



Agenda

- Airspace and air sovereignty
- Freedoms of the air
- Airline management and route





Airspace and air sovereignty

Countries of the world



The term "country" is used to refer to sovereign states. At present, there are 206 total sovereign states, 195 or so countries, with 193 states participating in the United Nations.



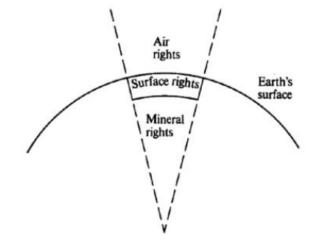




Airspace |



- Air sovereignty is the fundamental right of a sovereign state to regulate the use of its airspace, protect its territory and enforce its own aviation law in extreme circumstance by the use of military fighter aircraft.
- Airspace above the land and sea areas of a state generally forms part of the sovereign state area.
- Traditionally, flights by aircraft of one country into the airspace of another need prior permission.
- Flights by some civil aircraft into the airspace of a UN member state does not need prior permission (Convention on International Civil Aviation).
- Airspace means the portion of the atmosphere controlled by a country above its territory.
 - Including its territorial waters or, more generally, any specific three-dimensional portion of the atmosphere.
 - It is not the same as aerospace, which is the general term for Earth's atmosphere and the outer space in its vicinity.











Basic notations of aviation and air transport

Basic notations of aviation/air transport



Aviation/Air transport

Activities surrounding mechanical flight, the aircraft industry, and airspace and airport infrastructures.

Activities surrounding mechanical flight

The carriage of passengers and cargo by means of ...

- a. scheduled service;
- b. air logistics support;
- c. special flight;
- d. aeromedical evacuation.

Activities surrounding aircraft industry

- a. aerospace manufacturing;
- b. maintenance activities;
- d. Air safety and ergonomics; and others.

Activities surrounding airspace and airport infrastructures

- a. air traffic control and management;
- b. surface traffic operations;
- c. navigation; and others.





Basic notations of aviation/air transport



Civil aviation can be classified into two major groups
(1) Scheduled air transport and (2) non-scheduled general aviation

- (1) Commercial air transport (CAT) operations means an aircraft operation to transport passengers, cargo or remuneration or other valuable consideration on regularly schedules and routes.
- Scheduled air cargo and fright carriers;
- Scheduled air passenger carriers;
- Passenger transportation via regular routes;
- Lease of air-transport equipment in supporting scheduled air transport activities.







Basic notations of aviation/air transport



Civil aviation can be classified into two major groups

- (1) Scheduled air transport and (2) non-scheduled general aviation
- (2) Non-scheduled general aviation refers to the activities that are non-scheduled civil, private or commercial flights.
- Emergency services, such as medical/fire fighting/rescue services;
- Ac-hoc air transport activities / non-scheduled activities;
- Air taxi activities.









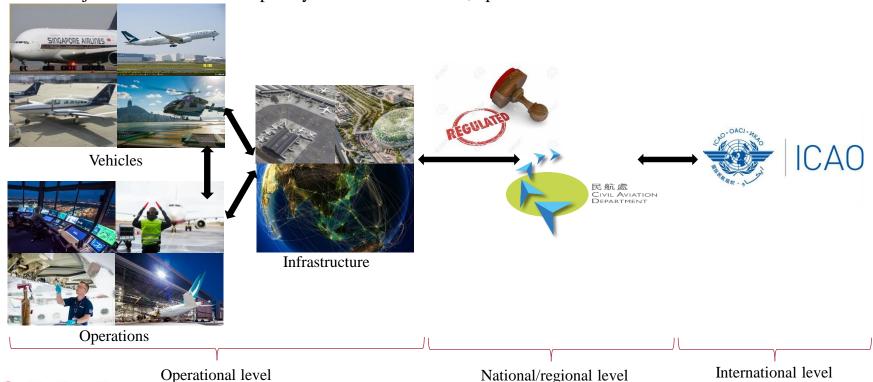


Air transport system



Air transport system is governed and regulated by the national aviation authority.

Three major elements in air transport system – Infrastructure, operation and vehicles.











Freedoms of the air

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Countries of the world



The term "country" is used to refer to sovereign states. At present, there are 206 total sovereign states, 195 or so countries, with 193 states participating in the United Nations.



How does it work?

