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AIR FREIGHT AND LOGISTICS SERVICES

ABSTRACT

Air transport industry has gradually increased its share of global passenger and freight traffic, and this trend has accelerated in the last 40 years. For the past decade, air-freight traffic growth has outpaced air passenger traffic growth by 1-2% each year. In the past, air-freight sector offered limited services, with heavy reliance on several intermediaries and a significant dependence on air passenger operations. The sector can now be characterized as a sophisticated, innovative one, relying heavily on new electronic technologies, offering a wide range of transport and logistical products through dedicated specialist freight operators. With increasing emphasis on the globalization of trade and economic activity, air-freight growth is expected to continue to outpace air passenger traffic growth. The air-freight growth is expected to be greatest in the Asian markets (intra--Asia; North America-Asia; Europe-Asia and Australasia). The process of physical distribution of freight has become a highly sophisticated operation, with increasingly greater reliance being placed on the use of new technology to assist in the movement, storage, and tracking of consignments. But transport is just one component in this logistics chain. In this paper, air-freight sector is examined in terms of its structure, organization, its role in the supply chains, the main trends in the recent period, constraints facing the sector and the future prospects in air-freight sector.

KEY WORDS

air freight organization, development, trends, forecast, logistics services

1. INTRODUCTION

The correlation between the world gross domestic product (GDP) and the world air-freight traffic forms the basis for traffic forecasts. Because of the cyclical nature of GDP growth, air-freight traffic growth is also subject to cyclical effects. World air freight growth typically outpaced GDP growth, by a factor of more than two.

Although economic activity is the primary influence on the world air freight development, many other factors must be considered. Those other factors that effect the airborne freight growth rate include available capacity, freight yields, jet fuel prices, relative current strengths regulations, national industrial initiatives, and development of other transport modes (land and maritime competition) [7].

For example, after a strong surge of 12% annual growth in 2004, the world air freight traffic as measured in revenue tonne-kilometers (RTK), slowed down to just 2% growth in 2005. Much of the reduction in traffic growth in 2005 was due to the diversion of some long-haul traffic from normal air freight channels to maritime trade lanes. As jet fuel prices rose throughout 2005, fuel surcharges added to basic air freight rates made air freight increasingly expensive, prompting shippers to move their goods by other transport modes (mostly to maritime transport for the long-haul traffic).

2. ORGANIZATION AND STRUCTURE OF AIR-FREIGHT SECTOR

For a number of reasons, air-freight markets are difficult to delimit and analyze. Air freight providers are a heterogeneous group of operators. They offer different types and different levels of logistics services. There are three main categories of air-freight operators:

1) Line-haul operators,
2) Integrated/courier/express operators, and
3) Niche operators.

Line-haul operators move freight from airport to airport, and rely on freight forwarders or consolidators to deal directly with customers. Line-haul operators can be:

– *All-cargo operators* (scheduled and non-scheduled), moving only freight in dedicated freighter or cargo aircraft such as Cargolux (European Union) or Arrow Air (USA). All-cargo operators offer relatively high reliability and have the capability to move large volumes over long distances.
– *Combination passenger and cargo operators*, which use both dedicated freighter aircraft and the belly

holds in passenger aircraft to move freight, such as Lufthansa (European Union) or United Airlines (USA). For the combination carriers, cargo operations are mainly long-haul, with a large amount of freight being interlined onto shorter haul feeder services. High utilization of long-haul aircraft justifies the purchase of new aircraft for these services.

– *Passenger operators,* that use the belly holds in passenger aircraft. Passenger carriers tend to view cargo as a by-product of passenger operations. They are considered to offer the lowest prices and the least reliable service. Passenger carriers move cargo in the belly holds of passenger aircraft, where it has traditionally taken second place to passenger services. Unlike passenger services, shippers do not have access to price information analogous to passenger computer reservation systems (CRSs).

Freight forwarders play an important role in consolidating shipments for line-haulers.

