

topic 1

Air Traffic and Air Transportation

Flygtrafik och flygtransporter

Airlines #1

General Questions

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 - Because of increased competition and higher efficiency
- ❖ Globalisation
 - More contacts and increased business exchange with other countries

Why not start an airline?

What is the easiest way to become a millionaire?

Why not start an airline?

What is the easiest way to become a millionaire?

From eHow:

Things You'll Need:

Fleet of airplanes

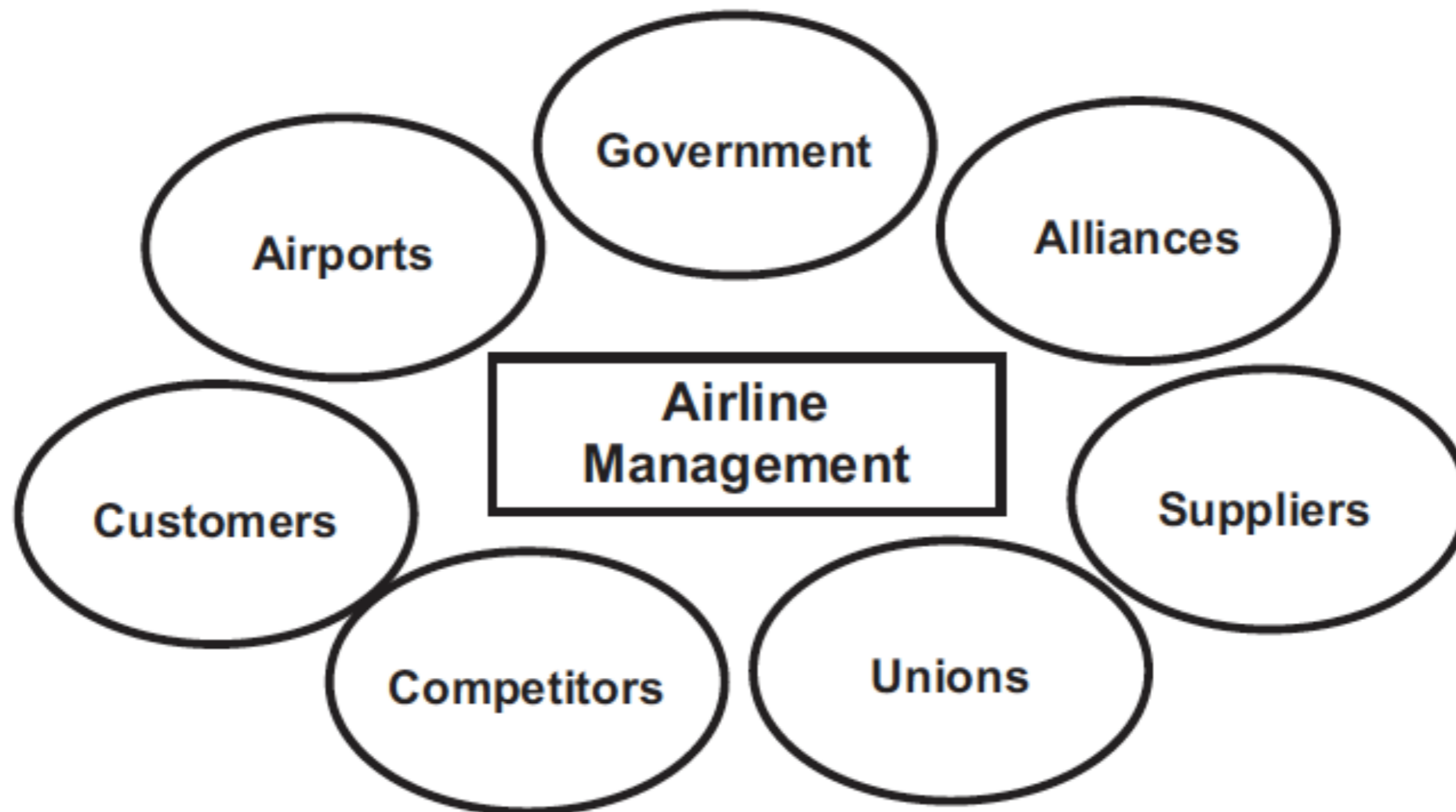
FAA air carrier certification

Airport land lease

Ticket printers

Federal Aviation Administration

Influence of other players



Abdelghany&Abdelghany, 2010

Rules and Regulations

- Many!

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- Nine freedoms of the air

Watch <https://youtu.be/thqbjA2DC-E> (14 minutes)
Read TGAI Chapter 2 until the end of 2.3
Then:



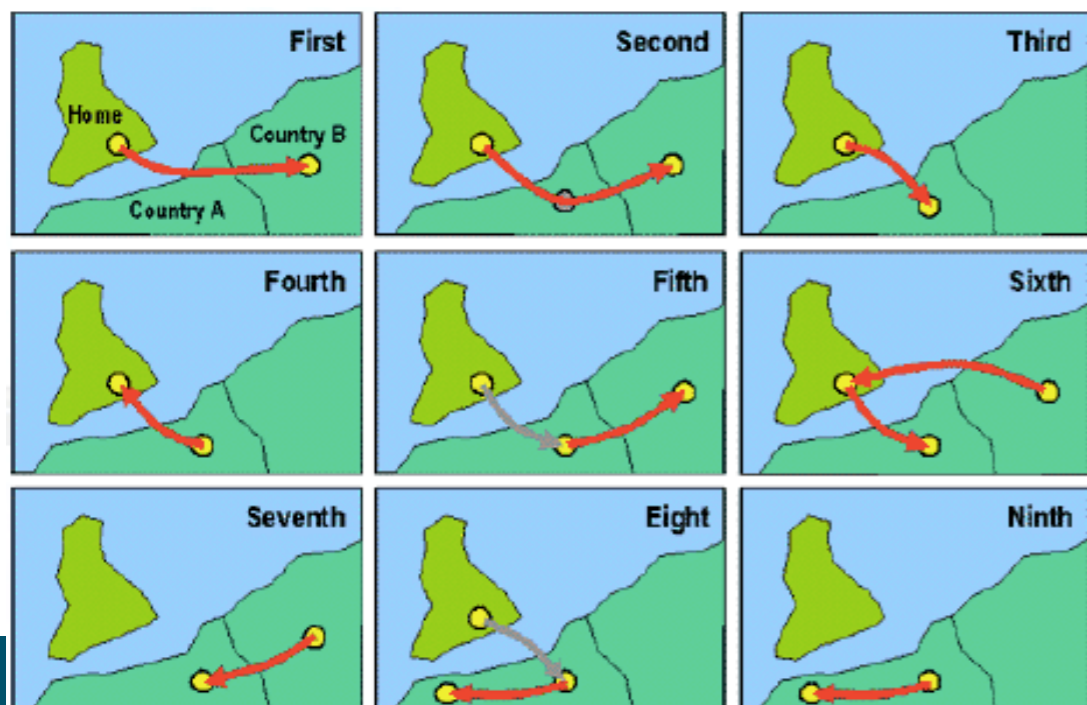
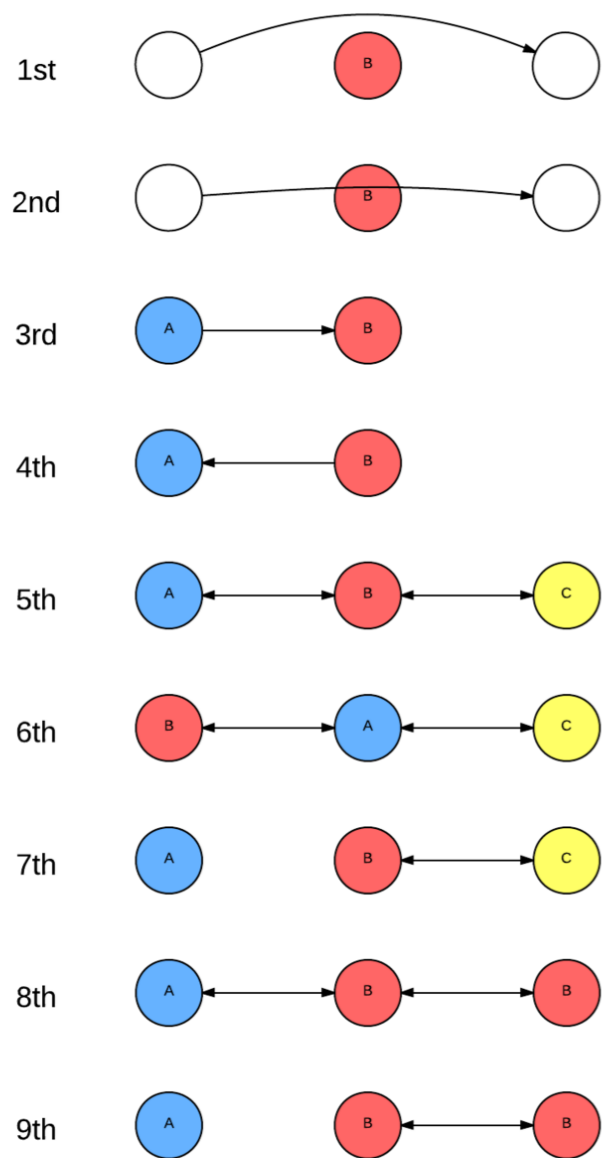
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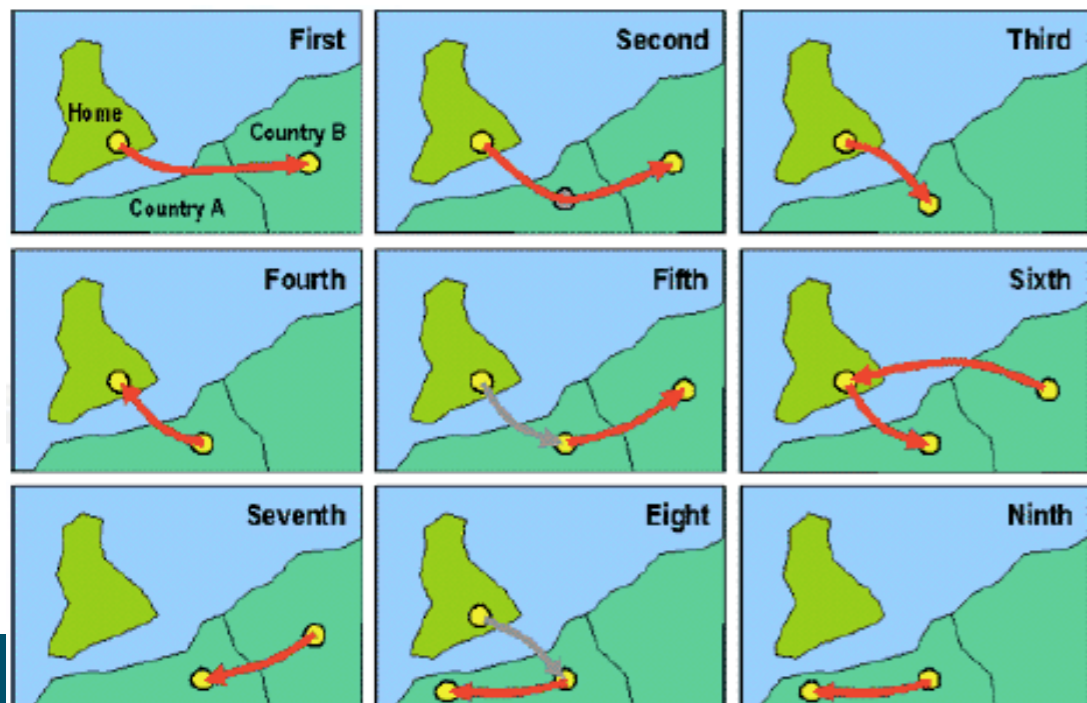
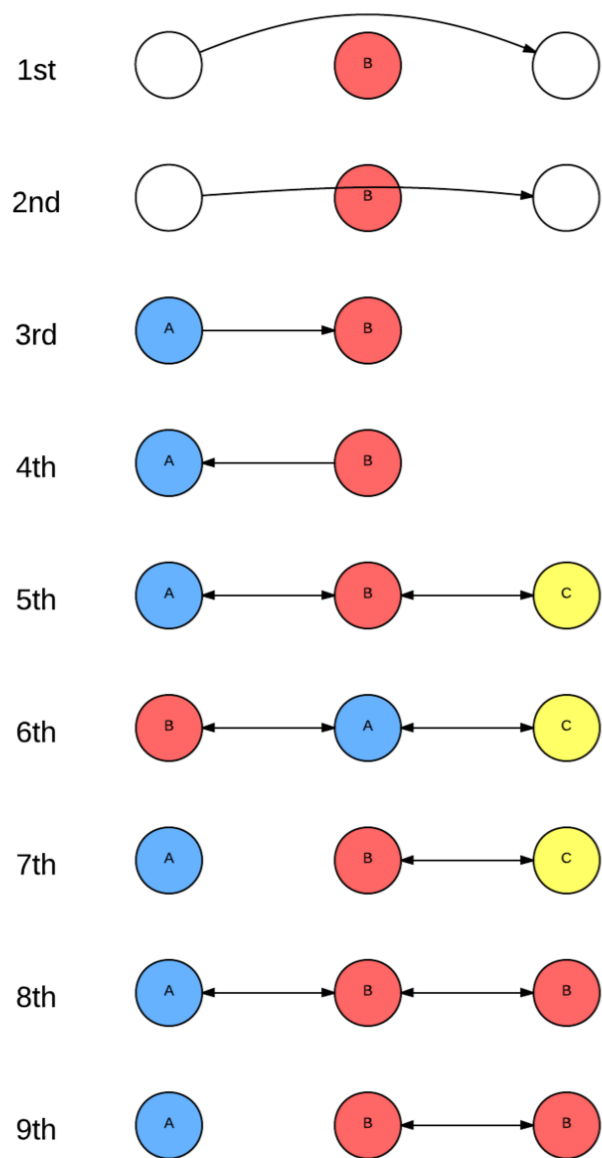
Go to <https://forms.gle/6BxsxTevcWsepkr5>

Nine freedoms of the air



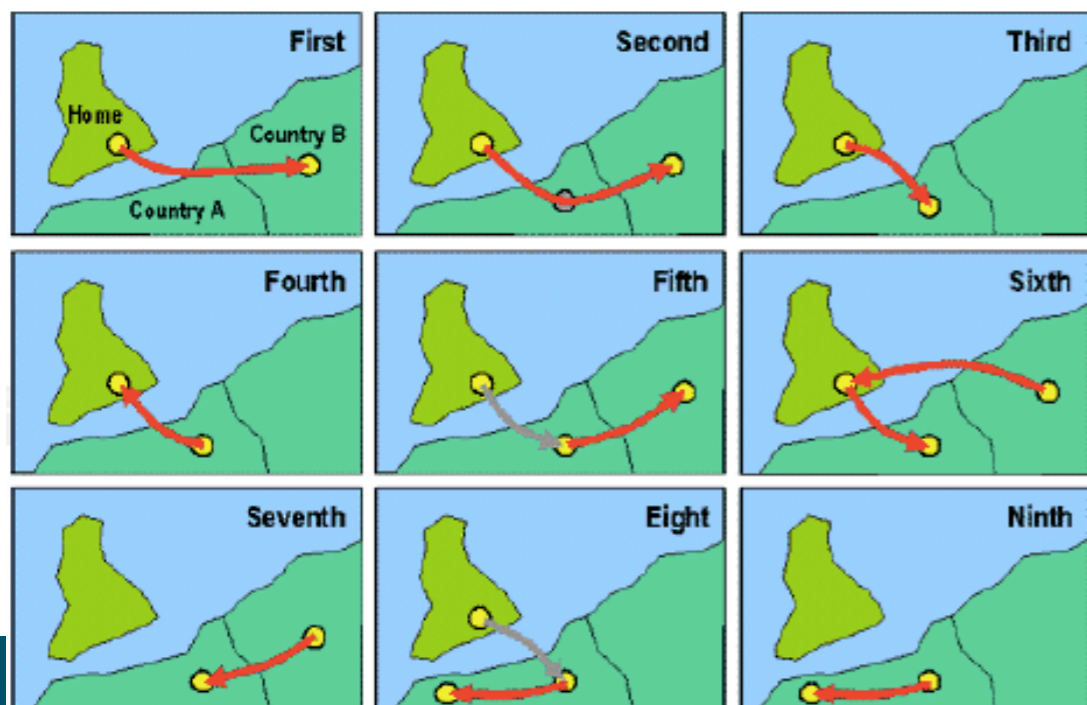
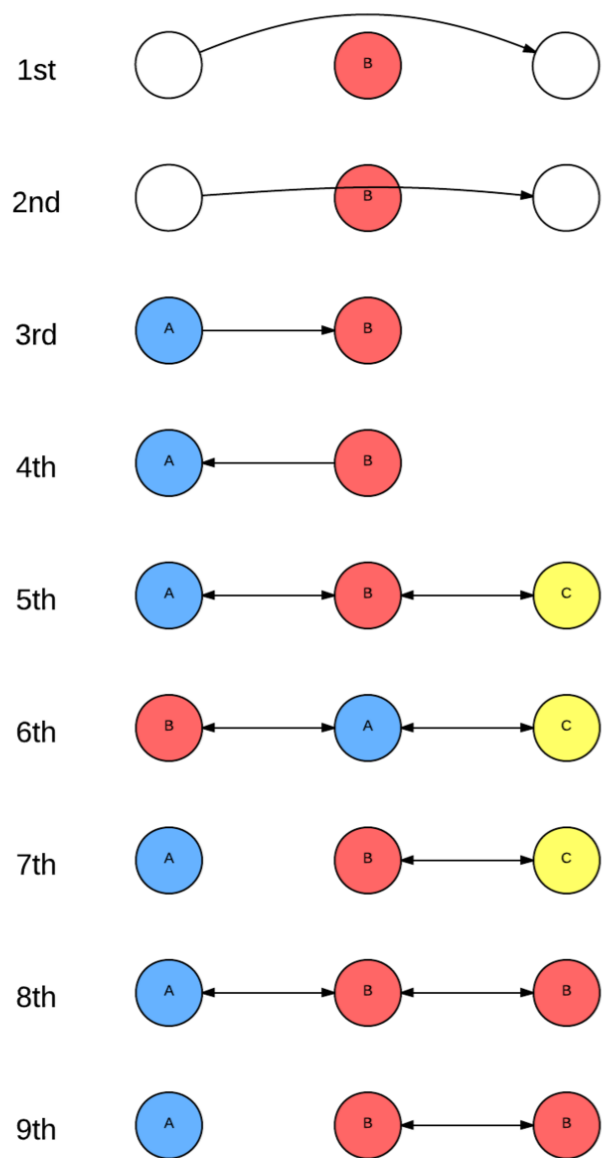
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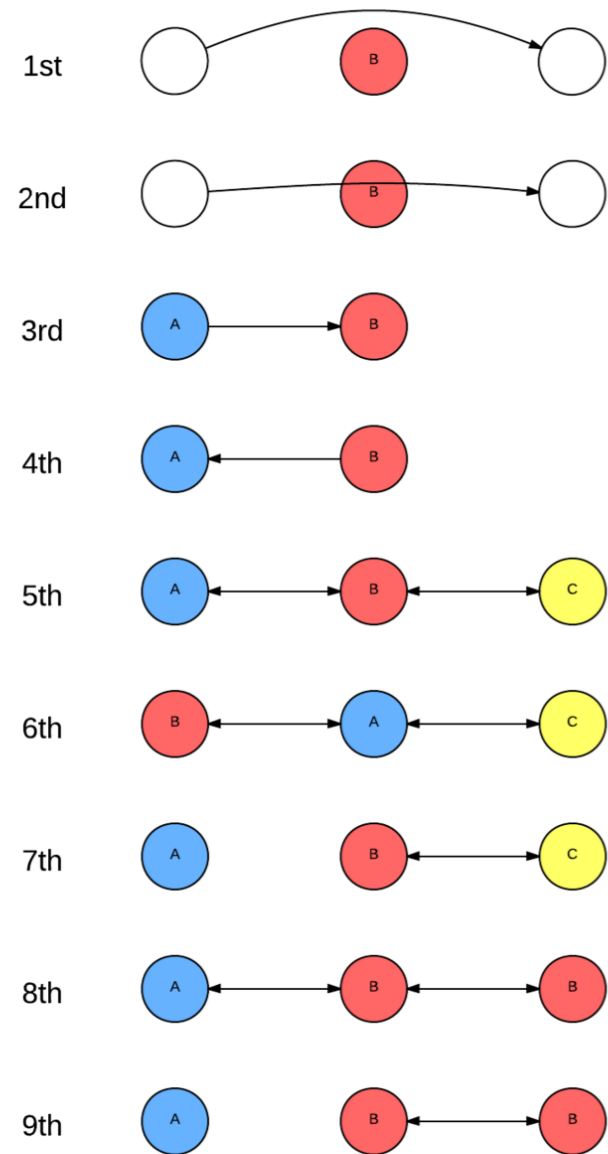


