
The Air Freight Industry in the UK

Final report

16 December 2013



Disclaimer

This document has been prepared for the Airports Commission in accordance with the terms of the Airports Commission Analysis and Strategy Support framework and the Contract Reference PPRO 04/08/72 dated 2nd May 2013 and solely for the purpose and on the terms agreed with the Airports Commission. We accept no liability (including for negligence) to anyone else in connection with this document. This document contains information obtained or derived from a variety of sources as indicated within the document. PwC has not sought to establish the reliability of those sources or verified the information so provided. Accordingly no representation or warranty of any kind (whether express or implied) is given by PwC to any person (except to the Airports Commission under the relevant terms of our engagement) as to the accuracy or completeness of the document.

Scope

As part of PwC's support on analysis and strategy to the Airports Commission, we were asked to explore both the structure of the air freight industry in the UK, its support for different types of industry supply chains in the UK economy, and to examine the needs of the air freight sector and how these align with the passenger sector's needs. The report was based on publicly available sources as well as discussions with a selection of stakeholders. This report summarises our findings.

Table of Contents

1. An overview of freight transport in the UK	5
Introduction	5
Role of road, rail, sea and air freight in the UK	5
Roads	6
Rail	6
Sea	6
Air	6
Market share of volumes and values	7
Introduction	10
Mail (including express)	11
Consumer goods	11
The airlinked assembly line	11
Perishables	11
Pharmaceuticals Case Study (Source: FTA Member)	12
Hi-tech Industries Case Study (Source: FTA Member)	14
Business location	14
Source: Doing Business	15
End users	15
Air Freight providers	16
3. The global air freight market	17
Introduction	17
Air freight operating models	17
Key stakeholders	18
Global air freight carriers	19
Low cost carriers	23
Advantages:	24
Disadvantages:	24
Global air freight corridors and trends	24
Value of slots by time of day	26
The impact of new technology	26
Aircraft modernisation and the impact on freight capacity	27
Dedicated Freighters	27
Bellyhold Freight	28

Airlines	29
The impact of new aircraft types	29
Emirates Case Study	30
4. Air freight in the UK	32
Introduction	32
Trends in air freight in the UK	32
Key hubs for air freight in the UK	33
Case Study: The decline in air freight volumes at Gatwick Airport	35
Level of transshipment	40
Value of air freight to the UK economy	40
Appendix 1: Stakeholder discussions	41
Importance of freight capacity to airline profitability:	41
Importance of freight in fleet and network development	41
Drivers of decision-making in locating fleet operations at a particular airport	41
Airport turnarounds and transshipment	41
Value of time slots	42
Products	42
Appendix 2	43

1. An overview of freight transport in the UK

Introduction

Freight is defined as the transport of goods in bulk by truck, train, ship or aircraft. The method of freight transport is generally determined by evaluating three factors - time, cost and product characteristics, for example, road transportation can potentially move large items faster than rail as the shipment is not dependent on rail timetables and has the ability to transport goods the last mile. For longer distances, transportation by sea has the ability to carry larger volumes at a lower cost compared with air freight.

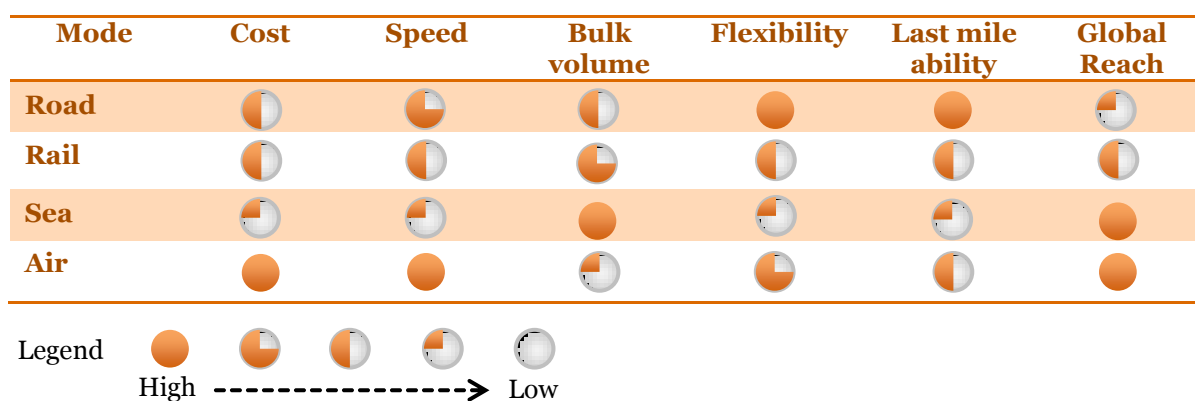
Role of road, rail, sea and air freight in the UK

Businesses in the UK see the quality and reliability of transport networks as more important to their investment intentions than any other type of infrastructure, and the logistics sector as a whole is heavily dependent on publicly funded transport networks¹. However, the existing transport infrastructure is under considerable strain from the travel demands of individuals and the exact requirements of many supply chains.

The FTA and PwC state that the economic downturn has had a significant impact on commercial goods vehicle levels, with traffic reducing since 2007². Although the recession has led to some easing of pressure on the road network in particular, the industry view is that the UK transport infrastructure is still not in a fit purpose to cope with an upturn in traffic and trade. In 2012 the World Economic Forum ranked the UK 24th for the overall quality of its infrastructure, behind 13 European countries and a number of other advanced economies. This view was reinforced in the results of a survey by the Confederation of British Industry (CBI) and KPMG³, in which 61% of British businesses rated the UK transport infrastructure as below average by international standards.

The table below provides an overview of the characteristics of each mode. Note that this is illustrative and the relative advantages and disadvantages will depend on a range of factors including distance, location of origin and destination and type of freight being transported. A spread of transport modes can also reduce risk in a shipper's supply chain.

Figure 1: Characteristics of freight transport modes



¹ FTA in association with PwC (2013), The Logistics Report 2013. Source: http://www.fta.co.uk/about/logistics_report.html (accessed 31-10-13).

² FTA in association with PwC (2013), The Logistics Report 2013. Source: http://www.fta.co.uk/about/logistics_report.html (accessed 31-10-13).

³ CBI/KPMG Infrastructure Survey 2013, Connect more, Source: <http://www.cbi.org.uk/business-issues/infrastructure/infrastructure-survey/page-turner/> (accessed 31-10-13).

The key infrastructure issues being experienced in the UK in each of the modes, and impacting upon the development of the sector as a whole, are summarised below:

Roads

Road freight is the most common mode used for the transport of goods including the “last mile”. It is integral to any supply chain as it is the only mode that enables goods to be transported from end-to-end, unlike rail, sea and air which depend on the location of the infrastructure, e.g. ports, railway stations, airports.

The Highways Agency’s capital budget has been slashed in recent years by 35%, and there is an estimated £10bn shortfall in funding for roads projects. Whilst the Government has since made a commitment to fund a number of projects, there are affordability concerns which have led to new funding and ownership models to be examined⁴. Improvements to network performance will also need to address the condition of existing roads as this impacts on journey time, reliability and operating costs.

Rail

Whilst the relative environmental benefits of rail and sea services over road are generally recognised, these modes can also offer commercial benefits; whilst the fixed costs are higher the marginal costs are lower, and they can also transport heavier loads, meaning that where sufficient volume is transported rail and sea can be more efficient on a unit cost basis.

Rail freight is receiving public sector investment to help optimise the mixed use rail network for freight; however, the agreement of Government and industry on the need for infrastructure to support greater use of rail does not automatically result in the delivery of necessary facilities. Whilst there is agreement among policy-makers about the need for a strategic rail freight interchange in the South East, there has been pushback from local communities which is delaying the achievement of mode shift policies and carbon reduction targets and impeding growth in competitive rail freight services in the UK.

Sea

Ports are exceptionally important to the UK economy, handling 95% of imports and exports by tonnage. There are many types of sea freight including deep sea shipping (intercontinental routes that cross an ocean) and short sea shipping (coastal and non-oceanic routes). There are also differences between lift-on/lift-off (lo-lo) services which require a crane to load and unload cargo and roll-on/roll-off (ro-ro) services which carry wheeled cargo and are effectively an extension of road haulage. Unlike many European and international competitors, UK ports are privately run and funded which is widely perceived to have produced an effective, market-led industry. However, maintaining the confidence of investors to continue developing infrastructure to accommodate larger vessels remains an issue. A key concern impacting demand is the introduction of the EU Low Sulphur Fuel Regulation in 2015. The industry says that these changes will lead to substantial increases in costs and reductions in service, and the FTA reports that a recent survey of logistics companies, hauliers and goods owners highlighted that more than 30% of sea-based movements would be more likely to move by road if the costs of sea shipping were to increase by 10%; furthermore, two thirds said that they would have to reduce their reliance on shipping in favour of road if the frequency of services was reduced⁵.

Air

Air freight fits into global logistics strategies and can be a complement to deep-sea shipping services, and has an importance in value disproportionate to the volumes it carries, particularly where time criticality is a key factor. The key issues affecting the growth of the sector are, firstly, the debate surrounding night flight capacity in the UK; over 80% of businesses surveyed by Oxford Economics stated that they would be badly affected if international next-day services were no longer available. Secondly, the issue of constrained availability of slots at Heathrow has seen a decline from 240 to 180 in the number of destinations served over the last decade. The role of air freight is discussed in further detail in the remainder of this report.

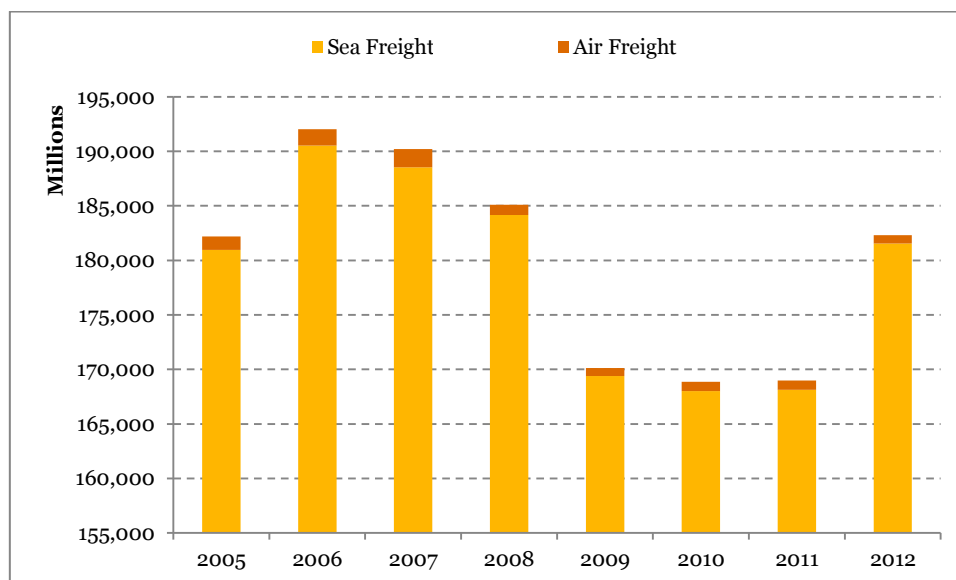
⁴ As highlighted in the National Infrastructure Plan, published in 2012.

⁵ Survey results as highlighted in The Logistics Report 2013. Source: http://www.fta.co.uk/about/logistics_report.html (accessed 31-10-13).

Market share of volumes and values

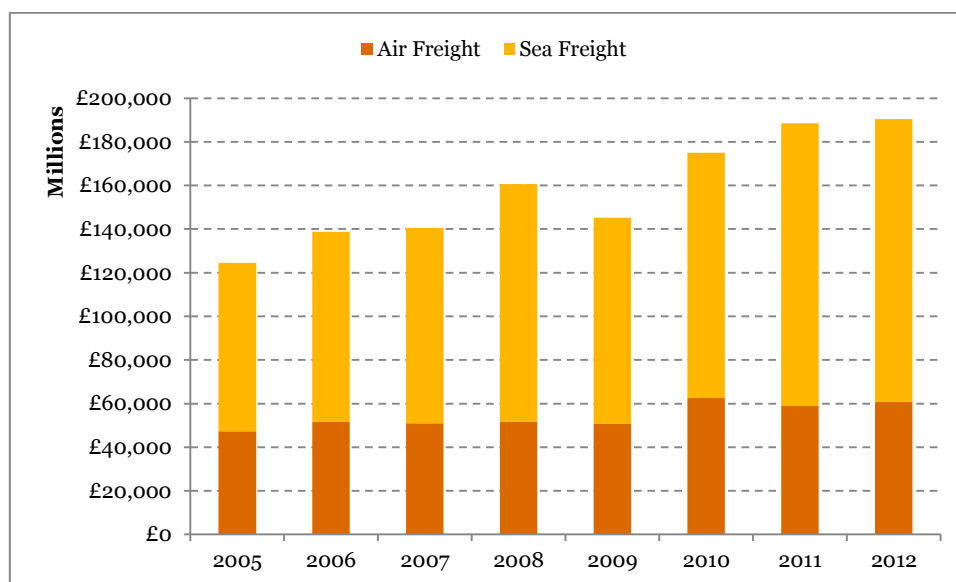
Air freight only accounts for around 0.4% of the UK's non-EU imports by weight; however, as a result of the products typically being moved by air being high value or perishable, when measured by value, air freight accounts for 32% of the UK's non-EU imports, as illustrated in Figure 2 and Figure 3 below⁶:

Figure 2: UK non-EU imports by weight (net mass – kg)



Source: HMRC

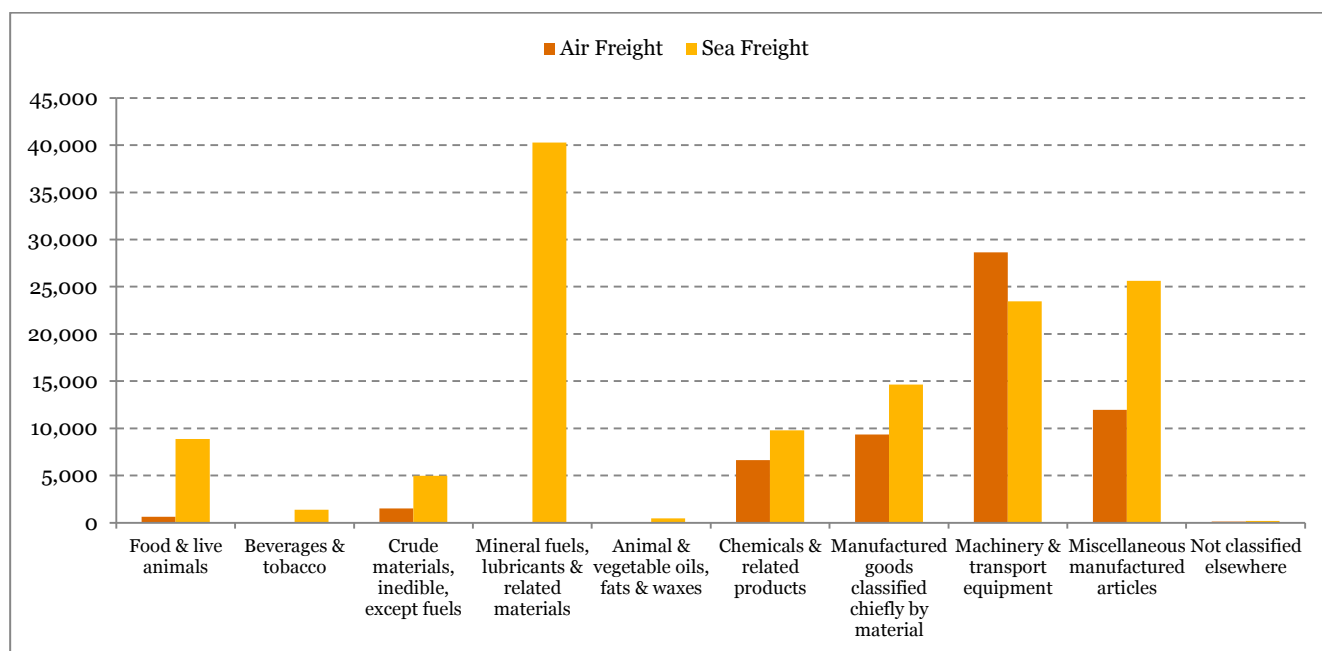
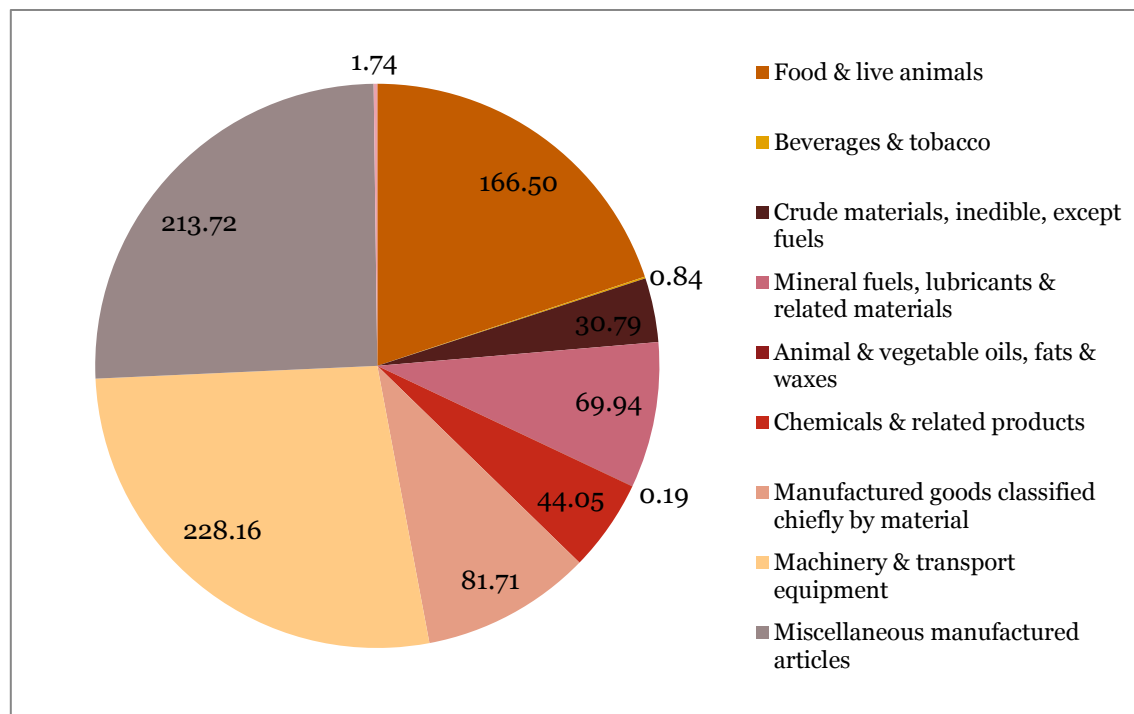
Figure 3: UK non-EU imports by value (£ million)