Integrated/courier/express operators move consignments from door to door, with time-definite delivery services (e.g. UPS; Federal Express; TNT; DHL). These integrated carriers operate multimodal networks, combining air services with extensive surface transport to meet customer demands. Integrated operators offer a variety of services to shippers, and supplement air services with extensive ground transport to provide time-definite delivery with continuous shipment tracking and, with logistical expertise to support just-in-time (JIT) inventory control strategies. In order for integrated operators to be able to offer door-to-door next day deliveries, they require night-time operations. In terms of aircraft requirements then, they need to operate quiet and reliable aircraft, with low utilization levels. These operators seek to purchase a combination of new aircraft, with high capital costs and better utilization on long-haul segments, with less expensive renovated second-hand aircraft for the medium-haul operations with lower utilizations. The integrated carriers initially began offering services in the small parcel/document sector, but now typically offer a broad range of services. The Association of integrators with purely express freight is no longer valid. The integrators have focused their attention on the premium high-yield traffic. Legislative changes in the USA have permitted *integrated freight forwarders* to line-haul their consignments themselves, and since 1994 interstate ground operations for all carriers have been deregulated.

Niche operators operate with specialized equipment and technology, in order to meet extraordinary requirements (e.g., Heavy lift from the Netherlands and Challenge Air Cargo from USA). These operators attract business through their capabilities for handling outside freight or special consignments, including line-haul to locations with poor infrastructure facilities. For chartered freight and niche operators, the discontinuous use of aircraft makes it financially preferable to acquire freighter aircraft on a second-hand basis.

Air-freight industry was dominated until the mid-1980s by the line-haul carriers. Following deregulation in this sector, which started in 1977, the integrated carriers rapidly increased their market share and most recently in international air-freight markets. There are several important distinctions between passenger demand and shipper demands for air transport services. These distinctions place a different set of constraints and operating conditions on carriers depending on whether they are carrying cargo, passengers, or both. Freight comes in a large variety of shapes, densities, and sizes, and must be loaded onto and off aircraft by equipment and handlers. Large units may have to be carried in freighter-only aircraft. The routing of cargo, including the number of stops or transfers, is unimportant to the shipper. What is important is the lapsed time between pick-up and delivery. For passengers, however, their preference is typically for daytime, non-stop flights. Shippers' preferences are for night-time carriage of goods, with early morning delivery.

One of the most significant differences between passenger and freight air transport lies in the fact that passenger typically travel on round-trip journeys, while cargo travels from a point of production to a point of consummation [8]. Matching demand with inbound and outbound capacity is a difficult task and can lead to different network organizations for freight services compared with passenger services. For combination carriers, this can pose difficulties, since freight demand and passenger demand for principal destinations may not coincide. Carriers will take account of inbound and outbound requirements in considering, and in deciding on the segments of the route and capacity available on each of the segments.

3. AIR-FREIGHT PRICING

Air-freight services are sold and marketed in a number of different ways. The line-haul operators sell a relatively small proportion of their cargo space directly to their customers. The greater proportion of their space is sold through general sales agents (GSAs), or freight forwarders, who negotiate with the airlines for fixed amounts of space. The agents or forwarders then sell on the freight space to customers.

The line-haul airlines publish their cargo tariffs as agreed at International Air Transport Association (IATA) tariff conferences. In practice, only a small percentage of customers pay these published tariffs, which can be considered as an upper-band on air

cargo rates. As with passenger fares, discounting is widely applied on the basis of different circumstances [10]. In case of cargo the rates will be determined on the basis of a number of characteristics and circumstances, including the following:

– volume, density and weight of shipments;
– commodity type;
– routing;
– season;
– regularity of shipments;
– imports or exports and
– priority or speed of delivery.

Consolidated shipments, aggregated by forwarders and carried by the line-haul operators, typically travel under a single air waybill (AWB). The freight forwarders offer shippers a wide range of logistical and transport services and options [9].

These include collection and door-to-door delivery of shipments, complete documentation and paperwork for customs purposes, customs clearance, tracking of shipments, and control. The freight forwarders act as wholesalers and earn their profit by maximizing the difference between what they pay the airlines and other carriers and what they can charge the shippers.

The integrated operators offer a variety of services depending on:

– the weight of the consignment, and
– the speed of delivery required by the customer.