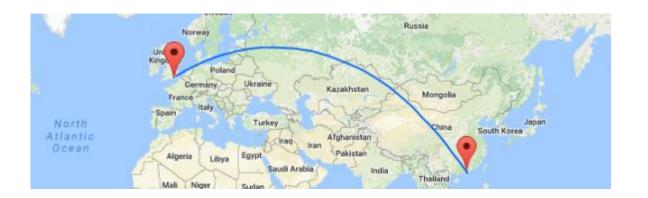


Hong Kong to London Example

- The distance between London and Hong Kong is some 9641km.
- A flight from HKG to LHR passes through 7 different countries (sovereign states): China, Kazakhstan, Russia, Ukraine, Poland, Germany and the Netherlands, and enter and land in the territory of the UK.

Problem:

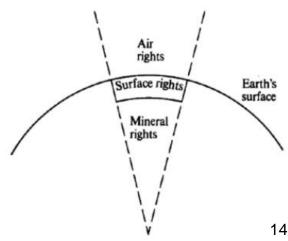
• Crossing the airspaces of sovereign states and landing in the UK require permissions of each state.



Airspace



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Freedoms of the air



How did the aviation industry create boundary-free way of air travel that we take for granted today?

The freedoms of the air

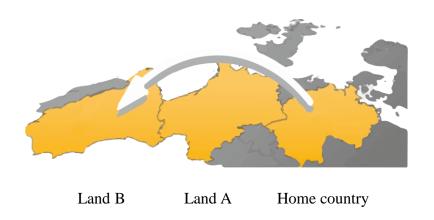
- The freedoms of the air is the fundamental building blocks of the international commercial aviation route network.
- A set of commercial aviation rights, agreed multilaterally, but some bilaterally, between two states, granting a country's airline the privilege to enter and land in another country's airspace, formulated as a result of agreements over the extent of aviation liberalisation in the Convention on international Civil Aviation of 1944, known as the Chicago convention.
- There are 9 freedoms of the air:
 - The first five freedoms are officially stated in the Chicago convention.
 - The remaining 4 freedoms have been agreed and in use, but not official instated.

9 freedoms of the air



First Freedom of the Air:

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

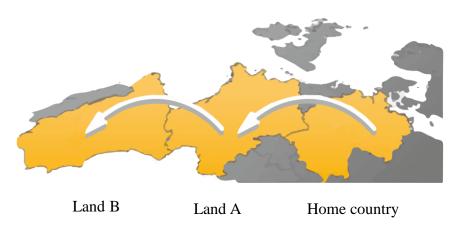


Example: An American Airline flight from the US to somewhere in South America would be permitted to fly through Mexico's airspace to get there.



Second Freedom of the Air:

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

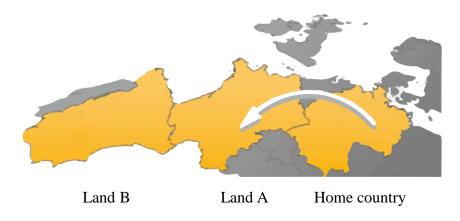


Example: An Australian Airline flight from Melbourne to London could stop in Dubai to refuel but no passengers nor cargo could get on or off.



Third Freedom of the Air:

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

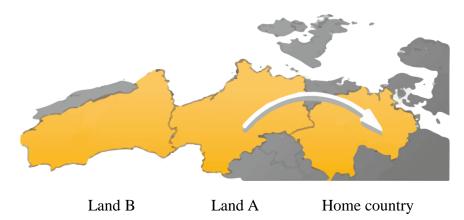


Example: A HK Airline flight from HK to Malaysia could bring passengers originating in HK to Malaysia.



Fourth Freedom of the Air:

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

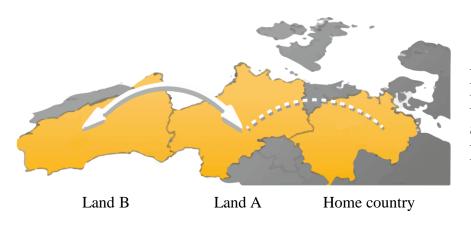


Example: A HK Airline flight from Malaysia to HK could bring passengers originating in Malaysia to HK.



Fifth Freedom of the Air:

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



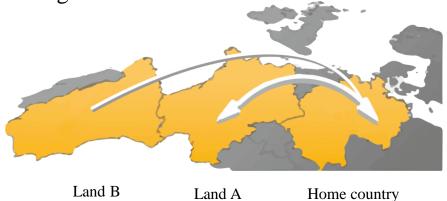
Example: An Australian Airline flight from Melbourne to London could stop in Dubai to enplane and deplane payload before continuing the flight to London.

