

# Commercial Cargo Needs, Market, and Metrics

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# Overview

- Current state of the market
- Predicted market growth
- Predicted air cargo fleet growth
- Air Cargo Airlines
- System issues
- Risk / Constraints

## Current State

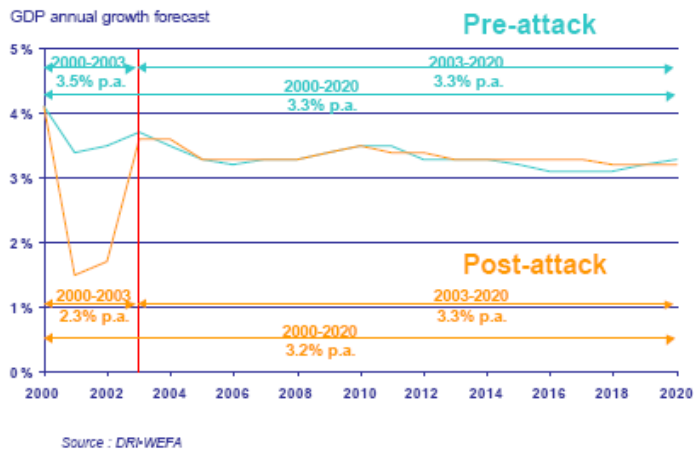
- Most economic models show large correlation between air cargo growth and economic growth
- Multiple factors have led to the current crisis:
  - Economic slowdown in US/Europe
  - Sept 11
  - Increased security costs
  - Reduction of information technology/high-tech equipment sales
  - SARS virus
  - Geopolitical conflict
- Falling yields, integrator expansion, and consolidations of freight forwarders

Most economic models have shown an extremely high correlation between the air cargo growth and economic growth, as measured by GDP. There are other drivers such as globalization and lean inventory strategies, but the economic downturn is probably the biggest reason that the air cargo industry has been suffering through a huge recent crisis.

This crisis was caused by multiple factors. Around the year 2000, the economic slowdown in the US as well as in Europe preceded the terrorist attacks on Sept 11<sup>th</sup>, which then led to increased security costs. The reduction of information technology/high-tech equipment sales also put a small dent in air cargo. The recent outbreak of the SARS virus along with the plethora of conflicts that have plagued the 21<sup>st</sup> century so far were also key ingredients in forming the current crisis.

In addition, falling yields, the expansion of integrated express carriers, and the consolidation of freight forwarders have all been recent trends in the air cargo industry.

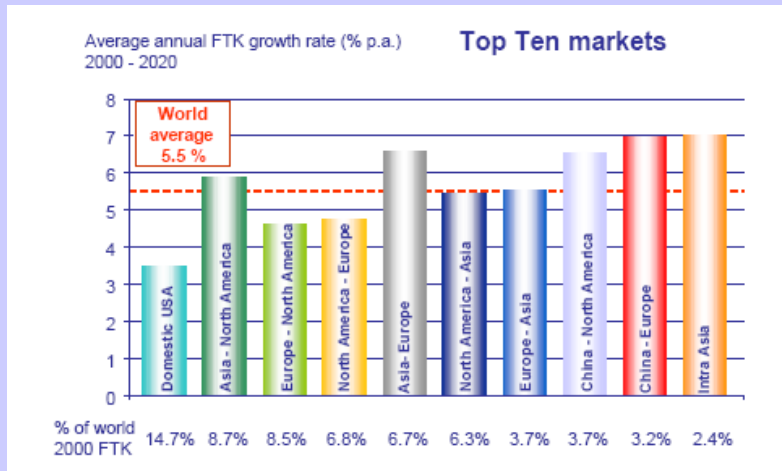
## World GDP growth : deep recession and strong recovery



- World GDP will average 3.2% growth per year
- World air cargo traffic will grow at 6.4% per year

However, most major market forecasters predict that world GDP will make a strong recovery, which will then of course be the impetus for strong recovery in the air cargo market. The predictions for the next twenty years are for world GDP to grow on average 3.2% per year and for world air cargo traffic to grow on average 6.4% per year.

# Regional Growth



- Asia growing fastest; mature markets growing slower

Now here is a chart of the top ten air freight markets in the next twenty years according to the Global Market Forecast produced by Airbus. As is evident, the fastest growing markets are those linking Asia to other regions as well as Intra Asia whereas the domestic US market and other maturing markets will grow much more slowly.

