Problem 07

Hub and Spoke

- Terminal as a Hub
  - Seaports
  - Airports
- Concept of Hub & Spoke
- International Aviation Control
  - Air Freedom Rights

Definition of Terminals

- Any location where freight and passengers either originates, terminates, or are handled in the transportation process
- They may be points of interchange within the same modal system to ensure a continuity of the flows, particularly the case for airport and seaport operations
- Terminals are the key facilities in a Hub-and-Spoke System
  - Airports: Interface between air and land, between one airline and another
  - Seaport: Interface between sea and land, between one shipping line and another
  - Railway Station: Interface between rail and bus/taxi/walking
  - Bus Interchange: Interface between bus and taxi/walking

Functions of Freight Terminals

1. Pickup and Delivery (PUD)
   - Basic transportation service is the pickup and/or delivery of freight on peddle runs
   - Peddle run is a route out of the terminal for the purpose of collecting freight for outbound moves or delivering freight from inbound moves
2. Break-bulk
   - Performs both consolidation and dispersion services
3. Relay
   - Freight is not touched, but relay may be necessitated by transport regulations (usually for motor carriers)

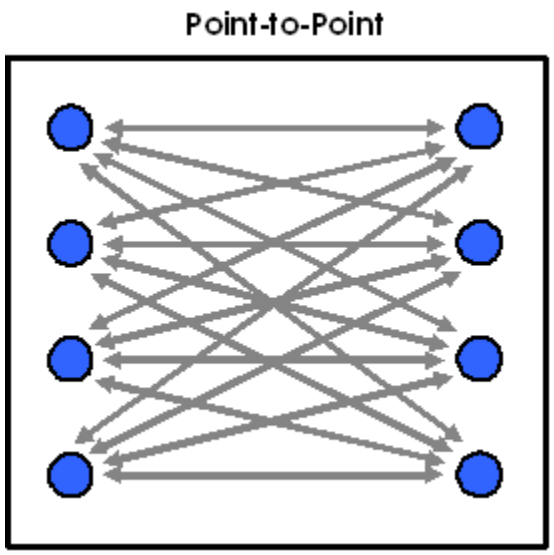
Function of Seaports

1. Traffic handling – two categories:
   a. Import and export (cargo) or inbound and outbound (pax) – intermodal gateway between sea and land
   b. Transshipment (cargo) or transit (pax) traffic – connection point between one ship and another
2. Unforeseen technical and emergency stops
3. Base for ships – parking
4. Ship servicing centre – food, fuel and maintenance

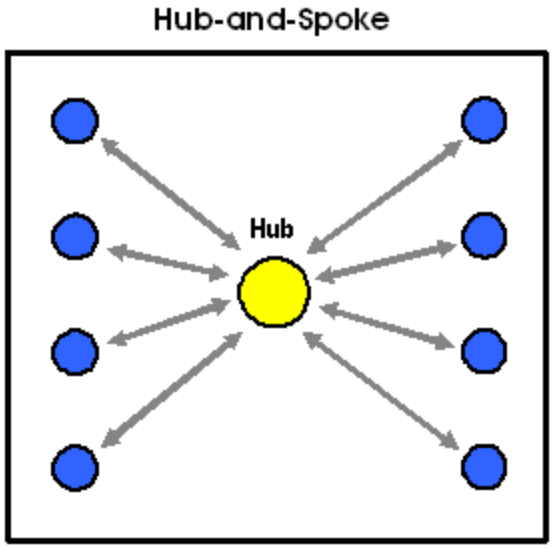
Function of Airports

1. Traffic handling – two categories:
   a. Import and export (cargo) or inbound and outbound (pax) – intermodal gateway between air and land
   b. Transshipment (cargo) or transit (pax) traffic – connection point between one airline and another
2. Unforeseen technical and emergency stops
3. Base for aircraft – parking
4. Aircraft servicing centre – food, fuel and maintenance

Hub-and-Spoke



Cost of all point-to-point trips = $20,000 x 32 = $640,000



Cost of all point-to-point trips = $20,000 x 16 = $320,000

- **Cost savings** from the reduction in trips (from $640K to $320K)
- **More passengers/cargoes per trip** due to aggregation from several cities at the hub- better utilization of transport

Pros & Cons of Hub-and-Spoke

Advantages

- Economies of scale on connections by offering a high frequency of services
- Economies of scale at the hubs, enabling the potential development of an efficient distribution system since the hubs handle larger quantities of traffic
- Economies of scope in the use of shared transshipment facilities rather than many minimal facilities in many small terminals

Disadvantages

- Additional transshipment as less point-to-point services are offered, which for some connections may involve delays
- Potential congestion as the hub becomes the major point of transshipment

TERMINAL AS A HUB

- A hub in this case is the central airport that are routed to, and spokes are the routes that planes take into/out the hub (Singapore Changi Airport).