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



Sixth Freedom of the Air:

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



Example: A British airline flight from HK to Hamburg via London could pick up passengers from HK via a transit in London before deplaning passengers in Hamburg.



Seventh Freedom of the Air:

- The right or privilege, in respect of scheduled international air services, granted by one State to another State, of transporting traffic between the territory of the granting State and any third State with no requirement to include on such operation any point in the territory of the recipient State (also known as a **Seventh Freedom Right**).
 - E.g. The service need not connect to or be an extension of any service to/from the home State of the carrier.

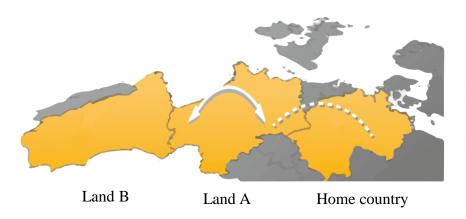


Example: A Singapore Airline flight from Frankfurt to JFK could pick up payload in Frankfurt to flight and off load passengers in New York.



Eighth Freedom of the Air:

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

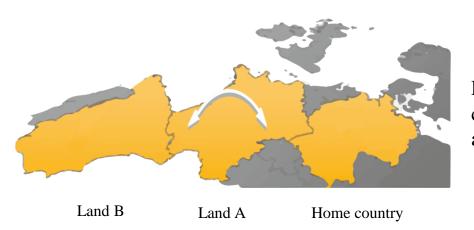


Example: A Singapore Airline flight from Frankfurt to JFK to San Francesco could pick up passengers in New York and off load passengers in San Francesco.



Ninth Freedom of the Air:

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



Example: Qantas Airways, an Australian airline, to carrying passengers and fly regular domestic flights and routes in New Zealand.



Freedoms of the air	航權	名稱	Description
First Freedom of the Air	第一航權	領空飛越權	The right to fly over a foreign country without landing.
Second Freedom of the Air	第二航權	技術經停權	The right to refuel or carry out maintenance in a foreign country without embarking or disembarking passengers or cargo.
Third Freedom of the Air	第三航權	目的地卸載權	The right to fly from one's own country to another country.
Fourth Freedom of the Air	第四航權	目的地裝載權	The right to fly from another country to one's own.
Fifth Freedom of the Air	第五航權	中間點權	The right to fly between two foreign countries on a flight originating or ending in one's own country.



Freedoms of the air	航權	名稱	Description
Sixth Freedom of the Air	第六航權	橋樑權	The right to fly from a foreign country to another while stopping in one's own country for non-technical reasons.
Seventh Freedom of the Air	第七航權	完全第三國 運輸權	The right to fly between two foreign countries, while not offering flights to one's own country.
Eighth Freedom of the Air	第八航權	境內運輸權	The right to fly inside a foreign country, continuing to one's own country.
Ninth Freedom of the Air	第九航權	完全境内 運輸權	The right to fly inside a foreign country without continuing to one's own country.



Further comments

- The 6th 9th Freedom of the Air (inclusively) are not officially recognised under international treaties.
- Most signatory sovereign states exchange the first and second freedoms through the international air service transit agreement.
- The other freedoms are usually established between states in bilateral or multilateral air service agreements.
- The third and fourth freedoms are always granted together.
- The eight and ninth freedoms have been exchanged by ICAO signatory states in the EU, and between AUS and NZ.

Hong Kong to London



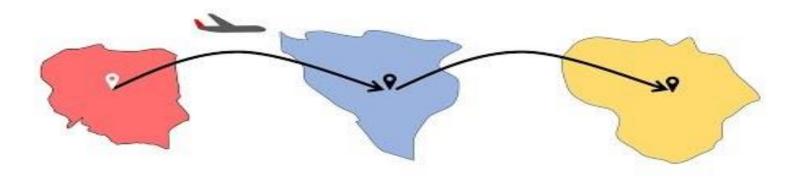


- A Hong Kong airline flight from HKG to LHR will passes through 7 different countries: China, Kazakhstan, Russia, Ukraine, Poland, Germany and the Netherlands.
- Given all 9 states are signatory members of the Chicago Convention, the scheduled commercial flight from HKG can exercise the first freedom of the air to flyover all 8 foreign states.
- The UK and HK governments must have a bilateral agreement in place to exercise the third freedom of the air, in order for the flight to land and disembark at LHR.