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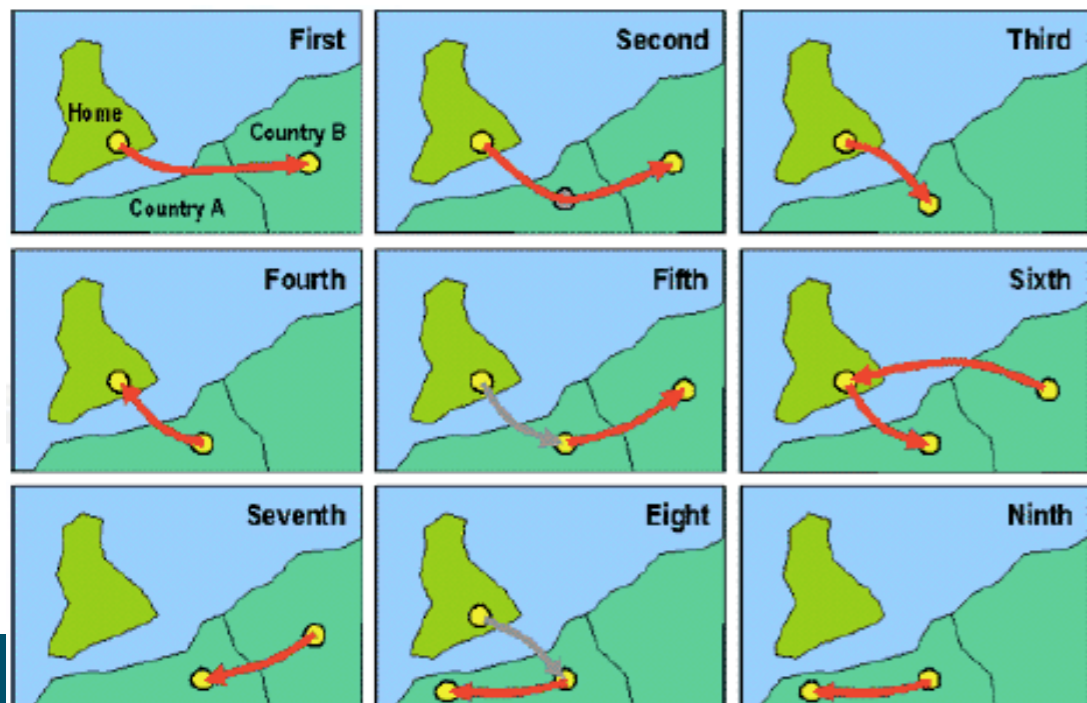
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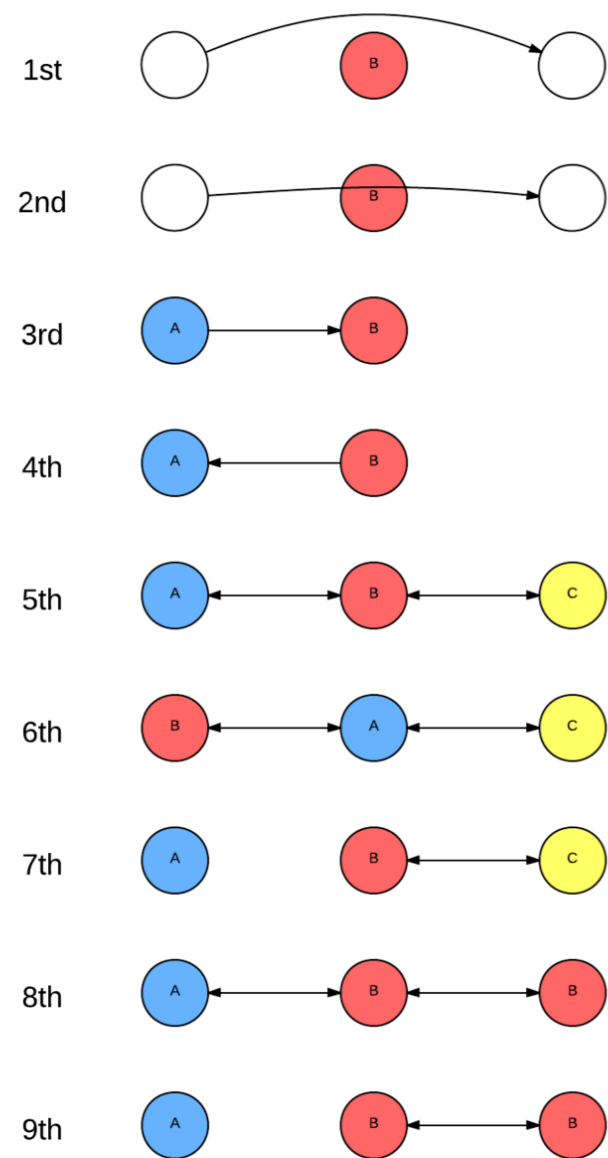
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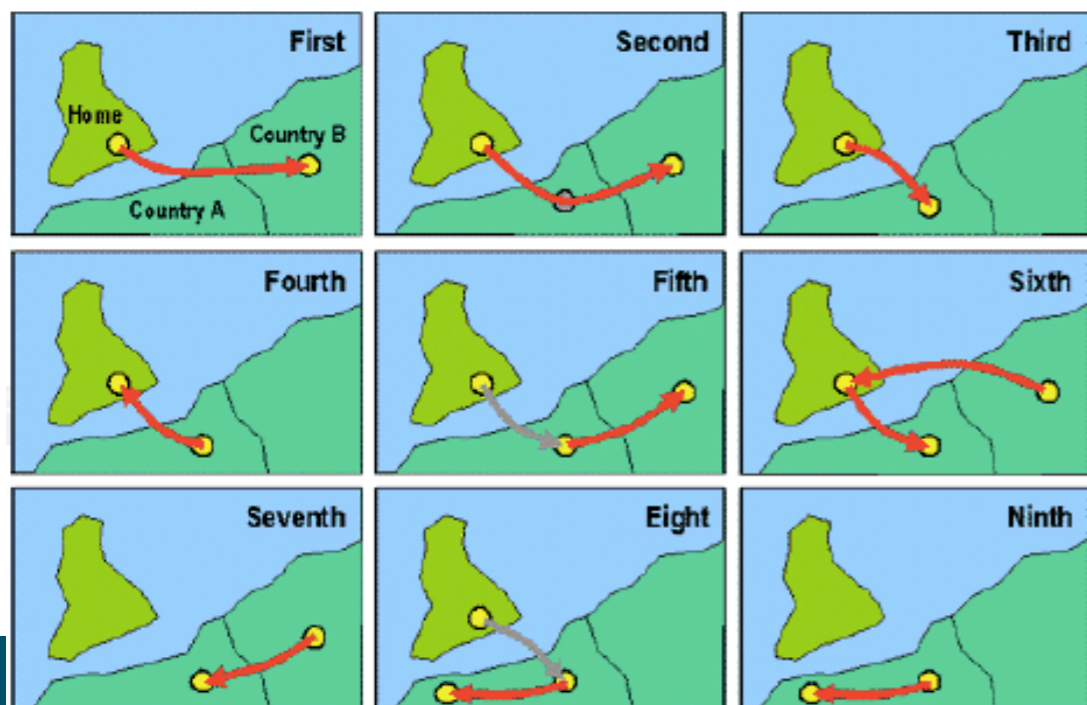


