What are the factors that influence the cost to transport cargo by air? How a basic freight rate is formulated and what are the many processes that have to be accounted for when shipping cargo are analysed.

The elements that combine to form a freight tariff

Historically freight shipment rates were governed by the distance flown and the fuel used. This all changed with the introduction of widebody aircraft, such as the 747, in the early 1970s. This is when, according to many freight forwarders and operators, the modern airfreight industry was born.

It is the belly capacity of the 747 that permitted airlines to carry generous freight payloads. For the first time airlines viewed belly cargo as an additional revenue stream, rather than a marginal income.

Ralph Perkins, managing director Aviation Logistics Network Ltd, says: "Today it is possible to charge more for a freight rate going to Europe than for a consignment from London to New York."

This is because of the level of demand in relation to the available capacity and the size of the passenger aircraft belly space. "In Europe, 75-80% of air cargo is shipped in the belly of a conventional passenger aircraft," says Perkins. "Everybody thinks that freighter aircraft have the monopoly on airfreight, but from the UK I believe that not to be the case."

Shipping goods to Europe means that capacity is typically based on narrowbody aircraft, because of the large numbers of the type that operate in European airspace. Shipping capacities are therefore squeezed because lower payload space is squeezed.

Freight rates

A freight rate mainly comprises the actual rate, a fuel surcharge and a risk fee.

The freight rate is based on supply and demand for capacity to a destination. "For example, for a very popular destination, like New York, it is possible to have 40-50 airlines offering different rate combinations," explains Perkins. "These rates can range from a very high express rate to a very low rate. Yet sometimes the lowest rate does not mean it is the worst service."

Sometimes an airline has a more frequent flight rate, and so will have more belly capacity to fill. Operators in such circumstances will generally lower their freight rate.

The basic freight rate prices can change daily, and a carrier will give an indicative price on what they can offer. Typically, once a carrier quotes a freight rate price, it will adhere to it, even if demand on that route leverages a price increase.

A spot rate is a rate that is given for an individual shipment, on a specified flight. "If you ask a carrier for a spot-rate for something that is particularly large or heavy, then depending on the load factors at that time, you may well get a quote that brings the price down even cheaper," explains Perkins. "If the airline knows that a flight is running light on cargo, then you might get a spot rate to fill that void in capacity. This can often be discounted. The airlines will have a set discount matrix that they will not go below."

In terms of pricing, carriers are sophisticated in terms of how cargo adds to the revenue stream of a flight. Often major carriers will employ large cargo sales teams who are dedicated to selling freight capacity to maximise aircraft potential.

Sales teams are constantly analysing the market and capacity to seek out the best ways to use available capacity. Their duties are to leverage fixed and spot cargo rates for specific flights. Sales teams will also contact freight forwarders to promote new routes or services.

Loose rates pertain to shipments that are forwarded to the airline as bulk cargo. The non-containerised cargo is commonly based on shipment weights of less than 1,000kg.

ULD rate is when a unit load device (ULD) is bought from the airline at a fixed price by a shipper or consolidator. It is their responsibility to fill that container and make it profitable. Not all freight forwarders are consolidators, because they do not always have the demand to load a container full of cargo.

"For certain destinations freight forwarders will have enough critical mass to fill a ULD," says Perkins. "Forwarders will buy the container space from the airline. Choice of carrier is typically based on which one has the capacity, and which is chasing the most work."

Many cargo routes are omni-directional in terms of capacity. This means the aircraft operates at a maximum cargo capacity in one direction and can be nearly empty on the return. Not all flights, however, are long-haul operations or direct. Transhipment carriers often charge a cheaper freight rate than a point-to-point carrier, because they take a less direct route via different countries.

Block space allocation & permanent bookings

Permanent bookings (PB) are when a freight forwarder will commit to a certain level of freight on a certain day on a certain flight for a set period of time.

"I might say that I need to fly 1,000kg out to New York every Saturday," says Perkins. "As a freight forwarder I will guarantee that shipment each week, so it is advantageous to agree a PB with the airline."

The agreed price will be based on a set value per kilo or per pound. PB rates can be good, because it is a volume business, but if routes get very busy, a PB can be expensive. Then it is more economic to

Due to its range and payload, the introduction of the widebody aircraft, such as the 747, in 1970 signalled the beginning of the modern airfreight industry.

agree a block space agreement (BSA) with the airline.

"The difference between a BSA and a PB is that if you do not use your full allocation with a PB, the airline can sell the deficit in capacity. It is important that you are honourable with the airline and tell them in advance," explains Perkins. "If you are only shipping 500kg out of an arranged 1,000kg PB, then the remaining 500kg will be released into the market and sold to another forwarder."

With a BSA, the freight forwarder is contracted to a period that the BSA in place. If a 5000kg BSA is agreed, the forwarder will have to pay for all of it, regardless of how little it uses. This is because BSA contractual conditions are significantly more binding than a PB.