Freedoms of the Air | ATPL Theory - Air Law



FREEDOMS OF AVIATION







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- Airlines are in the business of providing transportation service to passengers and/or cargo by air.
- Like any businesses, airlines can only survive if it is profitable. Economics provides basis for key decision making for airlines.
- The airline business has the following characteristics:

Capital intensive

High cash flow

Labour intensive

Thin profit margin

Seasonal + purchasing behaviour







Capital intensive

- Airlines need an enormous range of expensive equipment and facilities, from airplanes to flight simulators to maintenance hangars.
- Equipment can be financed through loans, the issuance of stock, and leasing.
- ➤ It is a capital-intensive business, requiring large sums of money to operate effectively.

High cash flow

- Each flight can potentially generate millions of dollars of revenue for the airline, but most cash flow is used to repay debt or acquire new aircraft.
- When profits and cash flow decline, an airline's ability to repay debt, pay salaries, function efficiently, and acquire new aircraft is jeopardised.







Labour intensive

• Each major airline employs a large number of pilots, flight attendants, engineers, mechanics, baggage handlers, reservation agents, gate agents, security personnel, cooks, cleaners, managers, accountants, lawyers, etc.



Thin profit margin

 More than one-third of the revenue generated each day by the airlines goes to pay its workforce.

Seasonal

- The airline business historically has been very seasonal.
- The summer months were extremely busy, as many people took vacations at that time of the year.
- Winter, on the other hand, was slower, with the exception of the holiday periods.



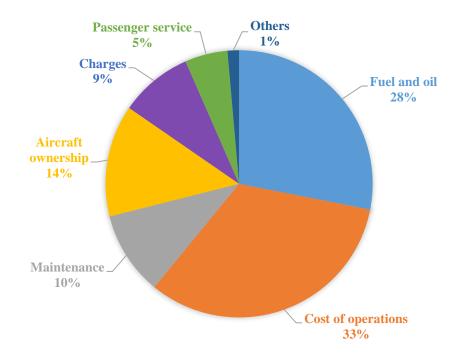


Operation cost



The chart shows the operation costs of IATA Airline Cost Management Group in 2018.

- Fuel cost is 28%
- Cost of operation is 33%.
- Fleet maintenance cost is 10%.



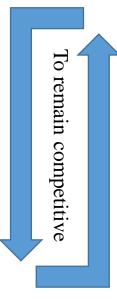






Airline operation is basically:

- 1. Marketing and networking
- 2. Scheduling, planning and evaluating
- 3. Coordinating the acquisition, leasing and deployment of aircraft and related resources
- 4. Analyse all possible competitive route networks to maximise long term profitability with short-term optimisation





Considerations in airline marketing and networking ~ 5 years ahead



- Market demand
- No. of competitors and partners on the route
- Aircraft range
- Existing supply schedule and frequency
- Potential interline support
- Traffic mix business vs group, front end demand
- Availability of codeshare partners
- Government policy e.g. open sky

Airline marketing and Planning defines an airline's products.

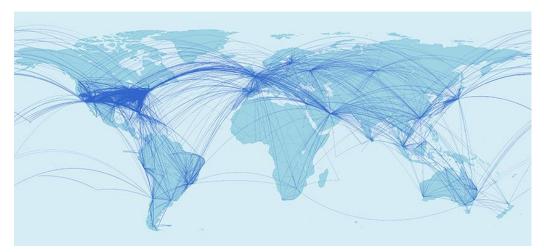




Airline network



- The destinations (airports or cities) in the airline network determine the route system.
- The marketing team plays a vital role in determining which destinations the airline serves.
- Given the destinations, the airline's schedulers and planners work to construct the route system, schedule, and aircraft planning.







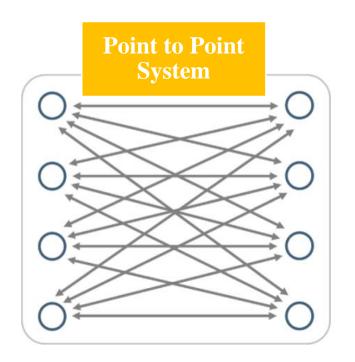


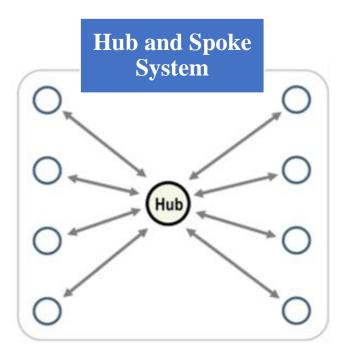


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Two types of route systems:

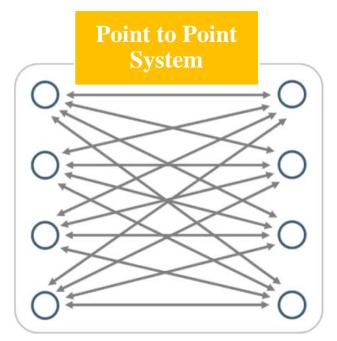












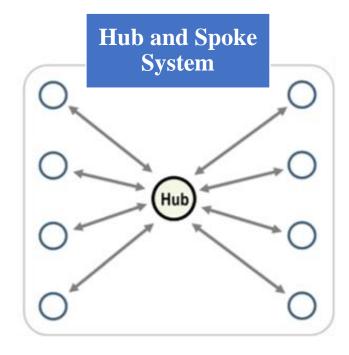
Advantages:

- Eliminate the need for connections
- Reduce travel time
- Reduce risk of baggage lost
- Independent
- Work well between major population centres or points that has significant amount of inbound and outbound traffic.
- Traditionally (before deregulation), airlines fly directly between two service locations. The direct-route system is also known as the point-to-point system.
- ➤ Highly inefficient use of aircraft where many flights that were routinely half empty in particularly between small population centres.

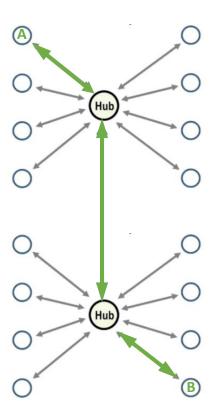








- Under continuous deregulation, most major full service airlines in operation use some variation of hub-and-spoke system to route their primary plane traffic.
- A hub is a central airport that flights are routed through.
- Spokes are the routes that planes take out of the hub airport.
- Example: Lufthansa operates a hub at the Munich airport. From Hong Kong to Hamburg, Lufthansa would first takes us from Hong Kong to its Munich hub, then from Munich to Hamburg (spoke) via a connecting flight.







Hub and Spoke vs Point to Point System



$$C = H(A-1) - \frac{1}{2}H(H-1)$$

Given that

C = No. of connections

H = No. of hubs

A = No. of airports serviced

A point to point system, i.e. H = A

$$C = \frac{1}{2} A \left(A - 1 \right)$$

A single hub and spoke system, i.e. H = 1

$$C = (A-1)$$

Example: in a system with 10 destinations, the hub-spoke system requires 9 routes to connect all destinations. A true point-point system requires 45 routes.

Α	H&S	P-P	
1	0	0	
2	1	1	
2 3 4	2	3	
4	3	6	
5	4	10	
5 6	4 5	15	
7	6	21 28 36 45	
8	7	28	
9	8	36	
10	9	45	
19	18	171	





Hub-Spoke System



Advantages:

- ✓ The hub-spoke system requires significantly fewer routes to connect all destinations when compared with the point-point system.
- ✓ Small number of routes lead to more efficient use of transportation resources. For example, aircraft are more likely to fly at full capacity, and can often fly routes more than once a day.
- Complicated operations, such as package sorting and accounting, can be carried out at the hub, rather than at every node.
- ✓ Spokes are simple, and new ones can be created easily.

Disadvantages:

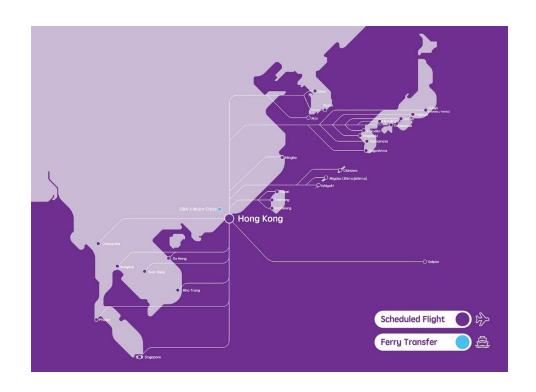
- × Need for connections. Transit, delays, missed connections impacting subsequent flights and air travellers.
- × Over congestion at large hubs
- × Baggage delay and lost during transfer at transit
- × Longer travel time