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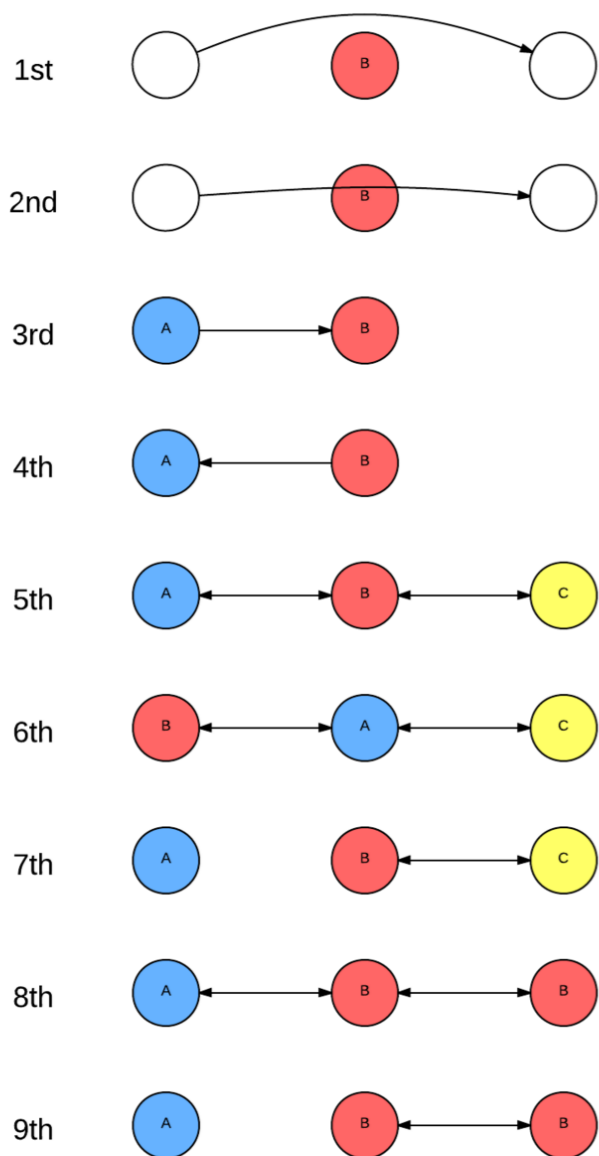
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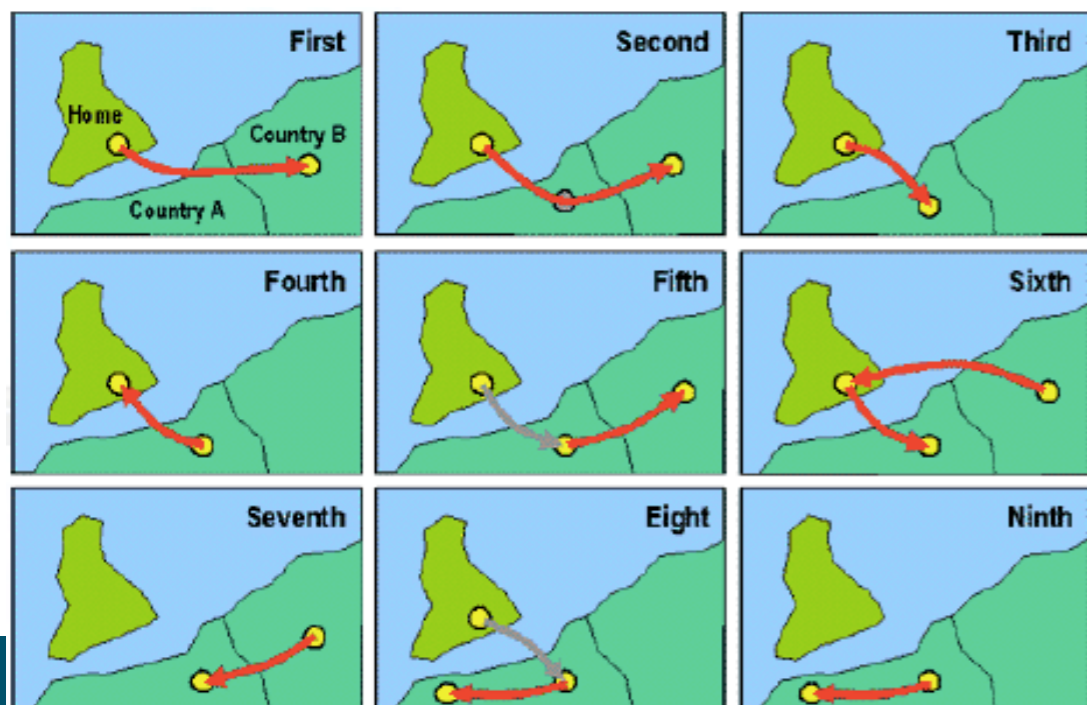
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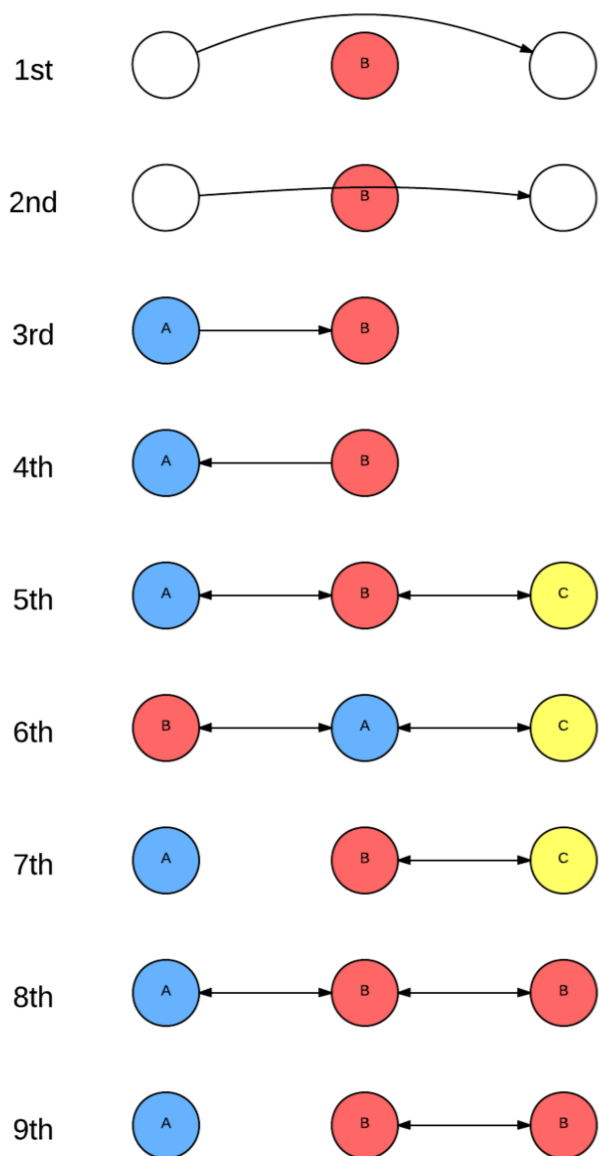
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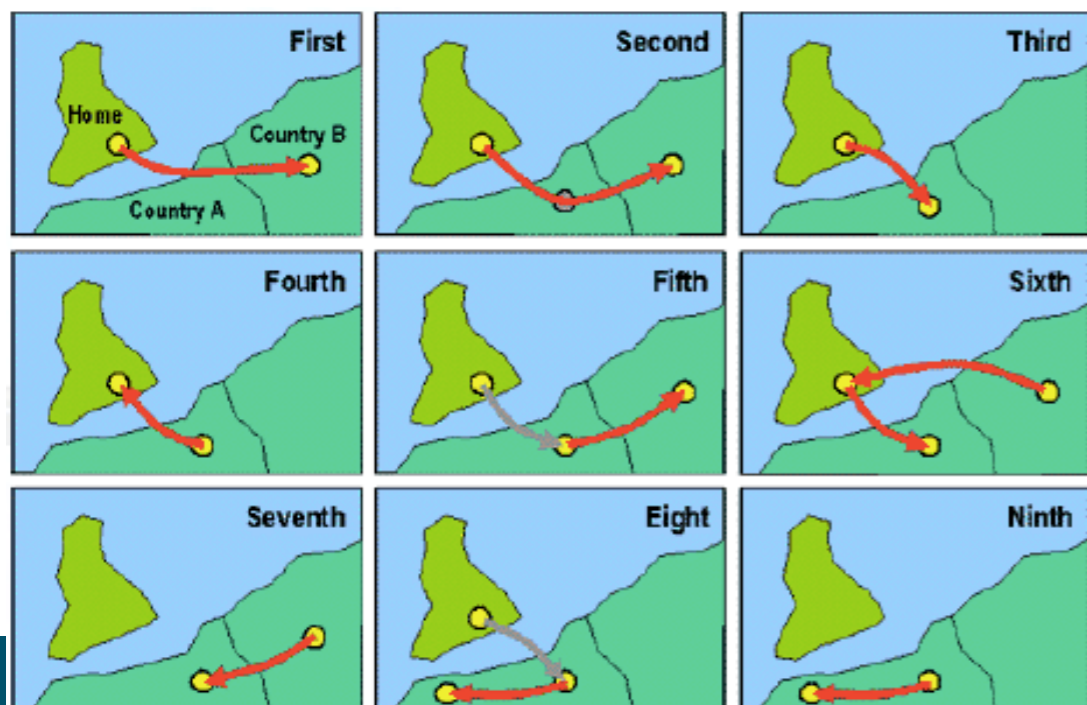
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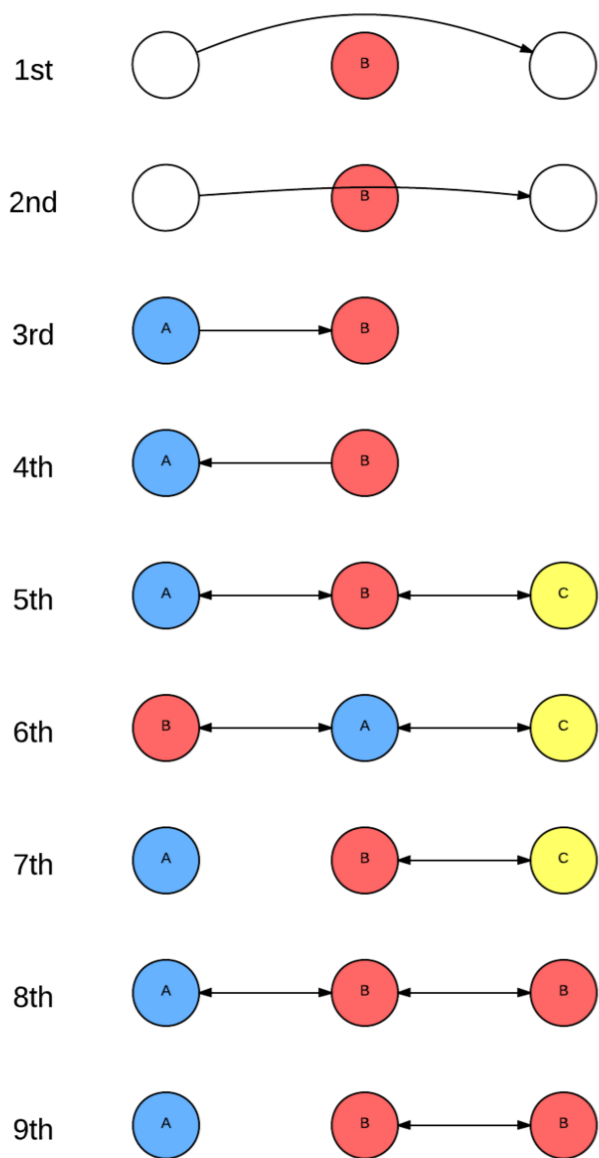