Source: HMRC

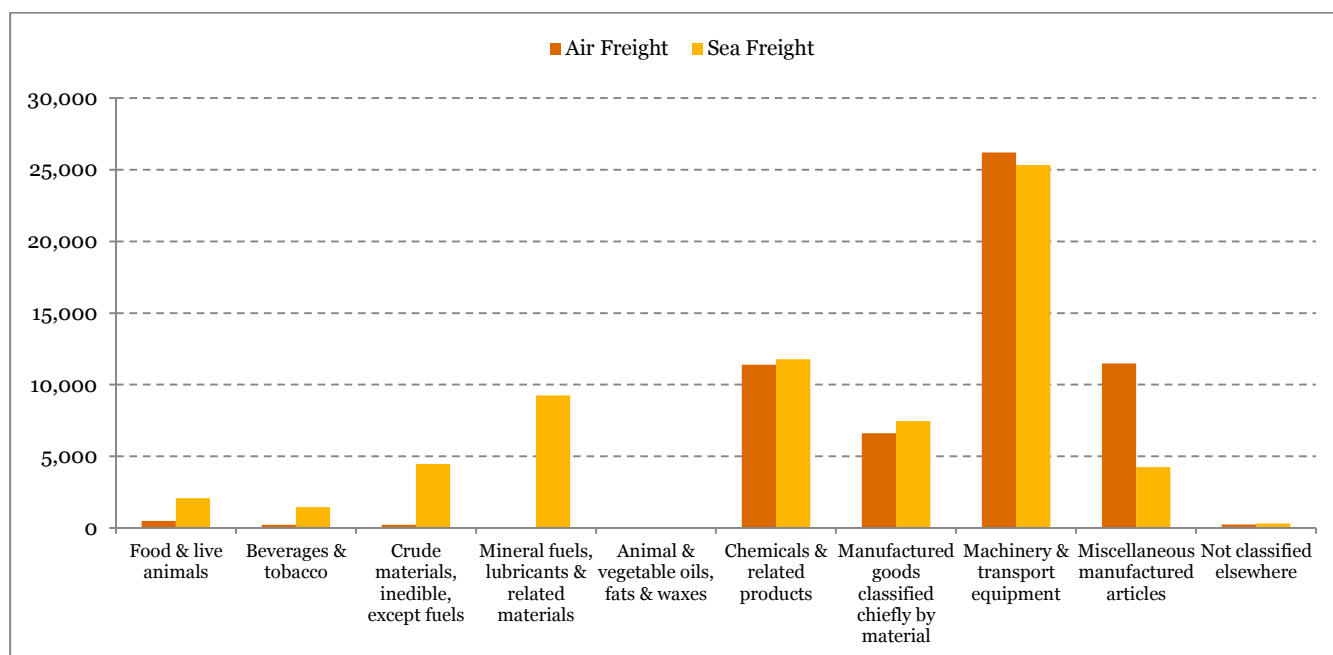
There are some sectors where air freight caters for a higher share of value (and volumes) of imports and exports than others. Key examples are machinery and transport equipment, manufactured goods and miscellaneous manufactured articles, and chemicals & related products. Figures 4 to 7 below show the split by product group for the value and volume of imports and exports by transport mode.

⁶ Note: Eurotunnel data is incomplete and also a very small proportion (less than 1%) therefore excluded

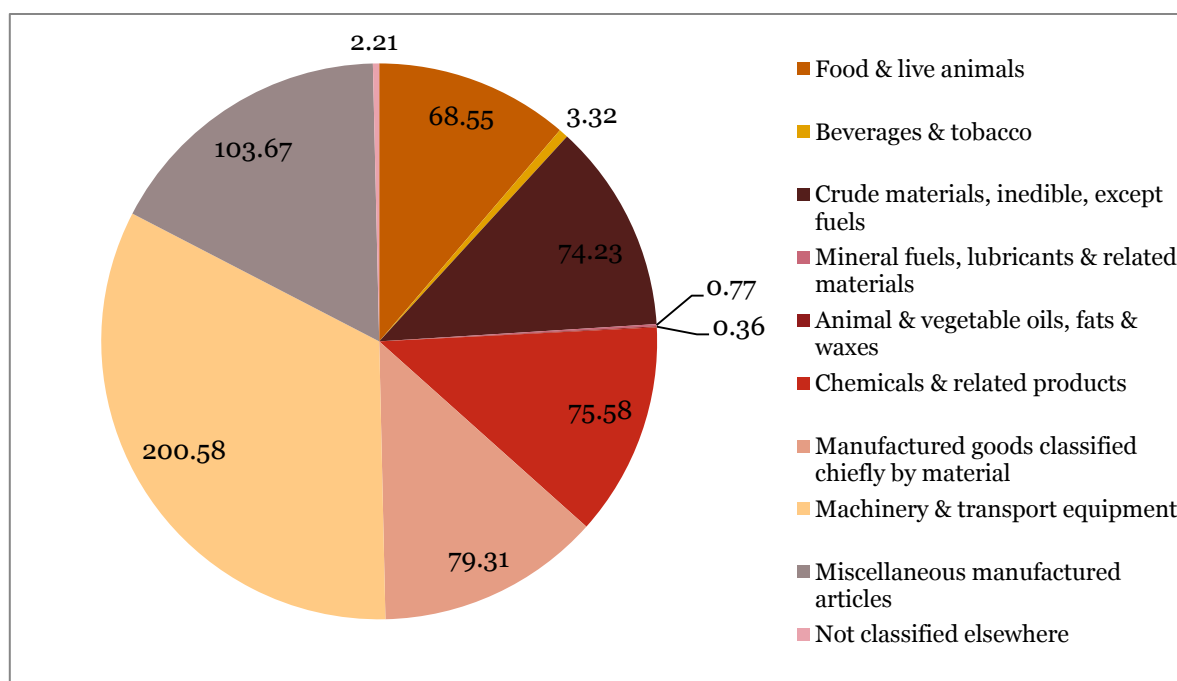
Figure 4: UK non-EU imports by product group and mode of transport 2011 by value (£million)Source: HMRC⁷**Figure 5: UK non-EU air freight imports by product group 2011 by volume (net mass million-kg)**

Source: HMRC

⁷ Note: Eurotunnel data is incomplete and also a very small proportion (less than 1%) therefore excluded

Figure 6: UK non-EU exports by product group and mode of transport 2011 by value (£million)⁸

Source: HMRC

Figure 7: UK non-EU air freight exports by product group 2011 by volume (new mass million-kg)

Source: HMRC

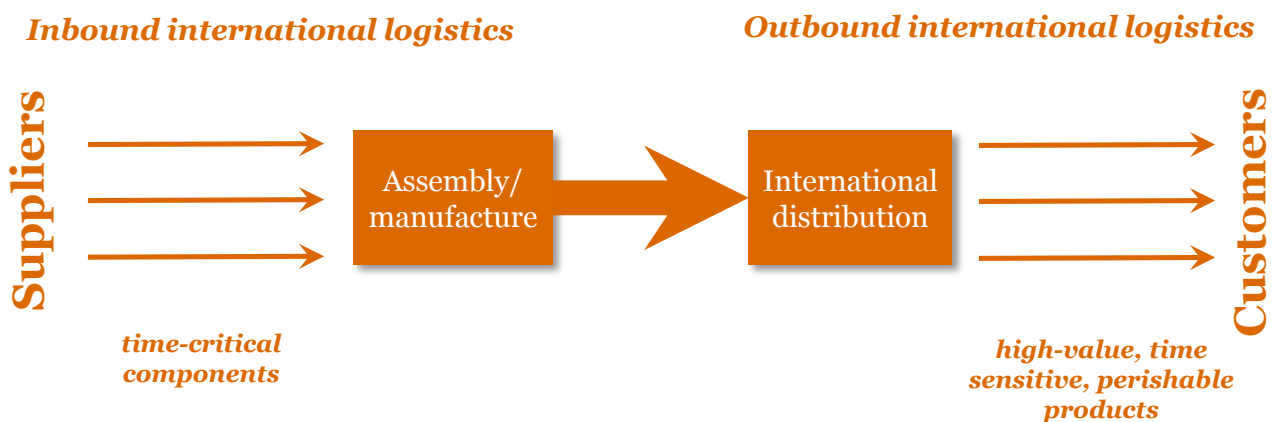
⁸ Note: Eurotunnel data is incomplete and also a very small proportion (less than 1%) therefore excluded

2. The role of air freight in the supply chain

Introduction

Air freight provides the fastest method of transporting goods over long distances, connecting industry and consumers to the global market place. Given the high cost of transporting goods by air, the users of air freight services are those with high value goods that need to be transported in small quantities (i.e. individual packages to meet customers' needs) or perishable goods that would deteriorate in the time taken for a sea freight voyage⁹. Figure 8 provides a simplified example of where air freight fits into a business to business supply chain.

Figure 8: Business to business air freight example



Source: PwC

The main industry sectors using air express operations in the UK include:

- electronics and telecoms;
- vehicles and auto parts;
- engineering;
- information technology;
- pharmaceuticals, biotech and health;
- business services; and
- government.

Air freight plays a crucial role in providing the level of flexibility, efficiency, robustness and timeliness in the supply chain required by its users. There are four key requirements for users of air freight, these are:

1. **Security:** high value goods such as jewellery and art, as well as restricted goods.
2. **Speed:** time critical goods including perishables (e.g. food and flowers) and those with a limited usable life (e.g. medicines and biological goods for the life sciences industry). Speed is also of importance in addressing spikes in demand in the retail industry.
3. **Information:** given the high value or time critical nature of most shipments, the provision of high quality information on tracking and timing is important to the majority of shippers.
4. **Global reach:** demand for documentation to be delivered globally at speed requires couriers and postal services to utilise air freight in order to reposition goods.

⁹ Freight Transport Association

The following is a summary of several key sectors for which air freight forms an important part of their supply chain:

Mail (including express)

‘Cargo’ is the generic term for freight and mail, with ‘freight’ referring to cargo excluding mail¹⁰. In 2012, 224,440 tonnes of mail were carried by air freight through UK airports, representing 9% of air cargo¹¹. The British Air Transport Association (BATA) argues that air is the only realistic mode of transport for Royal Mail to use in its operations, offering significantly faster times than road and rail as it works ‘against the clock’. Across the UK Royal Mail utilises 17 airports with up to 60 separate flights a night, with a daily average payload of 250 tonnes or 5 million items per night. For example, Royal Mail flights at Stansted operate from 20:50 to 02:25, carrying first class post and packets, special delivery and other items. BATA state that without this service there would be a negative impact on the Royal Mail, its customers (such as Amazon, eBay and the financial services industry), the wider economy and the general public, with an estimated loss of at least 1,000 UK jobs¹².

Consumer goods

A driver for the air freight of a wide range of consumer goods, including electronics like computer games and mobile phones, books and toys, is faster market cycles. Most of the profits are reaped in the first few weeks of sales. Fast fashion also has a limited shelf-life and a report on ethical fashion in 2007 looked at a range of studies which showed that British fashion buyers rely twice as much on air freight for imports from China and India in comparison to French, German or Spanish buyers. Use of air freight extends to firms that are regarded as exemplary in environmental practice in their operations, although many are attempting to reduce it. For example, in 2008 the Body Shop made a commitment to set a target for reducing its use of air freight¹³.

The airlinked assembly line

A high proportion of air freight is business-to-business, pre-consumer in the supply chain. In 2009 the DfT stated that 98 per cent of express freight volume was business-to-business traffic. Components, machinery and spare parts for products such as electronics, vehicles and textiles may not themselves have an intrinsically high value, but they are process critical, i.e. the cost of air freight can be lower than the cost of a production line coming to a standstill¹⁴.

Globalisation of manufacturing has extended supply chains with a combination of more complex products, a shift from factories making finished goods to assembly plants making components into finished goods, larger scale and more specialised operational sites, and just-in-time supply chain management to cut storage and inventory costs. AirportWatch states that the airlinked assembly line is exemplified by aircraft development, manufacturing, repairs and maintenance; for example, both Boeing and Airbus have constructed special freighters for flying components around the world to the final assembly plants.

Perishables

The term ‘perishables’ refers to temperature sensitive cargo goods that require a ‘chill-chain’ from point of origin to final destination, including perishables handling facilities at airports. This encompasses chemicals and pharmaceuticals including drugs, vaccines and veterinary products; about 80% of the perishables sector consists of food and ornamental plants. Perishables is widely stated by the industry as the biggest (by volume) and fastest growing air freight sector; for example in 2006 BA estimated that it constituted 11 per cent of world air cargo. The amount of food air freighted into the UK more than trebled between 1992 and 2006. Between 2005 and 2006, the amount of food air freighted into the UK increased by 11 per cent, an additional 24,000 tonnes of food, accounting for 13 per cent of CO₂ emissions from food transport. There are reports of a shift of

¹⁰ The CAA publishes mail statistics separately from freight

¹¹ Source: http://www.caa.co.uk/docs/80/airport_data/2012Annual/Table_02_2_Summary_Of_Activity_at_UK_Airports_2012.pdf (accessed 13-11-13).

¹² Response from BATA to DfT’s consultation: Night Flying Restrictions at Heathrow, Gatwick and Stansted - Stage 1 Consultation. Source: <http://www.bata.uk.com/wp-content/uploads/2013/09/BATA-Response-Night-Flights-Consultation-Final-220413.pdf> (accessed 13-11-13).

¹³ AirportWatch (2009), Air Freight: The Impacts. Source: <http://www.aef.org.uk/uploads/AirFreightReport.pdf> (accessed 12-11-13).

¹⁴ AirportWatch (2009), Air Freight: The Impacts. Source: <http://www.aef.org.uk/uploads/AirFreightReport.pdf> (accessed 12-11-13).

perishable produce from air to sea freight driven by the lower cost and facilitated by technological advances in refrigeration and other methods of preservation which extend the shelf-life of produce like asparagus and grapes. The bigger picture regarding modal shift for perishables appears to be mixed; for example, fruit salads and pre-chopped vegetables is a growth sector but these products are less suited to sea transport, as the cutting of the produce reduces its shelflife¹⁵.

Figure 9 below highlights the nature of shippers' requirements in terms of products transported by air.

Figure 9: Key requirements for specific products

Product	% market share ¹⁾	Security	Speed:		Information	Global reach
			Flexibility	Reliability		
Food & live animals	16.3					
Beverages & tobacco	0.3					
Crude materials, inedible, except fuels	7.3					
Mineral fuels, lubricants & related materials	4.9					
Animal & vegetable oils, fats & waxes	0.0					
Chemicals & related products (including pharmaceuticals)	8.3					
Manufactured goods ²⁾	33.1					
Machinery & transport equipment	29.6					

Legend:
High -----> Low

1) Non-EU imports and exports handled by air freight by weight

2) Manufactured goods includes 'miscellaneous manufactured articles' and 'manufactured goods classified chiefly by material'. Table excludes products that are 'not classified elsewhere' (4%).

Source: HMRC, PwC

Two case studies that consider the efficiencies that air freight brings to the pharmaceuticals and hi-tech industries are included below.