Hong Kong Express Airways Limited

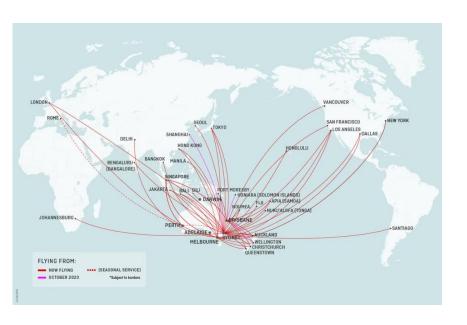


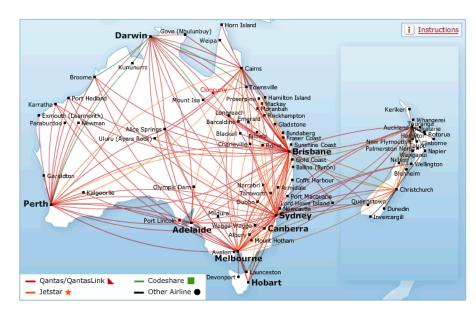




Qantas Airways Limited









Way to expend your route network





Route network – flight connections



https://www.flightconnections.com/airlines

Airline Alliances



Airline Alliances

- Airline alliances are partnerships between or among airlines
- With these collaborations, airlines can share resources, pick up or extend partner routes and offer the ability to earn and redeem miles through each others' rewards programs
- Codeshare Flights, allow customers to book more flights directly through one airline than that airline operates by itself. An alliance partnership may allow booking an itinerary with multiple airlines that are partners
- Points and Miles, it is possible to spend one airlines miles to book an itinerary that includes a flight on a partner airline
- Shared Benefits, membership status offers benefits across multiple airlines within an alliance. Access to partner airlines lounges is an example of one of the benefits

Airline Alliances



Airline Alliances

The Three Major Airline Alliances

- Star Alliance Founded in 1997 by Lufthansa, Air Canada, United Airlines and Thai Airways. 26 full members including Air China.
- Oneworld, Founded in 1999 by American Airlines, British Airways, Cathay Pacific, Qantas, Canadian Airlines (ceased operations) etc. 14 full members in total.
- SkyTeam, Founded in 2000, SkyTeam started a partnership between Delta, Air France, AeroMexico and Korean. 19 full members in total, including China Southern, China Airlines







Applications



• Different airlines use different proportions and combinations of point-point and hubspoke systems to maximise the efficiency and profitability of their businesses.

• The point-point model is extensively practiced by domestic and LCCs, e.g. Southwest

Airlines, EasyJet, AirAsia, JetStar.

But even for these airlines, the "home-base"
airport where most flights originate or depart,
is served as a de facto hub that connects
all serviced destinations.



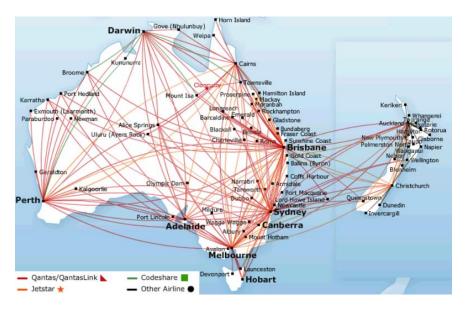




Application



- Some full-service network carriers operate between continents through their strategic hubs, and uses hub-spoke system and/or the point-point system between the domestic centres.
 - Lufthansa is an example of such carrier.
- Other airlines (e.g. Qantas Airways)
 employ their wholly-owned low cost carrier
 subsidiary (Jetstar Airways) to provide
 point to point services between the
 domestic destinations.







Route system summary



- Domestic carriers tend to utilise more point-point system due to the short haul nature of their flights.
- Trans-continental carriers utilise the hub-spoke system as their primary traffic connection.
- No one airline operates a pure point-point or hub-spoke system.
- Some airline operators use point-point system for tactical schedules and hub-spoke system for strategic planning to maximise short term and long term, seasonal or permanent revenues.



Route development



Strategic

Focus on future schedules, responding to major, long term changes in both business and operational environments.

Route development

Tactical

Focus on shorter-term changes to schedule and routes based on seasonal market demands, responses to competitors' moves, corporate member requirements and operations.

60+ months	36-12 months	12-3 months	4-1 months
Long range planning	Market evaluation	Schedule optimisation	Schedule issues





18 months ahead



Route analysis and development

- Identify potential new route/s for the next season
- Traffic data analysis and revenue projection
- Confirm aircraft availability
- Draft business plan integrate analysis from flight operations and finance
- Report management for approval







Thank you!