TERMINAL AS A HUB

- International terminal (airport or seaport) – three kinds of traffic:
  - inbound (import)
  - outbound (export) and
  - transit (transshipment)
- Major seaport or airport terminal should cater to all three groups if it wants to be a global or regional hub
- **Hubbing –** focus on transit or transshipment traffic
- Key hubbing agents are **Carriers** (shipping lines and airlines) and **Freight Forwarders (FF)**

TERMINAL AS A HUB

Key Hubbing Agents : Carriers (Airlines or Shipping Lines) Example:

- A large containership plying between Rotterdam and Yokohama stops at a few big ports along the way like Dubai, Colombo, Singapore, and Shenzhen, but it also sells cargo space to ports outside this served network
- Those containers are unloaded in Singapore and put onto a smaller ship bound for Manila port. The two ships may belong to the same company or two different companies with an alliance agreement
- Large container ships on routes stopping at major hubs – mother vessels. Small ships out of hubs to smaller ports – feeder vessels. In case of airlines, they are termed trunk and feeder services

TERMINAL AS A HUB

Key hubbing agents: Freight Forwarders (FF)

- Freight forwarders (FF) consolidate cargo for multiple destinations and sent to the shipping hub
- At the hub, the container is unloaded from the ship and reconsolidated according to destinations
- The reconsolidated containers are then sent back to the port to be put on the relevant ships going to these destinations