Pharmaceuticals Case Study (Source: FTA Member)

"As a leading supplier of pharmaceutical products from the UK, the company is heavily reliant on overnight flight operations and a comprehensive network of global air routes from the UK in order to service customers throughout Europe and across the world."

The company receives c30,000 orders per annum from customers around the world for their perishable pharmaceutical products which are used in the diagnosis of disease and treatments for patients. In many cases, due to the short life of the products, delivery is required to hospitals in Europe on a next-day basis with

¹⁵ AirportWatch (2009), Air Freight: The Impacts. Source: <http://www.aef.org.uk/uploads/AirFreightReport.pdf> (accessed 12-11-13).

delays or longer transit times rendering them unusable and leaving clinicians frustrated and patients distressed.

Many patients will have had longstanding courses of treatment suspended pending administration of their products, and failure to deliver within the prescribed time merely serves to cause added distress to patients and create increased costs for the hospitals.

The timescales associated with the company's supply chain typically involve receipt of order in the UK by late morning, same-day manufacture, and shipment overnight to reach the end-customer the next day. In order to achieve this throughout Europe, the only option available for many destinations is the use of the freight services provided by the express parcel carriers with their overnight network of flights.

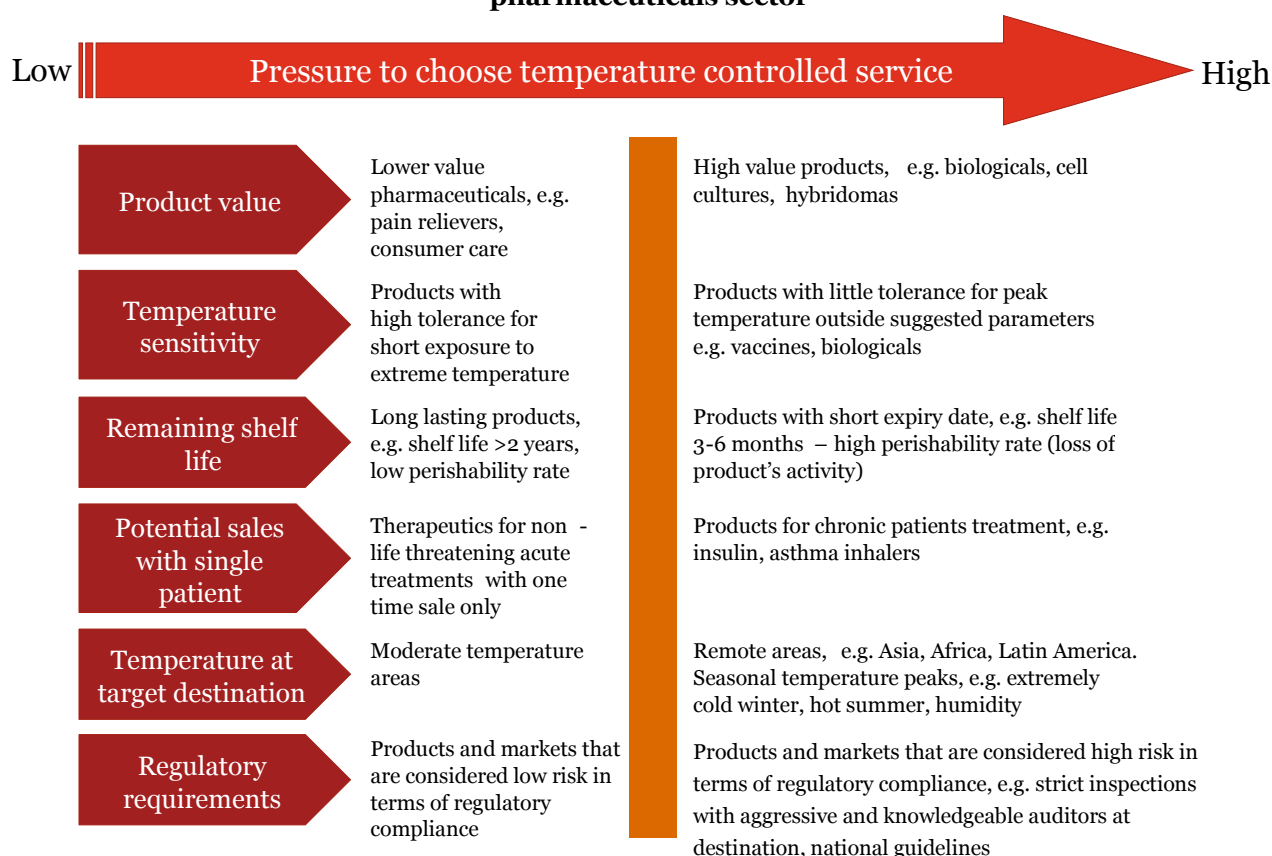
The air freight integrators also provide a solution otherwise unavailable with passenger flights, in that they operate freighter aircraft which overcome the restrictions and meet the specific distribution conditions associated with many short-life pharmaceutical products.

It is therefore essential that for reasons of both timescale and capacity, night flights from East Midlands and Stansted airports in particular remain unhindered and unrestricted. Without these services it would be impossible to service the 4,000 patients per day (1million per annum) in Europe alone, and generate the £80m p.a. revenue that just these shipments contribute.

The company's distribution network to the wider global market is also highly dependent on the range of air services available departing the UK. They ship to c150 countries worldwide with transit times again being critical, and so for this reason it is of paramount importance that Heathrow retains the variety of services and routes that it currently has and that it remains one of the primary hubs in Europe. Without further investment and additional capacity, Heathrow will begin to lose this status with an increasing number of destinations becoming inaccessible (as is already the case). Trucking to other European hubs is not an option for the company as its products are not able to withstand the extended transit times involved. The potential impact on patients around the globe, together with the reduction in their revenues, is immeasurable. The company has a target to continue to grow their business from the UK but this is very reliant on the required air services being available to enable them to optimise their supply chains. The need for both the continuation of night flights, together with the need to retain Heathrow as a primary hub, are key to the company's ability to achieve this objective and to continue to supply patients and hospitals around the world with the pharmaceutical products they need."

In summary, security, temperature control, approved methods of handling, inspection, pre-customs clearance and cross docking are important supply chain factors within the pharmaceuticals sector. These often lead companies to chose air over other freight transport methods. Many products require cold or cool chain solutions and freight is used widely for this purpose, especially when lead times are short. The factors impacting upon choice of temperature controlled service (which is often air freight) are summarised in the diagram below:

Figure 10: factors impacting upon choice of temperature controlled service in the pharmaceuticals sector



Source: PwC expert interviews, Novumed analysis

Hi-tech Industries Case Study (Source: FTA Member)

"In a high technology environment, most manufacturers have to use air freight because product life cycles are too short. Sea freight from the Far East can account for 10–20 per cent of a high tech products' sales life. It is also a fact that processor chips for leading edge products will always be a challenge. It is therefore vital that the fastest route to market is used for both high cost parts and finished goods. Failure to use air freight would cost high tech companies their market position and a high percentage of their production.

Air freight is the only way that high tech companies can compete with low labour cost environments. As most parts come from Asia Pacific, they must be in European products quickly. Manufacturers have to be quick to upgrade, adapt and change products to market swings if they are to compete with volume Asian suppliers.

Companies will always find the way to market if they want to survive. That means if they have to truck goods from continental European airports to their UK customers, they will. So it is vital that the UK keeps the centre position with air freight capacity to ensure the best efficiency for the UK economy. The goods will keep coming. We need the jobs and the profits to our economy that this can bring to keep coming as well."

Business location

The decision on where to locate a business is a complex one and depends on the nature of the business. For example, manufacturing industries ideally need to be close to sources of raw materials and transport links, whereas a retail business needs to be located in a convenient location for its customers. Businesses need to weigh up a range of factors in deciding where to locate, including:

- Proximity to market;
- Connectivity to global market;

- Competitive dynamics;
- Surface transport links;
- Access to supplies (e.g. raw materials);
- Access to labour force with required skills;
- Availability of utilities;
- Availability of land / office space; and
- Government incentives / taxation.

For decisions on where to locate global or regional headquarters for multinational companies, ease of doing business is a key factor in the decision. Based on rankings¹⁶ on Doing Business (in cooperation with the International Finance Corporation and the World Bank), the UK ranks in the top 10 countries globally, the third highest in Western Europe (behind Denmark and Norway) for the ease of doing business. Nearby European countries also rank highly with Germany ranked 21 and the Netherlands at 28.

Figure 11: Doing Business Rankings 2013

Economy	Ease of Doing Business Rank	Starting a Business	Dealing with Construction Permits	Getting Electricity	Registering Property	Getting Credit	Protecting Investors	Paying Taxes	Trading Across Borders	Enforcing Contracts	Resolving Insolvency
Singapore	1	3	3	6	28	3	2	5	1	12	4
Hong Kong	2	5	1	5	89	3	3	4	2	9	19
New Zealand	3	1	12	45	2	3	1	23	21	18	12
United States	4	20	34	13	25	3	6	64	22	11	17
Denmark	5	40	8	18	7	28	34	12	8	32	10
Malaysia	6	16	43	21	35	1	4	36	5	30	42
South Korea	7	34	18	2	75	13	52	25	3	2	15
Georgia	8	8	2	54	1	3	16	29	43	33	88
Norway	9	53	28	17	10	73	22	17	26	4	2
United Kingdom	10	28	27	74	68	1	10	14	16	56	7

Source: Doing Business 2013 (IFC / Worldbank)

Connectivity to a global market is a key factor for many businesses, particularly high-tech, knowledge, pharmaceuticals, advanced engineering and assembly and consumer product sectors. Fast and direct access to global markets is key to their success. By way of illustration, it is estimated that on average each flight from Heathrow to BRIC countries is worth over £400,000 in goods exports and each flight to China is worth over £1 million¹⁷. This statistic illustrates the value to the UK economy of current effective connections from Heathrow.

Discussions with stakeholders and review of the submissions to the Airports Commission Discussion papers have provided some key themes of what drives the decision for cargo businesses to locate at or near a particular airport, as summarised below:

End users

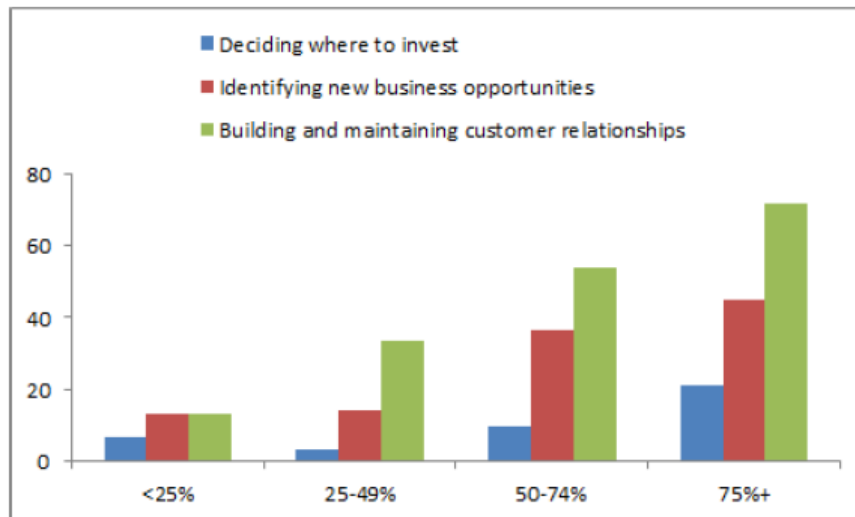
For the end users of air freight, it comes down to where they are based and what is the most efficient and cost-effective way of moving goods. International connectivity provided by air links helps connect the UK to the global marketplace and is a major facilitator of the UK's overseas trade. A recent stakeholder survey from the EEF (the manufacturers' organisation) found that three quarters of manufacturers cite aviation infrastructure as important to building and maintaining relationships with customers, and half see it as important to identifying new business opportunities. Almost 40% of respondents stated that aviation infrastructure is critical/important in deciding where to invest. Further analysis of EEF survey data, illustrated in Figure 12 below, shows the following:

¹⁶ A high ranking on the ease of doing business index means the regulatory environment is more conducive to the starting and operation of a local firm.

¹⁷ The Airports Commission Aviation Connectivity and the Economy discussion papers, the Department for Business, Innovation and Skills (BIS) analysis of HMRC data.

- Manufacturers for whom exports account for more than 75% of sales are more than three times as likely to see aviation as critical to identifying new business opportunities and deciding where to invest as those exporting less than 25% of sales.
- The most export-intensive businesses are five times more likely to identify aviation as critical to building and sustaining relationships with customers.

Figure 12: Percentage of survey respondents citing aviation infrastructure as critical to growing an export-focused business in the UK (by exports as percentage of turnover).



Source: EEF Transport Survey 2012

Air Freight providers

The following are key drivers of decisions of where freight companies are located:

- *Connectivity*: the air route network and available freight capacity;
- *Clustering of businesses*: economies of scale and synergy (even if it means locating near competitors);
- *Intermodal access*: capacity and efficiency of surface transport links;
- *Local regulatory environment*: e.g. if the UK Border Force becomes more onerous (and a significant cost) to send products through UK airports;
- *Set up costs*; and
- *Access to labour pool*.

There is evidence of new investment taking place around available aviation links. For example at Heathrow a new 70,000 sq.ft. flagship headquarters facility is being developed for an international freight forwarding and advanced supply chain management provider, which will support over 120 full time jobs. The investor has confirmed that this investment would not take place if there was a decision to create a dual or split hub because of the inefficiencies it would create associated with the need to move freight between hubs.

3. *The global air freight market*

Introduction

International trade has grown rapidly over recent decades; globalisation and technological innovation have led to economic interactions that are increasingly unrestricted geographically, having profound effects on the organisation of production and consumption. Transport volumes have expanded accordingly, with all sectors seeing significant growth. At a global level the volume of freight shipped by air has increased dramatically over the last 40 years; the DfT states that the overall size of the air freight market has been driven by a number of factors, including sharply declining air freight rates made possible by the expansion of long haul passenger services which provide significant bellyhold capacity for cargo; and by the composition of cargo towards smaller and lighter shipments¹⁸. Annually, \$6.4 trillion of goods travel by air, which equates to 35% of all world trade by value¹⁹.

Air freight operating models

The following section describes two air freight models that are in operation globally:

i). **The ‘freight forwarding model’**

In this model freight forwarders provide the link between those with a requirement for air freight (‘shippers’) and those with capacity, i.e. the major scheduled airlines who provide cargo capacity in their wide-bodied aircraft used on long-haul passenger routes, known as ‘bellyhold freight’. Additionally, airlines may operate dedicated freighter aircraft on key routes where there are high volumes of cargo. There are also a number of all-cargo airlines which only use dedicated freighter aircraft.

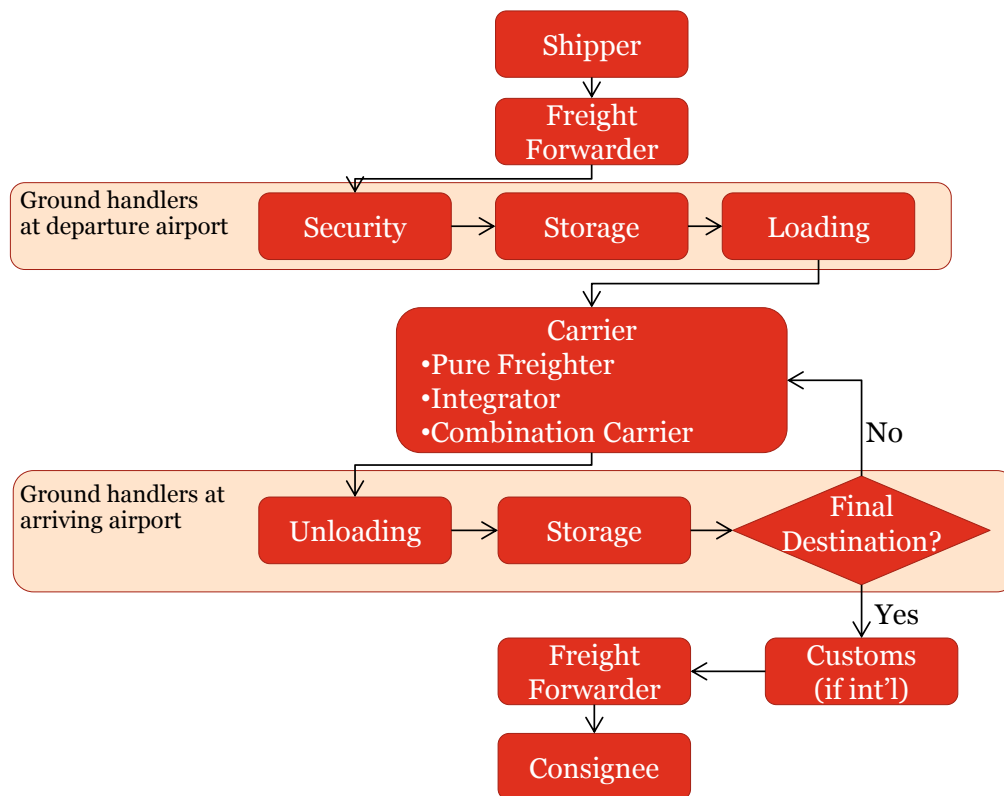
Freight forwarders sub-contract the collection of consignments from shippers and consolidate in order to achieve economies of scale and discounted rates from capacity providers, which is purchased on an ad-hoc basis or in advance via a permanent booking. Following processing by the airline’s handling agent the forwarder will sub-contract the collection and onward delivery of the consignment.

