessments for individuals with unescorted access to cargo;
- Codify cargo screening requirements first implemented under SDs, EAs, and part 1550 programs issued in November 2003;
- Require airports with SIDAs to extend them to cargo operating areas;

- Require aircraft operators to prevent unauthorized access to the operational area of the aircraft while loading and unloading cargo;
- Require aircraft operators under a full or all-cargo program to accept cargo only from an entity with a comparable security program or directly from the shipper;
- Codify and further strengthen the Known Shipper program;
- Establish a security program specific to aircraft operators in all-cargo operations with aircraft with a maximum certificated takeoff weight more than 45,500 kg;
- Strengthen foreign air carrier security requirements essentially to parallel the requirements on U.S. aircraft operators; and
- Enhance security requirements for Indirect Air Carriers.

Although TSA successfully met the Implementing Recommendations of the 9/11 Commission Act of 2007 (9/11 Act) deadline for screening all cargo to be transported on passenger aircraft departing airports in the United States, the agency also established a requirement for passenger carriers to screen 100 percent of cargo on flights departing international airports for the US.

In late 2010, TSA in coordination with Customs and Border Protection launched the Air Cargo Advance Screening (ACAS) pilot, an initiative to utilize manifest data submitted by passenger and all-cargo airlines in advance of departure to target high-risk shipments for additional screening. In early 2011, TSA issued risk-based security requirements to passenger and all-cargo airlines which required the screening of high-risk cargo shipments.

To meet the 9/11 Act requirement for screening 100 percent of cargo on passenger aircraft departing international airports destined for the United States, TSA issued security programs to domestic and foreign airlines that included a December 3, 2012 deadline by which all cargo must be screened for explosives. Since TSA worked closely with industry and foreign government representatives to develop the risk-based screening protocols, the requirement did not expected to disrupt commerce or the volume of cargo transported to airports in the US.

Through the ACAS Program, which in 2018 required airlines to submit information on air cargo shipments, CBP and TSA identify high risk cargo shipments prior to being loaded on aircraft.

Meanwhile, CBP implemented the Congressional mandate passed as part of the Trade Act of 2002 to require advance transmission of electronic cargo information for both arriving and departing cargo. Air carriers importing and exporting cargo must submit detailed shipment information to CBP electronically using the Automated Manifest System (AMS). For shipments into the U.S., the information must be transmitted four hours prior to arrival for intercontinental flights and at “wheels up” for flights from Canada, Mexico, and Central and South America north of the equator. For exports from the U.S., the information must be provided via AMS two hours prior to scheduled departure from the last U.S. port.

However, the Final Amended Rule issued in 2011 amended two provisions of the Air Cargo Screening Interim Final Rule (IFR) issued on September 16, 2009. The IFR established the Certified Cargo Screening Program, in which TSA certifies shippers, indirect air carriers, and other entities as Certified Cargo Screening Facilities (CCSFs) to screen cargo prior to transport on passenger aircraft. Under the IFR, each CCSF applicant had to successfully undergo an assessment of their facility by a TSA-approved validation firm or by TSA. In response to public comment, the final amended rule removed all validation firm and validator provisions, so that TSA will continue to conduct assessments of the applicant's facility to determine if certification is appropriate. The IFR also required that if an aircraft operator or foreign air carrier screens cargo off an airport, it must do so as a CCSF. The final rule eliminates this requirement, as aircraft operators are already screening cargo on airport under a TSA-approved security program, and do not need a separate

certification to screen cargo off airport. Finally, the final amended rule proposed a fee range for the processing of Security Threat Assessments.

2.3 Safety Constraints

Safety issues, which are addressed primarily by the Federal Aviation Administration (FAA), will also continue to constrain the cargo sector.

For years, the FAA has been conducting aviation safety oversight assessments of countries around the world, to determine whether U.S. aviation partners are complying with their obligations under the Chicago Convention to regulate their own carriers' safety practices. If the FAA finds a country to be doing so to its satisfaction, it assigns a Category I rating, and that country's carriers may continue to serve the U.S., and expand operations to the U.S., to the extent provided for in applicable bilateral agreements. If in the FAA's judgment the country is not in compliance with minimum international standards, it assigns a Category 2 rating. If a country has carriers with existing operations to the U.S. at the time it is assessed a category 2 rating, those carriers are permitted to continue current operation levels under heightened FAA scrutiny. If a country does not have air carriers with operations at the time of the Category 2 assessment, its carriers are prohibited from serving the U. S. However, new operations from category 2 countries are allowed if conducted using aircraft wet-leased from U.S. carriers or foreign carriers from category 1 countries authorized to serve the U.S. with their own aircraft.

As of November 2012, countries currently classified with a Category 2 rating include: Bangladesh, Barbados, Belize, Cote D'Ivoire, Curacao, Democratic Republic of Congo, Gambia, Ghana, Guyana, Haiti, Honduras, Indonesia, Kiribati, Montenegro, Nauru, Nicaragua, Paraguay, Philippines, Serbia, Saint Maarten, Swaziland, Ukraine, Uruguay and Zimbabwe. Thus, the carriers of these countries may not initiate new or expand existing U.S. service at the present time, regardless of what the bilateral agreements may otherwise permit.

On the brighter side, countries that had been given the Category 2 rating have since improved to Category 1 include Kuwait and Thailand.

Some foreign countries have challenged the fairness of these FAA assessments, and have questioned the authority of the U.S. to police other countries' adherence to ICAO standards. However, as a practical matter, carriers from countries rated as Category 2 face very real constraints on their ability to serve the U.S. market, regardless of how high a level of safety those carriers may be able to demonstrate with respect to their own operations.

The United States has been focused on safety domestically as well. The National Transportation Safety Board recently reported the following facts regarding air cargo operations:

- There have been over 40 NTSB Cargo accident investigations since 1984
- The fatal accident risk is 2-5 times higher for cargo than for passenger operations
- The cargo fleet, while changing and shifting towards newer, more fuel efficient aircraft, tends to be older than combination aircraft

The NTSB and Air Line Pilots Association, International have pointed out that there are significant differences between the safety standards for cargo and passenger operations. These include less stringent operating rules regarding flight and duty time limits, reporting weather information, and alternate airports, and use of flight dispatchers. In addition, less stringent certification standards apply to cargo aircraft, which, for example, do not require safety equipment standard on passenger aircraft such as fire-suppression systems in the main cabin or lower decks, emergency exits, and exit slides. The relatively greater age of

the cargo fleet means maintenance issues are more significant, including limited support from manufacturers. Moreover, many cargo aircraft undergo numerous modifications and reconfigurations, complicating maintenance. In addition, the ARFF requirements for airports that handle air cargo aircraft are not the same as those for air carrier passenger operations. In addition, there are no federal certifications or regulatory requirements for personnel and companies that prepare and load cargo.

To address air cargo safety issues, the FAA's Flight Standards Service developed the Cargo Strategic Action Plan and Air Cargo System Safety Implementation Plan (September 30, 2002), which identifies its long-term strategies as increasing inspector awareness on inspection guidelines by issuing an updated handbook policy and developing a formal training course.

These and other measures could add significantly to the cost of operating air cargo flights in the future.

3. SOLUTIONS TO THE CONSTRAINTS

3.1 Petitioning the Government to Provide Special Regulatory Relief

As security and safety take on central importance, industry stakeholders must recognize their pivotal role in ensuring regulators strike a reasonable balance with economic imperatives. Certainly this requires keeping a close eye on regulatory developments and participating in the legislative and regulatory rulemaking process. However, stakeholders oftentimes are most effective when taking the initiative to present specific proposals, which identify how the proposals will contribute to the attainment of national policy objectives. An example of this is passage of the Expanded Air Cargo Transfer Authority for Alaska enacted as part of Vision 100 – Century of Aviation Reauthorization Act in 2003. This initiative built on the success of the "Alaska Cargo Transfer Initiative," a regulatory proceeding decided by DOT in 1997. As a result of these measures, the State of Alaska and its international airports have obtained essentially unlimited cargo transfer flexibility for U.S. and foreign air carriers, including use of their code share partners. These measures have helped ensure Alaska (and so the United States) retains its share of the large and fast growing Asia-Europe cargo market. In the increasingly tense security environment, U.S. cargo airports must continue to monitor regulatory measures that can impact their competitiveness with foreign airports, particularly Canadian and Mexican airports that can function as direct competitors for handling cargo traffic transiting North America in either direction. On one hand, this means ensuring as much as possible that U.S. regulatory requirements are paralleled to the greatest degree possible in Canada and Mexico. In addition, it means ensuring that regulatory requirements are tailored to achieve critical security objectives without unnecessarily inhibiting industry growth and efficiency.

3.2 Participating in the Bilateral Negotiation Process

ACI-NA established the U.S. International Air Service Program for those U.S. airports interested in U.S. international issues. Participating U.S. airports pay an additional dues assessment. The Program promotes interests common to its participating airports, particularly with respect to the development of international air services to U.S. communities and the protection of U.S. airport proprietary rights in U.S. international agreements and aviation relationships. The Program provides the essential access to the negotiating process that enables U.S. airports to promote and protect their interests with U.S. and foreign decision makers.

Carriers and airports seeking to overcome constraints created by the bilateral network will find it useful to participate actively in the formulation of U.S. policy for upcoming bilateral negotiations. Whenever

negotiations are scheduled with a particular country, it is standard practice for the U.S. Government to invite all interested U.S. carriers and airports to submit written comments on the position the U.S. Delegation should take. In addition, there is normally an industry pre-negotiation meeting held in Washington which provides an opportunity to respond to issues raised by other parties, and discuss more fully the points raised in an airport or airline's own written submission to the negotiators. Furthermore, the U.S. typically permits its airports and carriers to include a representative as an observer on the U.S. Delegation to most rounds of bilateral and multilateral negotiations. Thus, U.S. interests usually have the opportunity to observe directly the course of these important negotiations, and to provide input to the U.S. Government negotiators as to the progress. However, there are many meetings that are that are not open to individual parties. In some of those cases, U.S. trade associations including ACI-NA and members of the U.S. International Air Service Program can participate in the meetings.

As noted above, U.S. policy specifically contemplates cargo may be a useful stepping stone to full liberalization with countries not ready for an immediate transition to "Open Skies," and U.S. negotiators therefore may be eager to hear from airports and carriers with specific ideas for expanding international cargo services through bilateral negotiations. Airports and carriers should first assess their strengths, in order to effectively present their interests to decision-makers among U.S. and foreign governments and carriers.

4. CONCLUSION

Despite the tremendously difficult circumstances it has faced during the past several years, the air cargo sector has remained relatively stable and it now positioned to continue the long-term trend of consistent growth. Air cargo carriers are positioned to play a vital role in contributing to economic growth, enabling U.S. exporters to reach foreign markets, and bringing products to U.S. manufacturers and consumers from sources around the world. As in the past, the industry faces a number of constraints, chief among them security issues, as well as bilateral and safety issues. However, sophisticated cargo carriers and airports will continue to be able to find ways to work with regulators to achieve important security and safety objectives, while continuing to work toward increased liberalization of international markets and facilitate continued growth and vibrancy in the air cargo industry. The carriers, airports, forwarders, and other players in the cargo industry need to take an active role in implementing the regulatory relief strategies touched on here, so that the full measure of air cargo's economic potential can be realized for the benefit of the national economy, shippers and consumers, as well as our industry.

Appendix - Freedoms of the Air

First Freedom of the Air - the right or privilege, in respect of scheduled international air services, granted by one State to another State or States to fly across its territory without landing (also known as a ***First Freedom Right***).

Second Freedom of the Air - the right or privilege, in respect of scheduled international air services, granted by one State to another State or States to land in its territory for non-traffic purposes (also known as a ***Second Freedom Right***).

Third Freedom of The Air - the right or privilege, in respect of scheduled international air services, granted by one State to another State to put down, in the territory of the first State, traffic coming from the home State of the carrier (also known as a ***Third Freedom Right***).

Fourth Freedom of The Air - the right or privilege, in respect of scheduled international air services, granted by one State to another State to take on, in the territory of the first State, traffic destined for the home State of the carrier (also known as a ***Fourth Freedom Right***).

Fifth Freedom of The Air - the right or privilege, in respect of scheduled international air services, granted by one State to another State to put down and to take on, in the territory of the first State, traffic coming from or destined to a third State (also known as a ***Fifth Freedom Right***).

ICAO characterizes all "freedoms" beyond the Fifth as "so-called" because only the first five "freedoms" have been officially recognized as such by international treaty.

Sixth Freedom of The Air - the right or privilege, in respect of scheduled international air services, of transporting, via the home State of the carrier, traffic moving between two other States (also known as a ***Sixth Freedom Right***). The so-called Sixth Freedom of the Air, unlike the first five freedoms, is not incorporated as such into any widely recognized air service agreements such as the "Five Freedoms Agreement".

Seventh Freedom of The Air - the right or privilege, in respect of scheduled international air services, granted by one State to another State, of transporting traffic between the territory of the granting State and any third State with no requirement to include on such operation any point in the territory of the recipient State, i.e. the service need not connect to or be an extension of any service to/from the home State of the carrier.

Eighth Freedom of The Air - the right or privilege, in respect of scheduled international air services, of transporting cabotage traffic between two points in the territory of the granting State on a service which originates or terminates in the home country of the foreign carrier or (in connection with the so-called Seventh Freedom of the Air) outside the territory of the granting State (also known as a ***Eighth Freedom Right*** or "**consecutive cabotage**").

Ninth Freedom of The Air - the right or privilege of transporting cabotage traffic of the granting State on a service performed entirely within the territory of the granting State (also known as a ***Ninth Freedom Right*** or "***stand alone" cabotage***).

Source: *Manual on the Regulation of International Air Transport* (Doc 9626, Part 4)

CHAPTER 7

THE AIRPORT – TENANT RELATIONSHIP

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1. INTRODUCTION

Airport operators recognize the broad economic impact of air cargo on the service region, and have become receptive – and enthusiastic – about air cargo development. The increased significance of these relationships between airport operators and cargo tenants has been accompanied by layers of complexity in cargo-tenant relationships, including the contractual relationships that define how the parties engage.

This chapter will explore the relationships between the roles and objectives held by local airport management and their tenants, which may include airlines, developers, and various allied service providers. Given that airport management has a tremendous public responsibility that could be different than the profit motive of their tenants, the chapter attempts to provide an even-handed assessment of the issues that frequently lead to a difference of opinions. However, these differences should not overwhelm the prevailing belief that tremendous opportunities for cooperation also exist between the public airport operators and their private sector partners. To encourage cooperation, and assist airports in future negotiations, some of the standard language that frequently appears in contracts between airports and their cargo users/tenants is included. The objective here is not to provide a survey course on contract administration, FAR compliance, or bankruptcy law. However, this chapter is intended to provide airport operators with sufficient insight to at least raise the appropriate questions. More importantly, we hope that this chapter will invest airport managers with greater confidence to proceed with the critical challenge of developing sufficient cargo facilities and infrastructure to meet the industry's complex and often diverse demands.

2. AIR CARGO STAKEHOLDERS

2.1 Airports

In its roles as public land owner, public guardian and local advocate for regional services, the airport has a vested interest in ensuring that assets are put to their optimal use while balancing environmental and noise considerations. Throughout this juggling act, airport operators must respect both the long-term perspective of the Airport Master Plan and the users' more immediate needs and expectations of equitable treatment. Airport operators must determine whether they desire to lease directly to the airlines and other cargo users, or to introduce a developer into the airport's development process. Ultimately, airport operators must consider all options when formulating the planning, construction, marketing and operations of cargo and its related businesses.

2.2 Airlines

Today, airlines come in a broad range of operational configurations. Not even accounting for various surface modes which may also be utilized for one or more transport legs, air transport of cargo typically occurs in one (or more) of four ways: the belly of passenger aircraft, in combi-aircraft, via integrated carriers, or in all-cargo carriers. Each category has distinctive networks, operational styles and landside requirements. In developing its physical infrastructure, airport management must evaluate the needs of each type of cargo operator. The ability to attract and maintain cargo operations is directly related to an airport's ability to address individual airline requirements with planning flexibility and financial responsiveness. Many foreign passenger carriers operate freighters, and most U.S. passenger carriers maintain cargo divisions. All routinely reexamine landside capital investment strategies. In cases where passenger yield management goals have been achieved by changing fleet mix and adjusting route structure, the result for cargo has been reduced belly capacity and an increasing reliance on all-cargo aircraft. These conditions were greatly exacerbated by the events of September 11th, 2001 and its

aftermath in which airlines initially shed capacity in an effort to match reduced demand. Later, as passenger demand returned, airlines restored passenger capacity through the use of regional jets with diminished cargo capacity. This evolution has left many airport managers scrambling to meet changing requirements as more cargo is carried via surface transportation and freighter operations.

2.3 Freight Forwarders & Customs Brokers

Despite extraordinary market share gains by integrated carriers, freight forwarders continue to be essential for effective goods movement by air – especially for international transport. While the relationships between forwarders and airlines can be challenging at times, there is still an obvious interdependence acknowledged by both parties. While freight forwarders historically have been perceived as little more than a travel agent for freight, many of today's more sophisticated forwarding companies operate vast trucking fleets, and a few command scheduled charter flights with cargo airline partners. Although many forwarders may choose to locate on less expensive property off-airport, recent security concerns have elevated the perceived value of an on-airport operation. While some forwarders are wholly niche-oriented, even the largest companies have departments dedicated to specific geographic areas or industries, including dedicated computer, pharmaceutical, chemical and automotive divisions.

While forwarders serve exporters, customs brokers cater to the needs of importers. Many freight forwarders and integrators may include customs brokerage functions; it is also common for these industries to have agency agreements with independent brokers. For both forwarders and brokers, success is increasingly dependent on their ability to integrate their own systems with those of shippers, carriers, forwarders, and federal inspection agencies worldwide. Recognizing that rapid clearance of goods is among their most critical functions, brokers play a crucial role in the cargo delivery chain. While electronic tracking and clearance systems have reduced the need for brokers to physically maintain offices on the airport premises, frequent complications suggest that proximity to the airport and federal customs is desirable.

2.4 Shippers

Having exhausted much of the low-hanging fruit in terms of time and money-saving manufacturing innovations, producers and suppliers are increasingly concentrating on logistics as a critical component in global competition. Providing the maximum in time expediency and delivery reliability, air transport's appeal has been magnified in the era of just-in-time manufacturing, zero inventory distribution, and contracted product life cycles.

Where physically and financially feasible, these major manufacturers and distributors are locating logistics centers on or near those airports that can provide the necessary lift. Increasingly, this strategy has led to the airport's enhanced role in local economic development efforts to lure companies to cities that are perceived to have an air cargo competitive advantage. This recognition has also galvanized industry discussion of all-cargo airports, although in North America few such airports are likely to be successful as long as ample capacity exists at existing commercial airports.

2.5 Ground Service Providers

Frequently, the ground service provider (GSP) is the link between the aircraft and the warehouse. The GSP loads and off-loads cargo, moves it to and from the warehouse - and even within the warehouse, itself. Historically, these operators have functioned in a fiercely competitive environment where cost-minimization was the dominant criteria in bidding for business. However, the industry has evolved from the obsession with low cost, to emphasizing value – balancing cost with quality. As a result, many air carriers are outsourcing part of their cargo operations to handling companies who gain economies of scale and cost

efficiencies by utilizing staff and equipment for multiple carriers. While this initially results in consolidation of space requirements and more efficient use of facilities, thereby reducing overall space requirements, the increasing provision of value-added services by GSP's eventually creates demand for additional space. As handling companies assume these larger roles, their need for GSP facilities and operating facilities on the airport (in general) will continue to grow.

2.6 Trucking

Ground transportation plays a critical, yet occasionally overlooked role in air cargo delivery. Not only do trucking companies serve airlines and forwarders but the major integrators rank among America's largest trucking companies in fleet size. This activity utilizes considerably more space than many airport operators realize, placing a substantial, yet often neglected impact on facilities and road maintenance, planning and development. On some airports, estimates of the cargo volume that moves entirely truck-to-truck can run as high as 30%. Whether freight is moved plane-to-truck or truck-to-truck, air cargo is inherently intermodal. Consequently, airport planning and design must include considerations of air cargo trucking in roadway geometry, building frontages and building design. Moreover, facilities for truck maintenance or truck to truck operations may also merit consideration. While most trucking companies do not have to be on-airport, the movement of logistics and manufacturing centers closer to airports may spur a change.

3. WHO SHOULD BUILD? THE SELECTION PROCESS

Airports have several options when considering the planning, development, construction and marketing of air cargo facilities. These include airport-owned and operated facilities, if funds are available and airport management has sufficient development expertise in-house. Many airports prefer to accept greater risk by developing their own facilities. This enables them to generate more revenue and retain greater control over airside operations and the ability to use federal or state grants that may reduce the overall cost of the project. Airports may, in some instances, pass any savings along to the end users in the form of reduced rents.

Alternatively, airport management may choose to allow site development by either the end user (airline or GSP) or a developer. If a third-party developer is used, the airport will typically make less money. However, the burden of development, financing, marketing, leasing and management, along with the risks inherent in the consolidation of carriers and carrier use of outside handlers, releasing, refinancing and bankruptcy is passed to the developer. A matrix of considerations for the pros/cons of using developers is presented below. If the facility is to be developed by the end user for its own operations, the negotiations proceed rather quickly.

Pros & Cons of Private Facility Development

PROS

Financing:

- Developers' financing has no recourse to airport nor effect on its credit rating. Risk related to occupancy, bankruptcy of tenants and associated debt-service considerations is borne by the developer.
- Typical air cargo facilities financing – including those using tax-exempt, special facilities airport bonds, do not affect airports' borrowing limits and caps
- Net result is to allow airport operators to invest their own funds in other priorities, including improvements with greater return-on-investment or operational priorities.
- Accelerated ground-lease income on property not currently utilized.
- Improvements revert to airport at no expense after initial land-lease term.
- Private development costs may be 15%-20% less than public.

Marketing:

- Developers provide marketing resources which may even relieve airport of need for cargo-specific staff.
- Developers have vested interest in leveraging their existing tenant relationships at other airports in their networks in pursuit of greater occupancy.
- Intangibles:
    a. Most developers bring cargo facilities expertise lacking at many airports.
    b. Often, developers supply improvements, such as utilities, aircraft parking ramp and other infrastructure for which airport may not have available funds.

CONS

Financial Considerations:

- Public airports often have unique access to less expensive funds, and thus privately-funded buildings may carry relatively higher rental rates depending on the financing model.
- Should developers go bankrupt, airport operators may be reconciled to partnering with financial institutions that have neither the industry sector skills nor motivation to aggressively pursue cargo development.
- Many cargo carriers still perceive that private developers inject an extra layer of costs into cargo facilities that otherwise would not be necessary.

Control:

- Airport operators must ensure through leasehold provisions that privately-operated buildings and infrastructure are maintained (appearance, safety and security) consistent with airport standards and federal regulations.
- Ability of airport operator to undertake speculative facilities development in pursuit of local economic development objectives may be incompatible with motivations of private developers. Similarly, application of public incentives to attract new service may be complicated by participation of private developers.

There are more complex situations that arise in which facilities will be required for either multiple tenants or where the demand for the facilities is unclear; a third-party developer/operator may be willing to construct facilities. In this case, airport management should initiate a clear, coordinated, and transparent selection process to determine who will develop the site. First, the governing authority must devise an orderly review process, identify a qualified selection committee and clearly define the evaluation criteria that will provide the basis for selection of the developer.

Typically, but not always, airport management conducts a Request for Proposal (RFP) as an open competition to select the best lessee for a particular site. Numerous positive and negative examples exist to inform prospective airport landlords of techniques for devising a productive RFP. ***It is important to note that RFP processes for development represent tremendous time and cost to prospective developers. Airports should be committed to the process and to the resultant deal and partnership prior to initiating the process.***

Where airports are not bound by public statute to conduct RFP's, many have opted for a less formal selection process involving the marketing of selected land tracts to qualified lessees and end users on a conditional first-come, first serve basis. This approach is ideal for airports with abundant land (Greenfield sites) and easily-established values, particularly if cargo development is described and anticipated in the Airport Master Plan and subsequent development can be directed to comply with the intentions of that planning document.