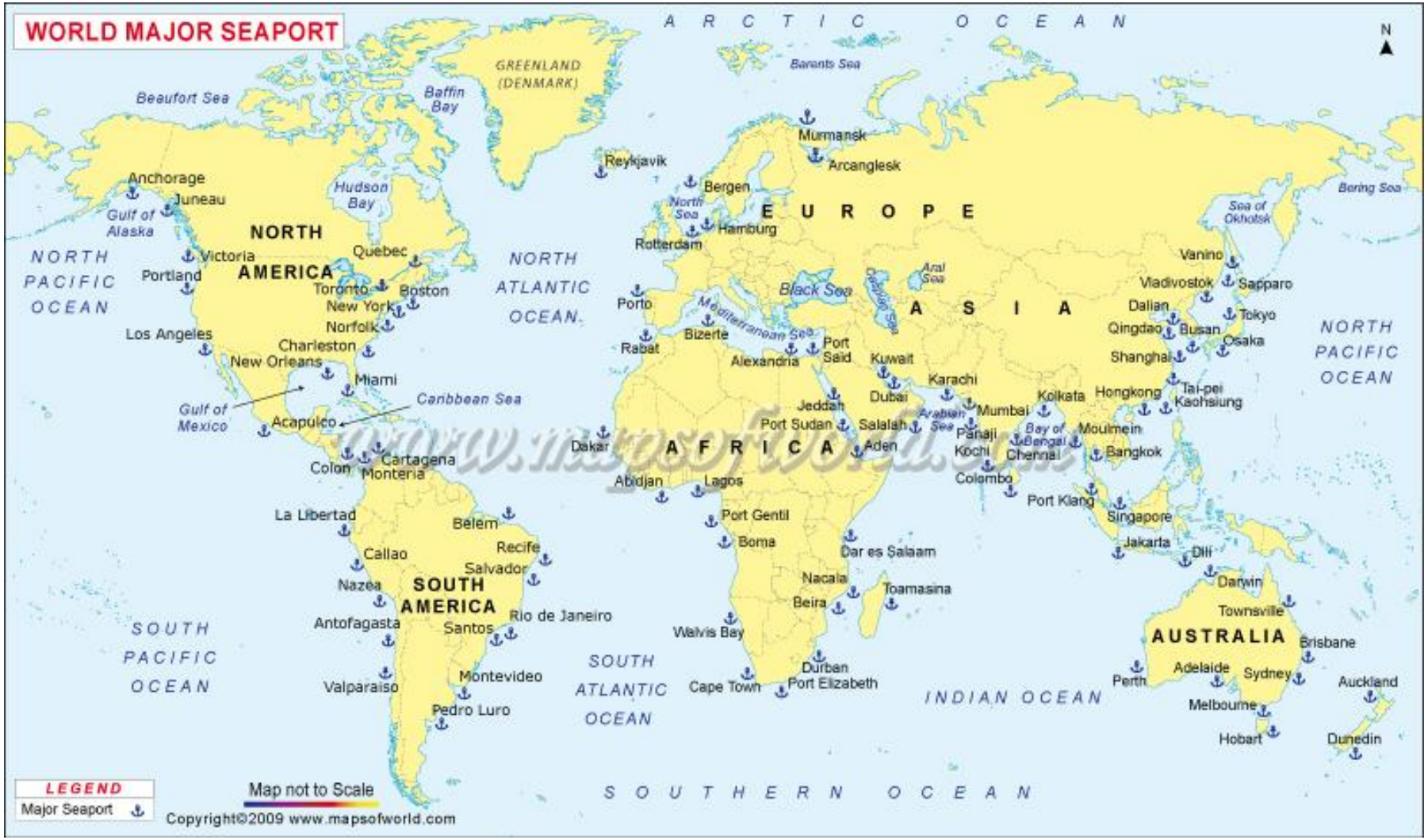
TERMINAL AS A HUB

EXAMPLE:

- In Sydney, a FF accepts consignments going to Singapore, Manila, Bangkok, Dubai, Colombo, and Port Klang. These consignments are packed together in one container and given to Neptune Orient Lines (NOL)
- The NOL ship brings the container to Singapore. At the port of Singapore, another FF (an affiliate) collects the container, brings it back to his warehouse, unstuffs it and places consignments according to destinations
- There are other ships coming into Singapore with containers from other origin cities to be unstuffed and reconsolidated. All the Dubai bound consignments are put together in one container and given to a shipping line that has a ship going from Singapore to Dubai, e.g. Maersk Lines. The same applies to consignments going to other destinations

Major Air Hubs and Routes of the World

Major Sea Hubs of the World



World's Busiest Airport

World's busiest airports by cargo traffic 2010

Source: Airport Council International 2010

Rank	Airport	Location	Code (IATA/ICAO)	Total Cargo (Metric Tonnes)
1.	Hong Kong International Airport	Chek Lap Kok, Hong Kong, Hong Kong Special Administrative Region	HKG/VHHH	4,168,394
2.	Memphis International Airport	Memphis, Tennessee, United States	MEM/KMEM	3,916,937
3.	Shanghai Pudong International Airport	Pudong, Shanghai, People's Republic of China	PVG/ZSPD	3,227,914
4.	Incheon International Airport	Incheon, Seoul National Capital Area, South Korea	ICN/RKSI	2,684,500
5.	Ted Stevens Anchorage International Airport	Anchorage, Alaska, United States	ANC/PANC	2,578,396
6.	Paris-Charles de Gaulle Airport	Seine-et-Marne/Seine-Saint-Denis/Val-d'Oise, Île-de-France, France	CDG/LFPG	2,399,067
7.	Frankfurt Airport	Flughafen (Frankfurt am Main), Frankfurt, Hesse, Germany	FRA/EDDF	2,275,106
8.	Dubai International Airport	Dubai, United Arab Emirates	DXB/OMDB	2,270,498
9.	Narita International Airport	Narita, Chiba, Kantō, Honshū, Japan	NRT/RJAA	2,167,843
10.	Louisville International Airport	Louisville, Kentucky, United States	SDF/KSDF	2,166,226
11.	Singapore Changi Airport	Changi, East Region, Singapore	SIN/WSSS	1,841,004

World's Busiest Seaport

Container Traffic 2010 (in thousands TEU):

Source: World Shipping Council 2010

Rank	Port	Country	2010[1][2]
1	Shanghai	People's Republic of China	29,069
2	Singapore	Singapore	28,431
3	Hong Kong	People's Republic of China	23,699
4	Shenzhen	People's Republic of China	22,510
5	Busan	South Korea	14,194
6	Ningbo	People's Republic of China	13,144
7	Guangzhou	People's Republic of China	12,550
8	Qingdao	People's Republic of China	12,012
9	Dubai	United Arab Emirates	11,600
10	Rotterdam	Netherlands	11,140