There are many steps in the journey of air freight from when it leaves the shipper to when it arrives at its final destination. Up to 15 different service companies can be involved in this model, with a correspondingly high organisational expense of communication, coordination and inspection²⁰. This is expressed in a high number of interfaces, which can lead to high costs and transit time; this process is outlined in Figure 13.

¹⁸ Department for Transport (May 2009), The air freight end-to-end journey: An analysis of the end-to-end journey of air freight through UK international gateways. Source: <http://webarchive.nationalarchives.gov.uk/+/http://www.dft.gov.uk/about/strategy/transportstrategy/tasts/usereexperience/endtoendjourney.pdf> (accessed 25-10-13).

¹⁹ Source: <http://www.iata.org/Pages/default.aspx> (accessed 30-10-13).

²⁰ Cordula Neiberger (2009), Air Freight: Trends and Issues – chapter in Aviation and Climate Change, Earthscan. Source:

Figure 13: Freight Forwarding Process

Note: Full process, not all steps may be followed in practice

Source: Air Freight Industry White Paper

ii). The ‘integrated air freight model’

Integrators are global express logistics companies (e.g. FedEx, DHL and UPS) that offer a complete origin to destination service on short-haul routes, providing an express or next-day delivery service to customers.

Integrators generally control the entire logistics chain from pick up from the shipper to delivery. In contrast to the forwarding model, integrators will collect the consignment and deliver to its final destination, providing all links in the transport chain, combining an extensive surface transport collection and delivery network with an in-house fleet of dedicated freighter aircraft and trucks. On long haul routes integrators will also buy bellyhold capacity on passenger scheduled airlines.

Key stakeholders

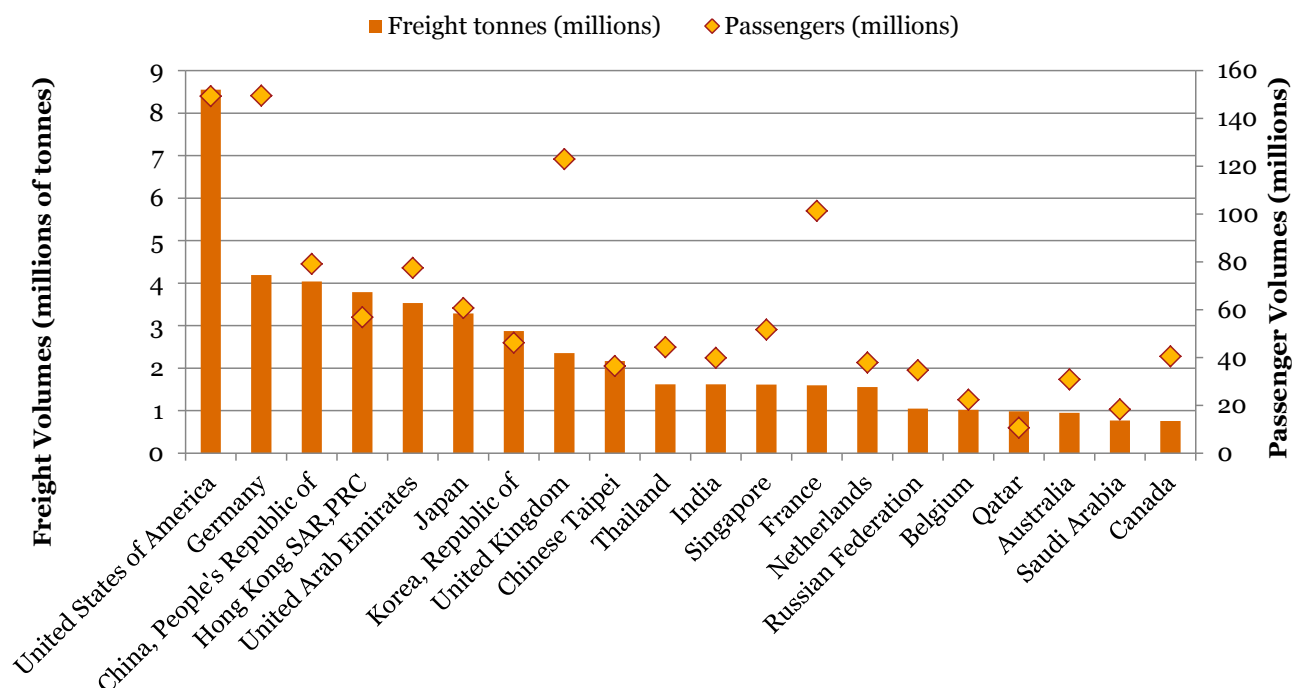
Along with the users of the service (i.e. the shippers and receivers of goods), there are a range of participants in the air freight sector. These include, but are not limited to, the following:

- Ground handlers – e.g. dnata, Swissport, Menzies, WFS;
- Passenger airlines – e.g. British Airways, Emirates, Korean Air;
- Mail providers, e.g. Royal Mail
- Express and dedicated freighter, e.g. FedEx, UPS, DHL, Cargojet Airways, Atlas Air, Cargolux;
- Third Party Logistics – e.g. Kuehne + Nagel, DB Schenker. Appendix 2 provides a map detailing the presence of third party logistics companies located in the South East of England, which highlights the clustering of companies around Heathrow;
- Firms that provide multiple, integrated logistics services for use by customers (e.g. DHL, UPS, FedEx); and
- Road transport providers - e.g. TNT, FedEx, UPS.

Global air freight carriers

The following chart highlights the 20 countries in which the volume of air freight handled (inbound and outbound) is highest, with the total number of international and domestic passenger flights added:

Figure 14: International air freight and passenger volumes 2012

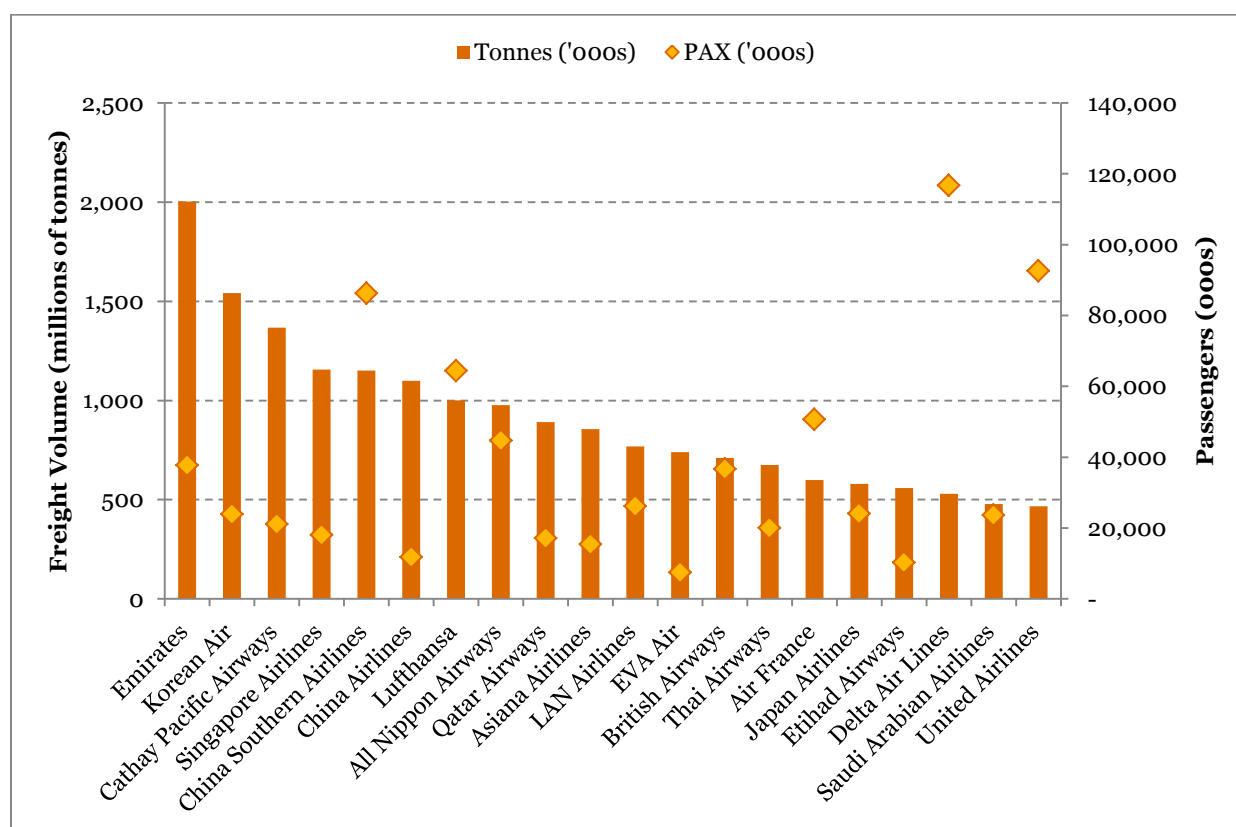


Source: IATA²¹

To examine whether there is any relationship between freight and passenger volumes it is necessary to exclude dedicated freighters from the data. The chart below is compiled at an airline level in order to achieve this²².

²¹ IATA Airline Industry Forecast 2013-2017

²² IATA members only. Dedicated freight carriers have been excluded.

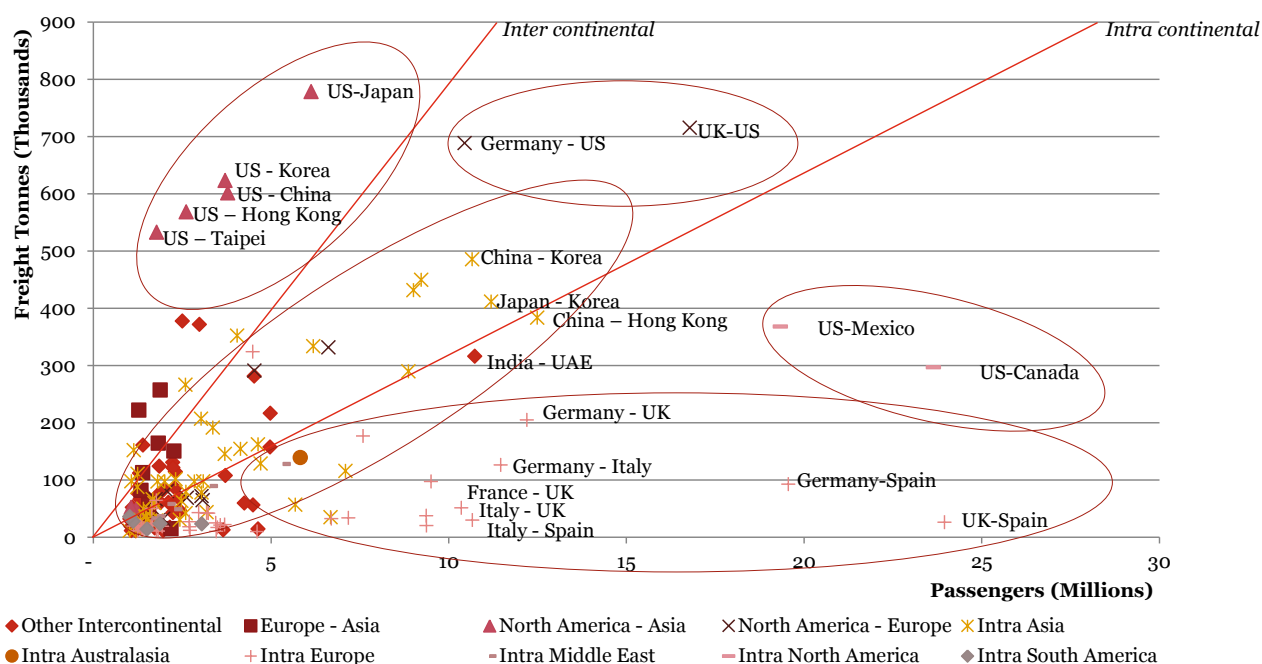
Figure 15: Top 20 airlines by freight and passenger volumes - 2012

Source: Source: IATA²³

Given that economic activity and trade between countries are key drivers of both air passenger and air freight demand, it would be expected that there would be some level of correlation between the two. However, the level of air freight is also strongly influenced by the availability of alternative modes of transport, for example, where country pairs have viable options of alternative surface transport modes within a comparable time frame to air, it is expected that the share of freight carried by air would be lower.

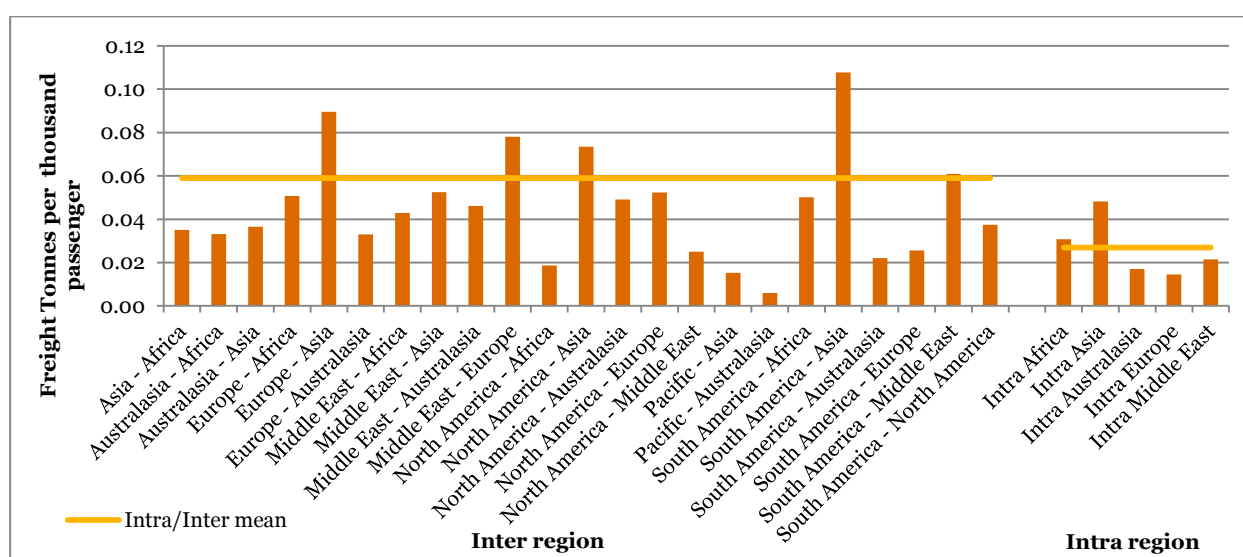
Figure 16 below plots air passengers against air freight tonnage on a country-pair basis based on 2012 data from the IATA airline industry forecast 2013-2017. Over 800 country pairs are included, which represent where data was available for both passengers and air freight. The correlation between the level of air passengers and air freight for country pairs is 0.57.

²³ IATA (2013), World Air Transport Statistics: Digest and Key Performance Indicators

Figure 16: Country-country passengers vs. freight volumes in 2012

Note: Excludes country-country pairs with less than 100,000 tonnes of freight and 1 million passengers in 2012
Source: IATA Airline Industry Forecast 2013-2017

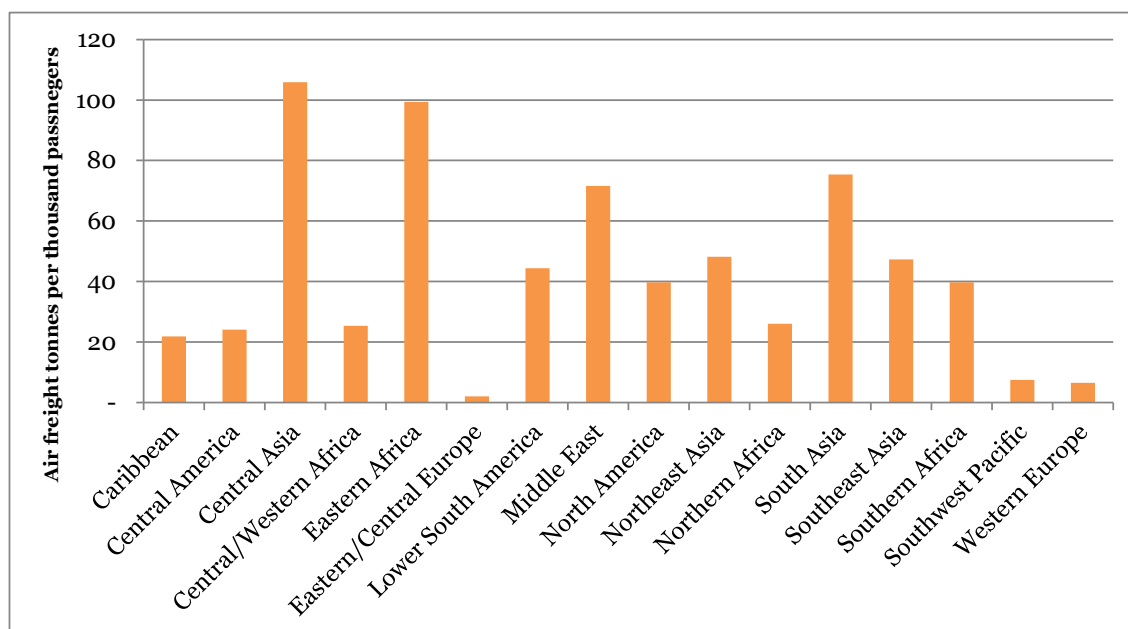
Figure 17 looks at the average freight tonnes per passenger for each region pair²⁴. It is apparent that intercontinental pairs carry a higher volume of air freight relative to the level of passengers, which may be indicative of the availability of alternatives for freight. For example, the level of air freight between EU countries is lower relative to the level of passengers on these routes given the availability of surface transport for freight. The industry density and key industries also plays a significant role in the amount of goods for example, the United States has significant trade between Asia in high value and perishable goods such as machinery and agricultural products.