Agreeing a BSA puts an emphasis on the airline to guarantee that it can move the requested freight volume at that time. "Another difference between a BSA and a PB is the way that the capacity can be released if it is not used," says Perkins.

The reason why freight forwarders agree to take a risk by agreeing to a BSA is because some key markets can become saturated at certain periods of the year. Arranging a BSA ensures movement of a supply chain during times of high demand. Many freight forwarders will negotiate BSAs six months or even a year in advance.

Surcharges

Normally carriers will quote separately for the fuel surcharge. Some carriers are introducing an all-inclusive price, but most include a fuel surcharge to react to fluctuations in oil prices.

If the oil price goes up, the fuel surcharge goes up correspondingly. The system allows any increase in fuel charges to be passed directly to the consolidator or forwarder. Fuel price rises are then passed from the freight forwarder to its client.

"In the past, fuel would not have a surcharge, because fuel and the distance flown were part of the same equation. Now this has changed. The fuel surcharge is an evolution of the original rule, meaning the amount of fuel used and its cost are attached to the surcharge," explains Perkins. "If you take the cost of the fuel out, the rate would just be the distance flown and the capacity used. Today it is the space available in the cargo hold, not the price of fuel that relates to it."

Fuel consumed comes from the fuel surcharge. Characteristically the fuel surcharge is higher than the higher capacity used. Fuel surcharges are built into the pricing matrix to safeguard the carrier against fluctuations within the oil market.

Security & handling

Handling is charged at a per kilo rate, and may vary between carriers. Costs incurred are to take the shipments airside and include loading the shipment onto the aircraft, and unloading it.

In addition, there is the security vetting of the contents. "Because the UK is classified as a high-risk area, you have to be able to warrant that the cargo being loaded on board the aircraft is safe," explains Perkins. "All the contents of the cargo need to be security checked. This leads to a separate security fee for screening the cargo by various methods, of which X-ray is the most popular."

The charges typically reflect the process of any X-ray screening or dealing with the administration. Known shippers have regulated levels of security clearance. Unknown shippers need enhanced security checks such as X-ray screening, either at the forwarder's premises or at the airline or their designated handling agent.

Transportation charges will be applied for collecting the consignment at the freight forwarder's premises. Clients can also be responsible for the charges incurred by shipping agents for creating all the required shipping documentation, such as the airway bill.

"Additional fees are applied to cover the cost of export customs clearance," says Perkins. "This is now done electronically. There is a fee for transmitting that information, and for the customs entry. Every forwarder must provide this time-critical information before any shipment is sent. It cannot send it a week later."

Once customs has cleared the consignment, an electronic release note will be generated. Only then can a trucking company collect the consignment, complete with the release note and manifest. Customs clearance processes vary between countries, and different rates of duty and taxes will be applied to a consignment.

Green initiatives

According to Perkins many clients are now conscious of the carbon footprint of aircraft operations, meaning calculations must be made to demonstrate a shipment's carbon footprint.

"Carbon footprint calculations are very technical," explains Perkins. "For example, we have to demonstrate the grams of carbon emitted per kilometre of any given consignment. Clients who choose to offset the carbon emissions can be charged at a percentage rate of the consignment."

Green initiatives mean that airlines are now taxed on their carbon emissions. These taxes are passed down though the supply chain and eventually to the client. Carriers that are operating less efficient, older aircraft will be penalised.

Airline pricing

In terms of pricing for freight, both belly space and freighter space work from the same business model. Most transactions are based on a per kilo tariff, which is usually the same for passenger belly capacity and a dedicated freighter.

Charles Roberson, managing director,

Boeing 747 freighters with a nose loading capability are in high demand. This is because the vast nose door enables shippers to load outsized cargo, that will not fit through a side cargo door.

ITW Aviation Ltd, says: "Freight forwarders want to buy the capacity from the operator for as little as possible, then sell that capacity to the market as high as they can."

It can be very difficult for airlines to attract business when clients are faced with trade disputes between countries. The additional tariffs raise the price of the goods, which translates to a drop in demand. Air cargo between China and the USA has declined because of trade sanctions. As the cost of an item rises thanks to additional tariffs to import it, this will slow demand for it.

"Chinese producers have been lowering the prices of their products to dilute the tariffs to maintain demand. Lowering prices, however, means it then makes less economic sense for suppliers to send their products," explains Roberson. "Fundamentally freight carriers in these regions have noticed a decline in demand, but capacity has stayed the same."

Lower cargo demand ultimately influences a carrier's freight rate. To incentivise these routes, operators reduce their freight rates to increase demand.

Often the demand for cargo on routes will fluctuate, which will in turn influence the price of the freight rate. Asia is a large generator for airfreight demand to Europe and to the US. There is a much lower demand for courier material from Europe to Asia, and from the States to Asia. Consequently, a general cargo demand driver is needed to leverage demand.

