

**TURKISH
AVIATION
ACADEMY**



Introduction – State of Industry

Prof. Richard de Neufville

Istanbul Technical University

Air Transportation Management

M.Sc. Program

Airport Planning and Management

Module 01

January 2016

Welcome to Class

- It is my honor and pleasure to be here in Istanbul to participate in this class!
- I have very much enjoyed my previous visits over the past 50 years, and am happy to return.
- The opportunity to learn more about new airport developments here is a special treat.
- Allow me to take a few moments to introduce my colleagues and my sequence of introductory presentations.

What we bring to course

- Together, the team has very extensive, worldwide experience. We have worked on “every inhabited continent” (except perhaps Antarctica). We are thus able to share a perspective that goes beyond convention.
- We enjoy the opportunity to share thoughts with you and to learn from your experience. We know that someone in the audience knows more than we do on any subject, so we welcome your comments and questions.

Introductions to Team

- Professor Amedeo Odoni is my colleague at MIT and co-author of our text on “Airport Systems Planning, Design, and Management”. His specialty is on the “airside” and finance.
- Complementarily, I am a civil engineer and my expertise is on the “landside” of airports.
- Dr. Joe Sulmona is a consultant on airport strategic management and training, working closely with the Airports Council International. See his bio at <http://www.aci.aero>

Outline of my first presentations

I have 3 overall complementary, overlapping presentations to share with you:

→ Introduction – State of Industry (module 1). The focus here on the overall picture of the trends shaping the context for airports.

→ Airports in the 21st Century (module 2). This highlights the range of technical, organizational developments at airports.

→ Changing Airline Industry (module 8). This discusses the critical changes in our clients.

Topics for this session

→ **What appears steady trends:**

- Growth
- Centered on Asia
- Falling Prices
- Average Aircraft Size stable

→ **What is definitely changing:**

- Rise in Low Cost Carriers (LCC)
- Range of New Carriers
- Consolidation of Traditional Carriers
- Disappearance of Traditional Carriers
- Different Transfer Hubs
- Rise of Second Airports in a Multi-Airport System

Strong Steady Growth

- **About 6% each year, on average, worldwide**
 - Mostly in China
 - Also in Southeast Asia, India
 - And through Mid-East transfer hubs (Gulf)
 - More like 3% year in North America, largest market
- **This is mostly due to**
 - Increasing middle class with enough income
 - Technological improvements that increase efficiency and lower costs (lighter aircraft, better air traffic control (ATC))
 - Operational innovations of Low Cost Carriers (LCC)
 - Increase in Transfer Hubs (such as Atlanta, Dubai...)

World Traffic (Pax-Km, Billions)

Year	Pax-Km Billions	% year period
2014	6100	8.4
2010	4832	4.7
2000	3018	3.2
1990	2186	6.7
1982	1263	

Average Growth =
About 6% a year.

This implies that
volume doubles
every 12 years!

Note, however
that IATA stats
omit airlines that
are not members.

Source: IATA World Air Transport Statistics

Non-IATA Members

- **Many airlines among 2012 top 50 worldwide**
Predominantly low-cost carriers
 - Southwest; American Eagle, Atlantic Southeast, Republic, Pinnacle, Mesa, Frontier (US)
 - Westjet (Canada); Gol (Brazil)
 - Ryanair (Ireland), easyJet (UK), Norwegian (Norway)
 - AirAsia (Malaysia and region);
 - Tiger and Scoot (Singapore)
 - Indigo and SpiceJet (India)
- **IATA does not include them in their statistics**
(this means that IATA data are about 10% low)

Non IATA Airline Fleets

AIRLINE	FLEET SIZE	COMMENT
Southwest	683	All B 737
Fedex	634	
Ryanair	321	All B 737

Source: Wikipedia world's largest airlines
January 2016

Notes:

- 1) Southwest and Fedex have the 4th and 5th largest fleet in world, by number of aircraft
- 2) Both Fedex and UPS (not generally considered an airline) are among the top carriers in terms of aircraft – and profits!

Principal drivers of air transportation industry

- **Long-term annual decrease in costs, and fares:**
 - Due to new technologies (engine efficiency, carbon fiber, satellite navigation, etc)
- **Innovations of Low-cost carriers**
 - Southwest, Jet Blue, Westjet, Ryanair, easyJet, AirAsia
 - New operational practices (30 minute turn-around times, flight attendants clean aircraft, paperless tickets, etc.)
- **Operational changes:**
 - Use of transfer hubs (where passengers change aircraft to continue route, Boston-Istanbul-Singapore)
 - Consolidation of Industry into larger organizations

Cost Trends

- **Over past decade and more, “real costs” (net of inflation) have dropped significantly**
 - Yields (revenues/unit distance) dropped ~ 20%
 - While inflation has risen ~50%
 - So real costs halved ($0.8/1.5 \sim 0.5$)
- **Meanwhile traffic doubled**
 - Implying price elasticity of about $-2 > -1.0$ [this is the ratio of (+)change in traffic/(-)change in price]
 - A price elasticity more negative than -1 means that revenues grow as price drops
- **This is good for industry**