Figure 17: Average freight tonnes per passenger for country-country pairs by region pairs

²⁴ Average across country-country pairs within each regional pairing (not weighted by freight volume or passengers)

For routes from the UK, there are differences in the relationship between passengers and cargo based on the nature of the route, as demonstrated in Figure 18. The impact of route network on air cargo volumes is discussed in the Gatwick Case study in Section 4.

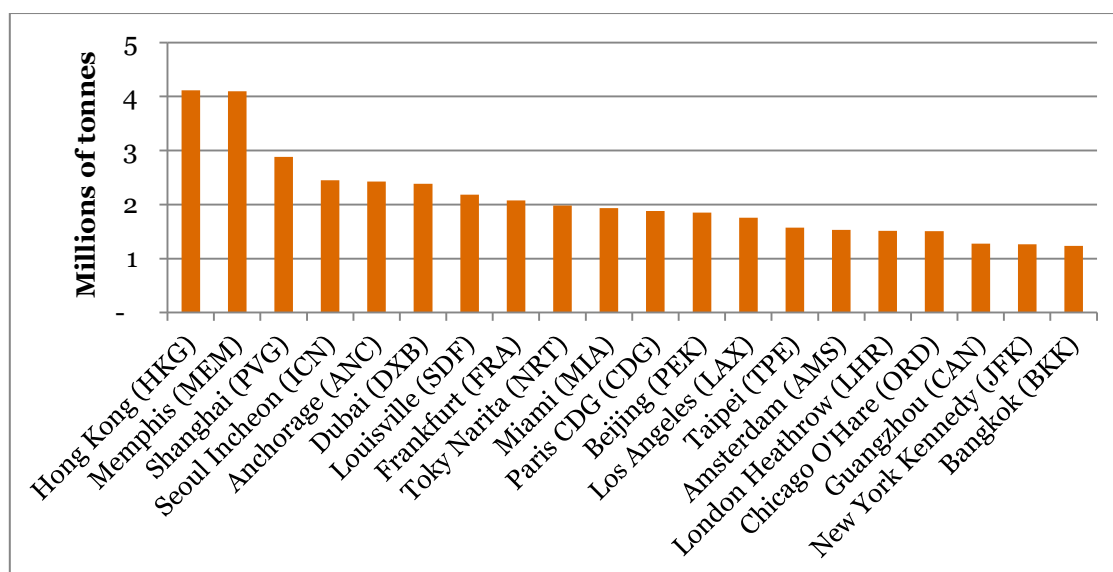
Figure 18: Air freight tonnes per thousand passengers for routes from UK by region, in 2012



Source: IATA Airline Industry Forecast, 2013-2017

Figure 19 shows the top 20 airports globally in terms of freight volumes. Many of the large global hubs feature in the top 20, indicating that the connectivity achieved through hub operations enables freight to be transported more easily. There are a few airports in the top 20 such as Memphis, Anchorage and Louisville in the US which are primarily freighter hubs.

Figure 19: Top 20 global airports for freight volumes (12 months to August 2013)



Note: Includes airports participating in the ACI Monthly Traffic Statistics Collection.

Source: ACI

Figure 20 shows the top 50 air cargo carriers by cargo traffic in revenue tonne kilometres (RTKs). Integrated logistics suppliers Fedex and UPS are the two largest carriers of air cargo. With the exception of the top two integrated logistics suppliers, passenger airlines carry much of the global air freight volumes. Emirates Airline carries the third largest amount of cargo in terms of revenue tonne kilometres, making it the largest passenger airline for cargo. For most passenger airlines, revenue from cargo only makes up a small proportion of total revenue, reflecting the focus on passenger services. For example, British Airways is in the top 10 carriers for cargo traffic, however, cargo revenues only make up 7% of total revenues. Far East carriers such as Cathay Pacific, Korean Air, China Airlines and Eva Air have a more significant focus on cargo, with revenues making up a quarter to a third of total revenue.

Figure 20: Top 50 cargo airline ranking by traffic, 2012

Ranking		Airline	Country	Cargo traffic RTK		Cargo revenue \$		Nominal yield	Cargo share of group by	
2012	2011			million	change	million	change		RTK (%)	revenue (%)
1	(1)	FedEx	USA	16,262	0.6	27,171	2.5	167.1	100	100
2	(2)	UPS Airlines	USA	10,761	-1.4	5,257	-9.3	48.9	100	98
3	(6)	Emirates Airline	UAE	9,318	14.6	2,817	8.4	30.2	34	14
4	(3)	Lufthansa Cargo	Germany	8,727	-8.0	3,468	-15.7	39.7	100	100
5	(4)	Cathay Pacific	Hong Kong	8,615	-8.5	3,166	-5.2	36.7	49	25
6	(5)	Korean Air	South Korea	8,279	-9.3	2,764	-12.6	33.4	58	25
7	(7)	Singapore Airlines Cargo	Singapore	6,764	-6.0	1,821	-9.4	26.9	100	100
8	(13)	Atlas Air	USA	5,110	9.2	1,621	17.9	31.7	97	98
9	(12)	British Airways	UK	4,891	2.0	1,173	-1.4	24.0	28	7
10	(8)	China Airlines	Taiwan	4,828	-14.9	1,384	-12.2	28.7	0	31
11	(9)	Cargolux	Luxembourg	4,800	-4.7	1,726	-7.6	36.0	100	99
12	(14)	China Eastern Airlines	China	4,701	6.3	1,274	1.7	27.1	33	9
13	(15)	Air China	China	4,554	3.1	1,337	-12.3	29.4	35	8
14	(16)	Qatar Airways	Qatar	4,491	15.9	1,078	8.1	24.0	40	14
15	(10)	EVA Air	Taiwan	4,472	-8.4	1,165	-6.2	26.1	0	32
16	(11)	Air France	France	4,443	-8.2	3,944	-10.2	88.8	26	12
17	(19)	Asiana Airlines	South Korea	4,209	10.3	1,294	-0.2	30.7	56	26
18	(22)	China Southern Airlines	China	3,862	16.9	1,041	16.6	27.0	28	7
19	(18)	KLM Royal Dutch Airlines	Netherlands	3,651	-4.7	2,147	-9.4	58.8		18
20	(20)	LAN Airlines	Chile	3,600	-0.3					
21	(17)	United Airlines	USA	3,590	-7.1				12	
22	(21)	Delta Air Lines	USA	3,482	-0.3	990	-3.6	28.4		3
23	(23)	China Cargo Airlines	China	3,302	14.5				100	
24	(25)	ANA - All Nippon Airways	Japan	2,975	10.1	1,517	-6.6	51.0		10
25	(29)	Etihad Airways	UAE	2,690	16.9	733	10.4	27.2		15
26	(24)	Thai Airways International	Thailand	2,653	-4.1	864	-6.0	32.6	32	13
27	(26)	American Airlines	USA	2,585	-1.2	669	-4.8	25.9	12	3
28	(30)	Nippon Cargo Airlines	Japan	2,423	8.9	934	-10.9	38.5	100	100
29	(27)	AirBridgeCargo	Russia	2,379	0.2				100	
30	(28)	Qantas	Australia	2,206	-4.1	814	-3.0	36.9		5
31	(32)	Southern Air	USA	2,101	4.2				100	
32	(31)	Malaysia Airlines	Malaysia	1,884	-8.9	534	-10.9	28.3	36	12
33	(40)	Turkish Airlines (THY)	Turkey	1,877	27.6	673	17.5	35.9	20	8
34	(36)	Saudia	Saudi Arabia	1,856	21.4				32	
35	(34)	Kalitta Air	USA	1,798	1.4	930	-8.9	51.7		81
36	(39)	Japan Airlines	Japan	1,699	14.5	907	-9.2	53.4	28	6
37	(33)	Polar Air Cargo	USA	1,676	-5.9	370	19.4	22.1	100	40
38	(38)	Air Canada	Canada	1,579	4.6	488		30.9	17	4
39	(37)	Virgin Atlantic Airways	UK	1,461	-4.4	365	-4.9	25.0	32	8
40	(42)	Swiss	Switzerland	1,452	8.9	581	-1.2	40.0	30	11
41	(44)	TNT Airways	Belgium	1,222	8.8	850	6.2	69.6	100	100
42	(41)	Iberia	Spain	1,187	-12.9	400	-15.3	33.7	22	6
43	(45)	South African Airways	South Africa	1,180	11.3				37	
44	(47)	Aeroflot Russian Airlines	Russia	1,121	23.4	364	30.9	32.5	20	4
45	(46)	Global Supply Systems	UK	1,060	14.0				100	
46	(49)	Air New Zealand	New Zealand	975	9.2	241	13.7	24.7		7
47	(35)	World Airways	USA	945	-41.6	225	-21.3	23.8	89	54
48	(48)	Finnair	Finland	918	2.3	309	-8.8	33.7	30	10
49	(52)	Ethiopian Airlines	Ethiopia	889	15.6	265	39.5	29.8	30	13
50	(51)	Jet Airways	India	849	1.3	252	-7.4	29.7	26	8

Note: The list includes only IATA airline members

Source: Flightglobal²⁵

Low cost carriers

European low cost carriers (LCCs) typically do not carry cargo, with a few exceptions. A number of operators have recently turned to cargo to take advantage of available capacity and increase bottom lines, for example Norwegian, AirAsia and Jetstar Japan. Southwest Airlines is a US-based low-cost carrier that has been running cargo operations for a number of years, and argue they can manage both freight and passenger aspects of their business model by being selective in what they carry, i.e. no livestock, mail or hazardous cargo. There is no

²⁵ Flightglobal Airline Business Special Report dated October 2013 – ‘Cargo 2013’

containerisation and all shipments are loose-loaded, meaning cargo is handled in the same way as baggage. This allows Southwest to fully maximise their flight schedule. In contrast, easyJet carried out a six-month trial in 2012, but concluded that issues associated with cargo operations (e.g. time taken for security processes) were too great a risk to their operations.

The following is a summary of the advantages and disadvantages to the low-cost carriers of diversifying into cargo operations:

Advantages:

1. Opportunity for additional revenue streams.
2. Provides a diversification opportunity; for example, the ability to ship higher volumes of freight during the SARS crisis in 2003 was cited by one airline as critical to their ongoing operations.

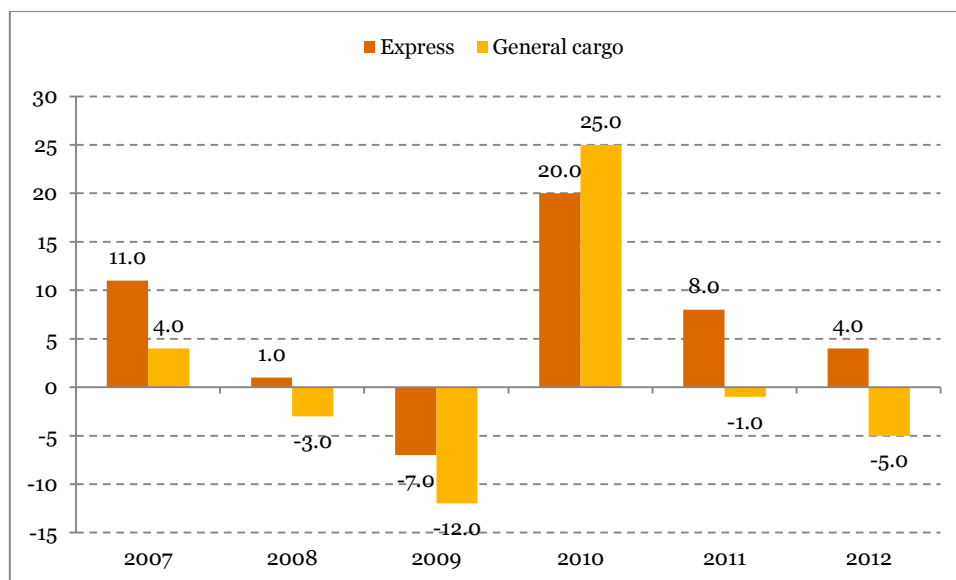
Disadvantages:

1. Capacity is dictated by the characteristics of the airline's fleet. Operating smaller planes with more flights to select destinations has been a successful blueprint for low-cost carriers as most passengers today are willing to sacrifice amenities for price. However, this means smaller bellyhold capacity, as highlighted later in this section.
2. Additional complexity and surplus costs.
3. Negative impact on turnaround times.

Global air freight corridors and trends

World trade remains weak in the aftermath of the banking crisis of 2008, and air freight traffic volumes have declined four times in the past ten years, in 2008, 2009, 2011 and 2012, as illustrated in the graph below. The graph shows that the express market has proved more resilient to the banking crisis, highlighting the value of next day delivery service to consumers and to industries that want to keep their supply chain as lean as possible.

Figure 21: Change in demand for express and general air cargo



Source: Airbus²⁶

The following economic drivers have a significant impact on the freight industry²⁷:

²⁶ Airbus (2013), Global Market Forecast: Future Journeys 2013-2032. Source: http://www.airbus.com/company/market/forecast/?eID=dam_frontend_push&docID=33755 (accessed 30-10-13).

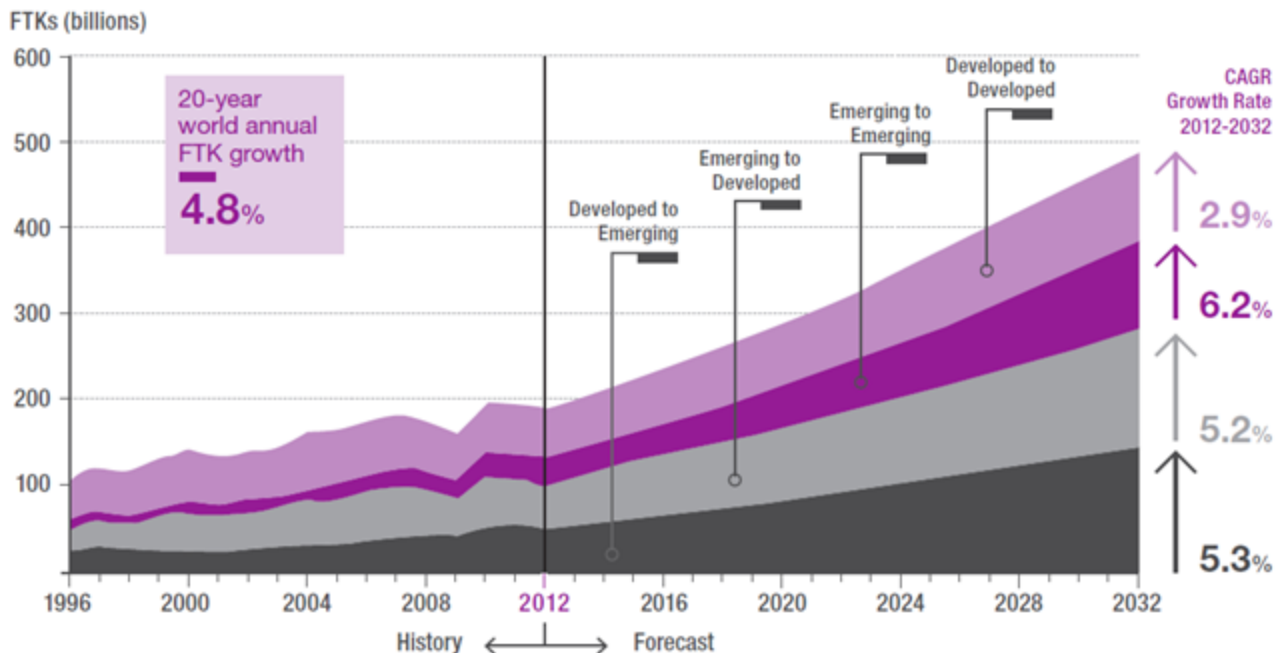
1. Economic activity, expressed in GDP;
2. World trade flows, i.e. combined imports and exports;
3. Private consumption; and
4. Industrial consumption.