4. TYPES OF AGREEMENTS & CONTRACTS

4.1 Developers

While carrier and third-party development have been utilized at some airports extensively, these forms of development have become even more attractive in recent years when airport operators' own resources have been strained and carriers have opted to invest in aircraft rather than real estate. Several key phenomena have been responsible for the change.

1. Fluctuating fuel prices and a general economic slowdown have resulted in operating losses on many airlines, forcing carriers to reconsider route structure, frequencies, and fleet mix. To maximize revenues, carriers have sought to optimize passenger load factors by reducing capacity; this has become a double-edged sword. On the one hand, cargo's traditional function was to consume the belly capacity remaining after baggage was loaded. However, new fleet mixes for many carriers included significantly less belly capacity. E-commerce, the changing fleet mix, coupled with security requirements, has made shipment of cargo in bellies on certain routes more difficult, thereby less desirable, increasing the industry's reliance on all-cargo freighters. Many airports are not physically equipped to handle these aircraft. Moreover, airports confront this challenge with their own available capital for expansion already strained by the preceding losses in operating revenues combined with increased security-related operating costs, and expectations of future cargo-related security outlays. On the other hand, the growth of new international passenger service using wide-body aircraft has caused many carriers to abandon freighter acquisition strategies and pursue greater utilization of belly capacity, This bifurcation of industry strategies make it important to consider who the carriers are and their specific needs before major infrastructure investment.

2. The amount of Airport Improvement Program (AIP) grant money dedicated to cargo (cargo entitlements) is very small and considered by many, inadequate. Therefore, as air cargo tonnage

has increased, federal funding as a percentage of total cargo capital needs has declined considerably. The combination of insufficient federal funding and the need for substantial infrastructure investment has led airports and airlines (who prefer to invest their capital in aircraft) to increasingly consider private developers.

3. There is an growing trend to consider development of logistics parks to stimulate cargo activity and at the same time generate incremental revenue for airports, and new jobs for the region. Since much of this development may be considered ineligible for federal grant money, a private partnership is a logical consideration.

However, it would be presumptuous to assume that private development presents a universal solution. Absent several key ingredients, the inherent difficulties can be substantial.

1. The developer must recognize that the airport has obligations and objectives that are more than financial, and encompass other areas such as safety, security, and operational requirements.

2. The airport must consider whether they will assume a share of development risk, depending on their analysis of the overall market potential and the policy the airport has established toward cargo development.

3. Inherent in the Airport-Developer relationship is a difference in perspectives on revenue generation. While long-term leases are typical and all facilities/improvements ultimately revert to the airport, a developer's short-term needs and finite window for capitalization and profitability may conflict with the airport's longer-term perspective.

Basically, what must emerge is a working partnership based on mutual flexibility and risk. While developers bring investment, expertise, and often new tenants, airport management controls a unique, restricted resource – airport land. Both ideally and realistically, the partnership should benefit the airport, developer, tenants, and local economy. While airport operators bear public accountability, developers must conform to the expectations of their potential lenders and tenants. Failure to do so may compromise the ability to finance and/or lease the development. As private development at airports becomes more common, the process is becoming more streamlined and certain guidelines and practical realities are gaining in acceptance.

A critical element in the mix is the cost allocation for related infrastructure that may not be easily recoverable by the developer. The key to a successful development may ultimately require that airports consider investing their limited federal funds to stimulate private sector development activity by sharing costs.

5. BANKRUPTCY PROVISIONS & OTHER TERMINATION SCENARIOS

While introducing many operational improvements, airline deregulation also brought a high number of airline bankruptcies. That era produced much of the prevailing methodology for protecting airports from the injuries of such proceedings. For many airport contract managers, the first round of airline bankruptcies amounted to uncharted territory but provided invaluable insight for more recent (and ongoing) airline bankruptcies. Navigating federal bankruptcy codes, airport operators can find themselves in protracted efforts to seize collateral assets, at best, or merely to regain occupancy of facilities leased to airlines in bankruptcy. In the worst cases, airport operators have endured lengthy periods in which precious resources were untouchable and providing no revenues while courts and creditors deliberated. There have been

other situations that do not reduce the airport's revenues but do damage the airport's image and could potentially increase its future cost of borrowing.

In recent years, a number of airlines have financed the construction of special purpose airport facilities with tax-exempt special facility bonds. Unlike general airport revenue bonds, which are typically used to finance most airport infrastructure and are repaid from general airport revenues, special facility bonds are unique in that they are repaid solely by the user or from the revenues of the special purpose facility. In addition, up to this point, it has not been uncommon for special facility bond deals for major airlines to be structured as unsecured loans, which essentially means that if the airline defaults on the special facility debt, the bondholders do not get paid and have no collateral in the financed facility. Ultimately, it is critical to ensure that any bond deals are structured to provide adequate collateral for both the bondholders and the airport. This can be accomplished by giving the bondholders a security interest in the leasehold and/or revenues of the special facility being financed. (For greater detail, see Chapter 5)

On a parallel track, airlines continue to explore and go through mergers and acquisitions. In the case of healthy airlines acquiring the assets of bankrupt airlines, airports have sought to attach existing liabilities to the acquisition partner – as Kansas City and St. Louis attempted with American Airlines' assumption of former TWA assets. Conversely, airports have sought to sever existing contractual obligations when tenants have been acquired by operators who were perceived less favorably. Airport managers must be vigilant and anticipatory in preparing contracts that provide sufficient flexibility to bind or unbind – depending on the circumstances – tenants in critical future junctures.

Depending on prevailing ownership standards, airport management's cargo leases may include contracts with cargo carriers, ground handlers and/or developers. While the contract language may vary, some concerns will be consistent regardless of whether the airport operator is leasing directly to air cargo carriers and ground handlers or to a developer.

For example, airport management must ensure that insurance standards - by developers and/or carriers – will cover environmental cleanup should a bankrupt operator leave contamination. Similarly, airport operators must be properly indemnified for injury and any other liability concerns that could potentially be left by a bankrupt operator. In all likelihood, airport management will require proof of sufficient coverage from both the developer (if there is one), as well as the carriers and other cargo tenants.

5.1 Contractual Covenants

Assignment and Subletting by Tenant

In leasing directly to cargo carriers or other operators, airport management must control the circumstances under which space or rights are assigned or sublet to another operator. Most obvious, management should include reporting requirements that inform tenants – in writing – that space will be utilized by another party. In the event of an assignment, the airport operator will seek to ensure a) that the sub-tenancy is for an appropriate use, and b) that all existing obligations of the tenant are maintained. Again, this condition is particularly critical when the lessee of record files bankruptcy. On the other hand, airport management will similarly want to ensure that the authority's acceptance of an assignment of lease does not reduce the obligations (rentals, fees, and other charges) of the lessee of record – in the event that the secondary assignee should file bankruptcy. Under either scenario, it is incumbent on the airport operator to ensure that the full obligation of the tenant is maintained. In extreme cases, airport management may require procurement of a surety bond to establish assurance of the reliability for rental payments, potential damages and any other costs.

Relinquishment of Space

Frequently, an operator (carrier or ground handler) in financial distress will seek to relinquish all or part of its exclusive use or joint-use space. As long as the user has not exhausted the term of its contractual obligation for the space, standard contracting procedure is to require the tenant to notify management in writing of its desire to relinquish. Typically, airport management will use its best effort to offer relief by marketing/reassigning the space. However, the tenant seeking to relinquish space will frequently retain its obligation until the space has been successfully reassigned – regardless of actual usage.

Default and Termination

Contrasting with situations in which tenants may move to relinquish space prior to or during bankruptcy, airport operators may have to take action to regain control of space from unwilling carriers or ground handlers. In these instances, it is critical that lease contracts contain cure provisions and clear, enforceable remedies. When existing cargo facility space is approaching or already at full occupancy, no airport operator or developer wants to have space occupied by an idle tenant while potential carriers or ground handlers are forced to wait for availability. In these instances, it is essential that airport management have a clear contractual basis to initiate default and termination proceedings. Typically, these covenants will specify a standard or schedule for rental and/or other payments. However, airports may also include activity-based standards to mitigate the potential for limited cargo space to be reserved by idle cargo operators. Although the idle carrier may desire to continue paying rent for a period of time, the airport could be better served by allowing another operator to occupy the space in question – especially, for example, if the idle operator has ramp accessible warehouse space but is no longer operating aircraft.

Bonds

According to the U.S. General Accounting Office's 1998 report Airport Financing: Funding Sources for Airport Development, the single largest source of airport funding is bonds. This remains the case. Tax-exempt bonds may be issued by airport authorities, as well as state and local governments. Since 1982, 95% of all airport debt has been in the form of General Airport Revenue Bonds (GARBs), which are secured by an airport's future revenues. However, airports may also issue Special Facility Bonds (SFB's) that retain the tax-exempt status but are generally secured solely by the revenue from the indebted facility (terminal, cargo warehouse and apron), rather than the airport's general revenue. Large hub airports have issued the vast majority of special facility bonds.

Given that bonds have a term of 15-30 years; airport operators may potentially be faced with a bankrupt tenant that was perfectly healthy when the bonds were issued. If GARB financing was used to issue the bonds, the airport operator would have to divert other airport revenues to cover scheduled bond payments while attempting to secure another productive tenant. The airport operator might attempt to refinance, although having a replacement tenant in line would likely be essential to the success of any new bond sale. If SFB financing was used, the creditor (bondholder) or developer would usually end up with the facility which would then remain in an unproductive status until a viable tenant could be found. In all cases, the sponsors must be attentive to their bond covenants to ensure that a possible change in operating conditions would not jeopardize the bonds' tax-exempt status.

6. PRICING OF AIRPORT FACILITIES AND SERVICES:

The most important element underlying pricing strategy is flexibility. Fees that airports charge for services must be adequate to recover costs for both long and short-term agreements. Historic long-term lease

agreements (typically 30 to 50 years) for new development, have not provided airports with the flexibility required to address the challenges of deregulation, dwindling federal support, and changing times and practices. The current trend is to view the airport-as-a-market with a movement toward short-term use agreements for existing space. The shorter terms provide airport operators with greater flexibility to adjust pricing, investment policies, and space allocation. While often for five years or less, many contracts may even take the form of yearly or month-to-month operating agreements. As older contracts expire, many airports are routinely shortening the term on renewals and/or inserting more adjustments of rates and charges into existing agreements.

In contrast, long-term leases are more critical at airports allowing carriers or third party developers to build cargo facilities. In these situations, carriers or developers typically pay the airports only a land lease for the ground with the property and improvements reverting to the airport authority at the end of the lease. To amortize their investment, developers require a minimum of 25-30 year leases – occasionally with 5-10 year renewal options.

In the cargo community, the debate continues over which pricing method best addresses current realities. The cost allocation method, joint-product model and derived demand models all have merit. However, airport rate structures typically are more influenced by the comparative rates and charges of other airports or regional real estate costs, than by an airport's cost recovery system.

In determining rental rates, airports must be mindful of their competitiveness. In addition to the obvious gauge of comparative rental rates against other locations on and off-airport, competitiveness is determined by facility condition, apron access and proximity to tenants' clientele, and such items as stem-time from the customers to the airport freight location, as well as the mitigation of double-handling costs. The airport should also compare its total marginal cost of having or operating facilities (infrastructure carrying cost, operating costs such as security and fire protection, utilities, maintenance, personnel, administrative and accounting expenses) with its rental and other fee revenues, such as landing and parking fees, and with the intrinsic benefits to the community when setting rental rates to avoid incurring losses where they are avoidable/illogical.

The following is a partial summary list of terms commonly negotiated in air cargo facility development contracts:

- Rental rates - usually expressed in dollars/square foot/year, on any tract of land. If the airport wishes to share in risks and greater rewards, this fixed rate may be combined or replaced with a rate based on a percentage of gross or net revenues.

- Appraisal process- as the ground rent may be tied to the value of the property, this issue is important to all parties concerned. One inherent difficulty is the identification of comparable properties.

- Rental rate increases- through the term of the ground lease, airports will often require scheduled rate increases, often based on consumer price index (CPI) or some other method agreeable to both parties.

- Lease term- ranging from 25-50 years. It has become common to offer a series of five or ten year extension options to the site lessee beyond the original lease term.

- Rent start date - usually at substantial completion or occupancy of the property by the lessee.

- Site Definition - typically determined by a survey, but it is important to make sure in general that ground is being offered and leased, including requirements for impervious cover, drainage, etc.

7. AIRPORT FEE STRUCTURE

Airports and their tenants must balance their individual objectives with the ultimate pragmatic goal of cultivating a mutually beneficial win-win relationship. While operating within a competitive environment, U.S. airports are subject to a myriad of federal regulations that govern how airport services may be priced. For airport operators that accept AIP monies, CFR 14, Part 152 known as airport grant assurances require airports to set rates and charges at levels sufficient to make the airport as self-sustaining as possible. Other federal regulations require airport operators to collect sufficient revenues to cover operating and other costs (net of federal grants and PFC's) on the airfield and terminal, but require fair market value pricing on all non-aviation assets. As airports are assuming more of a bottom line orientation, an emerging common ground should prevail. Airline negotiations frequently raise debates over the reasonable expenses comprising all of the fees and expenses which airport management charges to airlines and other users. Many of the airlines' operating costs fall beyond the control of airport management. These typically include the availability and cost of fuel, labor, cost of living, quality of life, and federal, state and local taxes.

7.1 Fee Methodology

At most commercial service airports, the financial and operational relationships between the airport operator and the airlines are defined in legally binding agreements that specify how all risks and responsibilities will be borne. These contracts - commonly termed airport use and lease agreements - establish the terms and conditions governing the airlines' use of the airport. They also specify the methodology for calculating the rates and charges that airlines must pay for use of airport facilities and services. Along with the airlines' responsibilities, these contracts identify the airlines' rights and privileges, frequently including the right to approve or disapprove proposed airport capital development projects. While financial management practices differ greatly among commercial service airports, the airport-airline relationship typically takes one of two very different forms, with important implications for airport pricing and investment:

1. In the residual-cost approach, the airlines collectively assume significant financial risk by agreeing to pay any costs of running the airport that are not allocated to other users or left uncovered by non-aeronautical sources of revenue.

2. In the compensatory approach, the airport sponsor assumes the major financial risk of running the airport by charging the airlines fees and rental rates established at a level anticipated to recover the actual costs of the facilities and services, and perhaps, a margin of profit for future capital needs, or for distributions to its stockholders in the case of privately owned commercial airports.

For airports using the compensatory approach, the pricing of airport facilities and services may be set (subject to all federal laws and regulations) in excess of break-even levels.

7.2 Aircraft Landing Fees

Traditionally, the single most important source of revenue for most airports has been the landing fee charged to operators of aircraft. Since the initiation of air service, landing fees have been based on the weight of the aircraft, usually either the maximum gross landing weight (MGLW) or the maximum gross takeoff weight (MGTW).

A number of variations exist to these two options, including the following types of landing fees instituted by airports around the world:

1. A fixed rate per 1,000 pounds (or some other unit of measurement) irrespective of the total weight. The total charge is calculated my multiplying the unit charge by the number of 1,000 pound increments.

2. A rate per 1,000 pounds, with weight break-points, so that the rate increases in plateaus as the total weight increases. An aircraft is charged by multiplying its weight times the appropriate rate per 1,000 pounds - for that weight category.

3. Similar to 2, a rate per 1,000 pounds, with weight break-points, so that the rate increases in steps as total weight increases. However unlike 2, the charge is cumulative. This means that – for example - the first 30,000 pounds of an aircraft's weight may be charged at the rate for that weight range, but the next 30,000 pounds (weights 31 to 60,000 pounds) will be charged at another rate - and so on. At a few airports, the rate per ton actually decreases incrementally as the aircraft weight rises.

4. A rate per 1,000 pounds whether fixed (1) or with weight break-points (2, 3) – dependent upon the nature of the flight. Traditionally, there have been two categories of charges - one for domestic and one for international flights. In some countries, the stage length has been used to differentiate the unit charge. Regardless of the basis of differentiation, the aim has been to ensure that aircraft on longer flights pay a higher unit rate.

5. A few airports replaced the weight-based landing fee with a single fixed charge, regardless of aircraft size dated in the early 1990's; however such method is used less frequently.

In the U.S., the most common landing fee is a fixed rate per 1,000 pounds of an aircraft's maximum gross landing weight. Variations of this basic landing fee are used infrequently in the U.S. As these formulae penalize long-haul operations, landing fees that are based on stage length or the maximum gross takeoff weight (heavier than an aircraft's maximum gross landing weight) are utilized mostly by airports that lack the need to compete for heavy transport aircraft. In most instances, penalizing long-haul operations is not in an airport's best interests. Similarly, a single fixed landing fee that does not discriminate between aircraft sizes, but which may vary at different hours of the day, is used to discourage traffic during peak periods. Again, relatively few airports have such leverage or lack a compelling need.

To encourage activity, some airports grant fee exemptions for a carrier's introductory period (based either on time or volume) of operations and most airports maintain lower rates for signatory or scheduled carriers compared with non-signatory carriers and itinerant charter aircraft. While not an industry standard, some airports have introduced a cargo-only signatory agreement as an enticement to nurture cargo operations while recognizing that cargo operators are unlikely to reap the full benefit of the passenger terminal improvements that often drive airport investments and subsequent costs.

Landing fees can vary dramatically among airports. Based on an airport's financial status and capital improvement programs, substantial adjustments to the landing fees may be required to attract new business. These kinds of modifications may be implementable - provided such adjustments are non-discriminatory.

7.3 Aircraft Parking Fees

Aircraft parking fees are a common means for airports to charge airlines for aircraft stays beyond the free-parking period, generally two to six hours, covered by the landing fee. Airlines may be required to pay a charge for preferential non-exclusive parking on the airport's apron or ramp. This charge does not apply to aircraft parked on apron space leased to the airline.

The parking fee, or ramp fee, is typically a charge per hour or unit of hours. Frequently, twenty-four hours is used as the billable time unit once the free period has been exhausted. However, this methodology provides no incentive for airlines to vacate parking stands once they have entered a twenty-four hour period. To improve utilization of parking stands, airport operators should institutionalize a very short preferential, non-exclusive free-parking period followed by a parking charge for each hour that an aircraft stays on the stand. This methodology would reduce the number and cost of required stands while introducing another source of revenue. With a preferential non-exclusive agreement, an air carrier's preference at a particular site does not supersede the requirement to move idle aircraft if another carrier requires that parking position.

The parking charge is typically calculated on the basis of the aircraft's weight or, less often, on its area (wingspan X length). If based on weight, the parking charge will typically be a fixed amount per 1,000 pounds. The parking fee may vary between different areas of the airport, and fees for preferential use of prime parking areas may be applied. Ramp fees may also be allocated according to each airline's prorated use of common ramp area.

7.4 Other Aeronautical Charges

Additional charges are levied selectively by individual airports but are not universal. In the U.S., the most common example is the fuel flowage fee, typically a flat charge per gallon of fuel.

Airports have also begun to impose separate charges for specific facilities and services that may be used in the process of enplaning or deplaning cargo. These charges may include fees for deck loaders and security charges. Incremental security charges are being explored as a means of defraying the costs of heightened security measures being considered for cargo carriers. Similar to the means by which passenger airlines collectively defray the cost of passenger security screening, cargo charges could be implemented to pass increased surveillance and monitoring costs to the airlines.

Many airports also charge a fee or commission to ground handlers who perform services for cargo carriers operating at the airport. The fee is generally calculated against the gross value that the ground handler has billed to the airlines. At airports where multiple airlines are served by a ground handling company, the commission can be substantial.

Again, some or all of these fees may be waived as enticements to new operators for an established, fixed period of time. Similarly, the applicability of these fees may vary between signatory and non-signatory airlines, as well as for airlines which self-handle their operations.

7.5 Related Fees

Individual airports have introduced a diverse array of surcharges and rebates augmenting the basic landing fee. These are usually related to the distance of the flight, aircraft noise levels, and night landings

8. SAFETY, OVERSIGHT and CONTROL

Safety, oversight, and control often invite conflict comparable to the previously-discussed compensation/profit motives of airports and developers. While tenants prefer that the airport operators exercise as little oversight as possible, airport management is held responsible for activities on its property. Among entities exacting that accountability are the FAA, the airport's other tenants, and the surrounding community. In contrast with some of the site and pricing issues previously explored, both parties must be aware that many control concerns have no flexibility – in essence, non-negotiable. This section outlines

some of the safety, oversight and control issues that frequently appear in facility negotiations. Several related issues were explored in the bankruptcy section earlier in this chapter.

- Use of facilities - typically, airport management will opt to restrict air cargo related activities to air cargo facilities or an air cargo complex
- Ingress and egress - control of access, both on the landside and airside is critical to the security of the airport, the value and utility of the property, and its operational effectiveness
- Assignments and subletting – for security reasons, as well as, bankruptcy liabilities, airport management should control to whom the tenant subleases or assigns its lease
- Financing restrictions - will include subordination of the rent payments, encumbrances and lender re-entry rights
- Control of transport of hazardous materials on site to comply with local, state, and federal requirements
- Environmental controls, including establishment of an environmental baseline for the site, handling of contaminants, and liabilities for pollution created after the baseline
- Facility entry and inspection rights - airport personnel should have the right to enter the property at reasonable times if inspections are required
- Insurance requirements - a list of categories of insurance, mandatory amounts, and description of shared liability
- Indemnification of officials - most airports want to be held harmless, to the extent possible, for anything other than negligence or mismanagement
- Architectural, construction, landscaping and signage restrictions, including approval procedures, bidding restrictions, as well as, future tenant modifications, etc.
- A statement of the obligations of the lessee for care and maintenance of the property
- Condemnation procedures - should the lessor need to take over the property through condemnation
- Availability and responsibility for utilities
- Regulations related to construction and operations of the facility within the non-discrimination guidelines of the airport and community
- General Airport Operating Area (AOA) and airport security requirements
- Conformance to FAA Guidelines
- Institution of performance measures
  Events of default and cure, including notice and cure periods
- Recourse for non-performance of lease terms

9. LOCATION

Among the most negotiable – yet critical issues is determination of the prospective facility/development site. It is essential to comprehend the dynamics of site selection, including the pros and cons of the various site alternatives. The single most important planning criterion for any airport is the effective utilization of its land resources in accordance with the airport master plan. The temptation for quick development and new revenue must be carefully weighed against the optimal long-term land use strategy. Both present and future development needs must be considered.

Airport users have at least two basic categories of property that may be used for air cargo facility development: (1) ON-AIRPORT sites may have or provide (via service road) direct airside access or may be non-airside; (2) OFF-AIRPORT sites are not typically owned or controlled by airport management but must be considered as real competition that could impose pricing pressure on lease rates for potential tenants that do not require aircraft parking. Historically off airport properties lease at fifty percent or less per square foot of an on-airport facility with ramp.

Among carriers, forwarders and other ancillary services related to air cargo and logistics, debate continues on the relative merits of operating on or off-airport. Depending on the operational characteristics and requirements of the user, both locations have their merits. As this Guide is intended for the airport user, this analysis will be limited to an evaluation of on-airport sites.

On-airport properties consist of three types: airside, non-airside with airside access, and non-airside. Airside properties provide direct access to aircraft parking ramp while non-airside with airside access connect to the AOA via restricted service road.. While still on airport grounds, non-airside properties provide no airside access. Airside facilities are ideal for integrated express carriers – and other operators – that fly aircraft into the airport and require fast, direct handling of cargo next to their aircraft parking positions. While this space is typically more expensive than non-airside property, carriers save operating costs and time by transferring their cargo in the most direct manner, from aircraft to warehouse, rather than using additional ground transportation. Integrators are not the only operators utilizing this operating method. By sorting at their airside facilities, operators are able to eliminate one handling step, dramatically improving their efficiency, control and profitability.

For operators whose limited needs can be met by tug access to the ramps, non- airside with airside access, facilities are an alternative. These facilities are usually located very close to airside facilities and the passenger terminal. Forwarders, ground handlers, and other logistics companies who only need limited access to aircraft, typically do not have their own aircraft or lack a compelling need to be on the ramp and can be located more remotely. Typically, their facilities are less expensive than airside property. There is no set design for these facilities. Some may be somewhat wider and larger than airside facilities, taking on more of a warehouse appearance. Lacking ramp access for aircraft, these facilities may take on cross-dock characteristics with trucks entering and docking on both sides of the building. These facilities will often contain more offices and other specialized features, due to their greater affordability that encourages the user to consolidate more activities on site. Airport operators must often consider the advisability or legality of operating tugs on or across public roads when considering this alternative.