Discounting is applied to these services on the basis of volume and regularity of custom. However, because each consignment is treated as a separate piece of freight, with an individual air waybill and customs declaration, the integrated carriers provide and practice electronic tracking of individual shipments, and levy charges individually.

Customs services in many jurisdictions now operate electronically, so that consignments receive clearance on route to their destination airport [17]. The customs authority can notify the operator of consignments that will need to be cleared on the ground, and this information can be forwarded to the customer via the tracking system.

4. RECENT TRENDS IN AIR-FREIGHT TRANSPORT

In global terms, the dominant air cargo flows are in three main markets:

– Asia-North America,
– North America-Europe, and
– Europe-Far East.

Table 1 lists the top 20 air-freight airports in the world in 2007. Table 1 includes the rank of each airport in terms of air passenger traffic, and highlights the distinctions in network organization of combination carriers and integrated carriers.

The line - haul combination carriers tend to focus their cargo operations on international gateway airports, allowing consolidation or break-out loads to be transferred between long-haul and short-haul services. The gateway airport is international airport which is the first point of arrival or the last point of departure in a state for international air services.

The integrated carriers focus their operations at cargo hubs that do not necessarily have very high volumes of passenger traffic.

The "Air Cargo World List" (Table 1) of the world's largest cargo airports, compiled from numbers from Airports Council International and the airports, shows "Memphis International", home to Federal Express (FedEx), still at No. 1 in the world.

"Hong Kong International" has remained No. 2 for international air transport, and Hong Kong is edging closer to Memphis. Hong Kong's growth outpaced Memphis during the last year, and again in the first few months of 2008, putting Hong Kong in reach of surpassing the world's longtime top cargo airport.

At No. 5 overall, "Shanghai Pudong" has remained the top growth market by cargo volume, with a 15.5 percent growth, reflecting the continued potential from the world's most populated country.

"Seoul Incheon" has remained No. 4, despite a slowdown from its primary carrier, Korean Air, as well as the threat posed by the Chinese airports as alternative gateways for Northeast Asia. China figures strategically in Incheon's development. Last year, transshipment traffic for the first time surpassed origin/destination cargo, and China accounted for a large portion of that cargo [12].

"Anchorage International", a transit stop for East-West traffic, remains at No. 3 spot and all signs point to further growth in cargo volume at this Alaskan gateway.

"Frankfurt" came in at No. 7, despite only posting a 1.9 percent growth in tonnage last year. Lufthansa and DHL Express must contend with onerous night-time flight restrictions that allow for only 17 flights between 11 p. m. and 5 a. m., and because of that, they move cargo to Leipzig and elsewhere.

A bright spot for airport expansion remain the Middle East and India. At No. 13, "Dubai", which has become a viable gateway for cargo to Europe and Asia and transit point for cargo from Africa, grew 11 percent in cargo volume last year. Dubai is not the only cargo centre of note in the Middle East. Some airports, like "Abu Dhabi" and "Sharjah", with 22.7 percent and 16.2 percent traffic growth in 2007, respectively, continue to inch up the list of the world Top 50 cargo airports. Freight tonnage for "Mumbai" (No. 36) and "New Delhi" (No. 42) continue to in-

Table 1 - Air-freight tonnage for the top 20 freight airports (2007)