In 2012, the global route on which the heaviest volume of air freight was carried was from China to the USA (462,477 tonnes)²⁸. The USA was the principal importer of goods by air freight, with Japan, Hong Kong, Germany and Korea the next dominant exporters. IATA forecasts that these trade routes will continue to grow between 2013 and 2017, with the Hong Kong-USA route forecast to have the highest CAGR (3.6%) over this period.

The routes on which more than 100,000 tonnes p.a. were transported by air freight in 2012 and which have the strongest forecast CAGR 2013-2017 are Korea-Hong Kong (8.7%), USA-Brazil (8.0%), Hong Kong-Korea (7.5%), Taipei-China (6.8%) and China-USA (5.7%).

Looking over the longer term, Airbus forecasts an annual CAGR of 4.8% for the next 20 years, as illustrated in the graph below:

Figure 22: Annual growth in air freight by region, 1996 – 2032



Source: Airbus²⁹

Overall, Airbus expect that traffic will be fastest growing between emerging regions and slowest growing between mature regions. Goods flowing between mature and emerging will grow at a slightly faster rate of growth than the reverse flow.

²⁷ Airbus (2013), Global Market Forecast: Future Journeys 2013-2032. Source: http://www.airbus.com/company/market/forecast/?eID=dam_frontend_push&docID=33755 (accessed 30-10-13).

²⁸ IATA (2013), World Air Transport Statistics: Digest and Key Performance Indicators.

²⁹ Airbus (2013), Global Market Forecast: Future Journeys 2013-2032. Source: http://www.airbus.com/company/market/forecast/?eID=dam_frontend_push&docID=33755 (accessed 30-10-13).

Value of slots by time of day

The value of slots by time of day is determined by the convenience for end users. For example, trans-Atlantic flights are most convenient for the transport of fresh goods to markets and restaurants when they arrive in the early morning. Middle East flights leaving the UK in the afternoon are popular because they arrive late evening, when a lot of transshipment activity takes place.

Night flights are of particular importance to the express sector³⁰. In 2010, the express sector contributed £2.3 billion to UK GDP, and the sector facilitated £11 billion of UK exports a year³¹. The express sector connects UK business to the international marketplace. Express services allow UK companies to implement best international business practice in terms of speed and efficiency, improve their customer service and compete effectively in the global economy. Courier and Express services enable UK businesses to achieve rapid, time-definite delivery of high value goods and documents to customers throughout the world. Although they are subject to fewer restrictions on ground or runway operations, night flights do require additional labour costs. They are seen as a necessity in meeting demands of the customers for next day delivery, e.g. transshipment can take place outside daytime working hours. This speed and the ability to collect and deliver overnight would not be possible without air freight hubs and night flights; if night flights were restricted, it could pose significant risks to a wide range of sectors, e.g. manufacturing and pharmaceuticals.

The impact of new technology

The air freight sector has been criticised for failing to modernise its systems, which lag far behind those in place for passenger travel. Contracts between shippers and air freight providers largely remain paper-based, which can add significant delay to a sector in which speed of transfer is achieved at a premium.

IATA has a goal of modernising the industry through the acceptance of its electronic air waybill in 20% of enabled countries by the end of 2013, and completion by 2015. Whilst this will require capital investment in IT infrastructure in order to facilitate capability, IATA's aim is to introduce greater efficiency and reduce cost, potentially making the industry more competitive in the future.

When the use of 3D printing becomes mainstream, it may have an impact on many aspects of the manufacturing and design processes. The characteristics of 3D printing allow for the manufacture of different designs without building a complete production line for each and every product, as well as localised production facilities close to consumer concentrations. Another benefit is that there is no need for the production of large batches to offset the investments necessary for setting up the supply chain, tooling, production lines and transporting the product to the customer location, therefore reducing risks in the supply chain for product failures. Production can take place in small batches, which makes it possible to adapt a product design almost immediately.

The simplification of supply chains using 3D printing can lead to shorter lead times and reduced supply chain risk. The impact of these issues is therefore potentially significant on the air freight sector, key characteristics of which have been identified previously as security, speed, information and global reach. However, the expected impact of 3D printing on the air freight sector is expected to be minimal given the characteristics of the products carried by air freight are generally not amenable to 3D printing (perhaps with the exception of some pre-consumer products). The table below suggests the likely impact of 3D printing³² on key goods transported by air:

³⁰ These are typically dedicated freighter services

³¹ Oxford Economics, Response to the Department for Transport's Night Flights Consultation, A report for the Association for International Courier & Express Services, April 2013.

³² Taking into account the technology as currently understood.

Figure 23: Potential impact of 3D printing on products frequently transported by air

Sector	Product	Potential impact of 3D printing
Mail	Air mail	Low
	Express mail and parcels	Low
Pre-consumer products	Machinery parts	Low
	Aircraft parts	Low
	Electrical components	Low
Consumer goods	Electronics	Medium/High ¹⁾
	Jewellery	Negligible
	Art	Negligible
	High street fashion	Low
Perishables	Pharmaceuticals	Negligible
	Food & plants	Negligible

- 1) Air freight is primarily used to ensure rapid global distribution of new products, with sea freight used for transport when the distribution of products is less time-sensitive.

Source: PwC

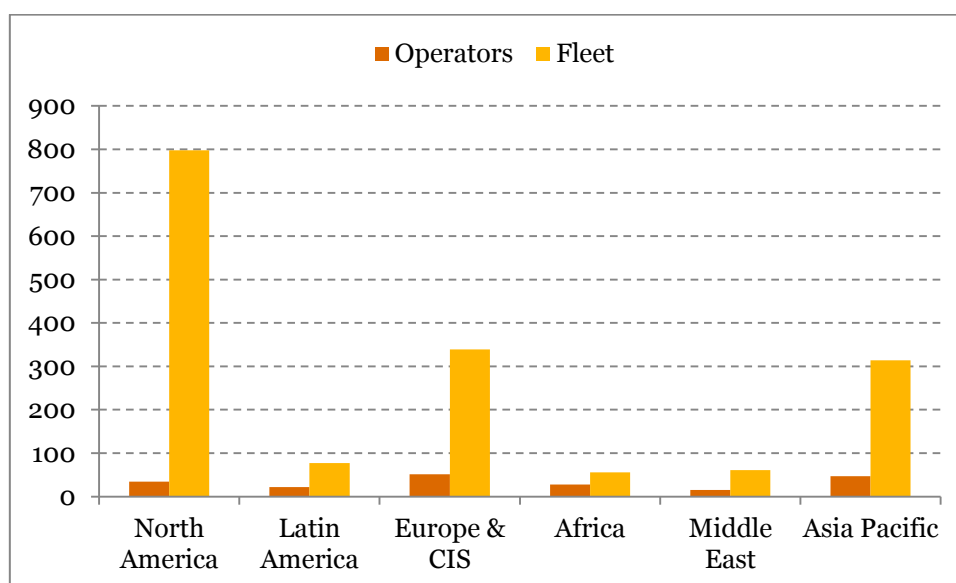
Aircraft modernisation and the impact on freight capacity

Dedicated Freighters

Dedicated freighter aircraft can be either purpose built for carrying freight or passenger conversions. Since 2001, freighter aircraft have carried on average around 60% of the world's total air cargo traffic each year.³³ The aircraft have specific design features for cargo (e.g. oversized doors, nose cargo door). Dedicated freighters are predominantly flown between freight hubs. They allow for superior focus and control, timing and routing, capacity (volume, weight, hazardous materials, dimensional).

During the last five years the total number of freighters has changed little, remaining between 1,600 and 1,700 units. The following chart highlights that together, operators in North America, Asia Pacific and Europe account for 88% of fleet (by number of craft) and 67% of companies:

³³ Boeing World Air Cargo Forecast 2012-2013

Figure 24: Global air freight industry in 2013

Note: Dedicated freight operators only

Source: Airbus, 2013 ³⁴

However, there have been significant changes in the fleet mix since 2000, with relatively more intermediate and large widebody aircraft now in service and a drop in the number of small (narrowbody) freighters. Thus, while the number of aircraft remains broadly unchanged, capacity available from the fleet in service has increased by an estimated 40% over this period³⁵. High fuel prices and the recent fall in demand have led to the early retirement of older freighter types³⁶ which, in most cases, have been replaced by more fuel efficient aircraft.

In addition to the delivery of 362 new build jet freighters the period 2000-2012 saw the conversion of 863 aircraft from passenger to freighter usage (P2F)³⁷. A further 50 new-build aircraft and 57 P2F conversions (mostly narrowbody or intermediate widebody aircraft for integrators and regional cargo operators) are forecast to enter the market in 2013, which has led to capacity concerns. In some markets affected by overcapacity issues a number of large freighters have been 'parked' in order to try to increase yields that are continuously driven down by the negative relationship between capacity and demand.

Bellyhold Freight

Bellyhold freight is carried under the main deck of passenger aircraft. The capacity depends on both volume and weight and varies with aircraft type, take-off and landing weight limits, the number of passengers, the amount of baggage, and volume of fuel required. There is a trade-off of weight between fuel and cargo where shorter flights require less fuel and therefore can carry more cargo. In terms of aircraft type, the 777 is viewed as the 'best' aircraft for cargo – the A380 generally has 25-35% lower capacity for freight due to flight length and fuel loads.

New aircraft designs allow for greater flexibility and capacity for cargo without the need for dedicated aircraft. Bellyhold cargo makes it viable to send ad hoc cargo packages and vastly increases the route network for cargo as it negates the need to fly dedicated freighter services and utilises the passenger network. One limitation is that there is not as much scale or capacity for large or bespoke items.

³⁴ Airbus (2013), Global Market Forecast: Future Journeys 2013-2032. Source: http://www.airbus.com/company/market/forecast/?eID=dam_frontend_push&docID=33755 (accessed 30-10-13).

³⁵ Source: Flightglobal news article dated 07-06-13 – 'Where next for freighter markets?'

³⁶ For example the 747 classics and DC10F aircraft.

³⁷ Source: Flightglobal news article dated 07-06-13 – 'Where next for freighter markets?' Note: number of aircraft differs slightly from the Airbus data referenced previously (1,529).

Airlines

The trend within passenger airlines is for increasing belly capacity, largely due to the development of small wide-body aircraft, e.g. the A350-900XWB, which will be able to transport 20 tonnes of cargo over 5,000nm. The industry is seeing a trend of airlines striving to reduce their unit costs by replacing narrow-body aircraft with larger aircraft and rationalising their networks, especially in more mature markets. For example, United Airlines are replacing their fleet of 767s with 787s, and Japan Airlines are replacing their fleet of 747-400s with 777-300ERs; in both cases cargo capacity has doubled.

Despite the fact that some passenger airlines are reluctant to carry freight due to additional complexity of their operations, surplus costs and slower turnaround times, the increase in belly capacity through the rollout of new generation aircraft is viewed as an opportunistic and complementary source of revenue for passenger operations. The costs of belly capacity are largely paid for by passenger ticket sales, meaning that cargo revenues only have to cover additional fuel, sales and handling costs, therefore generating high profit margins of up to 65%.

However, although belly carriers can often sell capacity at a lower price than freighters, it is unlikely that they will ever fully replace freighter operations, due to demand exceeding belly capacity on certain routes. Some shippers also prefer freighter operations, where they feel their requirements are not secondary to the passenger business. The percentage of air cargo carried on freighters has remained broadly constant at 60%, and forecast to remain so over the medium term (60.2% by 2021).

Each aircraft type has a different cargo capacity and configuration; even within aircraft models, there are variances (e.g. Boeing 747-400, 170.5m³, 747-Freighter c.779m³). Some examples are shown in Figure 25.

Figure 25: Passenger aircraft belly hold capacity

Boeing 747-400

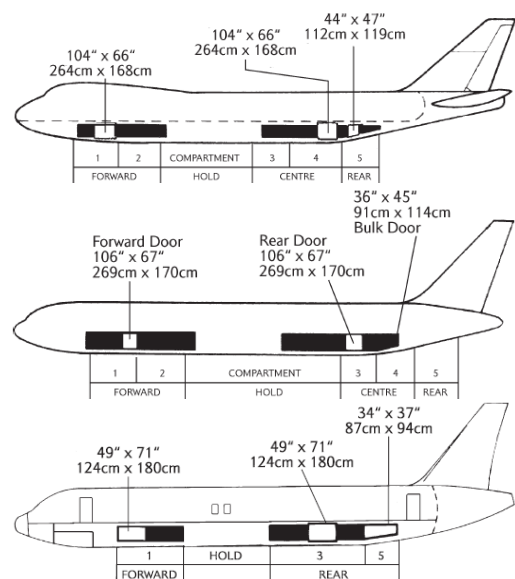
- Widebody long range passenger aircraft
- 20 tonnes of cargo in addition to a full passenger load (route dependant)
- Forward hold and centre holds are designed for the carriage of ULDs only. Compartment 5 is for the carriage of loose cargo

Boeing 777

- Widebody, medium to long range aircraft
- 14 tonnes (99.8 m³) of cargo and mail
- Five holds, four of which are designed to carry ULDs with compartment 5 available for bulk loaded cargo and mail

Airbus A320

- Narrowbody short-haul passenger aircraft
- Two tonnes of cargo and a full passenger load
- Three holds, two of which are designed to carry ULDs and the other hold for bulk-loaded cargo



Source: Boeing, Airbus

The impact of new aircraft types

The process of up-gauging (increasing the size of aircraft on certain routes to carry more passengers) and the introduction of larger, more fuel efficient aircraft does not automatically result in more cargo capacity. Newer passenger aircraft types such as the Airbus A380, Airbus A350 and Boeing 787 generally have lower cargo carrying capacity compared with the aircraft they are likely to replace – not due to lack of space, but due to a reduction in the available weight.

For example, the Airbus A380 can carry a lot more passengers than previous aircraft but there is a subsequent poor cargo uplift due to the additional weight of passengers, bags and also noise restrictions. The Boeing 787

has a very similar (if not slightly lower) cargo capacity to older variants due to lighter weight composite airframes and reduced overall lift capacity of the aircraft.

Figure 26 shows a range of new aircraft types and their cargo capability. Note that the actual amount of cargo that can be carried will depend on a range of factors including the route distance and required amount of fuel to be carried, the load factor and weight of passengers and their baggage and the noise and weight restrictions at different airports.

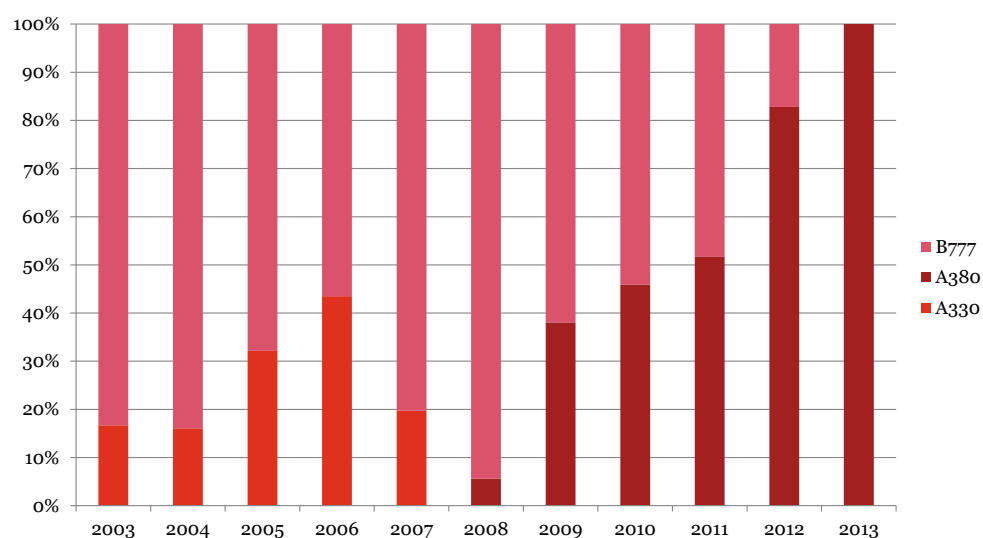
Figure 26: Passenger aircraft belly hold capacity

	Measure	A380-800	B747-800	B777-300ER	B787-10	A340-600	A350-1000
Typical Seat Capacity	Seats	525 (3-class)	467 (3-class)	386 (3-class)	300-330	359 (2-class)	369
Maximum TakeOff Weight (MTOW)	Tonnes	560	448	352	251	368	308
Max ULD-Lower Deck	Pallets	13	7	8		14	14
	LD3s	38	16 (LD1)	20		42	44
Bulk hold volume	metres ²	14.3	18.1	17.0		19.7	11.3
Total Volume	metres ²	184	161.5	201.6	175	207.6	208.2

Source: Boeing, Airbus

Emirates Case Study

Emirates operations between Dubai and Heathrow provide an interesting case study for the impact of passenger fleet changes on cargo capacity. Since December 2012, Emirates has operated an all-A380 fleet between Dubai and Heathrow from previously a mix of 777s and A380s, and prior to the A380, A330s.