Salient features of on-airport facilities include:

- Since the land is usually ground-leased from the airport, tenants generally do not own their premises. Depending on the strategy of the tenant, this may influence a tenant's choice of location – particularly at airports where airside facilities are limited and rental rates carry a premium.

- The tenant must balance location considerations against operational efficiencies, particularly if aircraft will be involved.

- Depending on the age of the landside features of any on-airport facility. Many older facilities have congested truck aprons and limited private vehicle parking conditions.

- An on-airport facility comes with very specific operating, security and safety guidelines that are typically more constraining than those at an off-airport facility.

Because each airport has its own environment and operating conditions, there is no single standard by which to evaluate the different types of facilities. However, one can identify certain market features that consistently influence rental rates – most obviously the classic supply/demand equation, as well as geographic and local economic conditions. In addition to existing supply/demand evaluations, rates are also affected by the financial and land capacities - both on-airport and off-airport – which could dictate future supply.

While logic dictates that more and consequently cheaper land space exists off-airport than on-airport, older airports and gateways are particularly susceptible; air cargo land space tends to be smaller and more built-out. Hence, on-airport facilities command a higher rental. Rule of thumb standards estimate that airside facilities rent for approximately 25 percent more than non-airside, and on-airport facilities for twice as much as off-airport facilities. This standard fluctuates widely depending on the availability of such facilities.

To support the effective movement of goods, an airport should have a healthy mix of well-connected and accessible on and off-airport facilities. Moreover, these facilities must be priced competitively to attract new users and keep current users. Airports should encourage competitive air cargo environments and lessees. By and large, developers will concede that competition breeds innovative and effective development of facilities. A good mix of both on and off-airport facilities is an essential economic catalyst for communities seeking global connectivity.

10. LANDSIDE REQUIREMENTS

While configurations vary greatly, most airside facilities offer aircraft parking immediately in front of the facilities accessed by at-grade warehouse doors. Cargo handling areas - between the buildings and the aircraft – typically run about 50 ft wide.

Modern cargo buildings vary greatly - as deep as 250 feet for sortation and as shallow as 60 feet for expedited throughput. The range largely depends on the extent to which operators will sort cargo on the premises. Landside facilities typically offer truck access, dock-high loading for tractor trailers, and some at-grade docks for smaller trucks. Modern airside facilities offer sufficient space for truck and trailer maneuvering/parking, as well as ample private vehicle parking for staff. All modern airside facilities must be truly intermodal, providing the main conduit between air and surface transportation. Rather than warehouses, these are pass-through facilities.

10.1 Trucks

As already noted, trucks are an essential component in most air cargo operations and the integrated carriers rank among North America's largest trucking companies. Consequently, airport planners should design facilities that are readily accessible for today's long tractor-trailers, and provide space within the leasehold for trucks to operate safely and effectively.

To allow trucks sufficient room to maneuver and park safely, a facility typically requires at least a 130-150-foot setback from the road. Space permitting, planners should allow for both queuing and, on a limited basis, parking. If the building operation does not involve aircraft, it can be tailored to the needs of the trucker. In a pure cross-dock facility, the building is much narrower and can be fit very well onto a site that otherwise may not be functional. However, as previously noted, much of the trucking activity on airports is not tracked, presenting stiff challenges for planners lacking the information and insight into actual roadway volumes, cargo volumes, and realistic space requirements. These same items also raise potential access issues.

10.2 Access

Given the inherent time concerns in air cargo operations, numerous access issues enter into the site selection process.

1. *Airport Access vs. Market Access* - does it make sense for the tenant to locate his cargo operation at the airport based on access to primary markets?

2. *Cargo Facility Access* - do roadway geometry and airport traffic patterns lend themselves to locating a cargo facility, with its inherent truck traffic, at a particular site?

3. *Airside Access* – is it necessary and possible for a tenant to bring an aircraft to the building site? What is the cost and allocation methodology for airside infrastructure (i.e., taxiway, ramp, etc.)?

4. *Tug Access* - does a restricted service road reach the site or can one be built and again, how will costs be allocated?

11. CONCLUSION

This chapter attempts to define the relevant parties involved in air cargo facilities development and has introduced potential areas of conflict and cooperation. The relevant partners are comprised of airport management, airlines, ground handlers, third party developers, trucking companies, shippers, freight forwarders, and customs brokers.

Before constructing cargo facilities, airport management must decide whether to develop the facilities by themselves, to allow end users to develop their own facilities or to solicit third party developers to build, typically, multi-tenant facilities. Among many determining factors will be the availability of financing and land for development, other capital priorities, and the willingness to accept risk.

The decision to partner with a developer must be supported by a clear process of selection, followed by an operating lease that offers both sides an acceptable opportunity to meet their goals. Both sides must recognize the demands placed on the other. Airports are responsible to their local public, other tenants and numerous regulatory agencies. Developers must be able to satisfy investors and ultimately their tenants.

Among the negotiable items are lease term, the rates and charges and the review periods for possible escalation of the ground lease. Non-negotiable items include a broad range of control issues, including insurance, environmental protection and security measures. Given the need to protect the airport from potentially damaging tenant bankruptcy proceedings, airport management will also attempt to control the usage, sub-letting and lease assignment of the facilities or area. As with any relationship, airport operators and their tenants must be flexible in their negotiations – when prudent and permissible – and respect (not necessarily yield to) the objectives held by the other party. Beyond that, both sides must ensure that their concerns are clearly addressed in their contracts. An ambiguous contract is an invitation to confusion and breakdown.

One mechanism that a number of airports have put in place, is an Air Cargo Committee, that includes carriers and all other relevant stakeholders – both on and off airport. Through monthly meetings, cost effective and efficient direct communications can help ensure timely and accurate two-way information flows and a much improved work environment.

CHAPTER 8

AIRPORT PERFORMANCE BENCHMARKING

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AIRPORT PERFORMANCE BENCHMARKING

1. INTRODUCTION – THE IMPORTANCE OF PERFORMANCE BENCHMARKING TO AIRPORTS

Measuring airport performance is one key to successful and efficient management of airports. To help move toward a common performance benchmarking language, for air cargo, the ACI-NA Air Cargo Committee determined that airports desiring to measure performance would benefit from the creation of a listing of potential measures that are presented in this Chapter. Rather than a precise formula of ingredients, performance benchmarking for purposes of this writing, means the process of identifying best practices, understanding their meaning in relation to business and adopting these practices to help airports serving the cargo industry improve their performance. Airport managers may wish to evaluate their own performance internally over time and also look externally at other comparable airports. Such external comparisons however are extremely difficult given the substantial differences that occur in cargo operations at airports that from many business elements other than cargo may be considered comparable.

For most airports, air cargo and its underlying business and operating dynamics are less understood elements of the aviation industry particularly by airport commissions and regional municipalities that sometimes evaluate their airports and airport management's performance based on raw cargo data and statistics. It is important therefore to note that while a number of stakeholders are discussed in this chapter, it has been written for airport managers and their staff. The chapter identifies a large number of potential benchmarks to help appropriate leadership create a set of *airport-specific* criteria that will enable them to:

- Better understand and/or manage the business elements of air cargo as they relate to airports
- Anticipate potential problem areas or issues to be more responsive to the service requirements of tenants and users and
- Select performance measures that are meaningful to their airports and enable them to reflect airport performance accurately to their governing bodies

The use of performance measures to compare one airport to another has little actual utility in terms of air cargo. The variables are so extensive and the industry dynamics so volatile and subject to anomalies that any results could prove uninformative. It is particularly important that in establishing performance measures that those that are adopted are not forced or inappropriate. They should address specific airport needs and not attempt to compare (for example) cargo functions at major gateways to small domestic operations at inland airports.

Airports play a prominent role in facilitating air cargo national and regional accessibility while also driving the economies of the areas or regions served by airports. Advances in technology and improvements in supply chain and modal transportation processes coupled with forecasted growth in the air cargo business have presented airports with many challenges. These include operational efficiency, cost effectiveness, and security. Linking the business process to customer needs is an essential part of benchmarking. The concept of benchmarking has also become increasingly important to airports as stakeholders along the air cargo logistics chain continue to demand benchmarking activities of interest to their various customers. Achieving performance standards can be the deciding factor when determining to whom to award business or how to route air cargo in or out of a country or region. Internally, Airports should know their competitive position in the market place. By establishing performance benchmarks, airports can develop a better understanding of both individual performance of stakeholders as well as the overall performance of the airport versus benchmark standards and goals.

2. PERFORMANCE BENCHMARKING DEFINED

Performance benchmarking is the process of identifying best practices, understanding their meaning in relation to business, and adapting these practices to help organizations improve their performance. The comparison to a defined data set provides organizations with comparative opportunities to establish performance goals with standards and measures that would be considered a performance benchmark. Over designated time frames, benchmarking can improve operating levels and lead to improved organizational efficiency and performance.

3. STAKEHOLDERS IN THE PROCESS

Stakeholders can be defined as people or organizations that have some interest in airports as they pertain to air cargo. Airport stakeholders can include the airports themselves and their governing bodies, shareholders, employees, airlines, customers, the public, members of the local community, government agencies, industry organizations, ground handling agents, freight forwarders, surface transportation providers, U.S. Customs Brokers, security companies, and other related vendors and service providers.

4. CONDITIONS OF MEASUREMENT

Effective benchmarking relies on the elements of focusing on what needs to be measured and the processes involved when measuring core practices and competencies. Performance relates to results and differences of various output performance. Core practices and competencies refer to how these processes are conducted and performed to achieve this output. It is essential that performance measures are consistent and identical, whether in the comparison between airports or in an airport's efforts to recognize the value of its own cargo operations. Performance measures also have the responsibility of accommodating the needs and requirements of all airports, regardless of size or volumes. Performance measures should be accessible, reliable, dependable, and accurate. Accessibility pertains to the ability of data to be obtained and gathered on a reasonable basis. This is perhaps the most challenging aspect of many potential cargo measures for which data are frequently tracked and reported very differently or not at all by many of the smaller but critical businesses that are part of the industry. Airports should evaluate the accuracy and reliability of their internal data and the data received from their stakeholders. Reliability will ensure that what is measured is truly what an airport has intended to measure. It is important to reiterate that an airport should be proficient in understanding the operations of its business partners and stakeholders. Dependability provides a consistent result throughout the continued measurement process or within designated time frames. Accuracy ensures a basis of completion and that the measurement is available for its desired uses.

5. THE BENCHMARKING PROCESS

Benchmarking requires a process that airports can follow in order to provide that airport with the ability to satisfy its individual benchmarking requirements. The benchmarking process is not a one-time event and must be maintained to ensure continuous improvement and that best practices are continually benchmarked against.

5.1 Goals and Implementation

The first phase in the benchmarking process consists of establishing a plan to include goals and objectives. This is the most arduous task and requires the identification of a) management and customer needs, and b) the manageable core processes at each airport that can address those needs. Some airports may decide that they only require very basic or simple benchmarking criteria where others need a more sophisticated menu. During this phase, it is necessary to obtain a full understanding of critical processes and the way they are measured. The airport must then decide what data are required and the method of collecting this data. The prioritizing of benchmarking metrics should be based on each airport's individual strategic goals and objectives. Defining the process is necessary, as this will lead to goals being determined and inputs, outputs, and measures for success being identified. Identifying the most critical issues will subsequently allow for determining any opportunities for improvement. The use of flowcharts and other graphic aids is a recommended visual aid for simplifying the process.

5.2 Selection of Peer Airports

If management opts to compare its airport against others, then determining which airports to benchmark against is the critical second phase of the process. Selecting inappropriate peer airports can lead to erroneous conclusions about the performance of your airport, so the selection of truly comparable peers is essential.

As already noted, air cargo is a complex undertaking with many elements. Finding airports that are truly comparable is a challenge, Basic cargo characteristics such as volume, the mix of operations (belly, dedicated freighters, integrated carriers), airport capacity and utilization should of course be similar. But even then, airports that may seem similar with respect to cargo may not be comparable (or compared with caveats) because of something not directly related to cargo. These other factors would include the ownership and governance structure, the competitive environment, the economic regulatory structure and the mix of traffic. For example, a cargo only airport (or an airport with limited passenger activity) needs to cover all of its costs through charges for cargo, and its rates will reflect that. Airports with large passenger volumes can cover more of the common costs from passenger charges, or non-aeronautical revenues. Airports in jurisdictions where government provides infrastructure funding or covers security costs from general revenues will have different charges than airports that have to be financially self-sufficient, paying for infrastructure and security.

No group of peers is going to be perfect, but care in selecting peers that are as comparable as possible is key to giving meaningful results. Understanding the key differences in the environment in which the peer airports operate will also help in interpreting the benchmarking results.

5.3 Data Collection

The third phase in the benchmarking process concerns the collection of data and methods used to achieve this function. Research must be conducted in order to identify the metrics that will be used, to select candidates for the benchmark process, and to subsequently collect the data used in the benchmarking performance process. The understanding of an airport's core competencies and processes is essential to the success of this project. When selecting organizational partners or candidates to benchmark against, it is important to consider factors such as cost, time, logistical efficiencies, and any previous relationships. An obvious selection would be to look within the same industry or an industry that is closed related to the operation of an airport or involved in the transport of air cargo. The actual collection of data can be achieved in a variety of ways. The most common are checklists, surveys, interviews, questionnaires, and published data. The collection of data should be conducted in a uniform manner to ensure that results will be continually consistent.

It is vital that an airport understands its data accuracy and sources; otherwise, performance results may be skewed. A good example of this is with facility capabilities in terms of space and tonnage which could also have financial implications. Consider that freight being processed in a warehouse is neither enplaned or deplaned at that specific airport but has either been trucked from or scheduled to be trucked to another airport. This freight is not reported and therefore not included in any statistical figures that could be measured. Ensuring that an airport is aware of relevant data and capturing it accurately and efficiently is necessary for usable results. Continuous improvement to the collection process should also be mandated. Due to the nature of the airport business, as well as that of stakeholders, it is important to also consider confidentiality as organizations may consider certain information and data to be sensitive and for internal uses only. Reciprocity should also be considered, as this will provide a level playing field for organizations involved in the process.

5.4 Analysis

Analysis of the data collected is the fourth step in the process. The results should be analyzed to determine where there are any gaps between the airport's processes and those that have been used for benchmarking purposes. This analysis can be conducted within various time frames, depending on if an airport is looking for quick view or focusing on long-term trends. From this information, strategic planning can be employed to make improvements to the processes. Understanding the reasons why and how the achievement of benchmarks can be accomplished will determine the root cause of any problem areas and allow for subsequent modification and improvement.

5.5 Adaptation

The final phase of the benchmarking process is specifically linked to the adaptation of the best practices defined and continuous improvement practices. Support of the various stakeholders involved in the process is necessary to ensure that newly acquired best practices can be applied. This can be achieved through effective communication to the relevant parties involved. Goals can then be set and an action plan implemented to address the task of closing performance gaps and instituting processes for continuous improvement.

6. AREAS OF PERFORMANCE MEASUREMENT

To clearly define areas of performance management where benchmarking initiatives can be conducted, it is necessary to identify the core competencies of airports as they relate to the air cargo industry. These core areas are identified as *Security & Safety, Facilities, Airport Infrastructure, Cargo Throughput and Flight Activity, Service Levels, Financial Implications, Economical Implications, Business Development*, *and Marketing*

Security & Safety pertains to government regulations & measures, industry regulations & measures, and internal regulations & measures that will ensure that airports meet and exceed minimum standards.

Facilities involve all aspects of cargo facilities including size, occupancy, throughput capabilities, efficiency, aircraft parking, automation, and age.

Airport Infrastructure relates to AOA capabilities such as runway dimensions and capacity, ramp, and types of aircraft handled. It also includes landside transportation access capabilities.

Cargo Throughput and Flight Activity refers to the volume of cargo handled at an airport, the types of cargo an airport handles, and the volume of flights in and out of that airport.

Cargo Service Levels refer to the various landside and airside operations that relate to air cargo.

Financial Implications refers to the various fees and revenues that airports realize from air cargo.

Economic Implications refers the economic vitality of the airport and airport region as a result of jobs created, wages earned, and revenue produced.

Business Development and Marketing encompass a wide array of Airport functions including marketing and planning.

6.1 Performance Measures

Included in the following are listings of potential measures that airports could utilize. Not all of these would be meaningful to every airport. It is important to note that airports can also create derivatives of the measures listed if they better suit an airport's benchmarking needs. The key is that airport managers utilize measures that most clearly relate to their own management needs and internal and external reporting requirements.

Security & Safety

Activity	Benchmark	Target	Results	vs. Bmark
Availability of Police Escort for High Value Cargo				
Percentage of Cargo Operations Area as SIDA				
Does the Airport Meet TSA Requirements				
Does the Airport Meet FAA Requirements				
Dollar value of cargo lost to theft.				
Dollar value of U.S. Customs fines				
Number of incidents of theft.				

Facilities

Activity	Benchmark	Target	Results	vs. Bmark
Facilities (Total)				
Number of Facilities				
Warehouse Square Feet (Total)				
Office Space (Total)				
Ramp Space (Total)				
Aircraft Parking Positions (Total)				
Truck Bays (Total)				
Warehouse Occupancy/Vacancy Percentage				
Warehouse Condition				
Warehouse Capabilities (Automated)				

Warehouse Capabilities (Semi-Automated)				
Warehouse Capabilities (Non-Automated)				
Truck Parking Positions				
Customer Parking Spaces				
Employee Parking Spaces				
Average Age				
Warehouse Throughput per Square Foot				
Warehouse Throughput per Square Foot vs. PY				
Facilities (Individual)				
Warehouse Square Feet				

PY- Previous Year

Airport Infrastructure

Activity	Benchmark	Target	Results	vs. Bmark
Efficiency of Cargo Area Access				
Efficiency of Airport Roadway Access				
Efficiency of Airport Cargo Area Access				
Efficiency of Aeronautical Infrastructure				
Number of Runways				
Condition of Runways				
Size of Runways				
Capabilities of Runways				
Total Aircraft Parking Spots				

Cargo Throughput and Flight Activity

Activity	Benchmark	Target	Results	vs. Bmark
Annual Cargo Throughput				
Annual Cargo Throughput vs. PY				
Annual Cargo Throughput per Carrier				
Annual Cargo Throughput per Carrier vs. PY				
Annual Cargo Throughput per Facility				
Annual Cargo Throughput per Facility vs. PY				
Annual Cargo Throughput per Facility not Flown				
Annual Cargo Throughput per Facility not Flown vs. PY				
Annual Cargo Throughput (Freighter Aircraft)				
Annual Cargo Throughput (Freighter Aircraft) vs. PY				
Annual Cargo Throughput (Passenger Aircraft)				
Annual Cargo Throughput (Passenger Aircraft) vs. PY				
Annual Cargo Throughput Passenger vs. Freighter Aircraft %				
Annual Cargo Throughput Passenger vs. Freighter Aircraft % vs. PY				
Annual Cargo Throughput Domestic Cargo				

Annual Cargo Throughput International Cargo				
Annual Volume of Flights (Total)				
Annual Volume of Flights (Total) vs. PY				
Annual Volume of Flights (Freighter Aircraft)				
Annual Volume of Flights (Freighter Aircraft) vs. PY				
Annual Volume of Flights (Passenger Aircraft)				
Annual Volume of Flights (Passenger Aircraft) vs. PY				

PY- Previous Year

Cargo Service Levels

Activity		Benchmark	Target (%)	Results	% vs. Bmark
Landside	Truck Waiting Time				
	Cargo Delivery				
	Document Delivery				
	Cargo Availability				
	Empty ULD Pickup & Delivery				
Warehouse	Breakdown (General Cargo)				
(Import)	Breakdown (Perishable Cargo)				
	Breakdown (Express Cargo)				
	Irreg Handling (No Locate)				
Warehouse	Build-up (General Cargo)				
(Export)	Build-up (Perishable Cargo)				
	Build-up (Express Cargo)				
	Irreg Handling (Wrongly Forwarded)				
	Irreg Handling (Short-shipped)				
	Irreg Handling (No Locate)				
Warehouse (Transfer)	Aircraft to Aircraft				
Airside	Aircraft Handling (Unloading)				
	Aircraft Handling (Unloading)				
	Aircraft Handling (Turnaround)				
Dwell Time	Transient (technical & fueling) activity				
	Cross loading pallets/containers				
	Partial breakdown/buildup				
	Full breakdown/buildup				
	Partial sortation				
	Full sortation and customs clearance traffic				

Financial Implications

Activity	Benchmark	Target	Results	vs. Bmark
Freighter Landing Fees				
Passenger Aircraft Landing Fees (per Cargo Wgt %)				
Percentage Fees on Revenues				
Fuel (Into Freighter Aircraft) Fees				
Fuel (Into Passenger Aircraft per Cargo Wgt %) Fees				
Revenue from Facility Leases				
Aircraft Parking Fees				
Total Revenue from Cargo				
Cargo Revenue vs. Total Airport Revenue				
Total Investment in Cargo				
Revenue per Cargo Facility				
Revenue per Ton				
Revenue per Warehouse Square Foot				
Revenue from International Carriers				
Revenue from Domestic Carriers				
Vs. Previous Year				
Freighter Landing Fees				
Passenger Aircraft Landing Fees (per Cargo Wgt %)				
Percentage Fees on Revenues				
Fuel (Into Freighter Aircraft) Fees				
Fuel (Into Passenger Aircraft per Cargo Wgt %) Fees				
Revenue from Facility Leases				
Aircraft Parking Fees				
Total Revenue from Cargo				
Cargo Revenue vs. Total Airport Revenue				
Total Investment in Cargo				
Revenue per Cargo Facility				
Revenue per Ton				
Revenue per Warehouse Square Foot				
Revenue from International Carriers				
Revenue from Domestic Carriers				

Economic Implications

Air Cargo Economics	Benchmark	Target	Results	% vs. Bmark
A. Direct Jobs Created				
Jobs per Investment Dollar				
Jobs per Cargo Short Ton				
Jobs per Average Truckload				
Total Wages				
Average Wage				

B. Indirect Jobs Created				
C. Total Economic Activity				

Business Development

Activity	Benchmark	Target	Results	% vs. Bmark
Creation of an Air Cargo Master Plan				
New Construction Initiatives				
Volume of Innovation Initiatives				
Marketing Initiatives and Venues				
Business Development Initiatives				
Creation of and Air Cargo Marketing Plan				

7. MEASUREMENT AUDITING

Airport performance benchmarking is an ongoing process that allows each airport to decide on its own levels and indicators of measurement and the intervals and time frames relevant to that airport. Performance benchmarking activities can be conducted on monthly, quarterly, bi-annual, and yearly intervals depending on the resources and requirements of the individual airport. It is recommended that airports measure performance as dictated by the needs of the specific performance measurement area that is involved. For example, cargo service levels may need to be measured more frequently than economic implications. It is also necessary for airports to incorporate these activities into their annual planning and budgeting forecasts to ensure that resources are available to conduct performance benchmarking.

Scheduled auditing of performance is also important to ensure that the performance measures in use remain useful and that the related business strategy should remain unchanged. In addition, when auditing performance, it is just as important to reassess the industry context as a double check for relevancy. For example, if the airport targeted five percent annual growth in air cargo tonnage for the year, and by mid-year growth was at six percent, the tendency is to believe that the airport is doing well. If, however, industry growth is at nine percent, then the picture looks less rosy and strategy may need to be reassessed. In contrast, if targeted growth were five percent and airport growth were four in an industry that grew only two percent, then the perception of performance typically would not be negative even though targeted growth was not achieved. This is often an extremely important message to convey to stakeholders.

7.1 TARGETING THE MEASURES

In July 2005, the Air Cargo Committee of ACI-NA attempted to refine the large listing of measures by surveying a wide range of constituents that included airports of varying sizes, developers of air cargo facilities, consultants, and various supporting services. The effort identified what were considered to be the top ten generic measures that could be used to compare air cargo performance across airport lines. These are listed below. This information is helpful in identifying a broad industry-wide perspective, but, still, without linkage to airport goals, provides little insight into what would be the best and most informative choices for an individual airport.

These are the “Top Ten”.