Average Aircraft Size stable

- **Average seats/aircraft is stable! In US from 166 to 172 over last 20 years. Favors smaller aircraft.**
- **As of 2015: Dreamliner up... A380 stagnant**
 - Large Airbus A380, (525 to ~850 pax in all-economy). Range > 10,000 km **317 orders total, none in 2015!**
 - Smaller Boeing 787 "Dreamliner" (210 - 330 pax). Range > 15,000 km **1142 net orders**
 - <http://www.boeing.com/commercial/787/#/flight-tracker>
- **Strong demand for smaller aircraft that can link distant airports bypassing connecting hubs**

Dreamliner nickname "hub buster"

Change: Rise of LCCs

- **Low-Cost Carriers**

- “Low Cost” due to their economical way of operating (any airline can have low-prices, to meet competition)
- 30 minute turn-around times (more time in air, working)
- Flight attendants clean aircraft
- Paperless ticketing...

- **Major examples**

- Southwest (+AirTran); jetBlue (US)
- WestJet (Canada)
- Ryanair; easyJet; Norwegian (Europe)
- Gol; Azul (Brazil)
- AirAsia (Southeast Asia)
- IndiGo; SpiceJet (India)

Change: Rise of Other Airlines

- **Middle East:**

- Fueled by oil money, ambition, and drive
- Good Location (between Europe Asia, good weather)
- Emirates, Etihad, Qatar

- **Chinese:**

- Huge population, growing middle class and markets
- China Southern, China Eastern, Air China, Hainan, Shenzhen, Xiamen

- **Integrated Cargo Delivery:**

- “door to door” service, efficient transfers (sorting hubs and uncongested airports)
- Fedex, UPS among biggest, most valuable airlines

Change:

Consolidation of Legacy Airlines

- **Mergers**

- Air France + Air Inter + KLM
- British + Iberia + Aer Lingus + Vueling
- Lufthansa + Swiss; TAP + Portugalia
- JAL + JAS;
- Air India + Indian
- Gol + Varig
- Delta + Northwest;
- United + Continental
- American + (US Air + American West) + TWA

Change:

Disappearance of Legacy Airlines

- **Some National Airlines have disappeared!**
 - Varig (Brazil)
 - Malev (Hungary)
 - Sabena (Belgium)
- **Major Bankruptcies... some recoveries**
 - Major airlines in North America have gone through bankruptcy to erase debts and continue
 - United, Delta in US
 - Air Canada
 - Swiss was “born again” as subsidiary of Lufthansa
 - Olympic Airlines faded into Aegean Airlines...

Change: Different Transfer Hubs

- **Major New Ones Challenge established hubs such as London, Frankfurt, Singapore:**
 - Dubai (Emirates)
 - Kuala Lumpur (AirAsia)
 - München (Lufthansa opens second hub)
 - Istanbul (Turkish) -- prospective
- **Transfer Operations moved elsewhere**
 - Madrid (Iberia bought by British)
 - Milan (Alitalia moved hub to Rome)
 - Pittsburgh (US Air moved to Philadelphia)
 - Minneapolis/St Paul (Northwest merged)
- **Market can change drastically**

Change: Rise of Second Airports

- **Low-Cost**

- Miami/Fort Lauderdale; Dallas/Love
- London/Stansted; Frankfurt/Hahn; etc.
- Sahiba Gokçen

- **Cargo**

- Memphis (Fedex); Louisville (UPS)
<http://www.cnet.com/pictures/at-fedexs-memphis-hub-sorting-1-5-million-packages-pictures/25/>
- Cologne (Fedex hub)
<https://www.youtube.com/watch?v=QFhFadMuyIY>

- **Now ~ 75 Multi-airport systems worldwide (cities with 2 or more significant airports)**

Airport and Airline Rankings

Thought Questions

- Which are the biggest airlines?
- How do we measure big?
- Which are the biggest airports?

Airline Ranking: Passengers carried (000s)

Rank	Airline	2014 ^[4]	2013 ^[5]	2012 ^[6]
1	Delta Air Lines	129,433	120,636	116,726
2	Southwest Airlines	129,087	115,323	112,234
3	China Southern Airlines	100,683	91,504	86,277
4	United Airlines	90,439	90,161	92,619
5	American Airlines	87,830	86,823	86,335
6	Ryanair	86,370	81,395	79,649
7	LATAM	67,833	66,696	64,983
8	China Eastern Airlines	66,174	62,653	79,611
9	EasyJet	62,309	58,410	
10	Lufthansa	59,850	63,273	64,393
11	Turkish Airlines	54,675	48,268	39,045
12	Air China	54,674		

Delta and United grew by mergers.