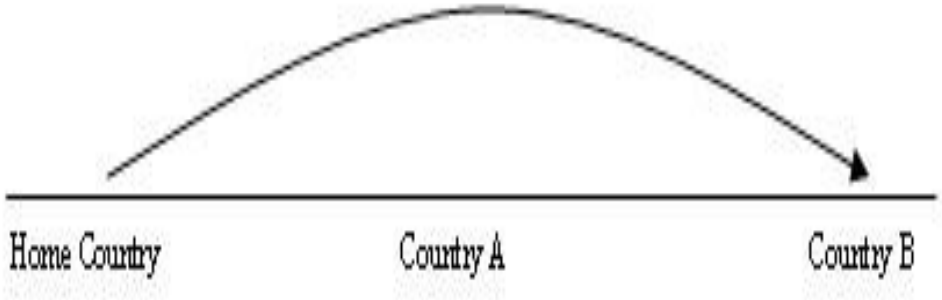
Air Freedom Rights

- A set of commercial aviation rights granting a country's airline(s) the privilege to enter and land in another country's airspace
  - After deregulation of the airline industry, the emergence of local hub-and-spoke networks centered on major airport where a single airline is often dominant
  - As airlines become more dependent on longer-haul international markets, in 1944, an International Convention was held in Chicago to establish the framework for all future bilateral and multilateral agreements for the use of international air spaces
- 9 Freedom of Air Passage

International Aviation Control

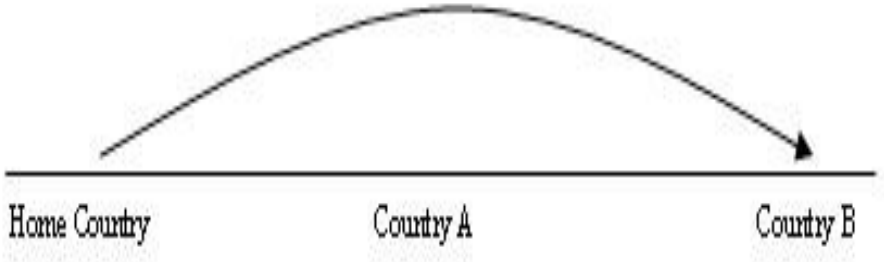
1st Freedom of air passage

Right for Home Country to fly over Country A



2nd Freedom of air passage

Right for Home Country to make technical stop in Country A



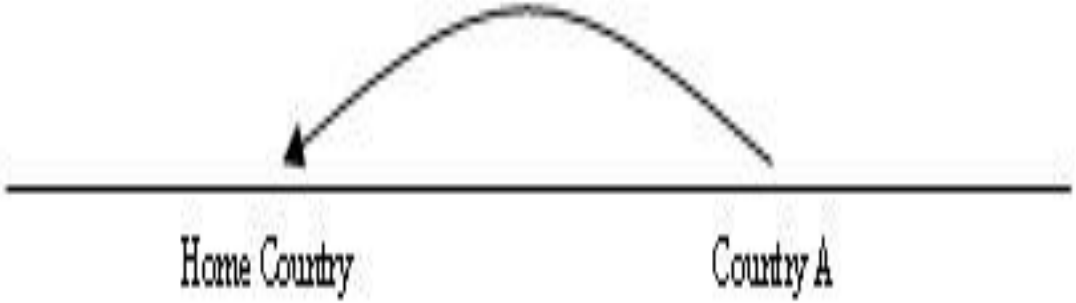
International Aviation Control

3rd Freedom of air passage

Right for Home Country to carry traffic to Country A

4th Freedom of air passage

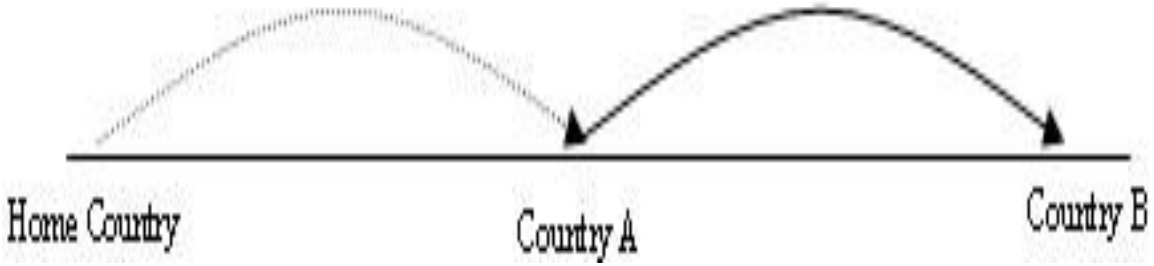
Right for Home Country to carry traffic from Country A