1. Tons of cargo enplaned and deplaned (annual).
2. Tons of cargo enplaned and deplaned (annual) – International Belly vs. Freighter.

3. Tons of cargo enplaned and deplaned (annual) – Domestic Belly vs. Freighter.
4. On-airport warehouse square footage (total).
5. Number of direct jobs created from cargo activity.
6. Average time required for international air cargo to clear customs.
7. Warehouse throughput per square foot.
8. Efficiency of cargo area access.
9. Efficiency of aeronautical infrastructure.
10. Warehouse occupancy/vacancy percentage.

Several of these measures, particularly those dealing with gross tonnage figures are in common use throughout the industry today and serve as valid volume comparisons. However, the volume numbers do little to benchmark the efficiency or effectiveness of one airport's operation versus another's. Given the variation in cargo operations, two sets of measures should be considered. The first is for the airport to use in the day to day management of the cargo function. These are the internal measures: they reflect feedback from existing tenants measured against airport goals, and are more narrowly focused. The second set reflects broader reporting issues that are most appropriately used for external reporting and to compare the airport's performance to other *comparable* airports. These recommended measures have also been derived from the goal structure of the cargo program.

The measures and benchmarks should be structured in such a way that the airport will be able to develop data that will enable management to better understand existing cargo operations and proactively manage future cargo growth strategies. They are listed in a suggested priority order. Airports have historically tended to focus on macro-measures that are more generic–tonnage, operations, etc. All of the following measures can be implemented without major problems. The decision of who will perform the measures and exactly how they will be measured and to what standards will depend on the creation of such standards by the airport and its operating partners. Establishing such standards prior to the acceptance of critical elements of an Air Cargo Plan is premature.

Internal management measures and benchmarking

1. **Volumetric measures:** These are the typical measures used throughout the industry dealing with tonnage and operations. They can be subset into inbound-outbound, domestic-international, and freighter-belly cargo. Reports should be structured so that data can be used to identify trends, anomalies, and planning issues, as well as providing routine reporting data. It should be noted that this number may also be looked at in conjunction with regional market share because of the presence of other nearby airports.

2. **Cargo revenue generation:** The ability of the airport to generate revenue from cargo is important. Realistic targets should be based on a methodology that considers tenant and user operating conditions, value for services provided by the airport, and coverage of airport cargo operating costs. These targets can be subset into landing fees, fuel flowage fees, leasing revenues, percentage agreements, and other cargo-related fees.

3. **Occupancy rates of cargo facilities:** Recognizing that revenue generation is an important issue for management, occupancy/vacancy rates of the facilities should be monitored on a regular basis. The rates should be linked to overall occupancy and revenue targets that would be met as a result of leasing.

4. **Utilization of cargo facilities:** Management should establish utilization ratios that reflect targeted throughput for cargo facilities. Effective management of tenant occupancies is far more cost effective than the development of new buildings. Monitoring cargo building throughput on a quarterly basis will help management to identify the need for new space or opportunities to relocate tenants on a timely basis. It will also enable management to identify underutilized facilities.

5. **Availability of cargo facilities and infrastructure to meet demand:** It is critical, particularly in growth scenarios, that new infrastructure and facilities be timed to come on line, or older facilities become available, to meet demand. This requires the establishment of development triggers and close management of the leasing portfolio.

6. **Utilization of the land envelope:** The scarcest resource available to most airports is land. The amount of unused property available for cargo development is an important aspect in measuring present and long-term capacity.

7. **Compatibility of facilities and infrastructure with tenant needs:** The mere availability of cargo facilities is not enough. Warehouses that cannot accommodate throughput, screening or storage requirements will heighten levels of tenant dissatisfaction and in some instances will cause tenants and users to seek other airports. The same is true if tenants cannot access ramp that they require, or lack sufficient truck courts or truck bays.

8. **Levels of tenant satisfaction:** The size of the regional cargo community warrants attention to the needs of this enormous contributor of revenue and jobs. Communications, responsiveness to tenant operating and maintenance needs, as well as administrative effectiveness are elements of business with which tenants and users are concerned.

9. **Efficiency of landside access and egress:** Cargo is inter-modal. An efficient operation must accommodate trucking requirements to and from the airport and to and from the cargo facilities. Many critical elements of a cargo operation are located off-airport. Time from off-airport facilities to on-airport properties is a vital criterion as is the ability to exit the airport to the highway system and proximate regional destinations.

10. **Reported incidents of theft:** While a great deal of focus is given to anti-terrorism, a major concern for the cargo industry is theft that affects insurance premiums and can result in penalties to parties involved in the movement of goods. Management can help control theft through effective building planning and design, appropriate physical separations, and assigned security personnel. One measure is the dollar value of goods lost to theft. While this is a reasonable measure it should reflect any incident as a percent of total dollar value of airport traffic. Otherwise it can be substantially skewed by a single incident and not reflect the effectiveness of a designed program.

External management measures and benchmarks

1. **Regional Economic Impact:** The total impact of the air freight business on a region is frequently surprising and often justifies investment beyond pure financial return on investment.

2. **Job generation:** Part of the justification for investment in cargo operations is the number of jobs generated by cargo. This could be a subset of Economic Impact but can stand alone.

3. **Volumetric measures:** These are the typical measures used throughout the industry dealing with tonnage and operations. They can be subset into inbound-outbound, domestic-international, and freighter-belly cargo. Reports should be structured so that data can be used to identify trends, anomalies, and planning issues, as well as provide routine reporting data.

4. **Investment in cargo facilities and operations:** Cargo is typically a lower profile aspect of an airport's operation than the passenger business. It can however generate substantial benefits. It will be important to be able to indicate levels of investment in cargo to put generated benefits in context.

5. **Cargo Revenues:** This number can be expressed in total or as a percentage of total airport revenues. Total revenue should include landing fees, fuel flowage fees, leasing revenues, percentage agreements, and other cargo-related fees.

6. **Total developed cargo facilities and infrastructure:** Airports, particularly those considered "gateways" are frequently compared based on their overall capacity for airside and landside cargo operations.

7. **Levels of tenant/user satisfaction:** The size of the regional cargo community warrants attention to the needs of this enormous contributor of revenue and jobs. Communications, responsiveness to tenant operating and maintenance needs, as well as administrative effectiveness are elements of business with which tenants and users are concerned. Tracking must lend itself to the formulation of key issue analyses and appropriate outreach and corrective initiatives.

8. **Appearance:** The aesthetics and overall appearance of facilities and the cargo zones in general are key marketing tools and for attracting new tenants or retaining existing ones.

Performance measures should provide meaningful information about what they are intended to measure. To inform the constituency effectively, measures should be triangulated when possible. By way of example the effectiveness of a cargo leasing program is not best measured by the amount of square footage under lease. Management is usually interested in the revenues generated by the leasing program. It is therefore important to measure not just the amount of square footage but also the rate per square foot at which the property is leased. Similarly, service improvements are important in the public sector, but the cost-benefit must be considered and where appropriate, alternatives evaluated.

8 CONCLUSION

Performance benchmarking is an integral part in the continuous improvement of any organization's effectiveness. From an airport's perspective, it links goals to the needs of customers, stakeholders and to the airport itself. Whether an airport is looking to improve its internal operations or to become more competitive on an industry-wide basis, understanding best practices and utilizing them properly is essential to future prosperity and growth.

CHAPTER 9

SECURITY

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SECURITY

1. INTRODUCTION

The definition of “Cargo Security” has greatly evolved over the past decade. Where theft was once the main focus of an airport’s cargo security program, the acts of September 11, 2001 and other terrorism-related threats and incidents have changed the scope of cargo security forever. The new definition of cargo security pertains to the safety of aircraft and the safeguarding of aircraft from terrorism-related activities. As mandated by The Department of Homeland Security (DHS) the Transportation Security Administration (TSA) has set forth approved security programs for airports to implement and follow. Although cargo theft remains an important consideration in today’s cargo security arena, this chapter will focus on the requirements of Title 49 in the Code of Federal Regulations, Chapter XII, Subchapter C, Part 1542 on Airport Security. Airports are issued security directives by the TSA. Part 1542 provides specific requirements for an airport’s security program including the areas of access control, SIDA (Secure Identification Display Areas), and AOA (Air Operations Areas).

Historically, air cargo consisted of time–sensitive or high-value products for which the higher cost of shipping by air represented a realistic trade-off for security and speed. Recognizing that the growth of the industry would in large part be linked to the protection of goods, air cargo security evolved as a loosely coordinated, inconsistent, but relatively efficient series of physical and administrative elements focused on the prevention of theft. The resultant business systems and physical infrastructure of modern goods movement in general were designed to reduce the potential for theft of goods by individuals within the employment envelope or by an external source.

Security remains at the forefront of an airport’s air cargo agenda and requires constant vigilance and continuous monitoring of the rules and regulations set forth by our lawmakers and government regulatory agencies. To gain a working understanding of an airport’s role in air cargo security, we will look at this topic from an airport management perspective and ask four basic questions of ourselves.

Cargo Screening – The Bottom Line

Under the current regulations, cargo screening has been delegated to the air carrier or an approved agent by the TSA. The airport has no direct role in the screening of cargo and remains a support function as described in the initial section in this chapter. Critical elements include access control to include perimeter security, vehicle security, and control and detection of unauthorized individuals on the airport; badging and background investigations; and finally, emergency law enforcement response. The TSA will enter into voluntary agreements with airports to test new cargo screening technologies. In these cases, the airport provides facilities and support but the cargo screening function and responsibility remains with either the TSA or the approved private entity.

The Role of the Airport Security Coordinator

Each airport must identify at least one Airport Security Coordinator (ASC) who serves as the primary point of contact with the TSA and has the power to implement immediate corrective action in the case of violations of security requirements. This Airport Security Coordinator must be available on a 24-hour basis. These requirements are contained in the TSA regulation. Most airports also identify alternate Airport Security Coordinators to serve as backups for the primary ASC. It is important that the ASC maintain an ongoing operational dialog with the TSA Federal Security Director in order to ensure a highly functional security capability at the airport. Good security is a function of cooperation and collaboration at the airport level.

The Importance of the Federal Security Director

The relationship between an airport manager, the Airport Security Coordinator and their Federal Security Director is extremely important. All significant security measures, procedures, and changes must be reflected in the Airport Security Program and approved by the Federal Security Director. The maintenance of ongoing communications and an appreciation of each other’s roles are central to making this a mutually productive and beneficial relationship.

The Terrorism Threat

In the Notice of Proposed Rule Making (NPRM) which the TSA published prior to issuing extensive regulatory changes, two critical risks were identified in the air cargo environment. They were: the use of cargo to introduce an improvised explosive device aboard a passenger aircraft; and, the hostile take-over of an all-cargo aircraft for use as a weapon. The magnitude of these risks was considered in view of credible threats and possible vulnerabilities. Extensive comments were received regarding the threat and proposed countermeasures from the time the NPRM was published (November 10, 2004 and the issuance of the Final Rule (May 26, 2006).

Terrorists have attempted to attack aviation via air cargo in the past and aviation continues to be a priority of terrorists. Past related incidents include:

- On American Airlines flight 444, a B727 flying between Chicago and Washington, DC, an IED constructed by Ted Kaczynski the Unabomber began smoking due to a reaction in the explosive. The pilot made an emergency landing.

- In 1995 following his attempt to place leave-behind IED's on U.S. carriers flying in Asia, Ramzi Yousef constructed two IED's to be placed in cargo on board two U.S. carriers flying from Bangkok to the U.S. Upon arriving at the airport, one of Yousef's co-conspirators was intimidated by the array of security measures in place at Bangkok and was deterred from attempting to introduce the IED's as cargo.

- In 2010 explosives were shipped from Yemen disguised as printer cartridges. While the aircraft was not the target this did increase the call for cargo security. It should be noted that this plot was foiled by intelligence gathering and not by cargo screening technology.

2. BACKGROUND

Since the Gulf War in 1991, more and more carriers and airports have placed increasing emphasis on air cargo (especially belly cargo) as a key component of their overall revenues. In the case of airports, cargo capacity has become very important in the generation of jobs, and in certain instances, has become a major factor in the economy leading to the location/relocation of large regional logistics and distribution facilities. Airport facilities and infrastructure have been designed to accommodate and encourage cargo growth even at airports that are geographically constrained. Carriers have established separate lines of business, unique route structures, and capital investment at select airports in order to meet cargo revenue and service objectives.

An expanded focus on security applications to include both anti-theft and anti-terrorism has had a substantial impact on all segments of the industry, and impacted the financial viability of a number of carriers and airports. By way of example, as a result of September 11, 2001, a decision was made to prohibit mail weighing more than 16 ounces from flying as belly cargo. The result found by the Committee on Commerce, Science, and Transportation on October 2002 estimated $90 million revenue loss to the passenger carriers in the twelve-month period to September 2002[5].

The air cargo industry has an enormous supporting business infrastructure of small, medium, and large size firms that tend to cluster around major gateways and/or large shipping hubs. These firms include customs brokers, freight forwarders, container freight stations, consolidators, etc., all of which are directly involved in the landside elements of shipping. These are the firms that, for the most part, work as direct links between carriers and shippers and consignees. They are also the firms that generate and control substantial portions of the paperwork (or electronic documentation) associated with shipping.

A general economic downturn that began in 2000, adversely affected air cargo in terms of growth rates, and in some markets, total volumes. After September 11, 2001 cargo activity was immediately impacted.

[5] http://www.gpo.gov/fdsys/pkg/CHRG-107shrg92436/html/CHRG-107shrg92436.htm

As a result, given the already weakened fiscal position of so many businesses, the financial stability of the entire aviation industry was compromised. Critical impacts included:

- Loss of airport revenue
- Loss of airline revenue
- Increased use of trucking
- Increased use of freighters
- Permanent escalation of insurance costs
- Consolidation among smaller firms
- Failure of smaller support firms
- Failure of many small cargo airlines
- Higher operating costs because of security
- Longer processing time because of security
- Increased available freighter capacity driving down rates

3. THE PARTIES INVOLVED – BASIC ROLES

3.1 The Airport

The most basic role of the airport is that of landlord. It provides the land on which the aircraft operators land and take off. It also provides and controls access to those parties wanting access to the aircraft. At its most basic the airport is in the business of providing the aircraft operators the rights to use the land and, as a result, providing the access to the aircraft. Implicit in the role of providing access is the role of controlling access. That is, restricting the rights of certain individuals at certain times, based on specific criteria. It is at this point that the airport's primary operational function and primary security function become identical -- access control. This holds true for cargo security as well as aviation security in general. In the largest sense this includes other perimeter security measures, including fences; doors and gates; employee and vehicle identification systems; and law enforcement response.

It must be remembered that access control is not an end in itself. It is a tool by which important assets are protected. In the past the primary asset in need of protection was the passenger aircraft to prevent hijackings and the introduction of explosive devices. More recently it has been recognized that those areas of the airport in which cargo is handled and stored must be protected to prevent the introduction of explosive devices and/or hijackers in cargo.

True access control has three critical elements. First, in the most primary sense, access by unauthorized individuals must be prevented or deterred. Second, unauthorized access of the protected area of the airport must be detected, and third, those persons or vehicles who have gained unauthorized access must be apprehended. It is a triad of responsibilities which comprise the single function of access control. All these functions must be formalized, documented and assembled in a single document known as the Airport Security Program.

Overlaying these several operational security functions of the airport, however, is a larger security function which, though not required by regulation or law, is of paramount importance. The airport must create a culture of respect and involvement for security. This is a management function that cannot be overestimated. Management respect and consideration for airport security (including air cargo security) creates a top down attitude that tends to pervade airport management and all tenants and organizations that belong to that particular airport community. A management attitude that is respectful of security ultimately results in an airport environment that is safe, orderly and secure – an environment that is unattractive to individuals or organizations that are planning to conduct a terrorist attack.

3.2 Aircraft Operators/ Air Carriers

Historically, in the scheme of cargo security it is the air carrier, most particularly the passenger air carrier that has been the target for terrorist attacks. Beyond this, it is not only the air carriers that are the target, but the passengers traveling on a particular air carrier. It is the combination of passengers with an air carrier that are identifiable with a particular country or political entity that makes it the target. In this two-element target, the passengers may serve as hostages or victims of a terrorist event. In the 9/11 attacks, the air carrier served not as the target but as the tool or instrument of the terrorist attack -- the terrorist targets becoming more prominent political assets/symbols or a significantly larger group of victims. It is the presence of the air carriers at the airports that create the need for airport security.

Belly Carriers

The passenger airlines, for which cargo often represents the margin of profit on many routes, have experienced decreases in both capacity and demand. On the airside, the effects of 9/11 were immediate. First, the number of commercial flights was dramatically reduced. At hub airports, operations dropped as much as 27%. The resultant loss in belly cargo capacity forced the diversion of cargo to trucking and freighter/integrator traffic. Second, the TSA restricted the nature of cargo that could be carried in passenger aircraft. This also accelerated the diversion. Third, carriers in many instances reduced the size of the aircraft, lowering operating costs, but also reducing belly capacity. Fourth, restrictions on the amount of personal possessions that passengers can carry on board forced additional baggage into the bellies, and further reduced available capacity for freight and mail. The bottom line is that the fundamentals of the goods movement infrastructure have shifted, and the result has and will continue to impact the nature of and demand for relevant airport facilities.

Freighter Operators

Freighter operators were the initial beneficiaries of the system's diminished belly capacity. Generally, security requirements are less stringent for these carriers enabling them to capture a greater percentage of the market. With most wide-body freighter operations focusing on international traffic, the challenge is to establish a level of confidence with security controls at international shipping points, given the almost limitless shipping points from which freight can originate. The imposition of unilateral security standards on a global basis is not immediately practical or politically viable, and restrictions on carriers or points of origin may appear arbitrary and be deemed an undue constraint of trade. (The term aircraft operator is used interchangeably with the term air carrier.) It should be noted that integrated carriers, have on their own, established very stringent security measurses.

Indirect Air Carriers

An Indirect Air Carrier is not an air carrier at all. An Indirect Air Carrier (IAC) does not typically operate or possess aircraft to carry cargo. By definition an IAC may not have an FAA operating air carrier certificate. An IAC is a company that arranges for the goods of another company to be transported by air. It is, in essence, an air freight forwarder. It is a middleman in the chain of operations and security for cargo. Nonetheless it is an important middle man since the integrity of cargo must be ensured from its origin at a trustworthy shipper to its loading in the secure cargo hold of an aircraft. IAC's are not granted operating certificates by the TSA in the same way that airports or air carriers are granted certificates by the FAA. IAC's are granted approvals to operate and conduct business in accordance with their approved security programs. IAC's are regulated under 49 CFR 1546. There are over 5,000 IAC's in the U.S.

Shippers

The term shipper is not defined in the TSA regulations. It is generally understood to mean the individual or entity that originates and tenders cargo for air transportation. The shipper, via ownership of the cargo, has the authority to move it, ship it, or possess it. Shippers are viewed as the initial point in the air cargo supply chain. In some cases, a shipper may utilize the services of a warehouse operator or other third party to store their products. In this case, the shipper remains the entity that owns the cargo and initiates its shipment. In such a case, the warehouse operator would be acting as an agent of the shipper and the

security measures of the warehouse would need to be equal to or greater than the measures required of the shipper. While shippers are not directly regulated by the TSA, they are indirectly by the guidelines imposed on air carriers and IAC's.

Shippers are currently divided into categories of "Known Shipper" and "Unknown Shipper." Cargo that is initiated by an unknown shipper is subjected to greater security measures than cargo from a known shipper. The concept is that a company or person that has established itself as "known" over a period of time in business is not an enterprise set up by terrorists in order to place an explosive onto an aircraft. This concept is valid if the shipper maintains an effective ongoing Personnel Security Program and maintains a high level of integrity among its employees that have access to cargo. The requirements that determine whether a shipper is a known shipper or unknown shipper are protected as Sensitive Security Information and are described in the approved security programs of aircraft operators and IAC's. At the current time in the United States, cargo from an unknown shipper is not allowed to be transported on a passenger aircraft. In other portions of the world it is subjected to additional levels of security and inspection.

Trucking Companies and Couriers

Trucking companies and couriers are not directly regulated by the TSA. They are controlled indirectly by the TSA via the regulations and security programs of the air carriers and Indirect Air Carriers. The air carriers and Indirect Air Carriers must ensure that entities acting as their agents (in this case trucking companies and couriers) abide by the conditions placed upon them. In general, violations of security requirements by an agent of a regulated party are the responsibility of the regulated party. Contractual agreements between a regulated party and their agent can shift the monetary penalty to the agent but the regulated party remains responsible.

A substantial amount of air cargo (anecdotal indicators are that as much as 25% of the cargo volumes at an airport) moves on trucks either as origin and destination freight, or as truck-to-truck freight, and goes unreported. Over the past decade, for financial reasons, freight has continued to be diverted to trucking when possible. Nevertheless, the truck/air relationship remains intact if somewhat diminished. It is likely that new security requirements on the cargo industry will involve the implementation of higher levels of screening technology, greater processing costs, and possibly lengthier processing times. From an airport planning perspective, some of these have already translated into a separate screening facility, modifications to an airport's infrastructure to include separation of truck and passenger vehicle traffic to and/or on the airport, further separation of vehicles in the air cargo areas, and modifications of the buildings and surrounding roadways to allow for a smooth flow of vehicles, easy truck parking and minimal potential obstructions caused by queuing.

Added security requirements may affect the flow of cargo to an airport. In some instances, trucks may be required to move to a holding area for more detailed inspection. More typically, additional space may be required for vehicles queuing for routine inspections. Any delays to arriving trucks, particularly if those delays tend to be unpredictable (and of varying lengths) will create additional pressure on local shippers and forwarders to accelerate cut off times and reduce their consolidation potential. Air cargo typically moves in fairly well-defined shipping windows, and most shipments are trucked to the airport as close to that window as possible. At international gateways, several hundred trucks could arrive at the airport over a two-hour period. For these trucks to be screened (even if screening could be accomplished in two minutes per vehicle) the delays could be extensive if the screening efficiency is not addressed. The problem can be exacerbated if the cargo is trucked over a large distance to airports with the specter of unknown screening delays waiting at the destination airport. Ideally, an airport will provide the space necessary to develop (as appropriate) effective central screening facilities that can eliminate much of the uncertainty. This will be a difficult task for some major gateways where land is the scarcest resource and connecting infrastructure is problematic to install. One potential way to help minimize these delays is a cross-referenced electronic identification program that links the driver to a vehicle. This has substantial potential, but given the nature of the industry, would be difficult to implement for all trucking.

The Regulation of Shippers, Trucking Companies, Couriers and Other Entities Not Specifically Identified.

Airports, air carriers, foreign air carriers, and IAC's are generally considered regulated parties in that they are specifically subject to discrete regulations. However, in the recodification and reissuance of aviation security regulations following the 9/11 attacks, a new Part of the regulations was issued which applies to all persons engaged in aviation-related activities. This is 49 CFR 1540. All individuals and companies engaged in aviation-related activities are subject to and must comply with this regulation. This applies to airports, individuals, corporations, organizations, and groups of individuals regardless of nationality.

Examples of regulations in this Part include:

- 1540.103 states "No person may make or cause to be made and fraudulent entry on a document or application required in aviation security."
- 1540.105 states "No person may tamper, interfere with or attempt to circumvent any federally required aviation security measure.

These are just examples. A complete understanding of Part 1540 by all individuals involved in aviation security from the passenger to the airport manager is a prudent and recommended undertaking.

TSA

The TSA has two major roles in the world of aviation security.

- First, they are a screening service provider, they conduct passenger screening, carry-on baggage screening, and checked baggage screening.

- Second, the TSA creates and regulates the security requirements for all parties involved in airport security and air cargo security. The TSA also issues regulations and criteria for security programs to include Security Directives, Emergency Amendments to Security Programs and Information Circulars.

In addition to these two primary roles, the TSA has several other roles supporting aviation and transportation security. TSA manages the Federal Air Marshall Program; and the explosives detection K-9 program (these K-9 teams may be used to screen cargo under approved conditions). Effective November 1, 2018 TSA created the Third-Party Canine-Cargo (3PK9-C) Program, under TSA's regulations for Certified Cargo Screening Programs (CCSP), *see* 49 CFR part 1549, to provide an efficient and effective method for screening air cargo to TSA's standards. Under this program, third-party canine teams trained in explosives detection can be certified by a non-governmental entity, acting under the approval of TSA, as meeting TSA's certification standards. Certified 3PK9-C teams can be deployed to screen air cargo for aircraft operators, foreign air carriers, and other TSA-regulated parties operating under a TSA-approved or accepted security program.