Cargo Rank	Airport	Country	Tonnage	% change in freight	Comments	Passenger Rank
1	Memphis (MEM)	United States	3,840,574	4.0	The main hub for edEx;also a regional passenger hub for Nordwest Airlines	87
2	Hong Kong (HKG)	China	3,772,673	4.5	Third cargo terminal to be finished in 2011; an Asia hub for DHL and main hub for Cathay Pacific/Dragonair	14
3	Anchorage (ANC)	United States	2,826,499	0.6	A major trans-Pacific transit point for carriers including FedEx, UPS, Northwest	144
4	Seoul Incheon (ICN)	South Korea	2,555,582	9.4	Hub for Korean Air; centerpiece of government plan to foster Asia logistics business	20
5	Shanghai Pudong (PVG)	China	2,494,808	15.5	Secondary hub for freighter operator Great Wall Airlines China Eastern hub	38
6	Paris de Gaulle (CDG)	France	2,297,896	7.8	Main hub for Air France; a European hub for FedEx and La Poste	6
7	Tokyo Narita (NRT)	Japan	2,252,654	- 1.2	Hub for Japan Airlines and gateway for Northwest Airlines Cargo	24
8	Frankfurt/ /Main (FRA)	Germany	2,169,025	1.9	Hub for Lufthansa Cargo; manager Fraport also runs nearby Frankfurt Hahn Airport; Main air hub for UPS	8
9	Louisville (SDF)	United States	2,078,290	4.8	Main air hub for UPS, now taking on DHL Ex domestic U.S. traffic	171
10	Miami (MIA)	United States	1,922,982	5.0	Main gateway for U.S.-Latin America traffic; regional hub for Amer. Airlines	29
11	Singapore (SIN)	Singapore	1,918,159	- 0.7	Home to Singapore Airlines; Swissport opened cargo terminal in 2005. as third freight handler at Singapore Changi	19
12	Los Angeles (LAX)	United States	1,877,876	- 1.5	Largest U.S.trans-Pacific gateway; FedEx has largest single share of cargo; Korean Air is the largest international carrier	5
13	Dubai (DXB)	United Arab Emirates	1,668,506	11.0	Emirates base; Dubai Cargo Village being expanded	27
14	Amsterdam Schiphol (AMS)	Netherlands	1,651,385	5.4	Hub for KLM; AirBridge Cargo,Jade Cargo; hosting TIACA Air Cargo Forum in 2010.	12
15	Taipei (TPE)	Taiwan	1,605,681	- 5.5	Base for EVA Airways and China Airlines	58
16	New York Kennedy (JFK)	United States	1,595,577	- 2.8	The largest U.S. trans-Atlantic gateway; American Airlines holds more than 10% at cargo market	13
17	Chicago O'Hare (ORD)	United States	1,524,419	- 2.2	Main hub for United Airlines	2
18	London Heathrow (LHR)	United Kingdom	1,395,909	3.9	British Airways hub	3
19	Bangkok (BKK)	Thailand	1,220,001	3.2	Thai Airways hub; the new Bangkok Suvarnabhumi International Airport replaces Don Muang Airport	18
20	Beijing (PEK)	China	1,191,048	15.8	Main base for freighter operator Great Wall Airlines, and for Air China Cargo	9

Source: Airports Council International, Airport reports, July 2008

crease by 12.1 percent and 8.7 percent in 2007, despite an infrastructure that significantly limits long-term growth.

A disturbing trend is the continued decline in cargo volume at many U. S. gateways. Cargo volume at "New York's John F. Kennedy" and "Newark" airports declined last year 2.8 percent and 2.7 percent, respectively. Cargo volume also declined at "Chicago O'Hare", "Oakland", "Dallas/Ft Worth", and many other North American cargo airports.

Even growth at the front-running Middle East and Asia airports, whose growth in the past led the way, is likely to continue to taper off until the economy improves and fuel costs become manageable. For now,

the expansion remains the dominant feature on these air freight markets.

Air-freight markets are shifting as the economic growth pattern of developing countries accelerates past that of the already industrialized economies. The main influences behind these trends are:

- primary influence of the world economic activity;
- impact of the range of services in the express and small package market;
- deregulation and liberalization;
- national development programs;
- stream of new air-eligible commodities;
- growth of e-commerce.

The deregulation of air freight raised cargo rates, but gave shippers greater choice among carriers with respect to rates, consequential damage, and excess value charges. Under CAB regulation of air freight, all-cargo operators were unable to generate reasonable profits with the result that the quantity and quality of service were deteriorating. It was generally felt that freight carried by air travelled longer distances than was necessary because surface modes could not be used to support the carriers operation [14].

Integrated carriers now offer multimodal services that take advantage of the distance, cost, and time trade-offs offered by different modes. In the European and Asian markets the integrated carriers have recently increased the size of their international operations. Indeed, within Europe, it is estimated that the integrated carriers now perform most of the total intra-European RTKs. Within Europe, competition from surface modes has had, and will continue to have, a downward impact on air-freight growth rates. This factor, along with a relatively low overall economic growth rate, explains low average long-term growth rate for air freight [19].