International Aviation Control

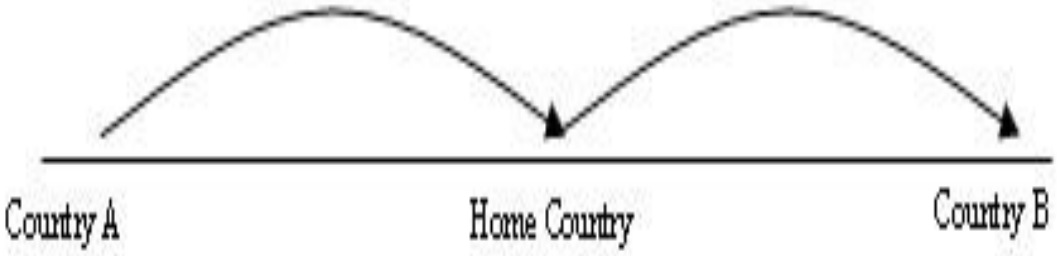
5th Freedom of air passage

Right for Home Country to pick up traffic in Country A and carry to other country



6th Freedom of air passage

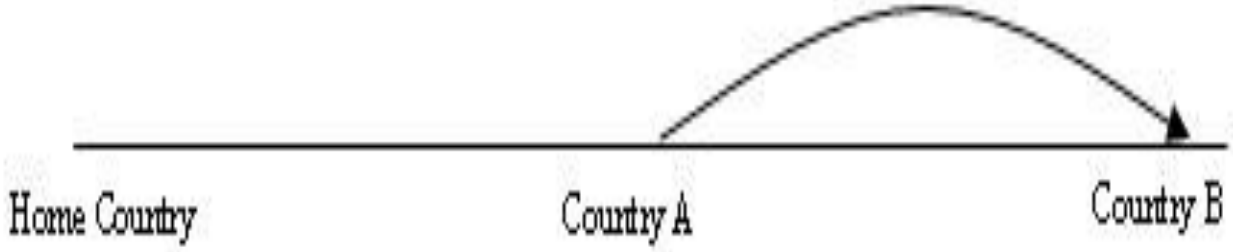
Right for Home Country to carry traffic from foreign country to other country via its own territory



International Aviation Control

7th Freedom of air passage

Pure foreign flight: Right for Home Country to carry traffic from foreign country to another country



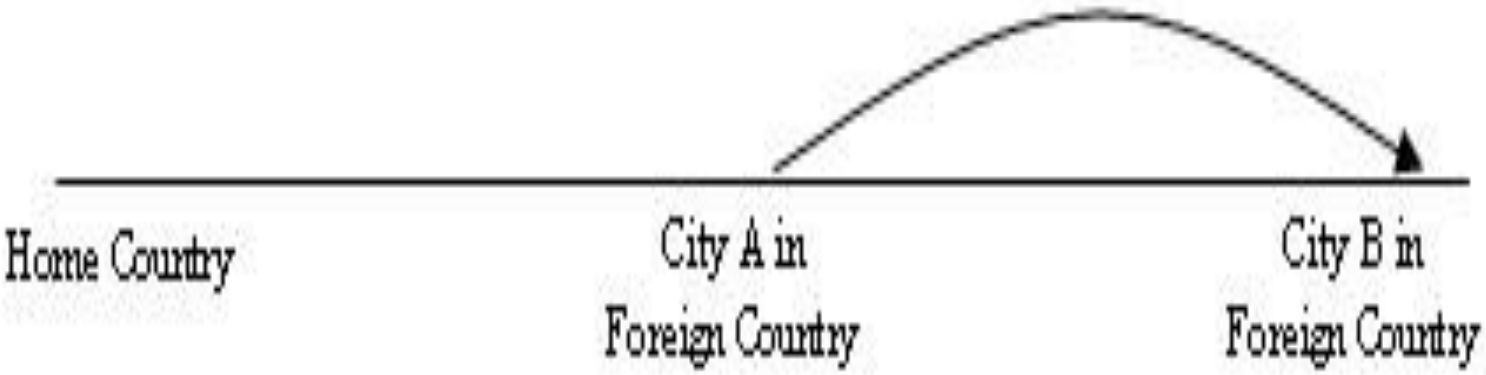
8th Freedom of air passage

Cabotage: Right for Home Country to carry traffic from City A in foreign country to another city in that country. Flight must originate in Home Country

International Aviation Control

9th Freedom of air passage

Pure Cabotage: Right for Home Country to carry traffic from City A in foreign country to City B in same country. Flight need not originate in Home
country



Today's Problem

- Michael may consider adopting a Hub-and-Spoke model for his company's distribution so as to enjoy:
  - Higher economies of scale AND
  - More efficient routing
- He needs to be aware of the International Air Freedom Rights when making transportation decisions with regards to air-freight

Today's Problem

Inter Hub routes ⟷

Today's Problem

Intra Hub routes

Learning Outcomes

- Terminal as a Hub
  - Seaports
  - Airports
- Concept of Hub & Spoke
- International Aviation Control
  - Air Freedom Rights