On May 18, 2018, TSA published a notice in the **Federal Register** seeking applications from qualified persons interested in becoming an approved 3PK9-C Certifier under the 3PK9-C Program. *See* 83 FR 23287. The CCSP-K9 security program defines the requirements that TSA-regulated canine explosives detection teams must meet when screening cargo for air carriers and screening facilities and will include eligibility requirements for canine explosives detection teams. These eligibility requirements for canine explosives detection teams include, but are not limited to, experience, education, vetting, and citizenship requirements for canine team handlers. These eligibility requirements for canine explosives detection teams are not contained in the 3PK9 Certifier Order. The 3PK9 Security Program and Order are not available to the public as they contain information that cannot be publicly disclosed under 49 CFR part 1520. Individuals that complete the required vetting processes and other agreements necessary for release of Sensitive Security Information (SSI), including documenting a "need to know," will be provided a copy of the Order and Security Program.

Canine explosives detection teams were eligible to seek certification as early as November 1, 2018, but all teams should understand that successful completion of a 3PK9-C certification event is only one of the requirements for explosives detection canine teams under the CCSP-K9 security program. Among other requirements, the CCSP-K9 security program requires canine explosives detection teams to pass a background check before an air carrier may hire them to screen cargo.

The TSA also has a significant R&D organization that is involved in the testing of new technologies that may be implemented within transportation security including the screening technologies for cargo. The TSA has established a program to train pilots in the use of firearms in the cockpit environment. A large number of pilots have been trained and armed as a result of this program. The TSA also has responsibility for surface and rail security and maintains a cadre of inspectors that are tasked with this mission. Since air cargo security most often involves surface transportation this function of the TSA could well have a bearing upon air cargo security.

Finally, as an extension of its regulatory inspection function the TSA conducts security inspections of air carriers, including those that operate from foreign airports into the U.S. In the course of these inspections, which are conducted at all locations in the U.S. where cargo is accepted for air transportation, and at the international airports of departure, air cargo security measures are inspected.

IATA

IATA, the International Air Transport Association, while not strictly a regulatory body, does issue recommended security practices to its air carrier members. Because of its membership, these practices focus mainly upon air carrier practices. Most IATA practices reflect the ICAO (International Civil Aviation Organization) Standards and Recommended Practices and the ICAO guidance material. IATA Recommended Practice 1630 applies to air cargo security.

USPS

The United States Postal Service has developed a set of security procedures for ensuring the security of mail that travels by air. These procedures were established via mutual agreement between USPS and the TSA. As with the approved security programs of airports and air carriers, the specific measures may not be disclosed to outside parties. However, an obvious example of these security measures is the prohibition to drop off mail packages greater than a certain size in unattended mail boxes.

4. THE GENERAL REGULATORY/STATUTORY SCHEME

The TSA is the primary regulatory agency involved in establishing requirements for aviation security in general and air cargo security in particular. Since airports, aircraft operators, all-cargo carriers, IAC's, and shippers are involved in air cargo security a discussion of how requirements are established for any one portion of the aviation security community cannot be made in the absence of understanding how the other members are regulated. The TSA is a sub-organization of the Department of Homeland Security. It was created by the significant legislation following the 9/11 attacks. This legislation had the most visible effect of assigning the responsibility for the conduct of pre-board passenger screening and checked baggage screening to the TSA. This legislation was called the Aviation and Transportation Security Act of 2001 and is often referred to as "the ATSA".

The legislation, once signed into law, formed the basis of the authority or actions taken by the various Federal agencies which are managed based upon what organization or activities they pertain to. Laws granting authority to the TSA are contained in Title 49 of the U.S. Code. This title is concerned with laws on transportation. Reference to the original legislation that gave rise to requirements often sheds lights on the intent and extent of the requirements themselves. It is sometimes the case that authorizing legislation is overlooked in closely examining regulatory requirements.

Since the TSA is a branch of the Federal government it actually derives its power from authority-granting legislation such as the ATSA. It is the job of the TSA and other administrations within the DHS and the Federal government as a whole to execute or perform the responsibilities assigned in legislation. It does so by regulation -- through proposing and establishing Federal regulations. These regulations are organized or codified according to what segment of the public they pertain to. In the case of regulations dealing with the airport, they are contained in Title 49 of the Code of Federal Regulations entitled "transportation" -- specifically in the 1500 series of regulations.

The regulations which contain the requirements for air cargo security are: 1544 which deals with passenger air carriers and large air cargo carriers; 1548 which deals with Indirect Air Carriers, a formal name for air freight forwarders; 1546 which deals with foreign passenger carriers and large foreign cargo carriers; 1542 which sets forth the requirements for airports; and 1540 which contains regulations concerning individuals and other entities not regulated in the other major sections. Finally, any understanding of air cargo security must be undertaken in light of 1520 which deals with Sensitive Security Information. Much of the specific security procedures and requirements of aviation security are considered Sensitive Security Information or SSI. By definition, Federal regulations are not SSI since they are publicly published in the Federal register.

All of the above Federal regulations contain wording similar to "…and the entity (airport, air carrier, IAC) will abide by the conditions of their approved security program." Security programs are an essential element of the regulatory structure that establishes requirements for air cargo security and all other regulated aviation entities. Airports are required to have approved Airport Security Programs. Airlines are required to have approved aircraft operator security programs. Indirect Air Carriers are required to have security programs, as are foreign air carriers. It is within these approved security programs that the specific security measures and requirements are spelled out. These security programs are Sensitive Security Information by definition. The reason for this is that if an adversary knows the details of a security measures it becomes substantially easier to circumvent or subvert that measure. Since adherence to security programs is required by the publicly published regulation, the entire contents of the security programs are made into regulatory requirements by reference, once approved by TSA.

There is another means by which the TSA establishes requirements upon the aviation security and air cargo community. It is the Security Directive. The conditions upon which a Security Directive is issued are identified in the regulations. These state that when the TSA determines that additional security measures are necessary to respond to a threat assessment or to a specific threat against civil aviation, a Security Directive is issued. Compliance with Security Directives is mandatory as it is with regulations or with an approved security program.

5. DEFINITION AND TERMS

There are two sets of definitions which have application to air cargo security. The first set is contained in the U.S. Code of Federal Regulations Titles 14 and 49. A clear understanding of these regulations is necessary in order to understand an airport's regulatory compliance responsibilities. The second set of definitions is provided by ICAO Annex 17. These are the definitions that are used so that terms are commonly understood across national boundaries. The United States is a signatory to ICAO and therefore must, at a minimum, adhere to ICAO requirements unless it files a formal "exception." U.S. requirements often exceed those of ICAO.

U.S. Definitions relating to air cargo security contained in Title 49 U.S. Code of Federal Regulations (49 CFR 1540.5 – not a complete list)

Air Operations Area (AOA)

The portion of an airport, specified in the Airport Security Program (ASP), which includes aircraft movement areas, aircraft parking areas, loading ramps, safety areas and any adjacent areas such as G/A areas that are not separated by adequate security measures. It does not include the Secured Area. (Note: this definition differs from a prior FAA definition of the AOA and should not be confused.)

Airport Security Program

The security program that is approved by the TSA for an airport regulated under 49 CFR 1542.

Airport Tenant

Any person that has an agreement with the airport operator to conduct business on the airport but does not include aircraft operators regulated under 1544 or 1546.

Airport Tenant Security Program

An agreement between the airport and an airport tenant that specifies which security measures the tenant will perform. It must be approved by the TSA.

Cargo

Property tendered for air transportation accounted for on an air waybill. This includes commercial courier consignments whether or not accounted for on an air waybill. Further definition is provided in the aircraft operator standard security program.

Exclusive Area Agreement

An agreement between the airport and an aircraft operator regulated under Part 1544 or 1546, whereby the aircraft operator assumes security responsibilities. It becomes a portion of the ASP and must be approved by the TSA.

Indirect Air Carrier

Any person or entity in the United States that undertakes to engage indirectly in air transportation of property and uses for all or any part of such transportation the services of an air carrier. This does not include any FAA certificated air carrier, the USPS, or representatives acting on behalf of the USPS.

Screening function

The inspection of individuals and property for weapons, explosives and incendiaries.

Secured Area

The portion of an airport, specified in the ASP, where certain security measures identified in Part 1542 are carried out. This includes areas where aircraft operators regulated under 1544 and 1546 enplane and deplane passengers, sort and load baggage and any adjacent areas that are not separated by adequate security measures.

Security Identification Display Area (SIDA)

The portion of the airport, specified in the ASP where specified security measures are carried out. This includes the secured area and may include other areas of the airport. (Note: Any part of the AOA which is used to load and unload cargo from an aircraft of a 1544 or 1546 air carrier or where cargo is present after acceptance by a 1544 or 1546 air carrier must also be classified as a SIDA.)

Sterile Area

The portion of the airport, defined in the ASP that provides passengers access to boarding aircraft and to which access is generally controlled by the screening of passengers and property.

Unescorted Access to Cargo

The authority granted by the aircraft operator or IAC to individuals to have access to air cargo without an escort.

Terms Undefined in 49 CFR 1540 -1550 but subject to frequent usage: Security Threat Assessment This term was introduced through the Air Cargo Final Rule but not specifically defined. It is a background investigation performed by the TSA for those individuals requesting unescorted access to cargo.

***ICAO Definitions with regard to air cargo security, Annex 17 Chapter 1**.*

Airside

The aircraft movement area of an airport, adjacent terrain and buildings or portions thereof, access to which is controlled.

Cargo

Any property carried on an aircraft other than mail, stores and accompanied or mishandled baggage.

Regulated Agent

An agent, freight forwarder or any other entity which conducts business with an operator and provides security controls that are accepted or required by the appropriate authority in respect to cargo or mail.

Screening

The application of technical or other means which are intended to identify and/or detect weapons, explosives, or other dangerous devices, articles or substances which may be used to commit an act of unlawful interference.

Security

A combination of measures and human and material resources intended to safeguard civil aviation against acts of unlawful interference.

Security Control

A means by which the introduction of weapons, explosives or other dangerous devices, articles or substances which may be used to commit an act of unlawful interference can be prevented.

Security Restricted Area

Those areas of the airside of an airport which are identified as priority risk areas where in addition to access control other security controls are applied. Such areas will normally include, all commercial aviation passenger departure areas between the screening checkpoint and the aircraft, the ramp, baggage make up areas, including those where aircraft are being brought into service and screened baggage and cargo are present, cargo sheds, mail centers, airside catering and aircraft cleaning premises.

6. ICAO STANDARDS AND RECOMMENDED PRACTICES

The International Civil Aviation Organization (ICAO) is the United Nations organization that is devoted to civil aviation (it does not generally address military aviation). It establishes practices for all areas of international aviation with the aim of standardization and seamless operations between the air space of sovereign states. Just as the U.S. Code of Federal Regulations is organized by subject matter into “Titles,” the ICAO requirements are divided into Annexes according to subject. Annex 17 is devoted to aviation security. Many ICAO requirements called standards bear upon the civil aviation authorities of the member states and indirectly apply to international airports. It is helpful to review these in order to see what is required by ICAO at international airports.

For the purpose of clarification, while a Standard requires compliance, a Recommended Practice is suggested but not required. There are five Standards and one Recommended Practice that are dedicated to air cargo security. (ICAO Annex 17, Amendment 11)

- Standard 4.6.1 Each Contracting State shall ensure that security controls are applied to cargo and mail, prior to their being loaded into an aircraft engaged in passenger commercial air transport operations.

- Standard 4.6.2 Each Contracting State shall ensure that cargo and mail to be carried on a passenger commercial aircraft is protected from unauthorized interference from the point security controls are applied until departure of the aircraft.

- Standard 4.6.3 Each Contracting State shall establish a process for approval of regulated agents, if such agents are involved in implementing security controls.

- Standard 4.6.4 Each Contracting State shall ensure that operators do not accept cargo or mail for carriage in an aircraft engaged in passenger commercial air transport operations unless the application of security controls is confirmed and accounted for by a regulated agent, or such consignments are subjected to appropriate security controls.

- Standard 4.6.5 Each Contracting State shall ensure that catering, stores and supplies intended for carriage on passenger commercial flights are subjected to appropriate security controls and thereafter protected until loaded onto the aircraft.

- 4.6.6 Recommendation. – Each Contracting State should ensure that security controls to be applied to cargo and mail for transportation on all cargo aircraft are determined on the basis of a security risk assessment carried out by the relevant national authorities.

7. SPECIFIC REGULATORY REQUIREMENTS OF THE MAJOR PARTIES RE: AIR CARGO SECURITY AT AIRPORTS

Title 49 Code of Federal Regulations, Part 1542 is primarily devoted to Airport Security. The TSA is responsible for issuing these regulations and ensuring compliance with them. They generally do that by conducting audits and inspections. Not all airports fall under the jurisdiction of Part 1542. In a general sense, an airport must comply with 1542 if it has scheduled passenger service with aircraft of 61 seats or more. It also applies if there is public charter service with 61 seats or more. Similarly, if there is scheduled air service of 60 or fewer seats that deplanes into the sterile area of another airport, the airport must comply. The regulations also require that a Part 1542 airport must have an Airport Security Program (ASP) that is approved by the TSA. The approval is currently done by the Federal Security Director.

- 1542.111 allows an airport to delegate responsibility to an air carrier or foreign air carrier by means of a specific kind of contract called an Exclusive Area Agreement. These EAA's can only be established with air carriers or foreign air carriers. An airport may delegate security responsibilities to non-air carriers on the airport by means of an Airport Tenant Security Program.

- Subpart C of 1542 is entitled "Operations." It is a crucial section and full of cross references to other regulations. It says that if your airport has scheduled service by a U.S. or foreign air carrier with an aircraft of 61 seats or greater you must establish a Secured Area of the airport in which the highest level of security measures are performed to protect passengers, aircraft and air cargo. Furthermore, Section 1542.205 says that this Secured Area must include an area where security identification badges are displayed and attendant security practices are performed. These areas are called Security Identification Display Areas, or SIDA's. Areas of the airport which are not included in the Secured Area, but are within the airport perimeter are identified as Air Operations Areas or AOA's. As noted earlier in the Definitions section, it is important that the current definition of AOA be used and not confused with the earlier FAA definition.

- Sections 1542.201 and 1542.207 combine to provide the operational requirements for an airport's access control system. They state that airports must have an access control system that only grants access to authorized individuals and that the airport must prevent and detect the entry, presence and movement of unauthorized persons and vehicles in the Secured Area.

- As described in the initial section of this chapter, before an individual can be granted unescorted access to the Secured Area of an airport, that individual must pass a background investigation. This is called the Criminal History Records Check or CHRC. Section 1542.209 enumerates the procedures and specific standards for the CHRC. This is a highly detailed section that closely reflects the legislation that caused this regulatory section to come into being.

- Once an airport has determined who is allowed unescorted access there must be some method that identifies who has been granted access. Section 1542.211 contains the requirements for these Identification Systems or ID badges. A logical requirement that is implied is that employees who have been granted access and have been given an ID badge must know what to do if they observe an unauthorized person on the ramp. These procedures are set out in 1542.213 entitled Training. Airports often refer to this as SIDA training. Employees are not granted their ID badges until they have successfully completed the SIDA training.

- The final operational requirement of the airport is to supply law enforcement officers to support the security requirements of the airport. These requirements are contained in Sections 1542.217, 1542.219 and 1542.221. Subpart D of 1542 contains the final requirements all of which pertain to crisis management. This subpart basically requires that each airport must have and exercise a contingency plan and establish procedures for managing security incidents. It also requires that airports must comply with Security Directives and must post Public Advisories when directed to.

Regulations, security programs, and security directives provide minimum requirements that must be implemented by regulated parties. The following best practices are recommended for use by regulated and non-regulated parties that deal with cargo.

8. NON-REGULATORY SECURITY BEST PRACTICES FOR AIR CARGO

8.1 Employee Issues:

- Each separate facility, and in many cases, each tenant, should appoint a security officer who will be responsible for interacting with the managing entity of the building and/or appropriate airport staff on all security issues.
- Airport and tenant employees should be trained to question the presence of unidentified persons in the cargo areas.
- Active cargo areas and any areas providing potential access to the aeronautical operating area should restrict entry to authorized employees only.
- Tenants and handling companies should establish policy guidelines and physical checks to ensure that the whereabouts of all employees on each shift is known.
- Tenants and handling companies should have clearly designated individuals responsible for signing freight in and out.
- Tenants should establish controls to record movements in and out of the cargo areas.

8.2 Non-Employee Issues:

These guidelines were designed to address access issues for individuals employed by businesses external to the airport and its cargo tenants.

- Every tenant should ensure that persons not authorized unescorted access to cargo areas are kept away from the cargo areas unless escorted.
- Tenant and airport employees should ensure that there is no parallel parking of trucks in front of cargo bays.
- Tenants should limit the access of Customs Broker runners to the facility and supervise their movements.

- No private vehicles should be allowed to park near loading areas.
- Tenants should ensure that no pickup is made without a valid release order. In the event there are any concerns, clarify any doubts with the consignee.

8.3 Physical/Equipment Issues:

These guidelines were created to focus attention on physical design and equipment issues as they relate to security monitoring devices and planning elements of the building and site.

- The tenant should create a high security, limited access vault area for high-value goods.
- When possible, tenants or the landlord should install a silent alarm system, connecting cargo areas with the airport security desk or a 24-hour alarm monitoring organization if the airport security desk is not staffed on a 24-hour basis.
- Loaded mobile equipment should be kept secure at all times.
- Key-operated positive locking devices should be installed in all mobile equipment.
- All cargo containers whether empty or loaded should be secured and access limited.
- The contents of cargo tug trains should be covered to prevent open viewing both to and from the aircraft.
- Forklifts and other related equipment that could be used to force access to the cargo areas should be secured and access controlled.
- The gates and doors of all trucks containing cargo should be locked when not in the process of loading or unloading.
- Physical planning configurations should eliminate employee vehicle parking immediately next to the cargo building.
- Segregate trucking from both employee parking areas and any parking facilities reserved for airlines.

9. IMPLICATIONS OF SECURITY FOR FACILITIES AND INFRASTRUCTURE

9.1 Airside/Landside Demarcation

An air cargo operation is intermodal. While traditional security applications have tended to focus heavily on the airside, there are three aspects of an air cargo leasehold that must be considered when addressing security issues.

- The aeronautical component to include taxiways and ramp, including setbacks;
- The building as it pertains to the dimensions, configuration, and operating characteristics of the internal space allocated to warehouse, office, and other related uses, and. the concentration of truck and airside doors;
- The landside component to include building frontage, queuing capacity, parking for customers and employees, and roadway access.

Aeronautical Component:

The movement area includes aircraft parking apron that is usually adjacent to the cargo building, as well as the taxiways and taxi lanes that provide access, and any restricted service roads (RSR) that enable belly cargo tugs to move on non-public roads to and from the passenger terminals. Direct aeronautical access to aircraft apron is not necessary for every tenant. Passenger-only carriers and handling companies that deal with belly cargo need only be connected to the movement area via a restricted service road. However, most carriers flying freighters, or handling companies dealing with freighters, need to have ramp access, and most appropriately, ramp directly adjacent to the cargo building to minimize operating costs.

Building Component:

The dimensions of a building directly impact the number of access points on both the airside and landside, and the resultant complexity of access control. Buildings must be designed with throughput, operating efficiencies, and leasing costs in mind. In leasing cargo facilities, rental rates are typically based on the leasehold square footage and the footprint of the building, while the tenant's operating efficiencies, in many cases, may be substantially enhanced by the height of the facility. The design and installation of security systems will add costs and may impact throughput capabilities. Other critical elements in building design are the number, dimensions, and spacing of cargo doors on the aeronautical and landsides, the use of floor versus mezzanine office, and storage for equipment.

Landside Component:

Typically, the landside element of an air cargo facility must have sufficient space for truck turning and queuing, acceptable proximate roadway geometry, and acceptable overall access to the leasehold. In many airports, older cargo facilities were not designed to accommodate the larger trucks that are typically used today for long-haul trucking. This is true of the areas surrounding the cargo buildings, as well as the access roads to the cargo areas in general. Ensuing problems usually result in diminished traffic flows, random off-site truck parking, and a negative impact on air quality.

Another critical element of landside planning is the automobile parking requirements for the facility. Typically, a freight operation does not require extensive parking; however, on an airport the needs can vary. Employees and customers must both have proximate parking that is physically separated from the trucking operations. In instances where automobile parking is limited, employee parking is usually shifted to a remote area, shuttles are set up, and operating costs are increased.

9.2 Site Fencing/Gate Security

The most obvious manifestation of airport security is fencing. In cargo areas it serves the dual purpose of keeping intruders out and freight in. Typical perimeter fencing around a site is eight feet, heavy gauge chain link. It is likely that future site design will require separation of automobile parking areas from trucking with fencing and security gates. It is also recommended that access points to the AOA from the cargo facilities be reduced and manned checkpoints be established. Similarly access points to the cargo facilities from the roadway should be minimized and manned gates created. The result will be additional staffing requirements and the potential for further delays.

9.3 Single-Tenant Facilities

Single tenant facilities, whether carrier or handling company controlled, are easier to secure than multi-tenant buildings. There are no concerns over the integration of individual tenant security systems and technology, fewer access points, direct accountability, and lower installation costs. The building system should be linked to airport security, and local law enforcement as necessary and appropriate. The interior design should allow for the control of visitors in a single area without impacting efficiency or effectiveness. As compared to a multi-tenant facility it has the benefits of more visible and known staffing, and an interior that is more open to observation of the cargo areas. At most airports, however, single tenant buildings are not the predominant facility.

9.4 Multi-Tenant Facilities

Multi-tenant facilities represent challenges from a number of perspectives. Unless the facility has been developed or is managed by a third party, the most problematic issue is accountability for day-to-day security in common building areas and within the vehicle areas. Historically, airports have had difficulty with tenants failing to perform even routine maintenance or policing of such areas. Insurance issues associated with security accountability may create a major obstacle. These facilities typically have multiple access points in order to serve the tenants: this will add impediments and additional costs to access control. A more complex issue is the introduction of security technology into the building. With a single tenant with uniform operating equipment and procedures the design and implementation of security technology to include such items as physical characteristic verification devices, CCTV, screening devices, etc., is less expensive and easier to maintain. In new facility development, the building design should incorporate

security systems and technology enabling amortization of the investment over a longer period of time and minimizing the impacts on tenants. The addition of individual tenant systems after leasing typically will be more costly to the tenants and more difficult to monitor and maintain.

9.5 Landside Access:

Roadways:

In an ideal environment, trucking activity, beginning with entry onto the airport grounds, should be separated from automotive/passenger traffic. A system of readers and transponders will allow a central control to track the vehicle from the airport entry as it moves to a central screening area, and eventually, the cargo facility. Electronically cross-referencing the driver with the truck should also be included at the screening facility. Roadways should be wide enough and appropriate to allow for easy unrestricted movement, and the ability to avoid a blockage. The problem is that many airports do not have roadway systems that currently provide for an optimum vehicle separation, nor do they have the physical capacity to make modifications. In other instances, the capacity to develop a truck screening facility with appropriate queuing areas may also be lacking. For those airports with the space to accommodate potential changes to trucking movements, the cost of creating new screening facilities and potentially miles of road, may be prohibitive.

Parking Lot Access:

To mitigate theft, a well-designed cargo facility requires that automobiles and trucks be segregated with regard to both access and egress to the complex, as well as parking for the vehicles. This separation should be physical with employee and visitor lots positioned away from the building and secured with a single manned pedestrian access gate. All employees and visitors should be checked and be subject to local security and administrative processes. No employee vehicle parking should be adjacent to the building. Parking for key management staff or for persons with disabilities, should be provided as appropriate, however even this parking should be designed away from cargo bay doors. Truck and driver identification should again be verified at the entrance to the cargo facility. After admittance, trucks should queue in an area away from, but easily accessible to the cargo bays. All drivers whose trucks are not loading should be either in their vehicles, in a rest area if one is available, or in a secure area in the facility handling their paperwork.