# Regional Growth

- US share of world market will drop from 30.4% to 26.1% by 2021
- Asia's GDP share will grow from 24.7% to 26.3%
- Domestic China will grow at 10.3% per year, or possibly 11.2% per year (depending on source)
- Intra-Asia will grow at 8.4%, Asia-North America will grow at 7.5%, and Europe-Asia at 7.0%
- Fastest growing air freight markets are those connecting Asia-Pacific to Europe and North America
  - 7/10 top flows serve this region
  - Together, they will represent 40% of world air cargo in 20 years and will form the majority of the demand for long range cargo airplanes

-So, to break that down a little further, the US share of the world market is currently 30.4% and will decrease to 26.1% by 2021.

-Asia's share of world GDP will instead grow from 24.7% to 26.3%.

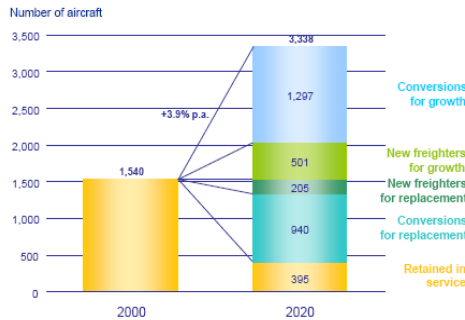
-Domestic China, one of the top future markets, will grow at 10.3% per year or possibly even 11.2% depending on which source is used.

-The Intra-Asia market will grow at the fastest rate of all Asian markets, around 8.4%. The Asia-North America market will grow at 7.5%, and the Europe-Asia market will grow at 7.0%.

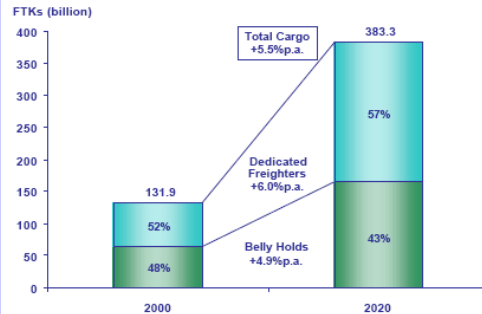
-So what can we conclude from all of these numbers? Essentially, the fastest growing air freight markets are those connecting the Asia-Pacific region to Europe and North America. 7 out of the top ten markets serve this region, as you saw on the previous chart, and together, they will represent 40% of the world air cargo market in 20 years and will be the basis for the demand for long range cargo airplanes.

# Air Cargo Fleet

**The world freighter fleet will more than double**



**Passenger aircraft will continue to play a crucial role in airfreight transport**



- World freighter fleet will double by 2020
- Not including passenger aircraft system

In response, the world freighter fleet will more than double by the year 2020, according to most predictions, going from an estimated 1,540 in the year 2000 to 3,338 dedicated freighters in the year 2020.

-About 395 of those will be ones retained in service throughout those 20 years.

-About 940 of those will be passenger airplanes converted to cargo ones to replace old or faulty planes.

-205 will be new freighters for replacements, and 501 will be new freighters for growth.

-Finally, 1,297 will be conversions for growth of the industry to meet the increasing demand.

Just to let you know, these numbers are all for dedicated cargo airplanes. This does not include the passenger aircraft system, which in the year 2000 carried 48% of the global airfreight traffic, and is projected to carry 43% of that traffic in 2020.

# Aircraft Size

- Most new production freighters will be large aircraft
  - In 2020, intermediate size (regional) freighters will still dominate the market

	Payload	Aircraft types	Open market neutral payload
Feeders	< 30 tonnes	BAC One-Elevens, BAe 146s, DC-9s, 737s, 727s	22 tonnes
Regional freighters	30 - 60 tonnes	707s, DC-8s, 757s, 767-200s, A300s, A310s, DC-10-10s	45 tonnes
Long range freighters	30 - 80 tonnes	DC-10-30/40s, L-1011s, 767-300s, 747combis, MD-11combis	60 tonnes
Large freighters	> 80 tonnes	MD-11s, 747s, A380s	120/110 tonnes (new/converted)

-To be able to support such a large increase in traffic, Airbus predicts that future freighters will need to be utilized much more often and that they will grow in size, increase capacity per aircraft, and thus achieve lower unit operating costs. The catch, as Prof Clarke pointed out, is that larger aircraft are nice only if you can fill them up all the way.