American had 146,814 in 2015 (after merger with US Airlines)

Southwest, Ryanair, and EasyJet are Low Cost Carriers

Old European Airlines down list

Airline Ranking: Number of Aircraft

Rank ▲	Airline (including contract carriers) ⇅	Fleet ^[16]
1	 American Airlines Group	1,494
2	 Delta Air Lines	1,280
3	 United Airlines	1,264
4	 Southwest Airlines	683
5	 FedEx Express	634
6	 Lufthansa Group	616
7	  Air France-KLM	572
8	  International Airlines Group	525
9	 China Southern Airlines	509
10	 Air Canada	408
11	 China Eastern Airlines	405
12	 Air China	338
13	 Ryanair	321
14	  LATAM	320
15	 Turkish Airlines	299

US based carriers have largest fleets.

Note Size of Fedex and LCCs Southwest and Ryan Air

Note 'almost mergers':

- Air France + KLM
- British + Iberia (and soon Aer Lingus)
- LATAM Lan+ Tam

Lufthansa group has Swiss and Austrian

Airline Ranking: Countries served

Rank ↕	Airline ↕	countries served ^[1]
1	 Turkish Airlines	118 ^[18]
2	 Lufthansa	83
3	 Emirates	83
4	 KLM	78
5	 Air France	78
6	 British Airways	78
7	 Qatar Airways	74
8	 Delta Air Lines	71
9	 Singapore Airlines	66
10	 American Airlines	60

**Countries served
not same as
Destinations
served!**

**Delta serves 325
destinations in
> 60 countries.**

**Atlanta hub serves:
178 US cities
80 International
258 cities in all**

Airline Ranking: Tonne-miles carried

Rank ↕	Airline ↕	2014 ^[12] ↕	2013 ^[13] ↕	2012 ^[14] ↕	2011 ^[15] ↕
1	 FedEx Express	16,020	16,127	16,108	15,939
2	 Emirates SkyCargo	11,240	10,459	9,319	8,132
3	 UPS Airlines	10,936	10,584	10,416	10,566
4	 Cathay Pacific Cargo	9,464	8,241	8,433	9,109
5	 Korean Air Cargo	8,079	7,666	8,144	8,974
6	 Lufthansa Cargo	7,054	7,218	7,175	7,674
7	 Singapore Airlines Cargo	6,019	6,240	6,694	7,118
8	 Qatar Airways Cargo	5,997	4,972		
9	 Cargolux	5,753	5,225		
10	 China Airlines Cargo	5,266	4,813	4,538	5,411
11	 British Airways			4,732	
12	 EVA Air			4,470	4,882

**Fedex,
UPS and
Emirates
top list**

**Korean,
Lufthansa,
Singapore in
decline**

Airline Ranking: Sample Market Capitalizations

AIRLINE	Market Cap US\$ Billions	AIRLINE	Market Cap US\$ Billions
UPS	81	United	17
China Eastern	73	Singapore	13.4
China Southern	62.4	Turkish	9.8
Emirates	37.5	British	6.9
Fedex	36.3	EasyJet	6.4
Delta	35.7	Lufthansa	6.3
Southwest	26.3	Latam	2.6
American	25.6	Air France	2.2
Ryanair	19		

Source: Quotes as of Jan 19, 2016

“ Market Cap” = value of company = (number of shares) x *(share price)
Note Importance of Freight, Low Cost Carriers; weakness of European Airlines

30 Busiest Airports in the World (2014)

(1) = pax (million); (2) = movements (thousand)

Source: Odoni from ACI

	(1)	(2)		(1)	(2)
Atlanta ATL	96.2	868	Singapore SIN	54.1	341
Beijing PEK	86.1	582	New York JFK	53.6	423
London LHR	73.4	473	Denver DEN	53.5	566
Tokyo HND	72.8	426	Shanghai PVG	51.7	402
Los Angeles LAX	70.7	637	Kuala Lumpur KUL	48.9	341
Dubai DXB	70.5	357	San Francisco SFO	47.1	432
Chicago ORD	70.0	882	Bangkok BKK	46.4	290
Paris CDG	63.8	471	Seoul Incheon ICN	45.7	298*
Dallas DFW	63.5	680	Charlotte CLT	44.3	545
Hong Kong HKG	59.7	402	Las Vegas LAS	42.9	522
Frankfurt FRA	59.6	469	Phoenix PHX	42.1	430
Jakarta CGK	57.0	382	Madrid MAD	41.8	343
Istanbul IST	56.8	440	Houston IAH	41.2	509
Amsterdam AMS	55.0	453	Miami MIA	40.9	403
Guangzhou CAN	54.8	412	Sao Paulo GRU	39.8	305

Transfer hubs generate much traffic, such as Atlanta, Dubai, Dallas, Frankfurt, Denver, Houston

Take-aways

- **The Airline/Airport Industry continues to grow quickly, thanks to**
 - Increased efficiency in many areas
 - Rise of incomes, middle class, especially in Asia
- **Much disruption in Airline/Airport Industry**
 - New Competitors, both for airlines and airports
 - Displacing, squeezing out traditional airlines
 - Challenging established airport transfer hubs
 - Rerouting traffic, from Europe toward Middle East
- **Disruptions may last another 20 years!**