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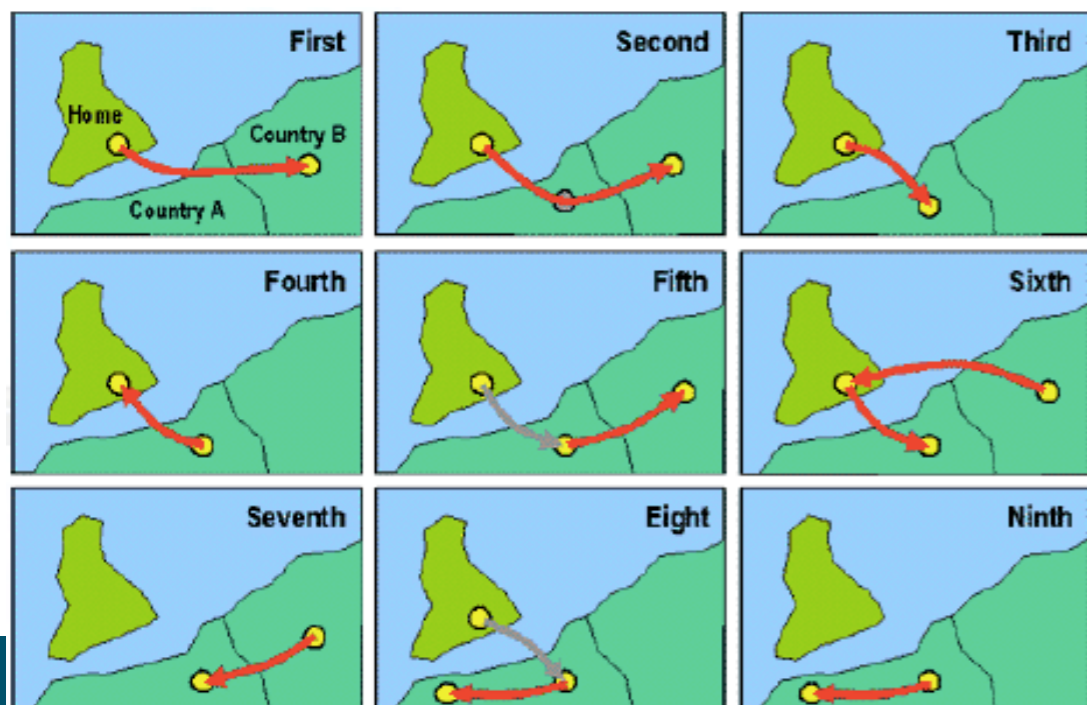
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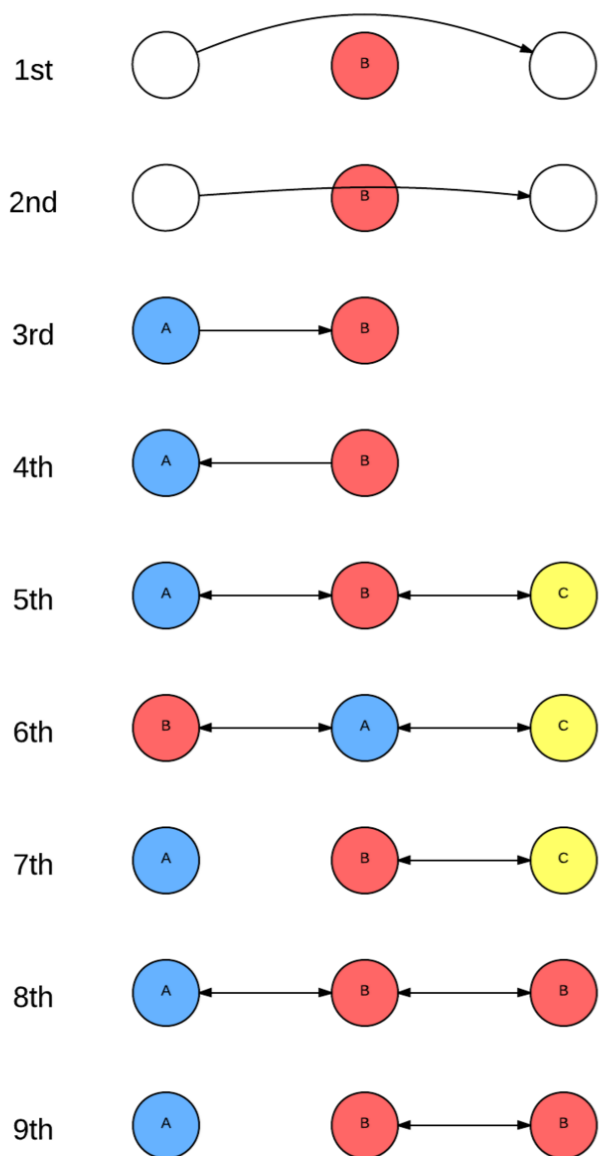
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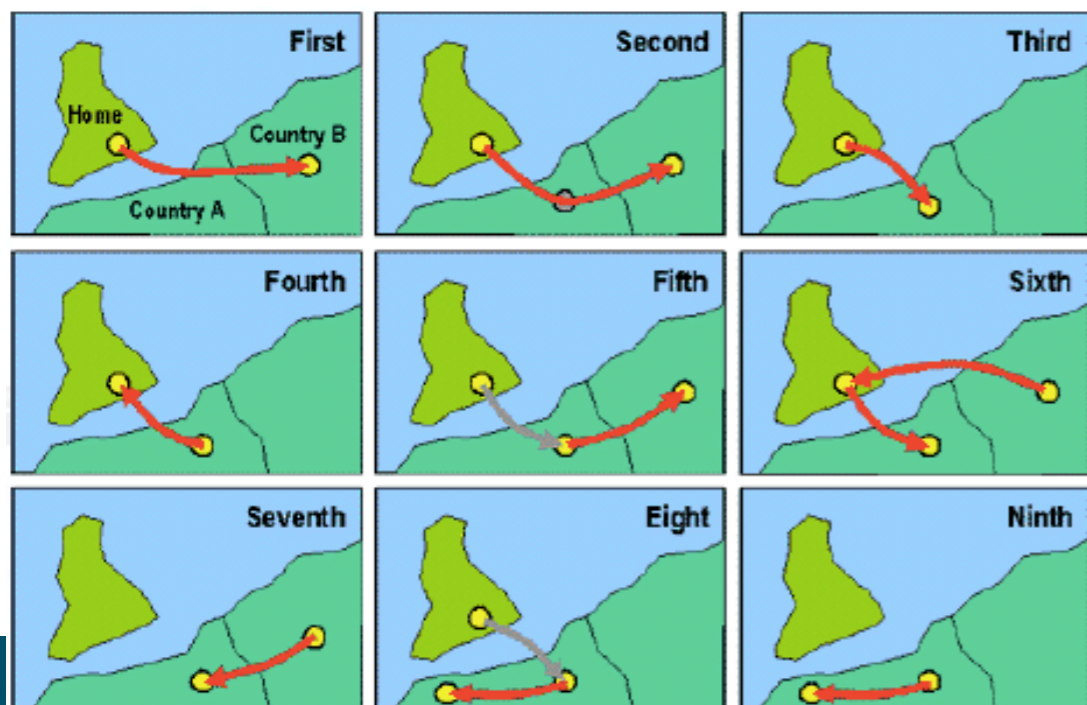
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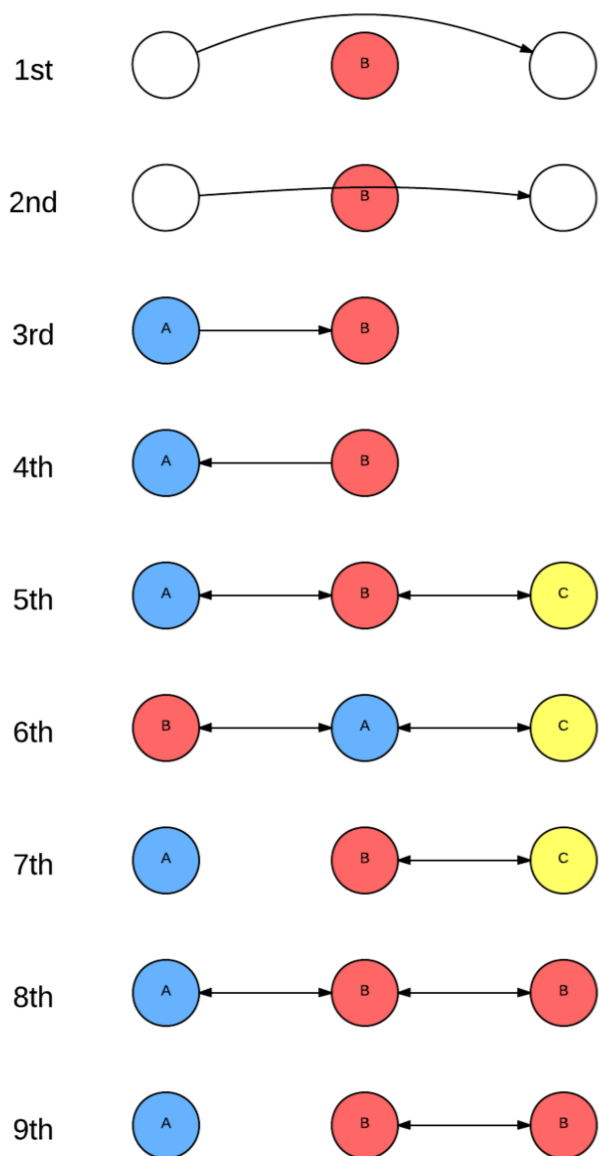
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8th the right to fly inside a foreign country, continuing to one's own country