Building Access:

Facility access must be tightly controlled. Cargo facilities with their extensive truck bays offer a number of access opportunities that must be controlled by observation and physical barriers. These can be as basic as keeping the bay doors closed until a truck is in the dock, or monitoring and enforcement of the “yellow line”. The “yellow line” can be an actual line that is painted on the floor of cargo facilities parallel to the front of the building. Usually it is 20 feet from the bay doors and defines the point beyond which unauthorized personnel may not pass. This concept is recognized by the trucking industry whose drivers need to be inside the cargo building to load and unload the vehicles.

Part of the difficulty in securing a cargo facility is the diversity of the population who need to access it, and the differences in the levels of access that each require. Office space should be physically separated and secured from the warehouse, but provide easy access for customers at the ground level. Access to mezzanine offices should not allow non-employees to enter warehouse space.

9.6 Facility Design Considerations to Accommodate Air Cargo Screening

When approaching the subject of facility design for air cargo screening it is important to take a step back and reflect upon a couple of basic differences between passengers and cargo with regard to screening. Aircraft passengers generally range from about 30-40 pounds for children to an upper range of about 300-400 pounds for the largest adults. They may bring to the airport both hold baggage and carry-on. In either case, the baggage must be carried by individuals. This puts a significant limitation on both size and weight. This is not the case with air cargo. A single piece of air cargo may range from one or two ounces to several

tons. This extreme diversity of size and weight is replicated by diversity in density and a broader diversity in the items themselves.

The point is that the challenge of screening cargo effectively is daunting. The numerous elements of diversity require that numerous methods are employed to screen cargo. The screening approach must be adequate to handle the size, weight, density, and material that is being examined. In turn, the approach (and related technology) can have significant and different implications with regard to cargo facility design. Some cargo is subject to physical inspection and hand search. The space/facility requirements for this type of screening are minimal. Cargo that is screened using the Electronic Trace Detection (ETD) technology has a greater but similarly minor requirement for space. ETD's typically have a 3-4 sq. ft. footprint and weigh less than 100 pounds. At the opposite end of the technology spectrum are the automated Explosive Detection Systems such as the CTX 9000 which weigh several tons, have the footprint the size of an automobile, require air conditioning and heating, and often require handling equipment to get the cargo into and out of the system.

Space requirements for cargo screening operations can reflect the type of technology being employed and the type of cargo being screened. It is envisioned that the use of consolidated cargo screening facilities will continue to increase. Worldwide, a range of technologies are being employed to screen cargo. Not all technologies are necessarily approved methods in all countries or by the TSA, but these technologies provide the widest possible view of what is available. Representatives of the appropriate authority (TSA, CAA etc.) should be consulted prior to serious consideration of any particular technology. As previously stated, the airport has no direct role in the screening of cargo.

9.7 Recommended Security Guidelines for Airport Planning, Design and Construction

The TSA released the above titled document on May, 2011. The Aviation Security Advisory Committee Working Group which was composed of experts from industry and government contributed to this comprehensive reference for airport security construction. Section D Part 3 directly addresses air cargo facilities and screening. Much of what is contained under the other headings of this volume can be applied to air cargo security. It is recommended that airports maintain a copy for frequent reference. An electronic version of this document which has links to related documents can be obtained from ACI-NA.

9.8 Other Important Considerations and a Look Ahead

Airport Capacity

- Airports measure capacity in different ways.

- The most obvious is air space, the ability of the region to sustain certain levels of air traffic. This is not typically an issue for cargo since it can and frequently does move at times other than passenger peaks.

- A second aspect of capacity is airside i.e. the aeronautical infrastructure. This is the ability of the runways, taxiways, and aircraft apron to accommodate the safe movement and parking of aircraft. If there is a shift to freighters, many airports maybe unable to meet the resultant demand for parking positions.

- The third aspect of capacity is terminal capacity. This pertains to passengers and would not typically be an issue for cargo. Instances, however, may occur where carriers who operate both passenger and freighter operations opt to change their route structure to fit with constraints arising out of cargo constraints thereby impacting terminal capacity.

- The fourth aspect of capacity is cargo facility capacity. Any major policy changes impacting how cargo is moved (belly versus freighter) could create serious mismatches in the compatibility of facility design and location with recommended revised operating guidelines. The cost implications could be substantial for many airports,

- The last aspect is landside access. All the major gateways and most large airports are fairly well constrained geographically. Requirements to create new roadway access points or screening facilities with large queuing requirements will cause enormous problems – many of which may not be resolvable – for these landlocked airports.

At airports where there is a lack of capacity for expansion, the airport may need to explore the availability of off-airport property that can be utilized for cargo screening and or handling. This may require the formation of public/private partnerships to include the use of third-party developers and the use of private funds.

9.9 Inbound Freight:

Many aspects of air cargo shipments do not impact airports directly, but are critical to improving air cargo security. They involve expedited clearance to minimize the length of time inbound international freight remains in the warehouse facility. This will involve a broader and more effective application of electronic clearance mechanisms. By inference this will involve increased compatibility between the requirements of the relevant government inspection agencies at the origin and destination of a shipment. This compatibility must be supplemented by enhanced communications that will facilitate data transmission within and between countries of origin. If goods can be cleared electronically, particularly shipments such as perishables, live animals, personal effects, and low-value goods, then targeted dwell times can and should be reduced to less than four hours. The system for clearing goods must be simplified as well as standardized. Entries into the system must however remain sufficiently clear to enable Customs and other facilitation organizations or other governmental entities, to identify information relevant to expedited pre-clearance. In a similar vein, partial shipments when possible should also be released as soon as possible rather than be held until the entire shipment is ready for release.

9.10 All-Cargo Airports:

The major forecasting agencies are calling for the world's air cargo volumes to double over the next 20 years. Given the constraints facing established airports, and the very real need to provide levels of assurance to the industry and the public, in certain geographic regions, it may become necessary to consider the redevelopment of existing underutilized airports, or the creation of new all-cargo airports to meet the industry's needs. Obviously, the costs for a new facility and the potential for economic disruption to other regions are substantial. Beyond that, a new airport (or airports) would create the need to totally reexamine how goods are moving throughout the country. A hub and spoke system of all-cargo airports strategically located throughout the country and linked to a massive trucking system could be an ideal solution to the cargo security issue. The reality of it is that an all-cargo airport may in isolated instances work, and bring benefit to the region in which it is located. However, the creation of a network would have major implications for existing regional economies, create substantial local job losses for existing airports, and foster the loss of additional jobs through the relocation of manufacturers. The financial impacts on carriers and airports could be substantial, and the higher costs of goods movement to sustain the new infrastructure would be challenging.

9.11 Implications of Cargo Security Costs:

Airports essentially have very limited resources to dedicate to cargo security. With most airports facing revenue challenges, and increased costs associated with the implementation of passenger security enhancements and related operational modifications, little funding is typically available for cargo. This however, is not a new situation. Despite the importance of cargo, many airports (and carriers) historically have placed their primary emphasis on the passenger segment that has been their principal source of revenue.

Air freight typically costs about eight times as much as trucking. Nevertheless, success in the cargo industry is predicated upon high volumes and small margins. Raising the cost of shipping by air will push additional domestic freight and possibly some international freight to other modes. The resultant loss of business could create a cycle of escalating costs and freight diversion. It is difficult to envision the diverse firms in the industry having the capacity to absorb the costs of the infrastructure improvements that could evolve

out of new security requirements, and airports have no unique mechanisms to raise funds that could be dedicated to security infrastructure modifications.

10. CERTIFIED CARGO SCREENING FACILITIY (CCSF)

Because of the belly cargo screening requirement, and the intent of the TSA to push cargo screening back down the logistics chain, smaller cargo support functions have sought out Certified Cargo Screening Facilities ("CCSF") for operating assistance and financial relief. There are a number of such operations located off airport in forwarder and trucking facilities. As security protocols mature, there is increased interest in having a CCSF (or several) located on the airport. This would reduce operating costs substantially if the facility can be located such that it will have airside access via restricted service road. This would eliminate the need to reload inspected cargo onto a truck for movement to the carrier. A CCSF would be an ideal element in an on-airport cargo village. A typical such facility allowing for truck circulation would require approximately 50,000 square feet.

11. CARGO SCREENING TECHNOLOGIES

Cargo screening technologies are as diverse as the items of cargo carried aboard aircraft. This presents a challenge for the airport manager who is planning for cargo screening facilities. Although it is the aircraft operator that retains the responsibility for cargo screening, it is the government authority (TSA, CAA, etc.) who determines which technologies and which particular equipment will be authorized to be used for cargo screening. So, while screening equipment manufacturers may advertise a particular piece of equipment as a "cargo screening unit" it is essential to know whether or not that particular piece of equipment is authorized for use in a given country; while a piece of equipment is acceptable for the screening of cargo in one country it may not be acceptable in a second or third country.

While the FAA, and now the TSA, established a certification standard for Explosive Detection Systems (EDS) for all passenger checked baggage and subsequently certified specific equipment, the extreme diversity of air cargo works against any such single "certified cargo screening system." It may become the case that certain systems are certified to screen only certain types of cargo while others systems are certified to screen entirely different types of cargo.

The simplest form of cargo screening device is the human being. A trained individual can effectively screen certain types of cargo. Following this, explosive detection dogs have been used to screen cargo for explosives. Again, the caveat - a given cargo screening method may only be applied if it is approved by the appropriate government authority. In recent times, the recognition of the need for harmonization of requirements between countries bodes well for more acceptance of "equivalent" cargo screening.

Some of the screening technologies that are employed at the passenger screening checkpoints have also been employed to screen cargo. They are the X-ray, the Advanced Technology (AT) X-ray, and the Explosive Trace Detector (ETD). This equipment, and their parent companies, have evolved over the last several years. Their size, weight and power requirements are relatively familiar. Further specifics can be obtained via a general internet search of the subjects. Similarly, requirements and dimensions of ETD technology can be obtained by referring to the website of GE Security or Smiths Detection. Bear in mind that this is an evolving technology that is constantly changing. Any discussion of specific devices or technology will likely be out of date before the ink dries. For that reason the following is a general discussion that should not be taken as authoritative.

High Energy X-ray Cargo Screening Devices

Several companies produce high energy X-ray imaging systems that are designed for the screening of cargo.

TSA Certified Explosive Detection Systems (EDS)

There are many devices that can detect explosives and several that are advertised as explosive detection systems. The FAA developed detection performance standards for the certification of Explosive Detection Systems. These performance standards identified the types, configurations and amounts of explosive that must be detected. The first such system that met these standards was certified in November, 1994. Since that time the TSA has continued these certification standards and currently there are multiple systems that are TSA certified Explosive Detection Systems.

X-ray Diffraction Technology

These are designed to be used downstream of an EDS system for the purpose of providing more definitive screening of items that have been identified as suspect items. These systems are not advertised as stand-alone systems but rather an additional feature to be added to an EDS system.

Gamma Ray Technology

Gamma ray technology is designed for screening cargo carried in trucks. Gamma rays are much more powerful and have greater penetrating power than X-rays so they have the ability to see through much denser material than X-ray technology. For this reason, they require greater shielding and attendant safety measures. The gamma ray devices are high-power imagers. They are not specifically designed to detect explosives as an EDS or ETD. Their ideal use is to scan a truckload of cargo to see if the material on the manifest is what appears on the image.

Pulsed Fast Neutron Technology

Pulsed Fast Neutron technology is being tested for application to cargo screening. It is a system whereby a pulsed beam of high-energy neutrons is scanned up and down in a raster (grid) pattern while the object under inspection is conveyed through the beam; characteristic gamma rays emitted by materials in the object are detected in order to analyze and image these materials with the help of time-of-flight measurements.

Appendix - Air Cargo Field Guide for Airport Operators

Four Steps to a Common Sense Understanding of Air Cargo Security at Your Airport

The four following steps are designed to provide a real-life understanding of the basics of air cargo security operations and responsibilities of the airport. There are many other parties involved - each with their own set of security responsibilities and regulations. But for an airport manager reporting to a new airport, or a manager assuming air cargo responsibilities these are four questions which if followed will result in a basic understanding of the airport's air cargo security responsibilities.

The First Question: **Where is (or are) the air cargo operations on the airport?** Find the cargo operations on the airport layout plan map. Next, find out how this area is depicted in the Airport Security Program (ASP). Then ask, "What does the ASP say about these areas? And "What does the ASP say our responsibility is for this area?" The answer will likely be that the airport is responsible for the perimeter fence surrounding the cargo area and that the airport has responsibility for access control measures at and around the cargo areas to include such things as doors, pedestrian gates and vehicle gates. Finally, one should ask "Are there any Security Directives or Emergency Amendments which modify what our ASP requires us to do?" Answering the above question will establish a firm foothold of understanding with regard to your responsibilities for air cargo security. You have two options at this point. Option 1: go out and observe this cargo area in person. See if the measures that are described in the ASP are really in place and if they make sense. Option 2: go on to ask the next question, but in no case going on to Question 2 before going onto the airport to see for yourself.

The Second Question: **How does cargo get to the aircraft?** In addition to cargo being introduced into the system through the on-airport cargo facility, there are often secondary ways that cargo gets on aircraft. Your first job is to identify all of them. Talk with air carrier cargo personnel. Talk with both managers and cargo ramp workers. They will know all the different means by which cargo gets on their aircraft. As an example, a courier for a medical lab could bring blood samples to an air carrier ticket counter each night for shipment to another blood lab. Another example might be a cargo airline that has a consolidation center located off-airport that brings in a truckload of cargo through a vehicle gate and loads the airplane from the truck. After identifying all these secondary air cargo venues, you proceed upon the same line of questioning as before. "What does the ASP say about these procedures?" What is your responsibility for the security of this operation?" Are there any Security Directives or Emergency Amendments which expand your responsibility for this? At this point, assign operations staff officers to observe what has been described to you. Take a notebook and make notes. Remember, you know what the ASP says and what the formal requirements say. Ask yourself, "Is this what I am seeing? Does this make sense?" Take notes.

The Third Question: **What is the airport's responsibility for badging the air cargo employees?** You will probably have found in the course of answering the first two questions that the airport bears the primary responsibility for issuing airport access badges as well as vehicle access authorization. Again, start with the formal requirements. Ask, "What does the ASP say about the airport's responsibility for issuing airport access badges to individuals involved in air cargo?" Make sure you read the ASP section yourself. Often, the ASP does not actually say what the individuals who deal with it on a day-to-day basis think it says. You will find that the issue of granting airport access badges requires that the airport perform a background investigation for most areas of the airport. Identify which areas of the airport require a background investigation. Identify what is required of those individuals involved in air cargo operations identified in Questions #1 & #2. Ask the question "Is there more than one kind of background investigation that the airport is involved in?"

Finally, follow Question #3 with a field trip. This will be a two-part field observation. First, go to the office where the airport's access badges are granted. Observe the process. Where are the background investigations performed? What causes an individual to fail a background investigation? Second go to the air cargo areas and observe how the airport access badges are being used. Keep in mind what the ASP says must be done. Is this actually what you are seeing? Does it make sense? Will it actually result in good security for the cargo? Take notes.

The Fourth Question: **What is the airport's responsibility when something goes wrong?** For example, what happens if cargo is suspected of containing a bomb, or a stowaway? What happens if cargo catches on fire on or off the aircraft? What happens if an intruder is found in the cargo area? These questions focus on the fact that the airport has a great deal of responsibility for emergency response both for security and police issues as well as for rescue and firefighting.

Follow up with: What does the ASP say we must do when an incident occurs? Review the section yourself. Does it say what everyone thinks it says? Do the responding organizations know what they are supposed to do? Is there a Memorandum of Understanding between the police department and/or the fire department that articulates what their responsibilities are? Finally, visit the responder organizations and find out what they understand their responsibilities to be. Having answered the preceding four questions, the new airport manager has established a solid understanding of the air cargo security responsibilities for a particular airport. Nevertheless, cargo is diverse and the attendant issues that could arise can be unanticipated and challenging. The key to successful management of a cargo function is maintaining awareness of industry best practices, and the implications for your airport.

CHAPTER 10

ALTERNATIVE LAND USE

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1. PURPOSE AND GOAL

Airports, in response to growing financial pressures on both them and their constituents, should continually explore new avenues of asset management including the use of airport property for expanded and non-traditional business uses. This document presents a context for decision making that will help individual airports recognize and address the considerable challenges associated with such development. It is not intended to present specific answers to the questions that airports ask since every airport development scenario is different and should be predicated upon an established and prioritized set of business goals.

2. DEFINITION

There are countless articles written about the “new” concept of airports as an impetus for urban development. The reality is that the idea is hardly new and far more than a concept. Airports have long been regarded as engines for economic development: they generate thousands of jobs on airport and in the case of the mega hubs, the secondary and tertiary job impacts off airport are numbered in the tens of thousands. A large airport can have a working population of 25,000 or more and as the industry has matured over the past 50 years we have seen, when possible and feasible, the addition of a wide range of ancillary and supporting businesses and services quite naturally grow to accommodate the needs of aviation tenants and customers. However, it is important to remember that the investment in such collateral development is predicated upon expressed demand and a wide range of enablers. Sound airport planning is based on this deliberate and rational foundation.

The first thing to bear in mind is that regions will locate airports when possible, at sites that are removed from, but readily accessible to central business districts and population centers. Safety, complex operating concerns, and environmental issues ranging from noise, to air quality, to ground traffic levels all clearly differentiate the airport from your every day urban land use. It is in many cases a 24-hour a day hub of activity and its unique ambiance, while dynamic and exhilarating, does not lend itself to a wide range of alternative uses. A successfully developed airport is the product of extensive physical and environmental due diligence, regional transportation planning, a complex array of business forecasts and operational analyses, legislative empowerment, national, regional and municipal review, and enabling financing. All of this must take place in a market that will enable the facility and services to be financially self-sustaining, while assuring compatibility with neighboring communities. The geographic locations where such a combination of factors can be achieved to create a global impact in a market of sufficient volume are decidedly limited.

Since airports are designed to move airplanes, their physically planned infrastructure will frequently create pockets of land that do not lend themselves to traditional airport uses. Many airports are beginning to explore alternative uses for some of these generally small parcels of land that can generate additional levels of revenue and higher levels of service for their constituents if properly planned. Such uses however are extremely constrained by safety, security, planning, and operating issues that are federally-controlled in order to protect the long-term capacity of the nation’s airports and aviation system. Most mature airports in municipal environments are also constrained by geography, roadways, and surrounding development. In a number of instances, where more recently constructed airports have substantial amounts of property, there is limited social, political, or economic will or need to try to tackle the complex issues that would foster broader use. Perhaps most important, there may not be a mechanism that would facilitate financial investment in the absence of demand, particularly when substantial proximate off airport properties are available for less money and unencumbered by the vast array of regulatory issues with which U.S. airports must deal.

The growth of the aviation industry in Asia has stimulated the development of airports and airport facilities on a scale that we do not typically see in more mature markets. Newer facilities are introducing the application of many of the planning principles and design features that experience and technological advances have brought to the industry. Nevertheless, the same planning, safety, environmental, and operating mandates still largely pertain. The key exception is that in instances where surrounding urban development does not mitigate against it, multi-modal access via rail, motor coach and ferry is developing. This changes certain marketing and demand assumptions for airports and warrants the introduction of a different array of services and amenities. Nevertheless, the concept of the airport as a stimulus for urban development as it has become often articulated is not particularly innovative, nor is it without precedent or insurmountable hurdles, even in most of Asia.

So many of the visionary concepts we have heard about take what over the years has become a fairly consistent and reliable model of the economic development dynamic at work, and artificially inflate it to a level that few airports or regions can ever hope to achieve. In the financially challenged world of aviation and airports, the fiscally prudent allocation of funds is critically important. Unrealistic expectations of what can be achieved can take politicians and communities down a road from which it is difficult to return. The journey to the airport city or “Aerotropolis”, is a slippery slope fraught with complex planning, operating, and regulatory issues. Once in a while, we all like to think of things that could be. In the real world, regardless of the opportunity, an airport’s location relative to supply chains and to the broad consumer marketplace drives the critical issues of demand and financing and dictates the feasibility of development. There are far too many examples of visionary airport projects standing empty and unfulfilled because of a rush to be first, a dream of tremendous economic growth, a naïve political mandate, or a market assessment that was ignored in the haste to secure headlines. This Chapter focuses on the practical elements of development, particularly those that relate to cargo and logistics. It addresses applications to unutilized, under-utilized, and potentially inappropriately utilized airport properties and explores highest and best use applications and relates these to the various business drivers that would interest an airport in such development.

However, alternative land use is not necessarily something that an Airport can simply undertake. There are instances where the FAA requires that Airports develop a Land Disposition/Divestiture Plan as a requirement before Airports develop an Alternate Land Use plan. There may also be a complex, lengthy, and possibly costly effort to obtain the release for land purchased with Federal funds. Land impacted by Federal Airport Aviation Regulation (FAR) 14 CFR Part 150, noise must be posted on the Federal Registry for public comments before Airports are authorized to develop Non-Aeronautical uses.

3. PURPOSES FOR PURSUING DEVELOPMENT

The critical decision in pursuing development is why. It is absolutely essential that an airport combine business planning with physical planning in making this assessment. To the extent possible, this planning work should be integrated with regional land use planning, regional transportation planning, and economic development initiatives. For this reason, a business plan with a sound understanding of regional and industry market dynamics should form the basis for developing and prioritizing initiatives. Assuming that strategic planning of all future development is the best approach, airports must develop sufficient focus and business logic to react appropriately to an outside influence such as airline consolidation or a regional economic slump that might precipitate a need for an interim but less satisfactory alternative to utilizing a piece of property.

It is important to first understand what is meant by alternative land use. It is generally accepted that the primary uses for airport property are passenger and cargo operations, maintenance, and general aviation.

These business segments receive support from a variety of different firms that typically are located off-airport because of space constraints or property costs. In an ideal environment many of these functions would elect to be located on-airport to minimize time issues, create operating synergies, and/or reduce the cost of doing business. These functions become the first order of priority. Beyond these elements, there are very basic functions that serve to meet the quality of life requirements of the airport's working population and those of its tenants and users. These are the next order of focus. In this case, the emphasis is on support for cargo and logistics, but a number of additional support functions could be included.

Typically perimeter property away from the main terminal and ramp operations areas is the most appropriate and viable target for development. An airport's first obligation is to maintain the integrity and capacity of these areas for both the near and the long-term aviation use. However, there will be instances when an airport will consider if there are alternatives that are consistent with long-term vision and goals. This means that the airport must address why it might want to change the existing planned use of an area to something else. The following are typical considerations for investigating and pursuing alternative land use.

a. The need for strategic as opposed to incremental land use planning.

   Airports may need to revisit existing development plans (and developments) that were the result of a more-spontaneous response to a client or airport want - rather than the product of a planned approach to airport development. It may also be appropriate, given the Business Plan to create more development opportunity for a specific function, e.g. cargo and cargo support, maintenance, general aviation, etc.

b. Optimizing the available property for aeronautical use

   As airports mature, and business expands (or changes) the need for aeronautical infrastructure will change as well. Redevelopment may be necessary to recapture property with aeronautical adjacency.

c. Optimizing revenue potential

   Given the changing marketplace, shifts in revenue generation, and new business partners, airports may look to create capacity to bring new business partners on to the airport, or develop facilities for established partners that traditionally have been off airport, but who for operating, security, or cost reasons may now prefer an on airport location.

d. Integrating on and off airport planning

   One of the critical concerns an airport faces is compatible land use. Typically, this is associated with noise and other environmental issues, but from a business perspective it is equally important. Development on airport must not be seen as a threat by local off airport businesses, and where possible should serve as a stimulus for growth.

e. Regional economic development

   Airports are considered economic engines. In the absence of suitable property around an airport, available airport property (assuming appropriate approvals) could be used to accommodate an economic initiative.

An airport must address some very basic questions including whether development of additional aeronautical use facilities is desirable *and* warranted. It may be that the local aviation infrastructure is seeing

increased demand. However, it could be just as likely that there is no market for local growth because enhanced infrastructure and services exist and are thriving at neighboring airports. An understanding of demand in the *regional* market is critical to understand if development of non-aeronautical but still transportation or multi-modal related facilities would be effective for attracting growth. Such development is more likely if it is an area where manufacturing is strong or geographically well-suited for truck, train or vessel connections. The probability diminishes if the airport is a spoke in a large network carrier's hub, with little or no manufacturing and limited access to major interstate or rail lines. Real estate growth is even less likely if the airport cannot compete with the lower rents that firms usually find off airport.