There is also one specific transport mode which involves movement of air cargo by road under airway bill (AWB). It is Air Trucking – also known as "road feeder service". Cargo that is transported by surface (usually by dedicated truck) on an airway bill carriage between origin and destination can be exclusively by surface or may also feed into airport-to-airport air or surface. Air Trucking has been expanding at a rate of 15% per annum since 1975.

International airlines through IATA introduced and adopted IATA Resolution 507b, which clearly defines the circumstances under which Air Trucking could be undertaken. The main conditions include:

- lack of available space on aircraft;
- consignments that cannot be handled on aircraft operated by an airline due to the size, weight, or nature of the consignment (certain commodities may only be shipped in freighter or all-cargo aircraft), or because the carrier refused carriage on some other grounds;
- carriage by air would have resulted in delayed transit times or in carriage not being accomplished within 12 hours of acceptance, and
- carriage by air would have resulted in missed connections.

Today, the practice of Air Trucking is predominantly oriented towards moving intercontinental freight traffic to gateway airports. This process is shown in Table 2, which helps illustrate the distinguishing characteristics of non-integrated operations compared with integrated operations.

5. CONSTRAINTS AND FUTURE PROSPECTS OF AIR FREIGHT

Several factors can be identified as significant constraints on the growth of air-freight. These include the significant growth of Air-Trucking and the reduction in freight carrying capacity of the passenger airlines.

Table 2 - Comparison of integrated and non-integrated services [1]

Integrated carrier/freight forwarder	Non-integrated operation with air trucking
Shipper	
Integrator: – Picks up consignment – Tags and electronically traces consignment until delivery – Line-hauls package from airport to airport – Clears customs – Delivers to destination	**Agent:** – Consolidates multiple shipments under a single AWB – Delivers to airport bond **Air trucker:** – Picks up consignment and delivers to another airport bond **Airline:** – Line-hauls consignment from airport to airport **Agent:** – Arranges customs clearance, collection and delivery
Consignee	

In the longer term, the integrated operators and all-cargo airlines can be expected to increase their share of the air-freight market, as passenger carriers are forced to charge more realistic cargo rates that are in line with the costs of producing the services. Passenger carriers have been facing declining passenger and freight yields (revenue per seat-kilometer or tone-kilometer) as competition has forced efficiencies on many aspects of their operations. Environmental regulations have affected air-freight sector by forcing a reduction in the number of older, noisier aircraft available, and have delayed or altered the infrastructure planning process and contributed to the capacity constraints at many airports, particularly in Europe. The noise and pollution requirements, now in place at many of the large airports, raise operating costs for many carriers. The congestion of air transport infrastructure has been identified in several studies as the major bottleneck in the development of competitive air passenger and freight transport markets in domestic and international markets. Finally, security problems are a significant factor constraining the growth and development of both express operations and Air- Trucking.

Boeing's World Air Cargo Forecast 2006/2007[6] projected the air cargo industry to grow roughly at 6 percent per year through 2025. Although its new forecast will not be released until November, Boeing executives remain optimistic.

This optimism is due to the fact that carriers are currently upgrading their fleets with passenger planes that aircraft manufacturers are converting with more fuel-efficient engines, and on the other side we have more products that accommodate increasingly higher payloads [13].

The high cost of fuel is affecting the financial health of nearly every air carrier on the global market. As example we can mention the "Northwest", which plans to merge with "Delta Air Lines", and recently posted a quarterly net loss of $4.1 billion, partly due to higher fuel charges. United Airlines also reported a $537 million loss and is cutting more than 1100 jobs and numerous flights [21].

Consequently, shippers are currently being slapped with higher fuel surcharges. In an attempt to help cut costs, some carriers implemented special programmes, which encourages employees to provide ideas that save fuel and energy [11].

Nevertheless, carriers are experiencing high demand for airfreight, but they are becoming more selective about the routes they serve.

For now, cargo volumes are shifting worldwide based on a slowdown in key airfreight markets. It is likely that the Boeing projections in 2006, air freight in Asia to grow 8.5 percent, 5.3 percent in Europe and 4.1 percent in North America through 2023, will not be realised [20].