Differences between the rate charged for general freight and the courier material is typically a factor of three; meaning the tariffs offered by airlines will be low. Yet as the service grows the market will notice the benefits and the freight rate will gradually rise. Furthermore, improvements in infrastructure and airports' ability to handle cargo more economically can influence the demand for an increase in general cargo. Nevertheless, demand is still significantly higher from East to West.

It can depend on the item and the nature of the relationship between the carrier and the shipper if freight rate is calculated on a volumetric or weight basis.

This is because the two main constraints for air cargo are the freight weight and freight volume; weight will ultimately decide if the aircraft can take off, and volume will be dictated by the physical size of an aircraft's cargo hold.

"If you are moving a large awkward piece, then generally the freight rate will be based on volume. If you are moving cargo that is quite dense, then as a rule the rate will be calculated on a per kilo basis," says Roberson.

Large, awkwardly-sized freight items can leave little meaningful fuselage capacity for any additional bulk cargo or containers. Shipping tariffs will therefore be volumetrically based because of the opportunity cost incurred for not utilising all the weight available.

Very dense cargo can mean that the aircraft will quickly hit its maximum take-off weight limit, but will not have reached its maximum volumetric limits. In this situation it is likely that the consignment will be charged by the weight because of the opportunity cost incurred for not utilising all the volume available.

Freight tariffs can be based on the average density of the cargo volume used. In these circumstances both volumetric and weight charging apply.

"Setting rates is not an exact science, and each airline sets its own," says Roberson. "Freight rates are governed by competition law. The original IATA concept was that a rate was set, and operators should not undercut it."

The IATA regulations proved to be anti-competitive, so the tariff system became based on supply and demand and to what the market will bear.

There have been recent cases in the US where airlines have been fined for price-fixing. Instead of freight rates being derived from market forces, airlines agreed to set their prices above market level. The high prices were passed onto customers, so airlines were generating a higher yield for their capacity.

"Frequency of operations comes into play when setting freight rates. If a carrier is operating at three or four times the frequency on a route, it can discount the base freight rate because of the extra capacity," says Roberson. "Airlines that operate at low frequency on the same route will find it difficult to compete."

Airlines such as Qatar and Emirates are filling capacity across their whole network. Established hubs in Doha and Dubai make it possible to tranship freight through them to anywhere across the world.

Military operations will often require a significant amount of airfreight, because of the vast supply chain needed to sustain them, while trade routes may be closed to ships and road cargo. The situation is exacerbated because many passenger airlines may not want to, or be allowed to, operate in a war zone. The resultant capacity further induces demand.

"Military operations in Iraq and Afghanistan relied on a huge amount of airfreight from all over the world," says Roberson. "Often the military will contract civilian carriers to meet the demand. Because the operator is flying into a war zone, there will be a high insurance premium on top of the freight rate to cover a risk cost."

Freighter operators can get special insurance, which will allow them to fly into a war zone, although the cargo base rate will significantly increase.

"When airlines are calculating a cost of the operation, insurance is part of the airline's cost matrix that includes the aircraft, crew, maintenance and insurance (ACMI). These are the four foundations for any aircraft operation," says Roberson.

ACMI is used by operators that own or lease their aircraft to determine their minimum operating costs. "Atlas Air operates on an ACMI basis. It owns the aircraft and facilitates the crew, maintenance and the insurance," says Roberson.

Freight charter

Chapman Freeborn offers freight charter solutions that range from dedicated freight charters, part-charters, one-way and return-charters.

Airfreight charters have the freedom to ship specific and specialised consignments to particular regions. Airfreight charters are unlike the general airfreight market, which is volumetrically constrained by lower hold capacity, and dictated by passenger timetables.

Similar pricing rules apply between airfreight charters and general freight. Yet for airfreight charters, clients must cover the total operating costs incurred by the airline.

The client will pay a comparable amount for the charter, regardless of whether 100 tons or 10 tons of cargo are loaded on an aircraft.

If it is assumed that the net cost of an aircraft charter between the UK and Miami is $150,000 and aircraft can carry 100 tons, then the rate per kilo must be $1.50 to cover the total operational cost. If the aircraft only carries 10 tons of cargo, the per kilo rate will rise to $15.0 to cover the same operational costs.

Brokers will keep unnecessary volume waste to a minimum by combining part charters when possible.

Raj Sungha, cargo sales manager UK & Ireland, Chapman Freeborn, says: "Typically, an aircraft will not be in the same location as the shipment, so clients will pay to ferry the aircraft from its current location to the shipment pick-up point, because it must fly empty. If the operator can pick up another shipment for the ferry flight this can significantly reduce the cost of the charter."