It may be that development of light industrial, commercial and even office would be the right fit. This use could serve to offer neighborhoods a soft buffer between the harshness of parking structures or hangers but would not be appropriate if it is the last contiguous land to Aeronautical Operating Areas (AOA) and terminal areas. Development, particularly with a private partner can generate new revenues but limit the airport as to the eventual use of the property. Long-term leases can be expensive to buy back if the area is needed for other expansion so it is critical to understand the market and what drives it. An airport must evaluate the tradeoffs between short-term profits and long-term growth, understanding if the new uses will still be the most appropriate and best use of property ten, fifteen, or twenty years into the future.

In reality, it comes down to choices by each individual airport based on its position in the aviation system and its respective community. There are always a wide-range of variables that must be examined but it is important to realize that there are no uniform answers. What is an acceptable alternative to one airport may be very problematic to another.

4. CRITICAL CONSIDERATIONS IN IDENTIFYING ALTERNATIVE LAND USES

There are basically three categories of considerations that have to be weighed in an examination of alternative land use – operational (to include security), physical (to include environmental), and administrative (to include financial). These obviously can be subset to a great many levels, but for purposes of this discussion are grouped as indicated above.

4.1 Operational and Security Considerations:

The first thing with which an airport must be concerned is preservation of the appropriate land envelope for aviation's operational capacity to include the ability to keep tenants and users safe and secure. The following are some of the primary issues to be weighed in considering new development options.

Line of Sight

One of the paramount considerations in any on-airport development is the relationship of the project to the Control Tower. From a safety perspective, it is critical that Air Traffic Control staff and in many instances, Airport operations staff, have direct visual access to the aeronautical infrastructure including all runways, taxiways, taxi lanes, and aircraft apron. Structures may not be erected that interfere with this line of sight.

Height of Structures

Tall objects and structures can pose obstructions to air navigation. The development of multi-story facilities and communication towers should be carefully considered in relation to airport activities. Federal Aviation Regulation Part 77 provides guidance in identifying the airport airspace areas, referred to as imaginary surfaces, that should be kept free of tall structures. The imaginary surfaces are as follows:

- Primary Surface.

  The primary surface is longitudinally centered on a runway. When the runway has a specially prepared hard surface, the primary surface extends 200 feet beyond each end of that runway. When the runway has no specially prepared hard surface, or planned hard surface, the primary surface terminates at each end of the runway. The width of a primary surface ranges from 250 feet to 1,000 feet depending on the existing or planned approach and runway type (i.e., visual, non-precision, or precision).

- Transitional Surface

  Transitional surfaces extend outward and upward at right angles to the runway centerline and are extended at a slope of seven feet horizontally for each foot vertically (7:1) from the sides of the primary and approach surfaces. The transitional surfaces extend to where they intercept the horizontal surface at a height of 150 feet above the runway elevation. For precision approach surfaces, which project through and beyond the limits of the conical surface, the transitional surface also extends a distance of 5,000 feet measured horizontally from the edge of the approach surface and at right angles to the runway centerline.

- Horizontal Surface.

  The horizontal surface is a horizontal plane located 150 feet above the established airport elevation, covering an area from the transitional surface to the conical surface. The perimeter is constructed by swinging arcs from the center of each end of the primary surface and connecting the adjacent arcs by lines tangent to those areas. The radius of each arc is 5,000 feet for all runway ends designated as utility or visual, or 10,000 feet for all other runway ends.

- Conical Surface.

  The conical surface is a surface extending upward and outward from the periphery of the horizontal surface at a slope of one foot for every 20 feet (20:1) for a horizontal distance of 4,000 feet.

- Approach Surface.

  Longitudinally centered on the extended runway centerline, the approach surface extends outward and upward from the end of the primary surface. An approach surface is applied to each end of each runway based upon the type of approach. The approach slope of a runway can be a ratio of 20:1, 34:1, or 50:1, depending on the sophistication of the approach. The length of the approach surface varies, ranging from 5,000 feet to 50,000 feet. The inner edge of the approach surface is the same width as the primary surface and expands uniformly to a width ranging from 1,250 feet to 16,000 feet depending on the type of runway and approach.

Safety Areas

FAA AC 150/5300-13 Airport Design Standards define safety areas to allow for the safe and efficient operation of an airport. These safety areas include:

- Runway Protection Zone.

  Runway Protection Zones, formerly clear zones, were originally established to define land areas underneath aircraft approach paths and to prevent the creation of airport hazards or the development of incompatible land use in these areas. Runway Protection Zones must be kept free

of structures and any development that would create a place of public assembly. A Runway Protection Zone (RPZ) is an area that begins at a point 200 feet beyond the end of the runway. The length of the RPZ extends 1,000, 1,700, or 2,500 feet depending on the category of runway and type of approach (visual, non-precision or precision). The inner width of a RPZ is located closest to the end of the runway. Opposite this end is the outer width, which is the wider end. The inner width of a RPZ varies from 250 feet to 1,000 feet. The outer width of a RPZ varies from 450 feet to 1,750 feet. As with the length of the RPZ, the inner and outer widths of a RPZ are dependent on the runway category and approach type.

- Runway Safety Area.

  The Runway Safety Area (RSA) is a critical surface surrounding the runway. RSAs should be cleared and graded and free of potentially hazardous surface variations. The RSAs should be properly drained and capable of supporting snow removal, aircraft rescue and fire fighting (ARFF) equipment, or an aircraft (without causing damage to the aircraft). The size of the RSA is dependent upon the runway design category and approach type (visual, non-precision, or precision). Taxiways also have similar safety area requirements.

- Runway Object Free Area.

  The Runway Object Free Area (OFA) is a two-dimensional ground area surrounding the runway. FAA standards prohibit parked aircraft and objects within the OFA. The runway OFA extends beyond the runway end at lengths that vary from 240 feet to 1,000 feet, depending on the runway design category and the approach type. There are also OFAs that are linked to taxiways.

Compatible Land Uses per FAR Part 77 Surfaces and FAA Safety Areas

Legend:

C Generally compatible land use
NC Incompatible Land Use
• Not clearly compatible or incompatible, requires specific study

Criteria for Compatibility:

1. Does not exceed height standards
2. Does not attract large concentrations of people
3. Does not create a bird attractant
4. Does not cause a distracting light/glare
5. Does not cause a source of smoke
6. Does not cause an electrical interference
7. Does meet compatible DNL sound levels

Land Uses	Primary	Transitional	Horizontal	Conical Surface	Approach	Runway Protecti
Residential						
Residential, other than those listed below	NC	NC	•	C	•	NC
Mobile home parks	NC	NC	•	C	•	NC
Transient lodgings	NC	NC	•	C	•	NC
Public Use						
Places of public assembly (schools, hospitals, churches, auditoriums)	NC	NC	•	C	NC	NC
Government services	NC	•	C	C	•	NC
Transportation (parking, highways, terminals)	NC	•	C	C	•	•
Commercial Use						
Offices, business and professional	NC	•	C	C	•	NC
Wholesale & retail - building materials, hardware and farm equipment	•	•	C	C	•	NC
Retail trade - general	NC	•	C	C	•	NC
Utilities	NC	•	•	•	•	•
Communication	NC	•	•	•	•	NC
Manufacturing & production						
Manufacturing - general	NC	•	•	•	•	NC
Agricultural (except livestock) and forestry	•	•	C	C	•	•
Livestock farming and breeding	NC	•	•	C	•	NC
Mining, fishing, resource production & extraction	NC	NC	•	•	•	NC
Recreational						
Outdoor sports arenas and spectator sports	NC	NC	•	C	NC	NC
Nature exhibits and zoos	NC	NC	•	C	NC	NC
Amusement parks, resorts and camps	NC	NC	C	C	NC	NC
Golf courses	NC	NC	C	C	NC	NC
Parks	NC	•	•	•	•	•

Source: Mead & Hunt, Satre Associates, Oregon Department of Aviation, Oregon Airport Land Use Compatibility Guidebook: 2003.

Density of Development

One way to reduce risks of damage or injury to persons or property on the ground due to aircraft accidents is to limit the density of development at or near airports. Studies have shown that accident probabilities increase with proximity to runway ends because of the greater concentration of aircraft, flying at low altitude, over these areas. Some airports and local communities have set development density limits ranging from 25 to 100 people per acre for various parts of a runway approach corridor. Shopping centers are likely to average about 75 people per acre and restaurants, over 100 people per acre. In general, high-density residential development and places of public assembly should not be permitted in the airport's approach corridors.

Lights

Lights that shine upward are potential hazards since they can confuse pilots in identifying airport or runway lights at night. In a similar vein, blinking lights connected with retail may create an issue.

Glare

Reflective surfaces can produce a blinding glare that can distract pilots. This should be considered in choosing building materials and water surfaces.

Smoke

Smoke, dust, fog and steam can reduce visibility when a pilot is looking for an airport or preparing to take off or land.

Electronic Interference

Land uses that generate electronic transmissions can interfere with aviation navigational signals and radio communications.

Security

Airport safety and security are preserved through a coherent closed-loop of requirements and procedures, rather than a patchwork of individual efforts and programs. Anything that diminishes security in individual areas compromises airport security in general. This is true whether applied to passenger carriers, cargo carriers, catering or alternative land users.

The challenge of alternate land use for non-traditional purposes, places an added planning burden on the development. Ideally, new uses will provide services and/or amenities to the existing airport community as well as the off airport business and residential population.

There are a number of considerations that have to be weighed for the development of on-airport property for non-traditional uses. From a security perspective some are very clear. The first is what kind of fencing, if any will be required to ensure separation from the aeronautical areas. It is important to clearly define the areas to be developed. The second is access. It will be critical to understand the need for commercial and private vehicle access and egress so that if some form of access control is required the impacts on resultant traffic queuing and parking requirements can be evaluated. More importantly, such analyses can lead to a more efficient siting of the development so that security controls are minimized or unnecessary. This may reduce development options, but in the long-run eliminate additional costs associated with security. In the event that the use will be primarily for airport tenants and users, then it is critical that access be available that will not increase the burden on airport security.

Any new development that increases the amount of labor on-airport and the number of entries onto the Air Operations Area (AOA) augments the potential for such dangers as theft and terrorism and therefore must be undertaken with considerable attention to detail. Theft concerns are heightened by recognition that air cargo tends toward high-value, smaller items more conducive to thievery. The relatively greater terrorism threat for the cargo industry revolves around the potential misuse of aircraft as a weapon. These concerns do not form in a vacuum impervious to the larger economic development objectives of the community and security concerns of the air transportation industry in general.

The Transportation Security Agency (TSA) has estimated there are about 1,200,000 airport and vendor employees who worked at the nation's commercial airports – with about 1,000,000 working in the secured or Security Identification Display Area (SIDA) areas. For those workers whose functions require such access, airport operators issue SIDA badges, identifying the workers and granting them authority to access the SIDA and secured areas without an escort. Any other worker needing to enter the SIDA or secured area must be accompanied by an escort who has been granted unescorted access authority.

For good reasons, the visibility of many of an airport's security measures is not readily apparent or open to the untrained or uninitiated. To determine if a site is AOA capable is typically a collaborative effort between the various security stakeholders. If airport property is to be used for other non-aviation purposes, these same stakeholders should still have an opportunity to comment on potential impacts to the airport's overall security. These impacts will vary depending on the site use and proximity to existing airport perimeters.

4.2 Physical and Environmental Considerations

Physical planning for any collateral development must be done within the context of the Master Plan and the approved ALP. On-airport development therefore becomes somewhat more problematic in that it faces certain constraints that must be addressed in order not to potentially trigger a large environmental review process which could create substantial delays in project implementation. The preferred course of action is to select a site that will enable the development to proceed with all appropriate environmental due diligence on a timely basis. All the physical elements of an off-airport construction project pertain. The site however, must, as discussed earlier, not adversely impact airport operations or safety. It should be as proximate as possible to the aeronautical functions for which it is intended to provide support without creating or complicating security issues. Lastly, it should be sited so as to facilitate doing business and maximizing revenue.

Impacts on roadway access to the site and to the airport should be carefully evaluated to minimize adverse impact on traffic flows keeping in mind overall effects on airport constraints. Critical construction issues such as cut and fill and water table levels will play an important part in site selection and in many instances, a separate cost benefit analysis on cut and fill problems may be required. The site selection should also be sensitive to water table issues and drainage, and consider containment issues if there has been a possible use of contaminants in the site. The ability and cost to pull utilities including water to the site is another important consideration. Similarly, should special communications infrastructure be required, its unique access issues must be weighed.

One of the greatest difficulties for an airport is balancing the need to accommodate growth with concerns for remaining environmentally friendly. The issues pertain to alternative land use as well the core business elements. These include noise, light, and emissions as well as all the other issues mentioned below. While there may not always be direct relevancy, a quick check of a contemplated initiative against the regulations might be worthwhile.

Waters and Wetlands

Pursuant to the Clean Water Act, development alternatives should avoid and minimize impacts on waters and wetlands, and should not cause water pollution. In some cases, impacts can be offset by the acquisition of mitigation property but cost-benefit then becomes a critical part of the analysis.

Air Quality

Pursuant to the Clean Air Act, the proposed development should not cause the degradation of air quality. This means that detailed analysis may be required for accessing roads with regard to traffic levels and emissions.

Bird Attractants

Water impoundments, garbage dumps, sanitary landfills, sewage treatment plants and certain species of flora and fauna often attract birds. The presence of a large number of birds around airports increases the risk of bird strikes.

Noise

As always however, the greatest single concern near an airport is the impact of noise. Therefore, the identification of alternative land use must consider compatibility with different levels of noise exposure as identified in FAR Part 150:

Land Use Compatibility with Yearly Day-Night Average Sound Levels

Legend:
Y (Yes) - Land use and related structures compatible without restrictions
N (No) - Land use and related structures are not compatible and should be prohibited
NLR - Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure
DNL -Average Day-Night Sound Level
25, 30, 35 - Land use and related structures generally compatible; measures to achieve NLR of 25, 30, 35 dB must be incorporated into design and construction of structure.

Land Use	Below 65	65-70	70-75	75-80	85-85	Over 85
Residential						
Residential, other than mobile homes and transient lodging	Y	N (1)	N (1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N (1)	N (1)	N (1)	N	N
Public						
Schools	Y	N (1)	N (1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y (2)	Y (3)	Y (4)	Y (4)
Parking	Y	Y	Y (2)	Y (3)	Y (4)	N
Commercial						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail - building materials, hardware and farm equipment	Y	Y	Y (2)	Y (3)	Y (4)	N
Retail trade - general	Y	Y	25	30	N	N
Utilities	Y	Y	Y (2)	Y (3)	Y (4)	N
Communication	Y	Y	25	30	N	N

Land Use Compatibility with Yearly Day-Night Average Sound Levels (Continued)

Land Use	Below 65	65-70	70-75	75-80	80-85	Over 85
Manufacturing & Production						
Manufacturing - general	Y	Y	Y (2)	Y (3)	Y (4)	N
Photographic and optical	Y	Y	25	30	N	N
Agricultural (except livestock) and forestry	Y	Y (6)	Y (7)	Y (8)	Y (8)	Y (8)
Livestock farming and breeding	Y	Y (6)	Y (7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y (5)	Y (5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusement parks, resorts and camps	Y	Y	Y	N	N	N
Riding stables and water recreation	Y	Y	25	30	N	N

Source: FAR Part 150, Appendix A, Table 1

Notes:

(1) When the community determines that residential or school uses must be allowed, measures to achieve an outdoor to indoor NLR of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. The use of NLR criteria will not, however, eliminate outdoor noise problems.

(2) Measures to achieve NLR of 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

(3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

(4) Measures to achieve NLR of 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

(5) Land use is compatible provided special sound reinforcement systems are installed.

(6) Residential buildings require an NLR of 25 dB.

(7) Residential buildings require an NLR of 30 dB.

(8) Residential buildings are not permitted.

Physical Considerations:

The same kinds of issues for any construction project on an airport will pertain to alternative land use. All of the critical elements linked to airport operations must be weighed in the siting of any new non-traditional land use.

- Geographic Constraints.

  The most obvious issue is whether there is enough property and whether or not it is properly configured to accommodate the proposed use. If there is not a good fit or the site does not have good visibility or access, then an alternative use should be considered.

- Cut and Fill.

  Having an available site is only the first step. Few sites are perfectly suited to immediate development. The nature of the potential development may require atypical grading, or the site itself may require work for routine development. Associated costs, if too high could eliminate prospects for development.

- Water Table.

  If the development requires any below grade work to include storage, parking, access etc. the water table will be critical. More often than not the airport will have complete information on this, but certain sites may require additional testing and examination.

- Soils.

  The nature of the soil may impact construction costs for certain uses. For example, in some areas pilings may be required. The associated costs could easily double typical foundation expenses and impact the financial feasibility of the development.

- Utilities.

  Development locations on the perimeter of the airport may affect both the availability of utilities and the municipality from which they are supplied. In either case the costs must be determined for both bringing the utilities to the site and the monthly costs.

- Access.

  It is important that the development use be consistent with the availability of ground access and egress to and from the site. The roadway must have both the capacity and geometry to accommodate the use and not interfere with projected access to aviation uses and operations.

- Ground Traffic Level of Service.

  Level of Service is critical for a number of reasons. First, the amount of traffic generated by the development must be consistent with the levels dictated by the airport's environmental plan. Second, the additional traffic that the new use generates should not adversely affect traffic flows to the airport's primary aviation facilities. Third, the traffic flows should not create congestion on the access roads to the project site. Fourth, the projected levels of traffic should ensure that carbon emissions are within airport and/or regional parameters. Development initiatives should therefore be mindful of the diverse impacts that new development could have.

4.3 Outreach Considerations

Public Relations

Communities look at their airports very differently. In many instances an airport will be surrounded by or possibly be part of separate municipalities that have different perceptions of the appropriate role of the airport. This flows into development initiatives that blur the lines and may create conflict between airport and commercial activity.

- Community.

An airport always must be sensitive to the surrounding community. Alternate land use implies the development of a non-traditional airport business with most typically, a commercial orientation. The absence of community resistance to a proposed use will be a positive step in its success. A use compatible with regional interests and needs should be an important criterion in the evaluation of development alternatives.

- Business Community.

Any commercial use of airport property has the potential to compete with private sector initiatives. This is particularly sensitive at airports with substantially developed surrounding properties. While there may be on airport development opportunities, the possibility for competing development should be addressed before planning advances too far. This should include an understanding of tax implications or where applicable Payments In Lieu Of Taxes.

- Political Community.

There is considerable potential for raising concern in political areas. In the event the surrounding communities or the business community have an issue with any element of the development, it is very likely that the debate will be escalated to a political level. The airport should anticipate the potential for such escalation and address the concerns before they become problems.

5 FEDERAL LAWS AND REGULATIONS RELATING TO AIRPORT-COMPATIBLE LAND USE PLANNING

The most difficult elements of determining the feasibility of alternative land use involve ensuring consistency with appropriate federal and other legislative guidelines which form safety, security, and operational planning parameters for airports. In identifying potential alternative land uses for on airport property, airport management must therefore comply with various laws and regulations. This section summarizes federal laws and regulations that must be considered in planning airport land use. In addition to federal laws and regulations, there are various state and municipal laws and regulations that also govern and/or inform airport land use planning.

Aviation Safety and Noise Abatement (ASNA) Act of 1979, United States Code (USC), Title 49

Congress passed the ASNA Act to provide assistance to airport owners in preparing and carrying out noise compatibility programs primarily to ensure continued safety in aviation. The ASNA Act required the following actions:

- Establishment of a single system of measuring noise at airports and the areas surrounding airports

- Establishment of a single system for determining exposure of individuals to noise – noise intensity, duration, frequency and time of occurrence – that results from airport operations
- Identification of land uses normally compatible with various levels of exposure to noise

Section 103 of the ASNA Act authorized the Secretary of the Department of Transportation to make grants for airport noise compatibility planning to minimize noise impacts on communities in and around airports.

Airport and Airway Improvement Act of 1982, USC, Title 49

The Airport and Airway Improvement Act (AAIA) obligates airport owners who accept federal funding to operate and maintain the airport and comply with specific assurances, including the establishment and maintenance of compatible land uses around airports. The airport owner must restrict the use of land adjacent to or in the immediate vicinity of the airport to reasonable activities and purposes compatible with normal airport operations, including aircraft landings and takeoffs.

Airport Noise and Capacity Act of 1990 (National Noise Policy)

Noise complaints from the public prompted Congress to establish a National Noise Policy that required the phase out of Stage 1 and Stage 2 aircraft, and the use of all Stage 3 aircraft in the United States effective December 31, 1999.

National Environmental Policy Act of 1969 (NEPA)

The NEPA established the commitment of the federal government to fully consider the effects of a proposed action on human environment. It states that "governments, and other public and private organizations, use all practical means and measures to create and maintain conditions under which man and nature can exist in harmony." The NEPA resulted in the development of guidelines for the application of a national policy to consider the impacts of a proposed project or action on the environment.

In land use planning, NEPA comes into play when an airport sponsor proposes a project or action that requires federal approval. All actions proposed by an airport sponsor are reviewed to determine whether there are environmental impacts that may result from the action being implemented and if these impacts are significant.

Section 404 (b) (1) of the Clean Water Act of 1977

This Act provides for the protection of waters and wetlands of the United States by ensuring that development alternatives to avoid and minimize impacts on waters and wetlands have been considered.

Section 401 of the Clean Water Act of 1977

This Act ensures that any activity that may result in a discharge of a pollutant into waters of the United States be evaluated for its effects upon water quality and compliance with federal and state effluent limitations and water quality standard requirements of the Act. For example, storm water run-off is a concern at airports because of refueling and deicing activities and impervious surfaces.

The Clean Air Act Amendments of 1990

As amended in 1990, the Clean Air Act established national air quality standards. Aircraft emissions do not significantly contribute to air pollution, but automobile emissions do. Airports, and developments at or near airports, can draw significant automobile traffic and truck traffic.

The Endangered Species Act of 1973

This Act ensures that proposed projects or land uses do not jeopardize the continued existence of, or result in the destruction of any designated critical habitat for, threatened or endangered species. Endangered and threatened species often find or have established habitat in and around airports.

National Historic Preservation Act of 1969

This Act directs the federal government to provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the nation. This Act also authorizes the Secretary of the Interior to expand and maintain a National Register of districts, sites, buildings, structures and objects significant to American history, architecture, archeology and culture. Homes or properties to be acquired or altered for a proposed airport development are subject to review under Section 106 of this Act.

Noise Compatibility Program, Code of Federal Regulations (CFR) Title 14, Part 150

Initiated by the Federal Aviation Administration (FAA) in 1981 and revised effective January 18, 1985, Part 150 provides financial assistance to airport owners to assess noise impacts and to identify and carry out noise-reduction measures. Part 150 established a standardized airport noise compatibility program that includes:

- Voluntary development and submission to the FAA of noise exposure maps (NEMS) and noise compatibility programs (NCPs) by airport owners
- Standard noise measurement methodologies and units
- Identification of land uses that are normally compatible (or incompatible) with various levels of aircraft noise around airports
- Procedures and criteria for preparation and submission of NEMs and NCPs.

The Final Rule states that Part 150 regulations apply to any “public use airport” as defined by Section 502 (17) of the Airport and Airway Improvement Act of 1982.

Notice and Approval of Airport Noise and Access Restrictions, CFR, Title 14, Part 161

Part 161 establishes the implementation of the Airport Noise and Capacity Act of 1990.

Objects Affecting Navigable Airspace, CFR Title 14, Part 77

Tall structures – including buildings, construction cranes and cell towers – are hazards to aircraft navigation. Part 77 sets standards for determining obstructions to navigable airspace etc.). It provides for studies of obstructions to determine their effect on the safe and efficient use of airspace, conduct of public hearings regarding these obstructions, and creation of antenna farm areas. Part 77 also establishes methods for identifying surfaces that must be free from obstructions.