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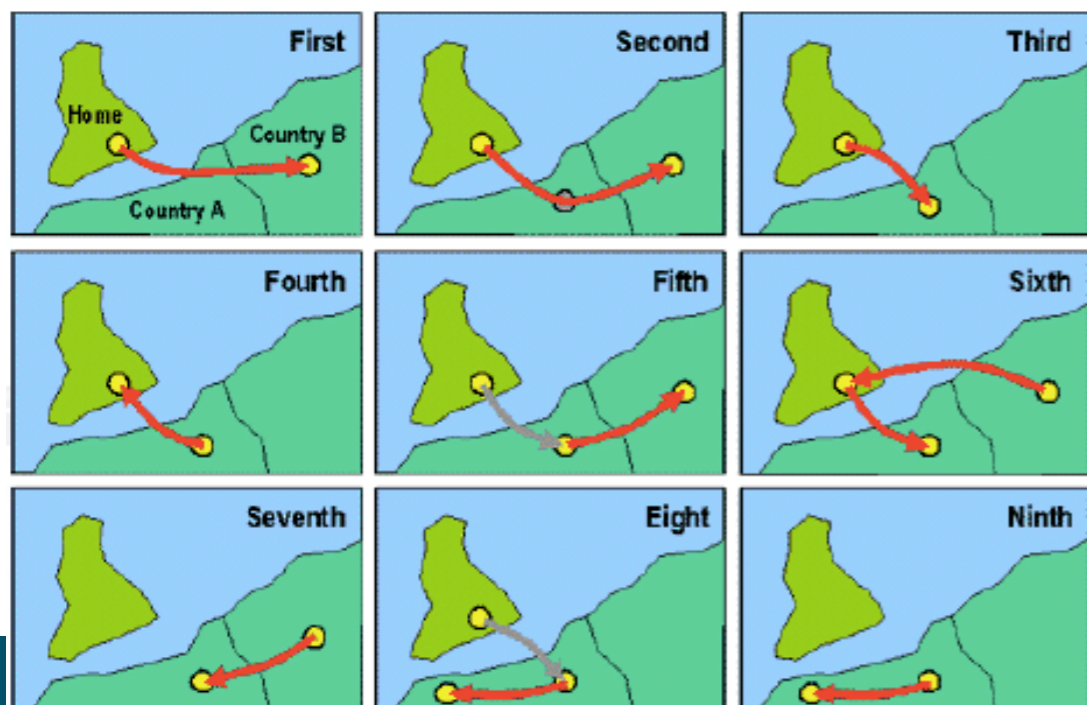
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9th the right to fly inside a foreign country without continuing to one's own country