The International Air Transport Association (IATA) expects that international air freight volumes through 2011 will continue to be dominated by Asia Pacific. According to IATA, freight within Asia Pacific, between Asia Pacific and North America and between Asia Pacific and Europe will account for 57 percent of the 36 million tonnes of international air freight tonnes in 2011, up from 55 percent in 2006. The majority of this growth will be from the outbound leg from Asia Pacific [15]. According to IATA, the international Air Freight Shares in 2011 could be as follows:

- within Asia Pacific: 26%
- Europe- Asia Pacific: 18%
- Asia Pacific-North America: 13%
- Europe-North America: 12%
- within Europe: 6%
- North America-Latin America: 5%
- within Latin America: 1%
- within North America: 1%
- within Middle East: 1%
- Others: 17%

6. CONCLUSION

Air freight is a significantly more expensive mode of carriage of goods than other modes, and will be used when the value per unit weight of shipments is relatively high and the speed of delivery is an important factor. Under these circumstances, the transport costs can comprise a small proportion of the revenue associated with the products. The advantages offered to the shippers through movement by air include speed, particularly over long distances, lower risk of damage, security, flexibility, accessibility for customers, and good frequency for regular destinations [18].

For integrated operators, the guaranteed delivery and the facility to track consignments gives customers additional advantages over standard air-freight carriage. These superior qualitative differences give rise to higher rates for integrated services [16]. Over shorter distances, air transport faces stiff competition from surface modes and from combined road and sea services. Air-freight demand varies by season, and this is taken into account by carriers supplying airlift capacity.

The emphasis on multimodal transport operations and on greater integration of transport with other logistical services will dominate freight developments in the next two decades. While e-commerce eliminates the need for physical distribution of some products and services, it is dramatically altering the pattern of consumption and generating new sources of business for the air-freight industry.

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SAŽETAK

ZRAČNI TRANSPORT I LOGISTIČKE USLUGE

Zračni saobraćaj je postepeno povećavao svoj udio u prometu putnika i tereta, i ovaj trend bilježi se u zadnjih 40 godina. U proteklom desetljeću, zračni teretni transport ima veći rast u odnosu na prijevoz putnika, i to za 1-2% svake godine. U prošlosti, ovaj sektor je nudio ograničene usluge, koje su velikim dijelom bile zavisne o nekolicini posrednika, a značajan dio je ovisio o putničkim operacijama. Zračni transport se danas može opisati kao sofisticirana, inovativna grana, koja se u velikoj mjeri oslanja na nove elektronske tehnologije, s ponudom širokog spektra transportnih i logističkih usluga, preko specijaliziranih cargo operatora. Sa sve većom globalizacijom tržista i ekonomskih aktivnosti, očekuje se da će rast zračnog teretnog transporta nastaviti da nadmašuje rast putničkog saobraćaja, i da će ovaj rast biti najveći na azijskom tržištu.

Proces fizičke distribucije tereta postala je veoma sofisticirana djelatnost, koja sve više ovisi o korištenju novih tehnologija koje pomažu u prometu, skladištenju i praćenju pošiljki. Transport je samo jedna karika u logističkom lancu.

U ovome radu, zračni teretni transport je analiziran s aspekta strukture, organizacije, njegove uloge u lancu distribucije, s aspekta glavnih trendova razvoja, kao i buduće perspektive odnosno prepreka za razvoj ovoga sektora.

KLJUČNE RIJEČI

Organizacija zračnog transporta tereta, razvoj, trendovi, prognoza, logističke usluge

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ACRONYMS AND ABBREVIATIONS

ACI – Airports Council International
AWB – Airway Bill
CARGO – Freight, express and airmail
CRS – Computer Reservation System
GDP – Gross Domestic Product; the total output of goods and services within a country
GSA – General Sales Agent
IATA – International Air Transport Association
JIT – Just-in-Time, A manufacturing and distribution approach that meets immediate needs as opposed to relying on large inventories

RTK – Revenue Tonne-kilometer
INTEGRATOR – cargo company that offers its customers complete services: pickup, airport-to-airport transport, delivery, and all supporting ancillary services
DHL; TNT; FedEx; UPS – Air Carriers-Integrators.