The round-trip price means the client will also have to cover the total costs for the return flight, assuming the aircraft is empty.

If an aircraft can fly several consecutive cargo missions along the same route it will reduce the aircraft operational costs. Typically, the broker can negotiate a consecutive flight discount between the client and the airline. Doing so will share some of the aircraft operational costs.

This is because the series of consecutive flights means that the operator knows that they have guaranteed business for a period, which creates certainty. Chartering seven or eight flights to a destination will reduce the cost of the charter because of the guaranteed utilisation flying routinely from A to B, and then B to A.

Ad hoc missions are more costly because they are one-off operations.

When the operator needs an aircraft to be positioned in a region, they will subsidise its charter costs for missions to that area. This is because it is in the operator's best interest to have cargo onboard the aircraft when transiting to the destination.

Specialist universal loading devices (ULDs) are used for the transportation of racehorses. Costs for transporting racehorses increases because most breeders require a groom to travel with the animals and monitor their welfare.

"If a client wants to transport a cargo, we will approach the open market and reach out to operators who have aircraft in those regions," says Sungha. "It is much cheaper to procure an aircraft that operates locally because they are nearer to the client's geographies. Sometimes an aircraft can be in the region because it is on a return leg. This means costs will be subsidised."

For summer music tour seasons, operators will have a good understanding of what a band and the festival touring schedule looks like. Instead of booking an aircraft for individual ad hoc operations, brokers will charter it for a whole tour. This is a benefit to brokers, who will know where the aircraft will be positioned and when it will be available.

If the aircraft has been chartered for a season, it can often sit idle at an airport for many consecutive days. It is not uncommon for the aircraft to be marketed for charters during such downtime periods. Because the initial charter has covered the costs for the aircraft's upkeep, charter prices for additional missions in the region can be scaled down.

If an operator can lease out the aircraft in between the pillars of its contract, then the revenue gained will be a bonus. It is possible that such revenue may be shared with the original contractor; reducing their charter cost.

"If it is known that an aircraft is flying from point A to point B, then it is possible to part-charter the aircraft on this route if there is enough capacity available. Because the operational costs have already been paid for through the original charter, then part-charter costs will be lessened," says Sungha.

Airlines and operators will publish their aircraft availability to advise brokers that they have an aircraft operating in a region. If the charter has already been paid for and the aircraft is on a return leg, then it is likely that price reductions can be negotiated.

Seasonal demand directly impacts the availability of some specialised aircraft types. "Recently 747 nose loaders have been highly sought after. The high demand for this aircraft influences the cost of the operation, because the aircraft charter rate increases," explains Sungha.

Many charters do not transit through large commercial airports. "We would not recommend completing a charter flight though Heathrow Airport, because of the challenges and costs to get suitable slots," says Sungha.

Smaller airports are beneficial because they often run a 24-hour operation, unlike many major airports that must close at night because of noise restrictions. As smaller airports are not overloaded with busy schedules, they are cheaper and more flexible in favour of the end-user requirements.

Other considerations can be that the handling agent could not be 24 hours meaning it will be closed during the night. If a client wants to operate a flight in the early hours of the morning, additional fees may have to be paid to the handling agent for out-of-hours charges.

Any clause that is in an airline's contract will be passed on to the client. Occasionally fuel escalation charges can apply, such as a scheduled airline's fuel surcharge.

"We only pass on the fuel escalation charge if there is evidence it has impacted the operational cost," says Sungha. "Fuel surcharges can be incurred at any time, even after the flight fixture. Normally we get notification at the turn of the month or on a weekly basis. Yet this is the current way fuel escalations are calculated."

There is a list of standard charges that charters could incur. When a client charters an aircraft, its obligations reflect the contract between the broker and the airline, because the broker is governed by the operator's terms and conditions.

Other contractual inclusions are the cost incurred for unscheduled night stops. These occurrences are rare and likely to be unplanned. This could be adverse weather conditions, any unforeseeable conditions beyond the control of the carrier.

Sometimes depending on the destination, it is possible that royalty charges could apply. Some countries apply royalty charges to foreign airlines to allow them to operate in their airspace.

"Chartering a flight from the UK to the Saudi provinces will incur royalty charges," explains Sungha. "Chartering a Saudi-registered aircraft or airline to fly a shipment to Riyadh, will be preferred, since the client will not have to pay any royalties."

Charter contracts will typically include fees for de-icing the aircraft, even if an aircraft is operating in a region where it is unlikely to experience a de-icing situation.

The transportation of animals can incur additional charges. "In the case of racehorses, breeders provide that grooms that travel with the horse at all times," says Sungha. "Checks have to be made throughout the flight to ensure that the animal is comfortable, fed and watered on time. There are also simple things like making sure the temperature is correct."

As part of the charter offering, other things come into play. Taxes and security are included in this cost, and are payable by the client. AC