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- C. Capacity (frequency of flights and number of seats)
- D. Airfares

Read TGAI Chapter 3 until the end of 3.1 (5 pages)

1. Look up the five main measures for SAS FY2017

2. On a flight from Arlanda to JFK an airline uses an a/c with
with

200 seats, the flight distance is 6308 km.

Compute the RPKs, the ASKs, the average cabin factor/
load factor and the average yield for the week.

	PAX	income in €
Monday	181	179500
Tuesday	130	99000
Wednesday	176	125400
Thursday	144	104700
Friday	156	99300
Saturday	113	73700
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RPK

$$=6308*(181+130+176+144+156+113+124)=6459392$$

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ASK

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ASK

$$=6308*7*200=8831200$$

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ALLF

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$$=(181/200+130/200+176/200+144/200+156/200+113/200+124/200)/7$$

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$$=0.73142857142$$

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RPK

$$=6308 \cdot (181 + 130 + 176 + 144 + 156 + 113 + 124) = 6459392$$

ASK

$$=6308 \cdot 7 \cdot 200 = 8831200$$

ALLF

$$= (181/200 + 130/200 + 176/200 + 144/200 + 156/200 + 113/200 + 124/200) / 7$$

$$= (181 + 130 + 176 + 144 + 156 + 113 + 124) / 1400$$

$$= 0.73142857142$$

ALF

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Why are ALLF and ALF the same in this case?

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ASK

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ALLF

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$$=1/7*(179500/(6308*181)+99000/(6308*130)+125400/(6308*176)+104700/(144*6308)+99300/(6308*156)+73700/(113*6308)+123400/(124*6308))$$

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average yield

$$= 1/7 \cdot (179500 / (6308 \cdot 181) + 99000 / (6308 \cdot 130) + 125400 / (6308 \cdot 176) + 104700 / (144 \cdot 6308) + 99300 / (6308 \cdot 156) + 73700 / (113 \cdot 6308) + 123400 / (124 \cdot 6308))$$

$$= 0,124 \text{€ per RPK}$$

	general	aircraft	staff
strategical	orientation, alliances	fleet planning	hire, train
tactical	price setting, time table	fleet assignment and routing	crew scheduling
operational	class reservation, customer management	fleet operations	crew operations

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 - ❖ Growth by acquisition

How to define a market?

- Typical Air Passenger Trip:

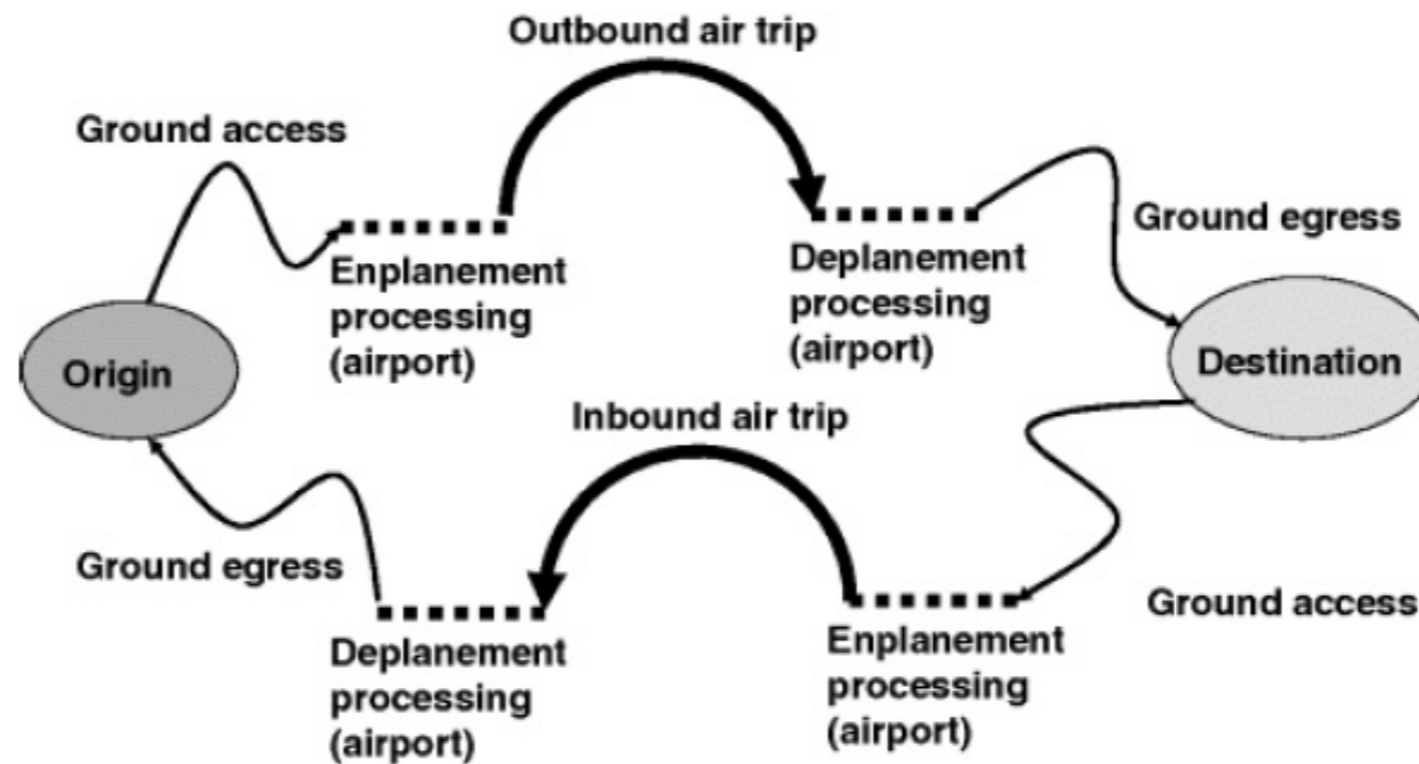


Figure 3.1 Representation of a typical air passenger trip

Read TGA1 Chapter 3.2 until the end of 3.3.4 (11 pages)

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Take a look at these slides by Peter Belobaba: <http://aviation.itu.edu.tr/%5Cimg%5Caviation%5Cdatafiles/>

Lecture%20Notes/

Network%20Fleet%20Schedule%20Strategic%20Planning/

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Lecture%20Notes/

Network%20Fleet%20Schedule%20Strategic%20Planning/

Lecture%20Notes/6%20-

%20Fundamentals%20of%20Airline%20Markets.pdf

Then:

Read TGAI Chapter 3.2 until the end of 3.3.4 (11 pages)

Take a look at these slides by Peter Belobaba: <http://aviation.itu.edu.tr/%5Cimg%5Caviation%5Cdatafiles/>

[Lecture%20Notes/](#)

[Network%20Fleet%20Schedule%20Strategic%20Planning/](#)

[Lecture%20Notes/6%20-](#)

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Then:

https://docs.google.com/forms/d/e/1FAIpQLSfsaFBXJ-rHZaTGN-NkuDlxp9UrBaGkR6-VIWaiF1omZ-9kiw/viewform?usp=sf_link

Dichotomy of Demand and Supply

You are working for a large, international airline. In conversation with a representative of a large dairy company at a conference, said representative asks you to quantify demand and supply on the route Arlanda-Newark. He is surprised to hear that you cannot easily quantify the demand and supply, as he easily can for, for example, milk with 3,25% fat in Stockholm in January. Give the dairy representative a detailed explanation on dichotomy of demand and supply in the airline industry.

- Cargo or passengers

- Cargo or passengers
- Time table or charter

- Cargo or passengers
- Time table or charter
- Business travel or low price company

- Cargo or passengers
- Time table or charter
- Business travel or low price company
- Big or small

- Cargo or passengers
- Time table or charter
- Business travel or low price company
- Big or small
- Domestic, international, continental or intercontinental

Factors affecting volume of O-D demand

TGAI - Chapter 3.3

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- Affected by many variables, models include usually only those variables with greater impact on demand and those that can be measured.

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Factors affecting volume of O-D demand

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- Affected by many variables, models include usually only those variables with greater impact on demand and those that can be measured.
- ❖ Socioeconomic and demographic variables
 - ❖ Larger populations, greater potential demand for air travel

Factors affecting volume of O-D demand

TGAI - Chapter 3.3

- Affected by many variables, models include usually only those variables with greater impact on demand and those that can be measured.
- ❖ Socioeconomic and demographic variables
 - ❖ Larger populations, greater potential demand for air travel
 - ❖ Amount and type of economic interaction between cities: two cities with common industries will generate more demand for air travel

Factors affecting volume of O-D demand

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 - ❖ Amount and type of economic interaction between cities: two cities with common industries will generate more demand for air travel
 - ❖ Disposable income

Factors affecting volume of O-D demand

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 - ❖ Prices of competing modes (train, bus, car)

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 - ❖ Time spent flying

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 - ❖ Time spent flying
 - ❖ Together: total trip time (“true” origin to “true” destination)

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 - ❖ Time spent flying
 - ❖ Together: total trip time (“true” origin to “true” destination)
 - ❖ Comfort

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- ❖ “Quality of service”
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 - ❖ Time spent flying
 - ❖ Together: total trip time (“true” origin to “true” destination)
 - ❖ Comfort
 - ❖ Safety

Factors affecting volume of O-D demand

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- ❖ “Quality of service”
 - ❖ Frequency of flight departures
 - ❖ Time spent flying
 - ❖ Together: total trip time (“true” origin to “true” destination)
 - ❖ Comfort
 - ❖ Safety
 - ❖ Ease of travel

Demand

Demand

- Strategical, technical, operational level

Demand

- Strategical, technical, operational level
- How to measure?