Figure 27: Share of fleet utilised on Emirates flights for LHR-DXB route

Source: Sabre Airport Data Intelligence

Despite the A380 having the space for cargo, the higher passenger volumes and the required weight for baggage leaves limited weight for cargo. An example of the severity of this cargo uplift is that Emirates introduced a 777 dedicated freighter flight between Dubai and Heathrow from January 2013 to replace the cargo capacity lost.

4. Air freight in the UK

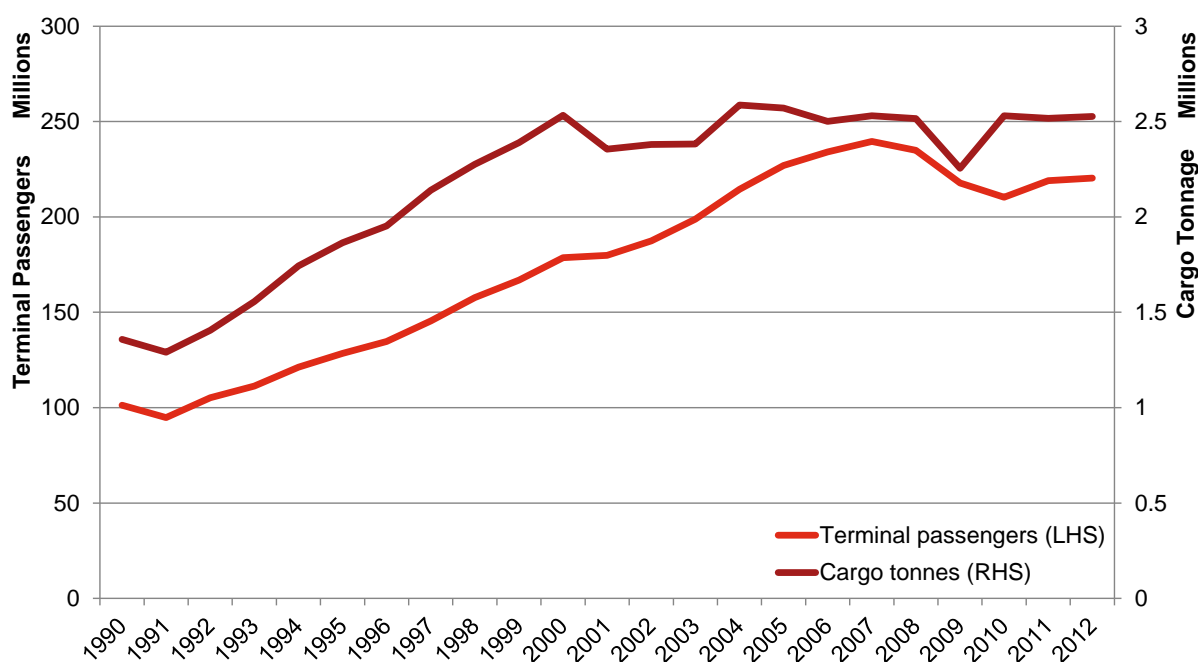
Introduction

Air freight in the UK is dominated by freight carried in the hold of passenger aircraft as opposed to dedicated freighter aircraft and is therefore linked to air passenger flows. Interviews conducted by PwC with a selection of stakeholders have highlighted that “passengers lead, freight follows”, i.e. for most passenger airlines, revenue from cargo only makes up a small proportion of total revenue for passenger; for example, as highlighted previously, British Airways is in the top 10 carriers for cargo traffic, but cargo revenues only make up 7% of BA’s total revenues. However, the contribution of freight to airline revenues may potentially make the difference between a route being loss-making/profit-making.

Trends in air freight in the UK

Passengers at UK airports have increased at a Compound Average Growth Rate (CAGR) of 3.6% per annum between 1990 and 2012, with air freight volumes increasing at 2.9% per annum over the same period. Passenger and freight volumes at UK airports have followed a similar trend between 1990 and 2000; however, freight volumes have been more or less stagnant since. There was a significant dip in freight volumes in 2009 following the global economic crisis, reflecting the sensitivity of the sector to changes in the economy.

Figure 28: Trends in Passengers and Cargo at UK airports

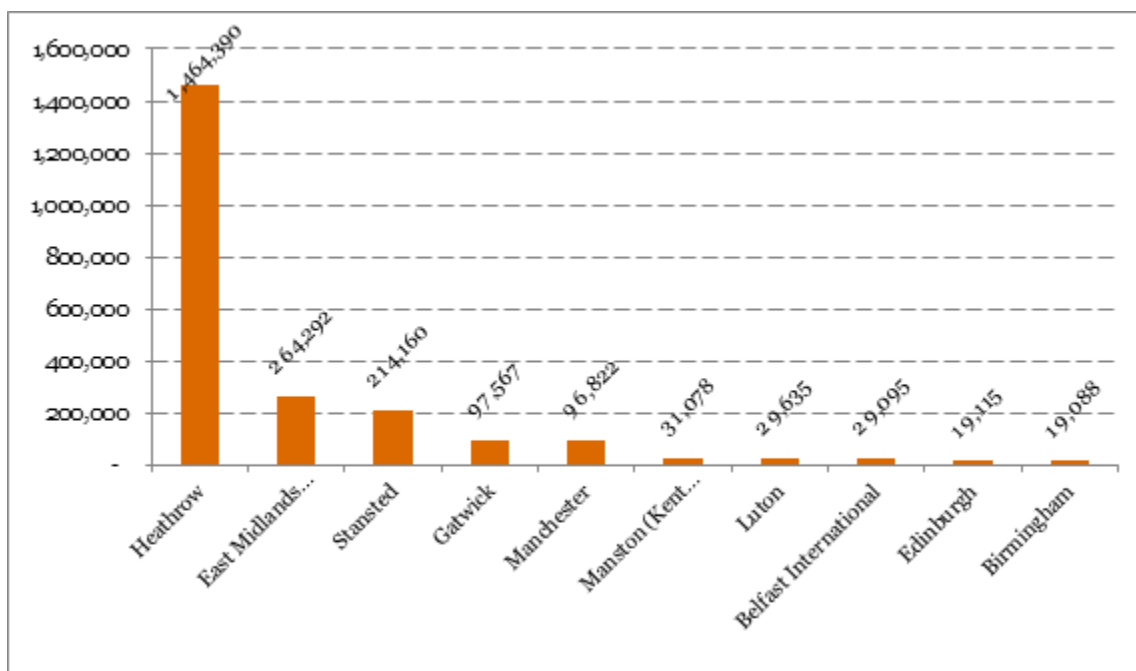


Source: CAA

Key hubs for air freight in the UK

London Heathrow Airport is the UK's most important airport for air freight given its proximity to London and its access to the global airline network. The chart below shows the ten busiest UK airports for freight tonnes handled in 2012:

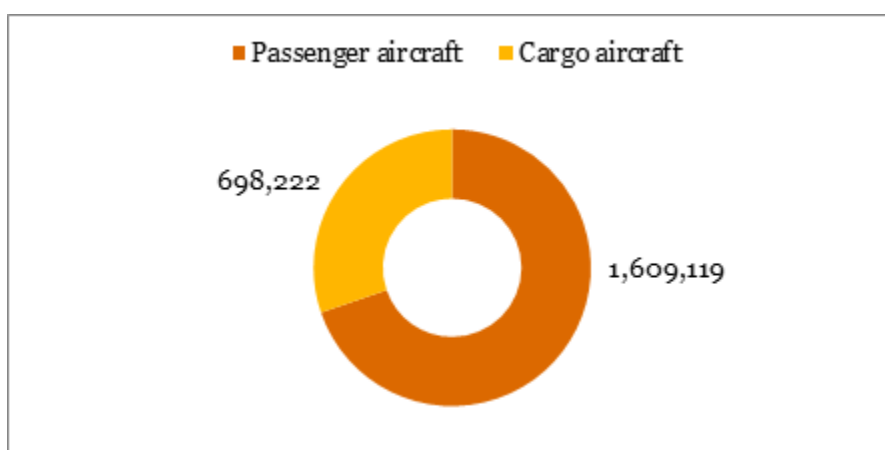
Figure 29: Busiest UK cargo airports - 2012



Source: CAA³⁸

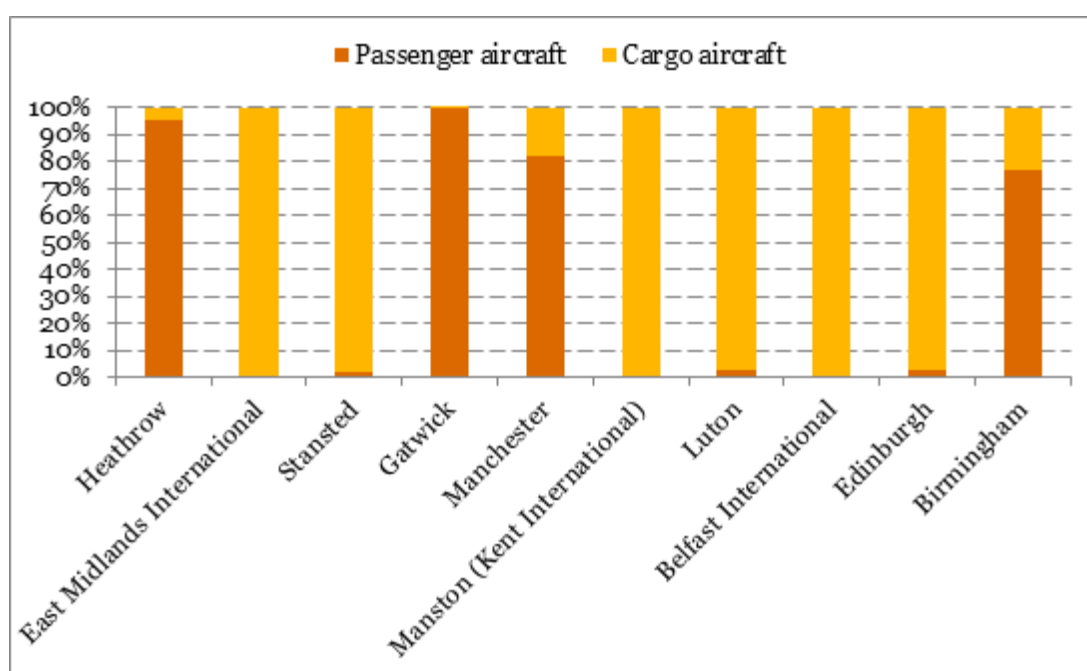
In the UK, 70% of freight traffic is carried in the bellyhold of passenger aircraft, as highlighted in the figure below. This is in contrast to the global market, where only 40% of freight is carried by passenger aircraft.

³⁸ Expressed as air cargo carried to and from UK airports (tonnes). Source: <http://www.caa.co.uk/default.aspx?catid=80&pagetype=88&sglid=3&fld=2012Annual> (accessed 03-11-13).

Figure 30: Total UK freight (tonnes) by aircraft configuration - 2012

Source: CAA³⁹

The dominance of Heathrow as the UK's main cargo hub explains this trend. In 2012 almost 1.5m tonnes of freight were handled at Heathrow, representing 61% of the UK's total. As a result of its extensive network of passenger flights, the vast majority (95%) of freight volumes at Heathrow are carried in bellyhold. Restrictions are in place at both Heathrow and Gatwick which limit the use of freighter aircraft within a highly slot-constrained environment. In contrast, cargo aircraft are more common at a number of other UK airports where fewer long haul flights are in operation:

Figure 31: Percentage of freight by aircraft configuration – 2012

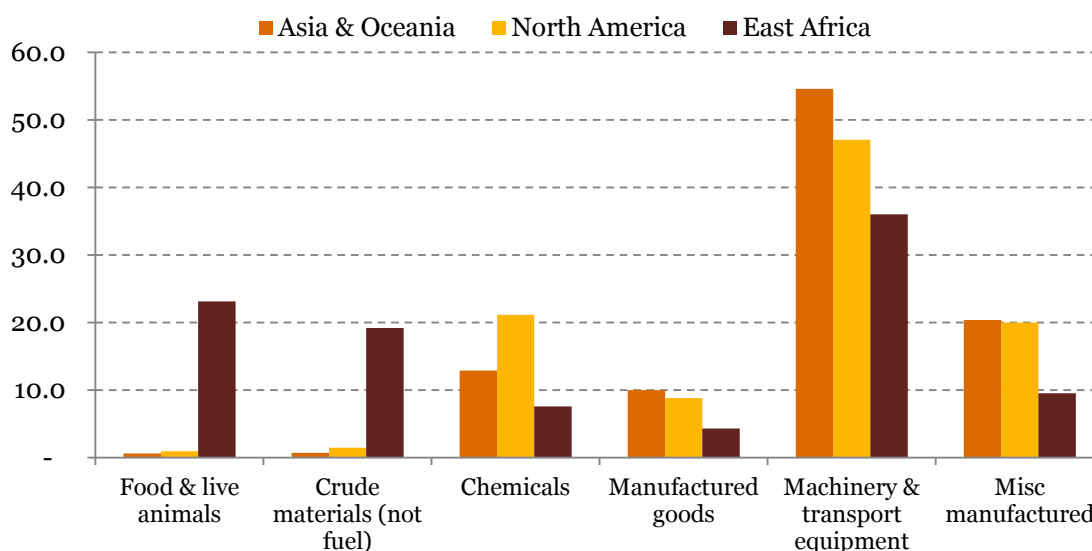
Source: CAA⁴⁰

³⁹ Expressed as air cargo carried to and from UK airports (tonnes). Source: <http://www.caa.co.uk/default.aspx?catid=80&pagetype=88&sglid=3&fld=2012Annual> (accessed 03-11-13).

⁴⁰ Proportion of air cargo carried to and from UK airports. Source: <http://www.caa.co.uk/default.aspx?catid=80&pagetype=88&sglid=3&fld=2012Annual> (accessed 03-11-13).

The following chart highlights the percentage (by value) of UK trade (total imports and exports) with three key regions, in which goods were freighted by air. The most significant product grouping across each region is that of machinery & transport equipment. Chemicals and manufactured goods are also significant product groupings in terms of trade with Asia and North America, whilst trade in crude materials and food & live animals is more significant with East Africa⁴¹.

Figure 32: Imports and exports by air as a percentage of total trade with each region (by value)



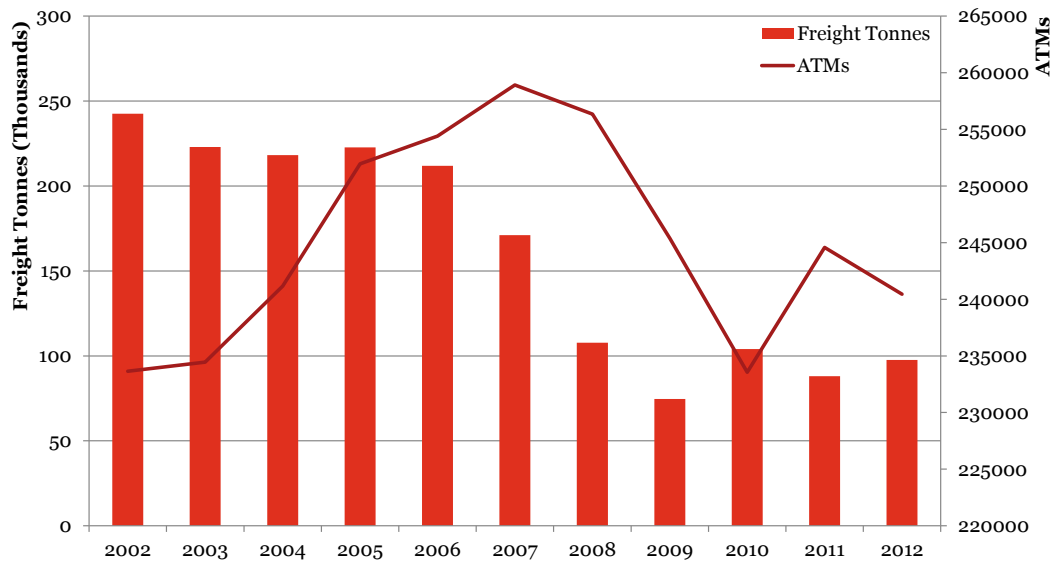
Source: HMRC, PwC analysis

Case Study: The decline in air freight volumes at Gatwick Airport

A case study looking at air freight activity at Gatwick Airport, its recent decline and comparison to Heathrow, sheds light on some of the drivers of air freight volumes. Both Gatwick and Heathrow are located close to the UK's economic centre of London. Gatwick caters for around 34 million passengers per year and 240,000 movements while Heathrow is nearly double this at 70 million passengers per year and 470,000 aircraft movements. However, Heathrow catered for 15 times more air freight than Gatwick in terms of volume in 2012.