-However, even though a majority of new production freighters will be large aircraft, the intermediate or regional size of aircraft will still comprise the majority of the actual market. In this table, you can see the breakdown of cargo planes into 4 different segments: The feeders, the regional freighters, the long range freighters, and the really large freighters.



# Air Cargo Airlines

## International:

- Federal Express
- Lufthansa Airlines
- Singapore Airlines
- Korean Air
- Air France

## Domestic:

- Federal Express
- UPS Airlines
- United Airlines
- Northwest Airlines
- American Airlines



They have been unable to penetrate the long haul high-end trucking market or the high-end sea cargo market.

-It is also necessary to what airlines are out there doing this right now. You can see the top 5 international carriers as well as the top 5 domestic ones.

-Whether it's designing an entirely new large freight transportation vehicle or using existing aircraft to fly formation to save on fuel costs, or possibly even some combination, it has not been accomplished. I'm sure you all remember the letter I read to you from FedEx outlining the desired specifications. They seemed pretty tough to meet, but then again, I guess that's part of the challenge.

# Air Cargo System

- Sea transport takes 99% of cargo market and leaves only 1% for air transportation (by weight)
  - Opposite for passenger transport
- Capture the top 1% or 2% of sea transport and cause a large growth in the air freight market
- Multiple factors involved:
  - Production and distribution are interconnected
  - Difficult to quantify supply and demand
  - Depreciation of shipped goods - TIME!
  - Total Distribution Cost (TDC) = Transport Cost + Holding Inventory
    - Transport Cost = DOC + IOC = Cargo Rate
  - Choose an aircraft type based on our mission design and cargo rate
  - Minimize cost per ton-mile

-So we need to look at it from an overall viewpoint. Sea transport is currently responsible for 99% of the cargo market whereas air cargo takes only 1%. Conversely, those numbers are the exact opposite for passenger transport. Thus, the two markets, people and cargo, are significantly different, and so the systems that transport both are significantly different as well.

-As a class, our job would be to capture that top 1 or 2% of the sea transport and cause a large growth in the air freight market.

-However, there are multiple factors involved in setting up such a system. I will give a few of them here, but I'm sure there are hundreds more. First of all, the production and the distribution of goods are inherently an interconnected architecture. Unfortunately, it is quite difficult to quantify supply and demand in this market because of the lack of comprehensive sources of data, carriers that provide cargo and passenger capacity, and many other issues. Another key component of the air cargo system is depreciation - that the goods being shipped lose value the more time it takes to deliver them. Time is such an important factor in a system such as this. This concept of just-in-time delivery of products is in increasing demand because a huge chunk of potential profit is lost when goods are not delivered in time to catch the right fad, for new orders, or for replacements. And carriers that can provide such rapid delivery can also charge a premium to increase their revenue. So time in this issue is paramount. An extremely simple model would equate the total distribution cost with the transport cost and the cost of holding onto inventory. The transport cost could be further broken down into the direct operating cost, like fuel and maintenance, and the indirect operating cost, like cargo handling and administration. That sum is also called the cargo rate. We would want to pick an aircraft based on our mission design and that cargo rate, and our main goal would be to minimize this total cost per ton mile. If we could do this to such an extent that significant savings could be demonstrated over a certain period of time, then we would be in business.

# Risk / Constraints

- Economic
  - Bankruptcy, regional or world economy deterioration, supply chain problems...
- Political
  - War, gov. changes, terrorism, privatization...
- Disasters
  - Weather, disease...
- Regulatory
  - Taxes, policy changes...
- Internal
  - Forecast error, strike, plain crash...

One final item that has not been discussed is the risk associated with maintaining a transportation system of this nature. You might also call these constraints. There are the economic risks of economy deterioration, supply chain problems, and other things. There are political risks such as war, government changes, terrorism. Natural disasters can certainly cause problems. Regulatory decisions to impose taxes or change certain policies can also have a profound effect on our system. Finally, internal risks such as our planes crashing into each other while flying in formation must certainly be taken into account.

Questions?

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