Demand

- Strategical, technical, operational level
- How to measure?
 - Market analysis

Demand

- Strategical, technical, operational level
- How to measure?
 - Market analysis
 - Check other companies

Demand

- Strategic, technical, operational level
- How to measure?
 - Market analysis
 - Check other companies
 - Prognosis

qualitative models	
based on opinions and assessment (from experts)	
long-term prognosis	
no historical data	

qualitative models	quantitative models
based on opinions and assessment (from experts)	mathematical
long-term prognosis	use of historical data
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Different types of prognosis need different methods

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Different types of prognosis need different methods

- Estimate demand for a completely new flight

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Different types of prognosis need different methods

- Estimate demand for a completely new flight
 - How many pax can we obtain Norrköping – Brussels

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- Estimate demand for a completely new flight
 - How many pax can we obtain Norrköping – Brussels
- Estimate demand for a proven route

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Different types of prognosis need different methods

- Estimate demand for a completely new flight
 - How many pax can we obtain Norrköping – Brussels
- Estimate demand for a proven route
 - How many pax during the winter half year on the route Norrköping – Munich

- Based on historical data

- Based on historical data
 - Time series analysis

- Based on historical data
 - Time series analysis
 - Trends, cyclical variations, seasonal variations, irregular events

- Based on historical data
 - Time series analysis
 - Trends, cyclical variations, seasonal variations, irregular events
 - Moving average, exponential smoothing

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-
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-
-
-

Talk to your neighbor: which factors determine the demand on a specific flight?

- Based on historical data
 - Time series analysis
 - Trends, cyclical variations, seasonal variations, irregular events
 - Moving average, exponential smoothing
- Based on knowledge of influencing factors
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- Based on historical data
 - Time series analysis
 - Trends, cyclical variations, seasonal variations, irregular events
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 - Example for factors?
- Based on knowledge of future events

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 - Panel of experts
 - Experts answer questionnaires in two or more rounds

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 - Panel of experts
 - Experts answer questionnaires in two or more rounds
 - After each round anonymous summary of the experts forecasts from the previous round
 - Experts answer same questions
 - It is believed that during this process the group will converge towards the “correct” answer

Various models, for more details, see TGAI Chapter 3.4

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- Elasticity of Air Travel Demand:

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- Elasticity of Air Travel Demand:
 - Price elasticity of demand is the percent change in total market demand that occurs with a 1% increase in average price charged.

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- Elasticity of Air Travel Demand:
 - Price elasticity of demand is the percent change in total market demand that occurs with a 1% increase in average price charged.
 - Price elasticity is negative for normal (<-> luxury) goods and services: A 10% price increase will cause an x% demand decrease, all being equal.

Various models, for more details, see TGAI Chapter 3.4

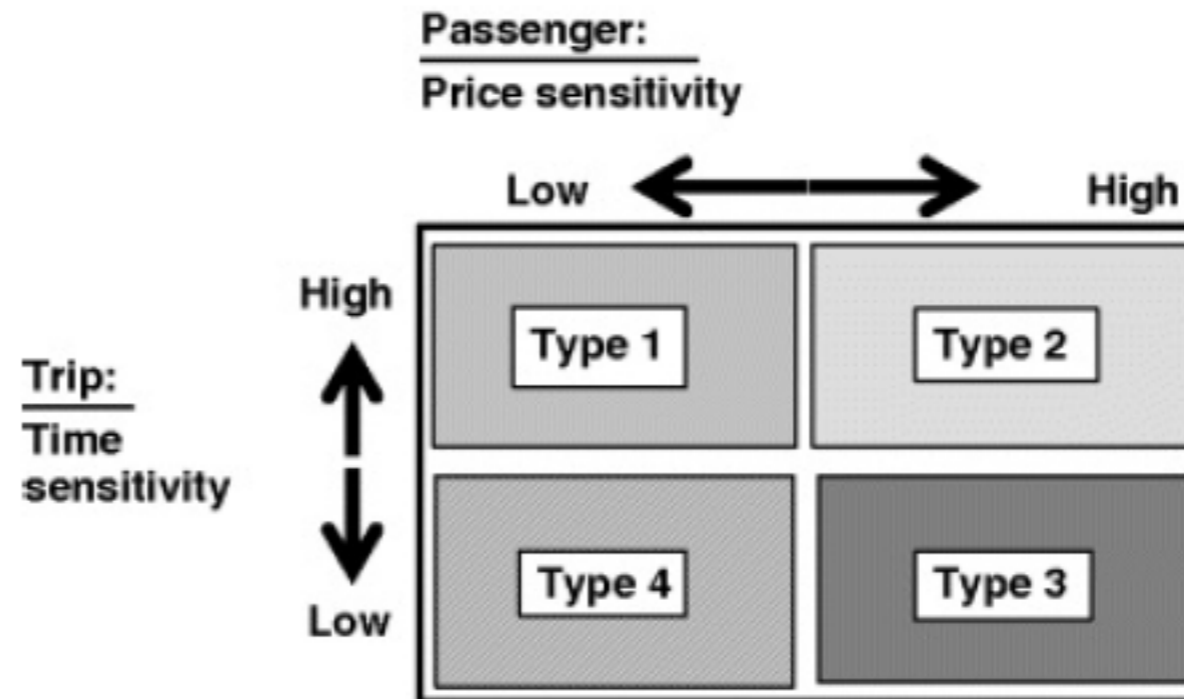
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 - Business air travel slightly “inelastic” ($0 < E_p < -1.0$): volume of demand does not change as a change in price (in %)

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 - Leisure demand for air travel is assumed to be much more elastic ($E_p < -1.0$)

Various models, for more details, see TGA1 Chapter 3.4

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 - Business air travel slightly “inelastic” ($0 < E_p < -1.0$): volume of demand does not change as a change in price (in %)
 - Leisure demand for air travel is assumed to be much more elastic ($E_p < -1.0$)
 - Similarly time elasticity



[Figure 3.6](#) Air travel demand segments (Belobaba, 1987)

Various models, for more details, see TGAI Chapter 3.4

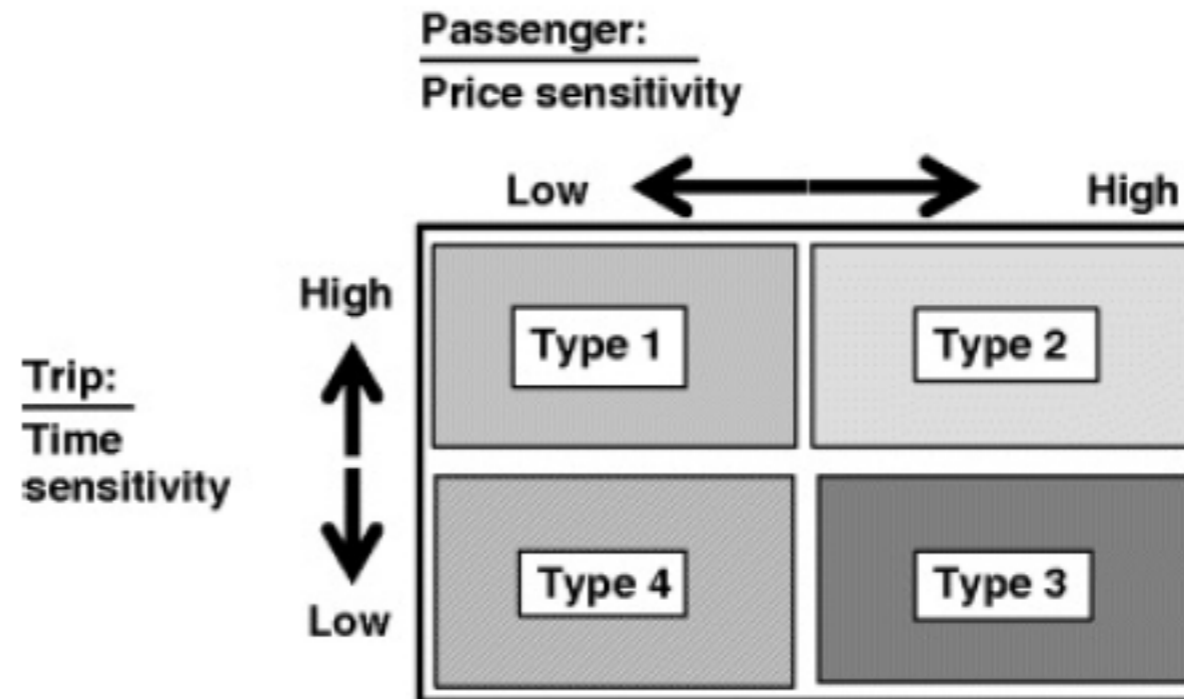


Figure 3.6 Air travel demand segments (Belobaba, 1987)