General Operating and Flight Rules, CFR Title 14, Part 91

Part 91 establishes general rules for the operation of aircraft with regard to different types of airports and different types of flight. These rules translate into specific spatial requirements for safety areas.

Hazardous Wildlife Attractants On or Near Airports, FAA Advisory Circular (AC) 150/5200-33

Bird strikes during flight and the interaction of terrestrial and avian species with aircraft on the ground are hazards to aviation. This AC provides guidance regarding the types of land uses that are considered

incompatible to airports due to their nature as wildlife attractants. These uses include, but are not limited to: wastewater treatment facilities, wetlands, dredge spoil containment areas and solid waste landfills. These uses must not be located within 10,000 feet of a runway that serves turbojet aircraft, or within 5,000 feet of any airport runway end used solely by piston-type aircraft.

Proposed Construction or Alteration of Objects That May Affect the Navigable Airspace, FAA AC 70/7460-2J

Planners must be aware of the various critical safety considerations when siting development in and around airports. All construction activities at or near federally obligated airports must be reported to the FAA via Form 7460-1 at least 30 days before the proposed construction or application for building permit. The FAA conducts an aeronautical study and issues a determination of whether the proposed development is a hazard.

Airport Land Use Compatibility Planning, FAA AC 150/5060-6

This AC guides the development of a compatibility plan to ensure the environs surrounding an airport are not developed in a manner that could pose risk to airport operations. This document specifically looks at land use and noise issues.

Airport Master Plans, FAA AC 150/5070-6A

This AC guides the development of airport master plans with the objective of developing safe and efficient airports through the use of acceptable standards. This document calls for an integrated approach to airport development planning where airside and landside issues must be equally evaluated to create a plan that provides for compatible airport and community development.

A Model Zoning Ordinance to Limit Height of Objects Around Airports, FAA AC 150/5190-4A

This AC provides sample language and models for zoning ordinances to limit the height of objects around airports. The height limits are based upon the surfaces described in Subpart C of FAR Part 77.

Airport Design, FAA AC 150/5300-13 Change 7

This AC provides basic standards and recommendations for airport design.

Noise Control and Compatibility Planning for Airports, FAA AC 150/5020-1

This AC provides guidance for the implementation of FAR Part 150, which allows for the development of a plan to establish compatibility between surrounding land uses through the reduction of non-compatible land uses around airports and noise-sensitive areas, and the prevention of additional non-compatible land uses.

Airport Landscaping for Noise Control, FAA AC 150/5320-14

This AC establishes guidance for the implementation of landscaping for noise control purposes and recommends various species of vegetation to be used for noise control.

U.S. Standards for Terminal Instrument Procedures (TERPS), FAA Order 8260.3 B change 14

This FAA Order contains standards for establishing and designing instrument flight procedure.

Airport Environmental Handbook, FAA Order 5050.4A

This FAA Order establishes the instructions and guidance for preparing and processing environmental assessments (EA), finding-of-no-significant-impacts (FONSI) and environmental impact statements (EIS) for proposed airport development requiring federal environmental approval. Over 20 categories of impacts are evaluated as part of this process:

- Compatible land uses – defined as "the compatibility of existing and planned land uses in the vicinity of an airport and are usually associated with the extent of the noise impacts related to the airport."

- Social impacts – associated with relocating residences or businesses, altering surface transportation patterns, dividing or disrupting established communities, or disrupting orderly, planned development.

- Induced socioeconomic impacts – address such issues as population movement and growth, public service demands, and changes in business and economic activity resulting from the proposed airport development.

- Environmental justice – intended to identify, address and avoid disproportionately high and adverse human or environmental effects on minority and low-income populations.

- Air quality – addresses compliance with Clean Air Act national air quality standards; required for airport development projects that involve airport location, runway development, physical airside or landside improvements that increase airport capacity, or any proposed development that does not conform to an approved state implementation plan for controlling area-wide air pollution impacts.

- Water quality – addresses compliance with Clean Water Act water quality standards and ensures that the quality of ground and surface water is not degraded by planned construction.

- Department of Transportation, Section 4(f) – provides that no program or project requiring the use of any publicly-owned land from a public park, recreation area or wildlife or waterfowl refuge, will be permitted unless there is no other alternative and that planning of such program or project includes plans to minimize harm resulting from the use of the property. This legislation has been superseded by Section 303© of Title 49, USC, but the criteria remain the same.

- Historical, architectural, archaeological, and cultural resources – address compliance with the requirements of the National Historic Preservation Act of 1969

- Biotic communities – intended to protect biotic communities, including native and introduced plants and animals in the project area.

- Endangered/threatened species of flora and fauna – ensures that proposed projects do not result in loss of habitat for endangered or threatened species, pursuant to the Endangered Species Act, Section 7, as amended.

- Wetlands – areas inundated by surface or ground water with a frequency sufficient to support, and under normal circumstances do or would support vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

- Floodplain – defined as “the lowland and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands that are subject to a one percent or greater change of flooding in any given year.”

- Coastal zone management – to preserve and protect the nation’s coastal zone, to encourage wise use of land and water resources of a coastal zone, to prepare a plan to provide protection of natural resources and coordination of the public, federal state, local interstate and regional agencies and governments affecting the coastal zone.

- Coastal barriers – The Coastal Barriers Resources Act of 1982, PL 97-348, prohibits, with some exceptions, Federal financial assistance for development within the Coastal Barrier Resources System, which consists of undeveloped coastal barriers along the Atlantic Ocean or Gulf Coasts.

- Wild and scenic rivers – The Wild and Scenic Rivers Act describes those river areas eligible to be included in a system afforded protection under the Act as flowing and possessing “outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values.”

- Farmland – The Farmland Protection Policy Act authorizes the Department of Agriculture to develop criteria for identifying the effects of Federal programs on the conversion of farmland to non-agricultural uses.

- Energy supply and natural resources – Energy requirements generally fall into two categories: those which relate to changed demands or stationary facilities (e.g. airfield lighting and terminal building heating), and secondly, those which involve the movement of air and ground vehicles. For most airport actions, changes in energy or other natural resource consumption will not result in significant impacts.

- Light emissions – consideration to any lighting associated with an airport that will create an annoyance to people in the vicinity. An EA should consider site location, type of system, and measures to lessen annoyance.

- Solid waste impacts – consideration of solid waste impacts; consultation with local officials concerning solid waste disposal facilities must be documented in the environmental assessment.

- Construction impacts – consideration of adverse environmental impacts including noise, dust, air pollution from burning debris and water pollution from erosion.

- Design, art, and architectural application – aesthetic enhancement and mitigation of adverse visual and other environmental impacts. FAA’s Airport Improvement Program Handbook prescribes guidelines for treating and promoting design, art, and architectural objectives in AIP funded airport development projects.

6 ROLES AND RESPONSIBILITIES OF STAKEHOLDERS

There are many entities involved in airport land use planning. This section identifies the different stakeholders and their corresponding roles and responsibilities.

Federal Aviation Administration

While the federal government does not have direct control over zoning and regulating development around airports, it provides planning guidance, technical assistance and funding for promoting compatible land use. At the federal level, the FAA is the primary agency responsible for promoting aviation-related land use compatibility. The FAA is responsible for federal laws and regulations affecting the aviation industry through the issuance of Federal Aviation Regulations (FARs), FAA Orders and Advisory Circulars (ACs). Specific FAA regulations and their impact on land use issues provide the foundation for airport owners when developing a land use strategy. The FAA also provides funding for the development of master plans, noise and land use studies, and environmental studies for airport development projects, and the expansion and safe operation of airports and related aviation facilities. As the governing aviation agency, the FAA is responsible for the preservation of the national airspace and control of aircraft while in flight.

In promoting land use compatibility, FAA's funding priorities are as follows:

- First, acquisition of clear runway safety areas and approach areas in close proximity to the airport
- Second, acquisition of easements to provide height controls over properties in close proximity to the airport
- Third, when warranted by a noise study, noise mitigation measures, which may include soundproofing structures, construction of noise barriers, or possibly acquisition to remove or relocate a noise-sensitive development

Despite the FAA's important policy, oversight and funding roles, local governments retain full control and jurisdiction over the use of land outside an airport's boundaries. The FAA's only leverage for promoting compatible land use planning off-airport is through the grant assurances that airport owners must sign to obtain federal funding for airport improvements. These grant assurances typically include promises or efforts by the airport operator to ensure that surrounding local governments will impose adequate zoning and land use controls to protect the airport.

It is also important to remember that the FAA, which is charged with maintaining the aeronautical capacity of the U.S. airport system, typically must approve non-traditional uses of airport property.

State Government

Some states issue guidelines for compatible land use planning around airports. State agencies that may be involved in compatible land use planning include the department of aviation, department of transportation, department of land conservation and development, department of environmental quality, department of fish and wildlife, and department of state lands. Typically, the States play a limited direct role regarding on-airport development, but can have substantial input nonetheless through integration with off airport planning initiatives and infrastructure projects.

Local Government

Local governments are charged with local land use zoning and control. They are responsible for preparing comprehensive land use plans, and reviewing and implementing zoning and land use regulations in a manner that considers effects on local airport facilities and aviation activity. They have the ultimate authority to approve or disapprove a particular regional land use. Accordingly, the relationship between local jurisdictions and airports is of critical importance because airport operators rely upon local government staff to provide notice of land use actions near airports and establish the planning and zoning policies that enable airports to operate effectively and safely.

Airport Owner / Operator

The airport owner/operator is responsible for land use planning and development on-airport. It is responsible for working with independent local governments and citizens to protect the airport from incompatible land uses in the airport's vicinity. It is responsible for informing the public of the importance of compatible land use planning around airports; preparing master plans, noise compatibility and land use studies; implementing community involvement programs; and interacting with local planners and government officials. When receiving federal funding, the airport owner/operator must ensure compliance with grant assurances relating compatible land use planning and development, and the protection of navigable airspace. The airport must also play a role in ensuring that its own development does not have an adverse impact on regional off-airport development opportunities and economic growth.

Property Owners

Owners of properties near the airport should participate actively in decision-making pertaining to local land use planning and zoning. Owners who might seek to undertake residential or other commercial developments that are potentially incompatible with airport operations must work closely with local airport operators and stay abreast of airport improvement plans. They should seek advice and input from airport operators in planning new development so that developments can be configured to reduce or eliminate potential incompatibilities. Similarly, on-airport development initiatives can be coordinated with off-airport projects to ensure optimum regional benefit.

Local Citizens

The role of local citizens is to understand the issues affecting airport operations and the importance of maintaining compatible land uses near and with the airport. Local citizens influence the decisions of local planners and policy makers.

Airport Users

Airlines, cargo carriers, and general aviation users need to be aware of issues relating to land use compatibility. Airlines and air cargo carriers are required to replace or retrofit aircraft to reduce noise and air quality impacts. Pilots are responsible for operating aircraft according to noise abatement procedures established at an airport and the local airspace. Other tenants, who basically are leaseholders, must ensure that their operations are consistent with regional land use requirements, and that their potential expansion does not adversely impact conditions in the surrounding communities.

7 PLANNING AND PRIORITIZING

The successful collateral development of airport property for activities ranging from ancillary and support activities to logistics parks hinges on the effective integration of a number of critical planning considerations. The backbone to proper planning and prioritization is a sound business plan with clearly defined goals and objectives with well-understood priorities. A simple acronym used in this process is SMART – which stands for:

- **S**pecific – The objectives clearly state what the airport wants to achieve
- **M**easurable – The results that are achieved can be clearly measured against a predetermined target
- **A**chievable - The objectives that have been set are realistically achievable and attainable
- **R**ealistic – The objectives that have been set can be met with available resources
- **T**ime – When do you want to achieve the set objectives?

If a priority is not assigned to each objective, then it is difficult for the airport to make the most politically acceptable and fiscally prudent decision when these objectives compete for resources, as to how best to allocate money, people, land, and equipment.

Correlation with the Airport Business Plan

An airport typically has a wide variety of constituents to serve and objectives to meet. Accordingly, Airport Authority Business Plans should contain well-thought out objectives and strategies associated with the following. Obviously, there may be others and the priorities may vary.

- Customer service
- Security
- Safety
- Revenue
- Job creation
- Improving cargo facilities efficiencies
- Improving the regional transportation and logistics sector

All these objectives are very important and their prioritization is essential to make the correct decisions when allocation decisions on land use are made. This is the foundation to a successful development plan; close attention to detail can help preserve the success of any commercial development initiative.

Correlation with Airport Master Plan

The Airport Master Plan determines where on the airport's property key activities and developments will occur. The plan both reflects and impacts the potential operations of, and services available to current and future tenants which means it should be well-thought out and integrated with sound business planning principles.

There are a number of important considerations to keep in mind when developing and reviewing the Master Plan for possible non-traditional land uses to include such concepts as a logistics park.

- The site should demonstrate compatibility between intended land use and airport operations (i.e. line of sight, noise exposure, electronic, radar, navigational systems)
- The site should be of sufficient size to meet development requirements
- If the development is a large and/or relatively busy facility such as a logistics park, road access to, from, and within the property should be carefully evaluated
- Clear linkages to create synergy between a Park and airport tenants and operations, and where possible the surrounding community should be created
- Positive impacts on airside efficiency should be created by the development
- Apron connectivity, if appropriate should be efficient and secure

Correlation with Regional Transportation Plan

The value of property and the success of a development are heavily linked to its road access. Particular types of land use are more sensitive to access. For example, successful commercial properties require clear visibility and access to major thoroughfares.

Due to this importance, it is critical to ensure that the organizations that are responsible for planning roads, overpasses and highways in the region are aware of the airport's plans and vice versa. It is also critical that the airport forges working relationships with these groups to influence the decision making process and

ensure that its needs are met as much as possible. Because these relationships can be so critical to both the timely implementation and success of a project, airports should be sensitive to a number of regional transportation planning considerations:

- Understand the roles that different organizations have in planning and maintaining the regional roadway system and how their plans are developed and communicated
- Identify the travel times and connectivity requirements for present and future tenants to the major thoroughfares and highways
- Understand the impact of development on current traffic and how much new volume the development may generate
- Have an access plan to enable tenant employees to get to work

Correlation with Regional Land Use Plans

It is important to understand the present and anticipate the contemplated land uses around the airport. Potential use conflicts can stall and even stop development. Things like truck traffic associated with commercial land use and airport noise tend not to mix well with residential property. There are some very basic subjects to be considered when exploring new development opportunities. These can include, but are not limited to:

- Compatibility/synergy with existing off airport uses
- Conflicts with different types of off airport property usage
- Effective use of landscaping, screening, setbacks to help reduce cost and optimize land utilization
- A detailed market analysis to determine the different tenants interested in your development
- Developmental timetable to coordinate scheduling and reduce delays
- Optimization of coverage to ensure all land is allocated
- Awareness of potentially conflicting multiple municipality concerns
- Flexibility to meet shifting user demand to minimize redefinition of allocated space

Lastly it is important to remember, that there is a very real potential for off-airport property owners to view any collateral on-airport development as a threat. If potential resistance from this sector is not effectively addressed at the beginning stages of a project, the resultant resistance may cause a development initiative to fail.

8 DEVELOPMENT OPTIONS

As airports examine the physical and operational elements of alternative land uses, it is extremely important that the basic business elements be addressed - the market and financial feasibility of the project, possible involvement of a third party, and securing the financing for the development.

Project Feasibility

There are some very important considerations that an airport should examine when evaluating feasibility.

- Level of existing demand for the development that has been expressed by tenants, or by a private investor seeking to undertake development
- The expectation that the level of demand will remain sufficiently high to sustain the development
- Indirect and direct revenues that will result from the new development (e.g. land rent revenue, landing and parking fee revenue increases). In an ideal situation, any new development will help grow and sustain primary components of airport business

- Direct and indirect costs associated with the development (e.g. servicing the land, planning, acquiring engineering services, construction, etc.)
- The airport's expected rate of return or payback period on capital expenditures.
- Comparative development costs for the private sector
- Net present value and payback period for the development

The key to most internal approval processes is to have the project's benefits quantified and linked directly to the Business Plan. For example, the economic impact of a new logistics park can be expressed in terms of tax dollars, potentially greater cargo volumes, or regional jobs. These numbers can be weighted against the cost and the benefits of other competing regional projects.

Airport Financial Status

Most airports are public entities which eliminates a number of traditional financing options. Many large airport projects require the issuance of debt to finance the necessary capital expenditure. Typically, an airport will need to determine its financial position and its ability or inclination to service debt in light of other projects that may be competing for funding. Financially speaking, an airport should consider the following ratios in examining the financial feasibility of a development.

Profitability Ratio – is the amount of the airport's revenues that are profit.

Gross Margin percentage = 100 * (Revenue - Cost of Goods Sold) / Revenue

Current Debt Ratio – expresses the capacity of the airport to pay its short-term (e.g. next 12 months) debt.

Current Ratio = Current Assets/ Current liabilities

An acceptable ratio varies by industry. If the airport's Current Ratio is 1.75 it means that for every dollar the airport owes it has $1.75 available in current assets. Generally speaking, a value greater than 1 means that the airport is positioned fairly well financially, while something less than 1 indicates that there may be problems meeting short term obligations.

Interest Coverage Ratio – reflects the ability of the airport to pay interest on outstanding debt.

Interest Coverage Ratio = (Revenue – Expenses)/ Interest Charges

This number is arrived at by dividing the airport's earnings before interest and taxes (EBIT) for a year by the interest expenses for the same year. It is the number of times over that, that the airport can pay for its debt. Typically, the preferred number is greater than 1.5.

Cost of Private Money

Debt issuers will use these same ratios to analyze the credit risk associated with the airport and the investment. The risk associated with the airport impacts the availability of these funds and the interest expense. There are other potential external sources of financial resources that include:

- Federal and/or state funding
- Alternate funding sources
- Private funding

The Final Decision

Ultimately, the decision of how to proceed with development can be reduced to two considerations: risk and return.

The Airport's return from the project will depend on whether a private developer is involved. If no developer is involved, then all revenues generated by the facility would be expected to accrue to the Airport. This would hold true even if the Airport were to hire a firm to manage the facility, in which case the management fee paid to the firm would be in the form of facility-related expenses. And while the Airport's return is in principle not capped, the Airport's exposure to cost increases and revenue decreases is equally not limited. In contrast, when a developer constructs and operates a facility the return to the Airport is typically a fixed (albeit possibly escalating) payment.

As with its return, the Airport's facility-related risks will depend on a number of factors including (perhaps most importantly) whether the project should be executed by a developer or by the Airport itself.

	Airport Development	Third Party Development
Airport Risks	Significant vacancy risk	Some vacancy risk
	Balance sheet exposure	No exposure
	Capital outlay	Lower revenues
	Completion risk	Developer credit risk (ground rent)
	Liability issues	Environmental costs
	Operating costs	No control over tenant rents/costs
	Marketing costs	
	Relocation costs	
	Environmental costs	
Developer Risks	Not applicable	Securing financing
		Significant vacancy risk
		Completion risk
		Operating costs
		Marketing costs
		Relocation costs

In the absence of a developer, the Airport's risk-return profile may be likened to that of equity in that returns generally increase in relation to the commercial success of the project, but the Airport assumes all the risk of commercial failure of the project. Generally, this is not substantially changed by the retention of a firm to manage the facility on the Airport's behalf. With the involvement of a developer, the Airport's risk-return profile may be likened to that of debt in that returns generally are specified in advance and are largely independent of the commercial success or failure (short of bankruptcy) of the project. The Airport gives up the upside potential for protection from downside risk.

One of the keys to building any new facility will be the cost of capital for whoever develops the facilities. Potential tenants sometimes raise concerns over the use of a new cargo facility particularly if a third party developer is used.

Typical Issues Regarding Third Party Development

The following issues are typically raised regarding third party development:

Issue - Third Party Development will cost more and translate into higher rents than if the Airport builds the Facility.

Facts - Despite the fact that developers take their returns and a management fee, their cost of development is typically less than an airport's. Much will depend on the flexibility the airport shows in its revenue target setting. In considering those targets it is important that the airport factor in other potential revenue generators such as additional landed weight and fuel flowage fees. Pragmatically speaking, an RFP can indicate that impact on tenants is a concern, and require the respondents to detail in their proposals the costs that will accrue to potential tenants. This will give the Airport definitive information in the event that carriers or other potential tenants raise concerns.

Issue - A Third Party will not be as knowledgeable or as concerned about tenant issues and costs as the airport.

Facts - Third party development generally reflects a step forward in private/public partnerships, allowing the airport to focus its attention and resources on passengers, while the developer, can focus time and resources on the project. In any industry, failure to provide good service and be responsive to tenant needs will put a developer out of business.

Issue - The airport will not make as much money if a third party builds and operates the facility.

Facts – This is accurate, but overlooks the fact that the airport will not have any capital outlay. The appropriate approach is to optimize revenue so that the airport and the developer achieve fair returns while maintaining an equitable rent structure that does not gouge tenants. Developers are in business to make money and so will not create a financial structure that discourages leasing. Once again, the airport will have control over the selection of a developer, and the selection will at least in part be predicated upon the rental rates and fees to tenants.

Issue - A third party development might not meet the airport's/tenants' needs.

Facts - No successful developer would propose on, or undertake a project without first speaking to every existing tenant in the area if not on the airport, and every potential tenant he can identify. Further, if existing tenants have issues that they believe should be considered as part of a new development, then, assuming that they are reasonable, these could be included in the RFQ/RFP.

Issue - Letting a third party onto the Airport to make money is a misuse of a public asset.

Facts - As evidenced by industry trends, third party development is an effective way to help airports optimize their scarce resources, and cannot reasonably be categorized as a misuse of a public asset. Such development is consistent with airport mandates to provide service while accommodating growth and demonstrating fiscal prudence.

Issue - A new facility will cost more to lease.

Facts - That will probably be the case regardless of who builds the facility. But if the existing buildings are old that is to be expected. If a third party builds the facility, a large percentage of the rent will be tied to the amount of ground rent that the airport seeks to recover, and the length of the lease itself. If the prospective tenants argue that age doesn't matter, and that they just need the space to do business, then any concerns they might express about security, operations, service, etc. would seem less substantive.

Comparative Cost Models

There are several important financial considerations in comparing third party development to Airport development that extend beyond the total cost of building the project.

- The term of the master lease. If the airport pursues third party development, the longer the period of amortization the easier it is for the developer and the Airport to achieve targeted returns while keeping the rental costs to the tenant lower.

- The cost of the ground lease. The cost of the dirt is typically passed directly through to the tenants. To keep building rents under control, the revenue targets of both the developer and the airport must be realistic. A high ground rent will often discourage third party development.

- Operations and maintenance costs. These reflect the costs of maintaining and operating the complex, including roadways and aeronautical infrastructure. The costs plus a management fee are typically passed on directly to the tenants on a pro-rated basis.

The key differences between the financial assumptions where the airport has capital responsibility for a facility versus the third party development are:

- The private sector can often construct a facility for 10 to 15 percent less than the public sector because of a faster decision-making process and the ability to negotiate modification of construction and bid prices.

- Private sector soft costs will be around 5 percent less than if the airport were to undertake the project.

- The third party will pay the airport a ground rent for the footprint of the building and associated space such as employee parking. The third party developer will recover this cost through ground rent to building tenants.

Things to Remember

Even if the airport can afford to self-develop a cargo or logistics project, there is still merit to considering use of a Third Party Developer who can:

1. *Share the financial risk*
2. *Add development expertise*
3. *Provide market intelligence*
4. *Include experience from other development markets*
5. *Provide tenants*

It is not always easy for an airport to balance the above benefits with a more limited role in project control. A developer is typically a private company that has profits to consider for its investors. While available labor might be critical, job creation is not normally a high priority. This could be a potential cause for concern. If a developer is allowed to take full control of the development, then the airport's ability to impact other goals is reduced. However, an appropriate level of control can be easily incorporated into a development agreement.

It is also important to consider conflict with off airport projects, and timing. It is essential that the airport know the local industrial real estate market. This could include regular meetings with brokers and developers in the market to align efforts. An airport can request that local brokers provide copies of their market overviews that typically include key market indicators such as:

- Vacancy Rate
- City Total Inventory

- Construction in the current quarter
- Construction expected in the next year

Understanding the local market will reduce the likelihood of a development simply flooding the market, optimize the productivity of the land, meet higher levels of customer service, and generate greater levels of revenue on a more timely basis.

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