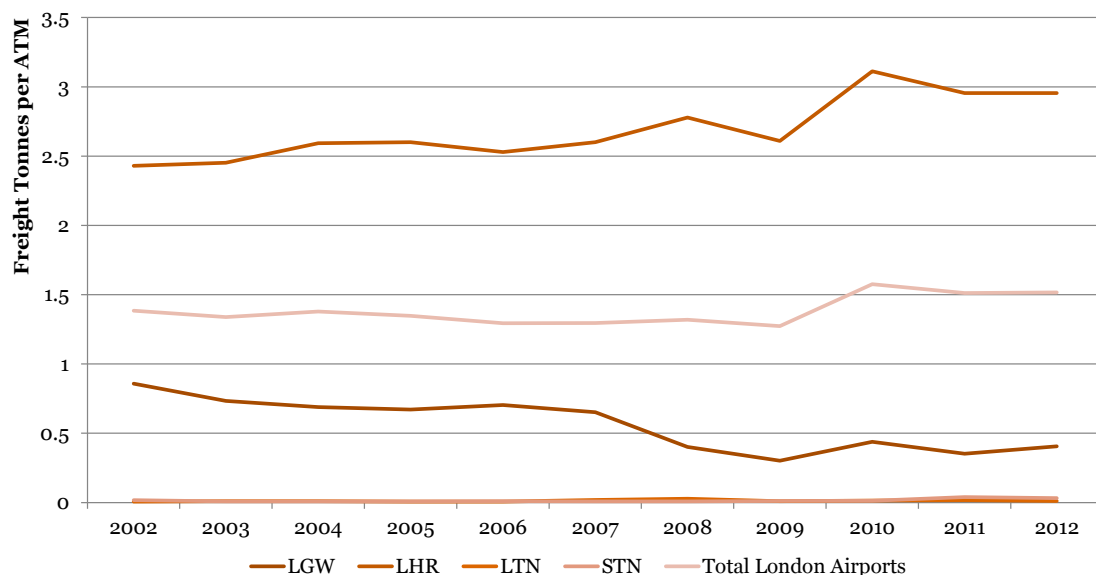
Cargo volumes at Gatwick Airport have fallen significantly over the past decade from nearly 250,000 tonnes in 2002 to under 100,000 tonnes in 2012.

⁴¹ Source: HMRC. Note: Value of imports and exports only.

Figure 33: Freight Tonnes Handled at Gatwick Airport, 2002-2012

Source: CAA

Bellyhold freight per air traffic movement (ATM) at Gatwick has always been lower than at Heathrow given the lower level of connectivity, mix of destinations and therefore lower freight activity. However, the level at Gatwick has dropped since 2008 due to the change in mix of traffic, however overall freight per ATM at London airports was maintained from 2007 to 2009 and increased from 2010. Possible drivers for the overall increase could be recovery in the market following the recession or additional freight generated through the consolidation of US flights to London at Heathrow. Passenger services at Luton and Stansted carry very little freight given the high proportion of Low Cost Carriers (LCCs) where their required short turnaround times do not support a freight operation.

Figure 34: Freight Tonnes (Bellyhold) per Air Transport Movement at London Airports

Source: CAA

The decline in cargo volume at Gatwick was driven by a combination of two key factors:

- 1) The expiration of Bermuda II⁴² and the introduction of the US-EU Open Skies
- 2) The reduction of British Airways services and the increase in easyJet services at Gatwick

The expiration of Bermuda II and the introduction of the US-EU Open Skies

In 1977, the British and US governments signed the first bilateral agreement for air services between the two countries, restricting flight frequencies and airlines operating on routes. For example, there were limits to the number of services and which airlines could operate to Heathrow. In 2008, the EU and the US signed an 'Open Skies' agreement removing all restrictions on air movements. As a result, carriers were free to move routes according to demand and Gatwick lost some of its routes to the US. As a result of US-EU Open Skies, Gatwick lost some of its long haul US routes. The gap was primarily filled with short-haul, low cost services. This trend is illustrated in the table below which reflects the frequency of flights from the US to major European airports. The overall number of flights declined by 4,584, and Heathrow was the only airport that saw an increase in frequency.

Figure 35: Frequency of flights between US and European airports 2007 - 2010

Airport	Change in frequency 2007 - 2010
LGW	-6,740
LHR	3,947
AMS	-460
CDG	-360
FRA	-971
Grand total	-4,584

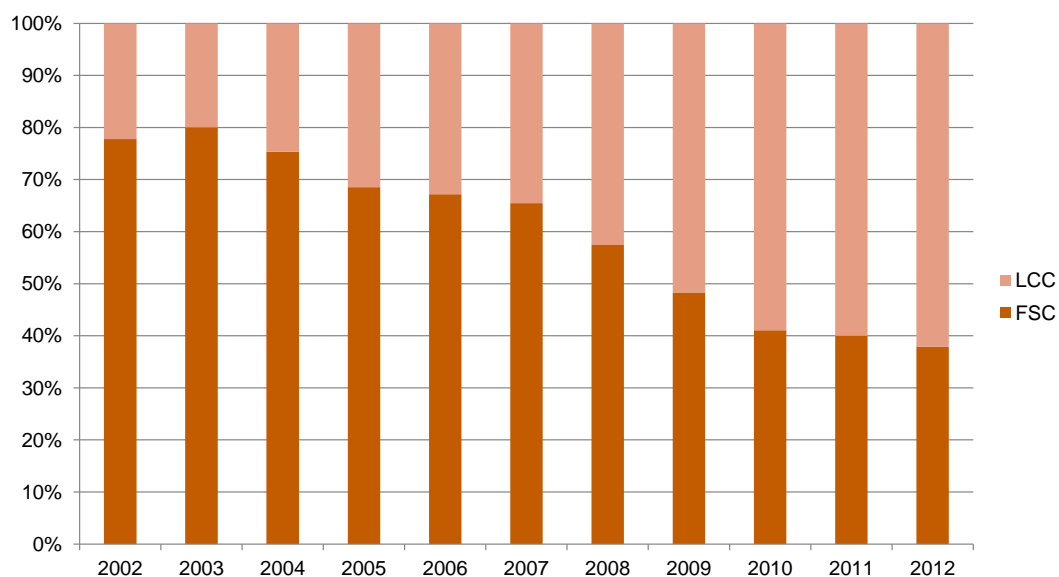
Source: Sabre Airport Data Intelligence

The reduction of British Airways services and the increase in easyJet services at Gatwick

With the creation of IAG in 2010/11, BA and Iberia began a process of consolidation of UK operations around Heathrow and hence BA traffic moved away from Gatwick. easyJet ramped up operations, filling the gap in capacity and becoming the largest operator at Gatwick in terms of both passengers and movements.

The overall bellyhold capacity at Gatwick has declined as a result of an increased share of short haul flights utilising narrow body aircraft, which have a lower cargo carrying capacity, as well as an increase in the share of low cost carriers, who do not carry cargo.

⁴² Bermuda II was a bilateral air services agreement between the governments of the United Kingdom and the United States signed on 23 July 1977 as a renegotiation of the original 1946 Bermuda air services agreement. The agreement limited which airports and airlines could serve routes between the two countries.

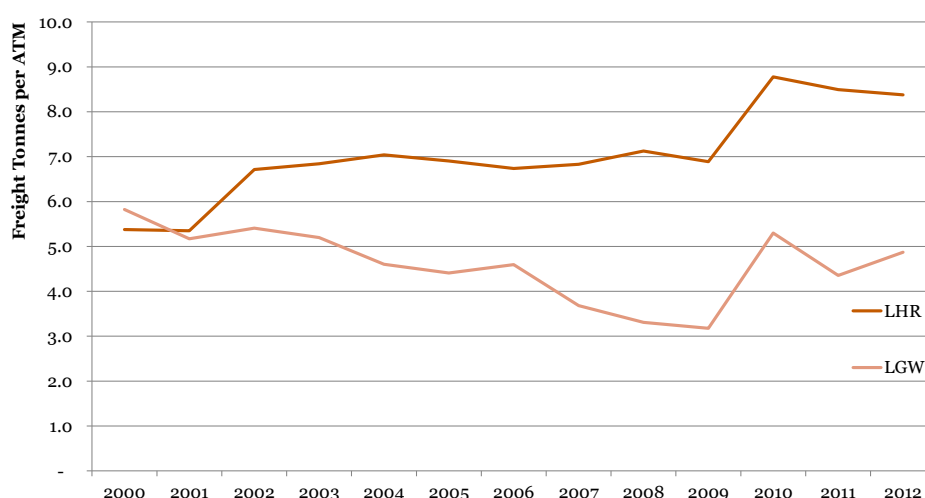
Figure 36: Share of scheduled seat capacity by carrier type at LGW

Source: Sabre Airport Data Intelligence Capacity Report

The share of widebody aircraft declined from 18% in 2007 down to 8% in 2010 and has remained at that level since. This has had a significant impact on the amount of belly hold cargo capacity at for passenger flights to and from Gatwick Airport.

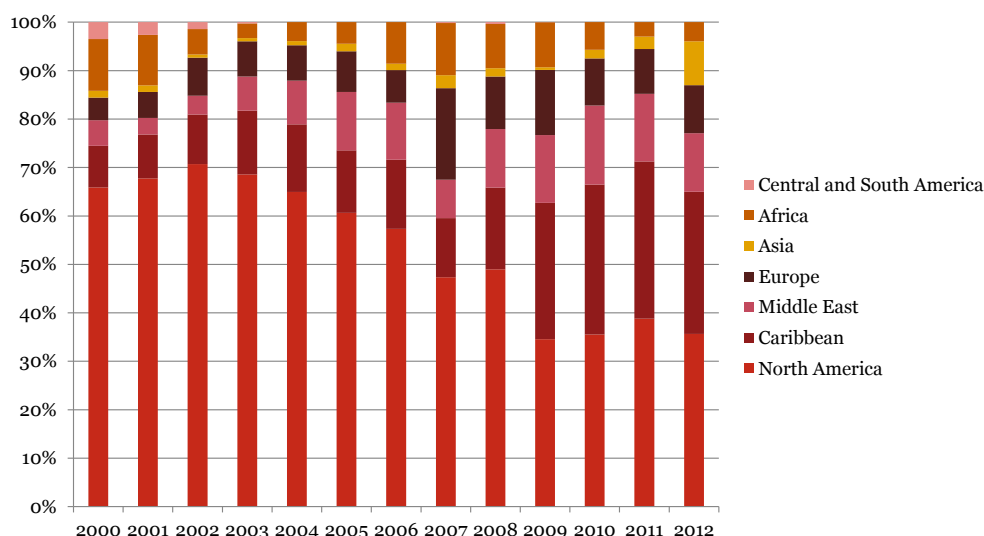
Figure 37: Share of scheduled movements at LGW by aircraft category

Source: Sabre Airport Data Intelligence, PwC analysis.

Figure 38: Bellyhold freight tonnes per widebody movement at LHR and LGW

Source: Sabre Airport Data Intelligence, CAA, PwC analysis

There appear to be other drivers of the reduction in freight, one of which could be the change in the route network as a result of the two factors mentioned above. Of routes using widebody aircraft (typically long haul), the share of frequencies to North American destinations declined, with the share of flights to the Caribbean increasing. Based on IATA data, the UK – North American air cargo market (787,000 tonnes in 2012) is much larger than the UK – Caribbean air cargo market (24,000 tonnes in 2012). Leisure destinations generally have a lower level of air freight compared with business destinations due to the lower level of trade of goods between the countries and therefore demand for air freight.

Figure 39: Share of scheduled widebody movements at LGW by destination region

Source: Sabre Airport Data Intelligence, CAA, PwC analysis

Level of transshipment

Similar to passengers transferring at airports, there is also cargo transshipment where cargo arrives from its origin to the transfer hub and is moved on to a different aircraft to reach its final destination. The majority of freight at UK airports arrives or departs by truck; however, the level of air to air transshipment is estimated at 10-12%⁴³. There are required lead times to unload cargo from its arrival flight and move it to its destination flight through secure processes. The minimum time for transferring cargo from one flight to another is around 2 to 3 hours⁴⁴ at UK airports.

Companies such as DHL, FedEx, TNT and UPS structure their businesses around a hub and spoke model as this provides the greatest operational efficiency and facilitates high levels of customer service. Goods and cargo are transported into Heathrow from all over the UK and in the same way transfer passengers support the viability of airlines to access new routes, so does cargo. These goods can then be sent to destinations all over the world on the network provided.

Value of air freight to the UK economy

Air freight services are vital to the UK economy and access to these services allows the UK to maintain its position as an international centre of business and high value manufacturing. The UK aviation sector is one of the most competitive in the world. Based on a study conducted by Oxford Economics, the aviation industry directly contributed £11.4 billion to UK GDP in 2004 and employed 186,000 people and 520,000 jobs in the UK depend on the aviation sector.

Based on a study conducted by MDS Transmodal in 1999, the UK air freight sector contributed an estimated £5 billion to GDP in 1996 and was estimated to directly employ 40,000 to 55,000 people. A 2010 report by Steer Davies Gleave for the DfT⁴⁵ estimates that air freight and supporting industries employ an estimated 39,000 people in the UK. A recent study by Oxford Economics⁴⁶ found that the express freight industry alone contributed around £2.3 billion to UK GDP in 2010. The study also found that the express freight industry directly employed 38,000 in the UK and supported at least 82,000 jobs indirectly.

⁴³ Stakeholder discussions

⁴⁴ Stakeholder discussions

⁴⁵ Steer Davies Gleave, a report for the Department for Transport, AIR FREIGHT Economic and Environmental Drivers and Impacts, March 2010.

⁴⁶ Oxford Economics, Response to the Department for Transport's Night Flights Consultation, A report for the Association for International Courier & Express Services, April 2013.

Appendix 1: Stakeholder discussions

The notes below were developed following discussions with a selection of stakeholders, i.e. airlines, trade associations and freight handlers.

Importance of freight capacity to airline profitability:

1. Cargo “is not just a nice to have”, it is an important factor in terms of route profitability.
2. Whilst an airline’s route network is driven by passenger demand, bellyhold freight is an important consideration in terms of profitability, and could potentially make the difference between a route being loss-making/profit-making.

Importance of freight in fleet and network development

3. Generally, the longer the flight, the more important bellyhold cargo becomes.
4. On flights with high pax load factors cargo becomes less important than other factors including route viability, incremental revenue and profit.
5. One airline quoted an example of a competitor’s cargo department requesting a different aircraft than that which had been decided on for passenger services solely due to its cargo capacity (747 combis / 747-800s).
6. In terms of aircraft type, the 777 is viewed as the ‘best’ aircraft for cargo – the A380 generally has 25-35% lower capacity for freight due to flight length and fuel loads. Flights of c.7-8 hours provide good freight capacity – longer flights have lower capacity due to fuel requirements.
7. The freight routes forecast to develop significantly over the medium term are routes between developing countries. This is not viewed as a significant threat in the UK, where established trade routes exist with Commonwealth countries.

Drivers of decision-making in locating fleet operations at a particular airport

8. Logistics companies will be driven by the following factors:
 - i. Carriers’ operations, i.e. frequency of flights with belly hold capacity.
 - ii. The local regulatory environment and costs – indicators of efficiency are reviewed on a European basis, and Heathrow needs to remain competitive in order to act as a global hub.
 - iii. Land-side transport links and the ability to forward consignments efficiently. The road network surrounding Heathrow offers significant benefits in terms of connectivity. One operator stated that this means that cargo operations can be based in Glasgow, where goods are received, then consolidated and transported by road to Manchester, East Midlands or Heathrow.
 - iv. Proximity of other operators – there are recognised economies of scale in terms of being part of a hub (lower set-up costs, synergies with competitors operating in the same area, availability of experienced staff etc.).

Airport turnarounds and transshipment

9. The minimum turnaround time at Heathrow is c.2 hours – this is dictated by Service Level Agreements (SLAs). It is much less at some other airports that have been designed in a way that encourages handling efficiency, e.g. Dubai. This is the same for transshipment – a large proportion of passengers and products are transferring to connecting flights, so the infrastructure is designed to enable loading of passengers and cargo together, hence minimising transfer times.
10. A lot of freight is handled at Heathrow from the US for transshipment to the Middle East

Value of time slots

11. Value is determined by convenience for end-use, e.g. flights that arrive in the morning (e.g. trans-Atlantic flights) are most convenient for transport of fresh goods to markets and restaurants. Middle East flights leaving the UK in the afternoon are popular because they arrive late in the evening, when a lot of transshipment activity takes place.
12. Night flights require additional labour costs, but they are seen as a necessity in meeting demands of customers (both shippers and end customers) for next day delivery. If night flights were restricted it would be seen as being of significant risk to the manufacturing sector, with the possible impact of relocation to mainland Europe.

Products

13. Fresh produce has a heavy reliance on air freight, as well as products with a high value to weight and size ratio, particularly electronics (both components and products).
14. Some products have a lower value, but the on-cost of delivery delays would be significant, e.g. oil rig engineering components.
15. Some shippers have very particular requirements, e.g. for the shipment of livestock. Pharmaceuticals is regarded as quite a specialised product, e.g. temperature controls and speed requirements of certain shipments, e.g. radiological pharmaceuticals.

Appendix 2

The map below highlights the presence of third party logistics companies in South East England, with a clustering around Heathrow:

