

**TURKISH  
AVIATION  
ACADEMY**



**İTÜ**



# Airports in the 21<sup>st</sup> Century

*Prof. Richard de Neufville*

Istanbul Technical University

Air Transportation Management

M.Sc. Program

Airport Planning and Management

Module 02

January 2017

# Focus of this Presentation

---

- **Top Airports – Passengers and Cargo**
  - Shifts in Ranking, Causes
  - Importance of Transfer Hubs
- **Rise of Low Cost Carriers**
  - Drive Traffic Growth, especially at Second Airports
  - Demands for “low cost” facilities and operations
- **Technological developments**
  - People movers for passengers at large airports
  - IT for electronic check-ins, border controls
- **Current Major Airport Projects**

# Airport Ranking: By Passenger Traffic

RANK 2015	RANK 2014	AIRPORT CITY / COUNTRY / CODE	PASSENGERS	
			(Enplaning and deplaning)	Percent change
1	1	ATLANTA GA, US (ATL)	101 491 106	5.5
2	2	BEIJING, CN (PEK)	89 938 628	4.4
3	6	DUBAI, AE (DXB)	78 010 265	10.7
4	7	CHICAGO IL, US (ORD)	76 949 504	9.8
5	4	TOKYO, JP (HND)	75 316 718	3.4
6	3	LONDON, GB (LHR)	74 989 795	2.2
7	5	LOS ANGELES CA, US (LAX)	74 937 004	6.1
8	10	HONG KONG, HK (HKG)	68 283 407	8.2
9	8	PARIS, FR (CDG)	65 766 986	3.1
10	9	DALLAS/FORT WORTH TX, US (DFW)	64 072 468	0.9
11	13	ISTANBUL, TR (IST)	61 836 781	9.2
12	11	FRANKFURT, DE (FRA)	61 032 022	2.5
13	19	SHANGHAI, CN (PVG)	60 053 387	16.3
14	14	AMSTERDAM, NL (AMS)	58 284 864	6.0
15	18	NEW YORK NY, US (JFK)	56 827 154	6.8
16	16	SINGAPORE, SG (SIN)	55 449 000	2.5
17	15	GUANGZHOU, CN (CAN)	55 201 915	0.8
18	12	JAKARTA, ID (CGK)	54 053 905	-5.5
19	17	DENVER CO, US (DEN)	54 014 502	1.0
20	22	BANGKOK, TH (BKK)	52 902 110	14.0

**Note Importance  
Transfer airports:  
Atlanta, Chicago,  
Dubai,  
Dallas/Fort Worth  
Istanbul,  
Amsterdam,  
Denver, Bangkok**

**Note relative  
growth of  
Dubai, Chicago,  
Hong Kong,  
Istanbul**

# Learning from Airport Rankings

---

## Passenger Traffic

- **Hub Effect**

- Notice that relatively small cities (Atlanta, Dubai, Dallas) with modest levels of origination/destination traffic are among biggest – due to transfer traffic

- **Shift in Traffic**

- Rise in importance of Middle East and Asia (Dubai and Hong Kong)
- Overtaking Frankfurt and Jakarta

# Top Cargo Airports, 2015

RANK 2015	RANK 2014	AIRPORT CITY / COUNTRY / CODE	CARGO (Metric tonnes)	
			Loaded and unloaded	Percent change
1	1	HONG KONG, HK (HKG)	4 460 065	0.4
2	2	MEMPHIS TN, US (MEM)	4 290 638	0.8
3	3	SHANGHAI, CN (PVG)	3 273 732	2.9
4	5	ANCHORAGE AK, US (ANC)*	2 630 701	5.5
5	4	INCHEON, KR (ICN)	2 595 677	1.5
6	6	DUBAI, AE (DXB)	2 505 507	4.5
7	7	LOUISVILLE KY, US (SDF)	2 350 656	2.5
8	8	TOKYO, JP (NRT)	2 122 314	-0.6
9	11	PARIS, FR (CDG)	2 090 795	0.2
10	9	FRANKFURT, DE (FRA)	2 076 734	-2.6
11	10	TAIPEI, TW (TPE)	2 021 865	-3.2
12	12	MIAMI FL, US (MIA)	2 005 174	0.3
13	15	LOS ANGELES CA, US (LAX)	1 938 624	6.5
14	14	BEIJING, CN (PEK)	1 889 829	2.3
15	13	SINGAPORE, SG (SIN)	1 887 000	0.4
16	16	AMSTERDAM, NL (AMS)	1 655 354	-0.9
17	19	CHICAGO IL, US (ORD)	1 592 826	15.6
18	17	LONDON, GB (LHR)	1 591 637	0.2
19	18	GUANGZHOU, CN (CAN)	1 537 759	5.8
20	24	DOHA, QA (DOH)	1 454 952	46.0

**Notice  
Role of  
“All Cargo”  
Airports  
Memphis,  
Anchorage,  
Louisville**

**Relative  
Growth of  
Paris,  
Los Angeles,  
Chicago**

# Learning from Airport Rankings

---

## Cargo Traffic

### •Hub Effect

- As for Passengers, some really small cities (Memphis, Anchorage, Louisville), with very low levels of origination/destination traffic, are among biggest cargo airports – due to transfer traffic especially from integrated carriers Fedex, UPS

### •Shift in Traffic

- Rise in importance of Middle East (Doha, Dubai)
- Stagnation, losses at traditional centers in Asia (Tokyo, Singapore) and Europe (Amsterdam, Frankfurt)

# Impact of Low Cost Carriers

---

- **Phases of Competition with Legacy Carriers**

- Much lower costs of operation, thus of fares
- Develop new markets, gain market share
- Come to dominate National and Regional Markets
- Legacy Airlines reduce costs to compete
- CONVERGENCE OF COSTS AND SERVICE

- **Impacts on Airports**

- Use of Secondary Airports
- Faster Turn around times -- fewer gates
- Smaller aircraft – more compact terminals
- Shared Use of lounges – space economies
- Eliminate VIP space, etc. – more savings
- Example: JetBlue Terminal at New York/Kennedy

# Southwest LCC Dominates Domestic Competitors











Airline	Passengers	
	Millions	% of Total
Southwest	118	20
American + US Air	99	17
Delta	96	16
United	58	10
<b>Total USA</b>	<b>584</b>	<b>100</b>

Source: US DoT, BTS, Air Carrier Domestic Market 2014

**Southwest has been top carrier for US domestic market for about 10 years**



# Ryanair dominates in Europe

Country (Cap m)*	No. 1	No. 2	No. 3	Share
UK (117)	easyjet	 RYANAIR <small>LOW FARES. MORE SIMPLE.</small>	BA	16%
Germany (112)	Luft	Air Berlin	 RYANAIR <small>LOW FARES. MORE SIMPLE.</small>	4%
Spain (105)	 RYANAIR <small>LOW FARES. MORE SIMPLE.</small>	Vueling	Iberia	18%
Italy (85)	 RYANAIR <small>LOW FARES. MORE SIMPLE.</small>	Alitalia	easyJet	25%
France (72)	AF- KLM	easyJet	 RYANAIR <small>LOW FARES. MORE SIMPLE.</small>	7%
Portugal (19)	TAP	 RYANAIR <small>LOW FARES. MORE SIMPLE.</small>	easyJet	17%
Belgium (15)	 RYANAIR <small>LOW FARES. MORE SIMPLE.</small>	SN Brussels	Jetairfly	25%
Ireland (15)	 RYANAIR <small>LOW FARES. MORE SIMPLE.</small>	Aer Lingus	BA	<b>46%</b>
Poland (15)	 RYANAIR <small>LOW FARES. MORE SIMPLE.</small>	LOT	Wizz	26%
Morocco (12)	RAM	 RYANAIR <small>LOW FARES. MORE SIMPLE.</small>	easyJet	12%

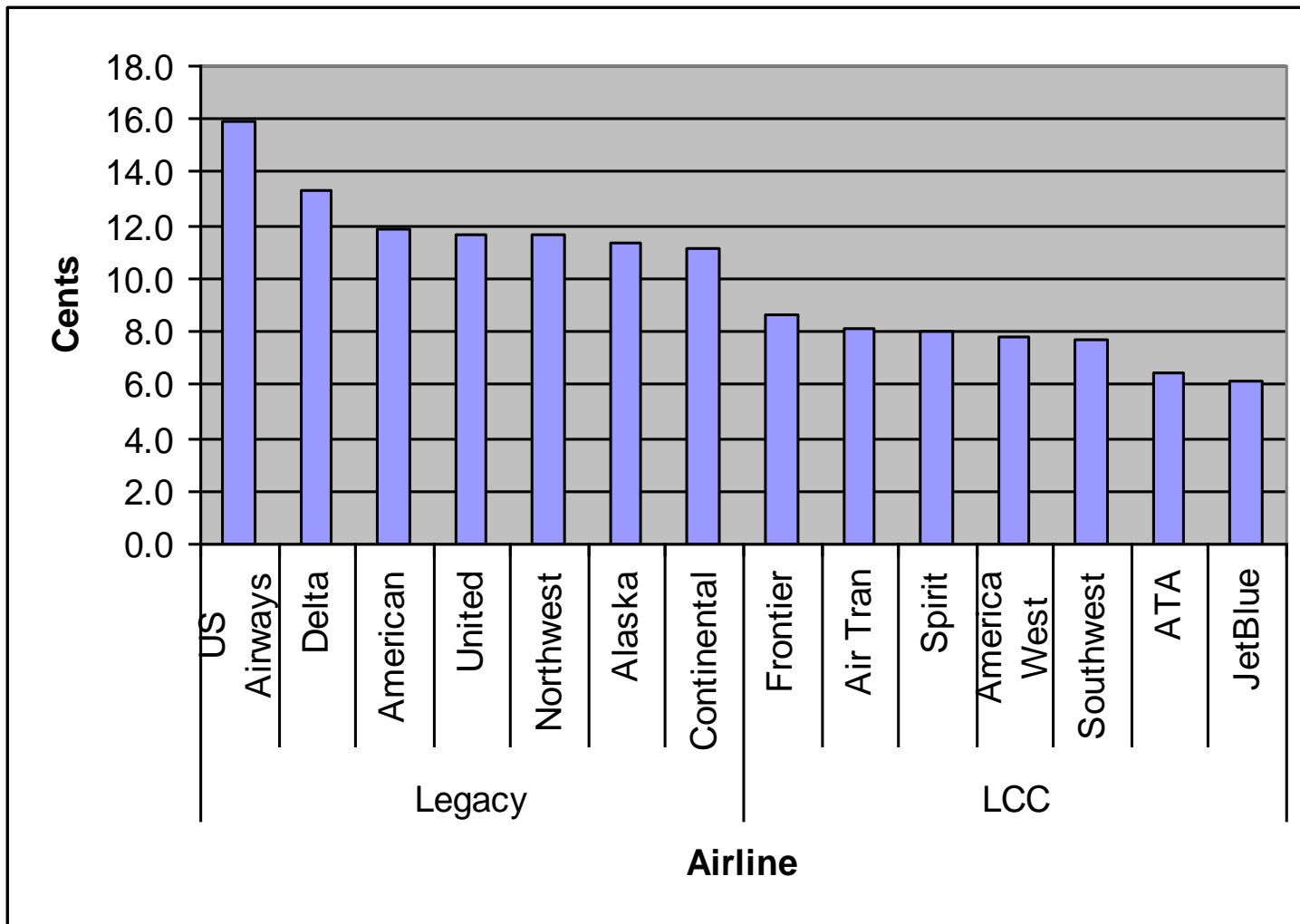
\*Cap Stats Departing Seats 2014

# Similar story elsewhere

---

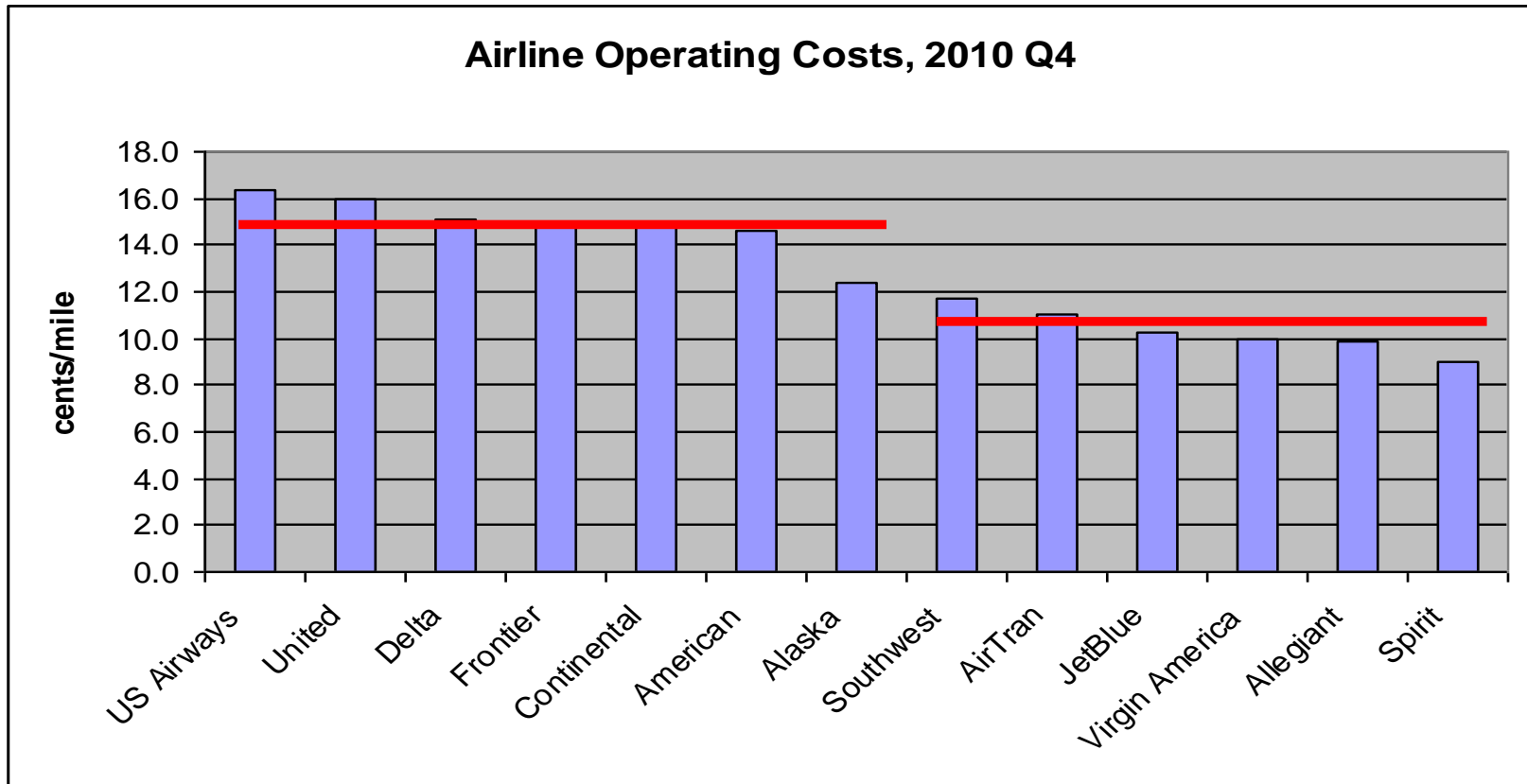
- **LCCs dominate India in 2016, having ~ 90% market share overall**
  - Indigo 46%; SpiceJet 23%; Jet 13%; GoAir 8%
  - And the National Indian Airways less than 10%
- **Pegasus 28% share of Turkey traffic in 2015, but situation not clear for 2016** your information?

# Airline Seat-Mile Costs, 2005



**In 2005,  
Southwest  
Costs were  
only 2/3 of  
that of  
Legacy  
Carriers**

# Airline Seat-Mile Costs, 2010 Q4



**5 years later, Convergence: Cost gap narrowed**

# Use of Secondary Airports

---

- **Low cost airlines have typically started operations at Secondary airports, where they were protected from competition**
  - Dallas/Love, Miami/Fort Lauderdale (Southwest)
  - London/Stansted (Ryanair)
  - London/Luton (easyJet)
  - Frankfurt/Hahn (Ryanair)
  - Bangkok/Don Mueang (Nok)
  - Istanbul/Sahiba Gokçen (Pegasus)
- **Later, have moved to Major Airports**
  - Southwest at Philadelphia, Boston/Logan

# Faster Turn Around Times: Fewer Gates

---

- **Southwest (and other LCCs) aim to “turn around” flights within 30 minutes, sometimes 20.**
- **They can serve many more flights at each gate than airlines needing 1 hour or more for turn around**
- **Boston example**
  - Annual Passengers per gate ~ 500,000 for JetBlue
  - About twice as much as Delta for domestic service!

# Smaller Aircraft: Terminals More Compact

---

- **Low Cost Carriers specialize in smaller aircraft**
  - Southwest – 100% 737s (>90% Next Gen)
  - Ryanair – 100% Next Gen 737s
  - easyJet – 100% Airbus 319 and 320s
  - AirAsia – 100% Airbus 320s
  - Pegasus – 72% 737s, 28% Airbus 320s
- **Terminals for LCCs thus are simpler and need smaller gate separations**

# Shared Departures Lounges: Savings in Spaces

---

- **Low Cost Carriers commonly share departure areas between gates – and other activities**
- **Great savings in space needed for this function – easily 30%**
  - To the extent that flights do not leave on time, passengers for later flights can use the space associated with earlier flights.
- **JetBlue terminal New York/Kennedy – departure space is also food court space!**



# **Jetblue Terminal at New York/Kennedy**

---

**A tour using slides provided by  
Gensler Architects  
Prof. Richard de Neufville**

**Plans before construction  
as built details differ**

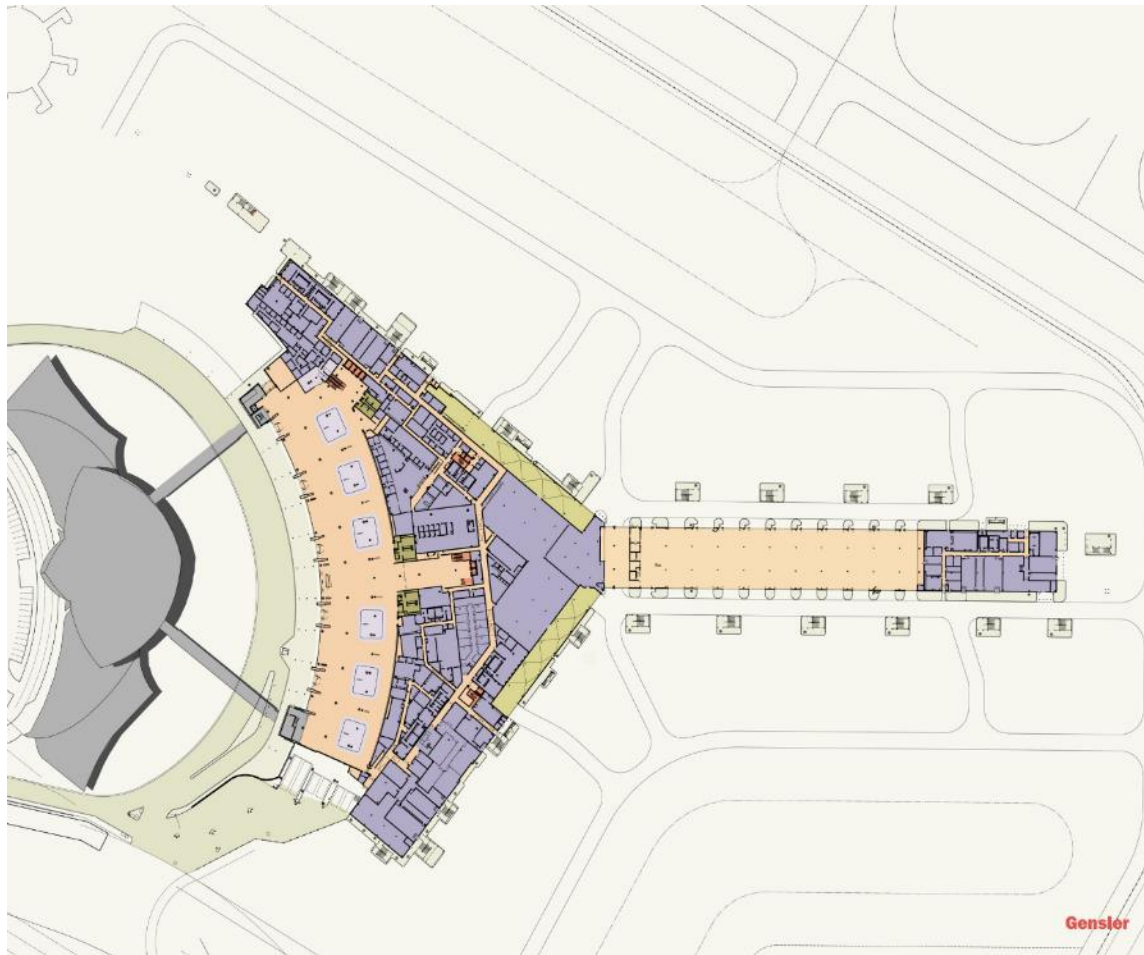
# Airside



Jetblue terminal New York/Kennedy

Slides courtesy of Gensler

# Plan view

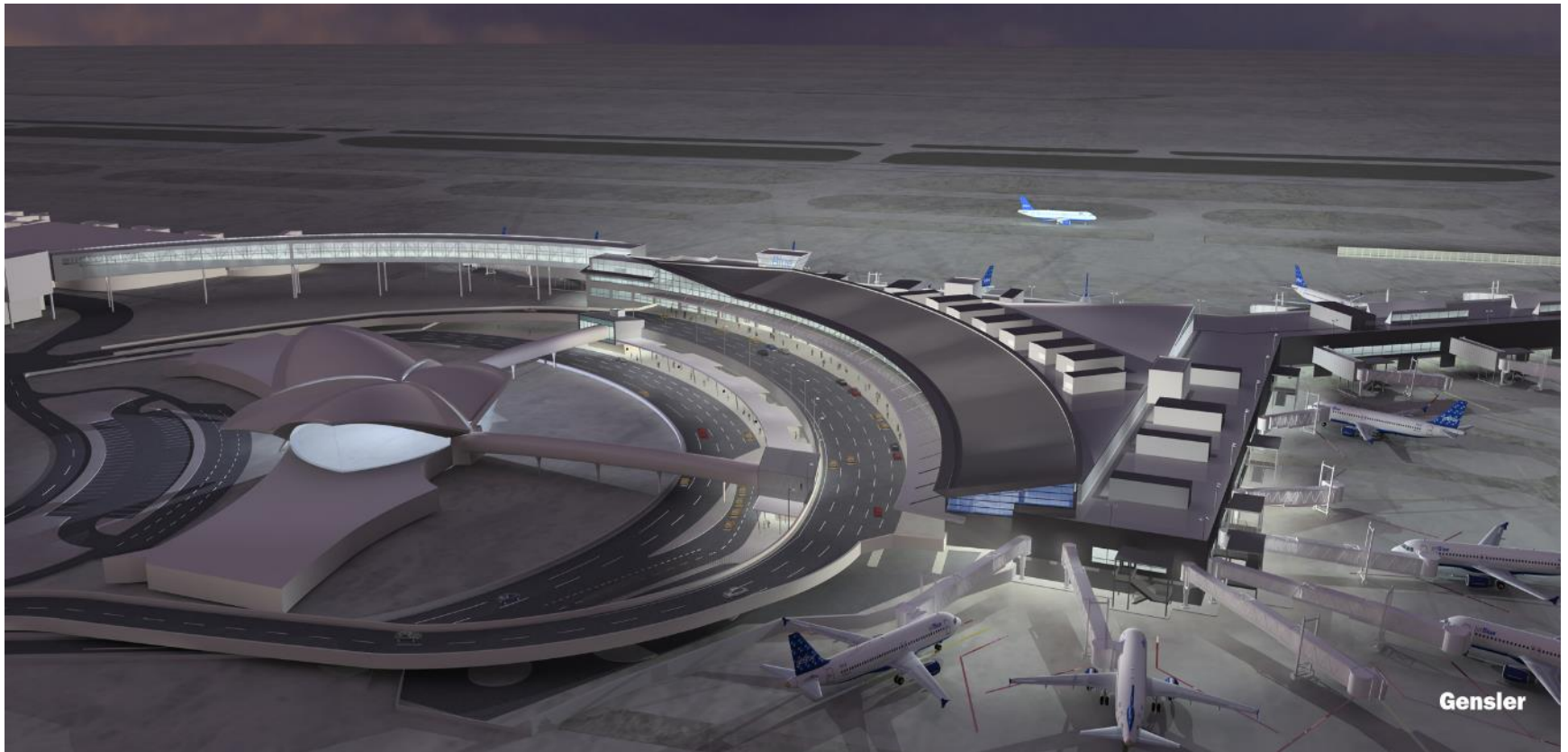


Jetblue terminal New York/Kennedy

Slides courtesy of Gensler

# Relationship to Saarinen Bldg

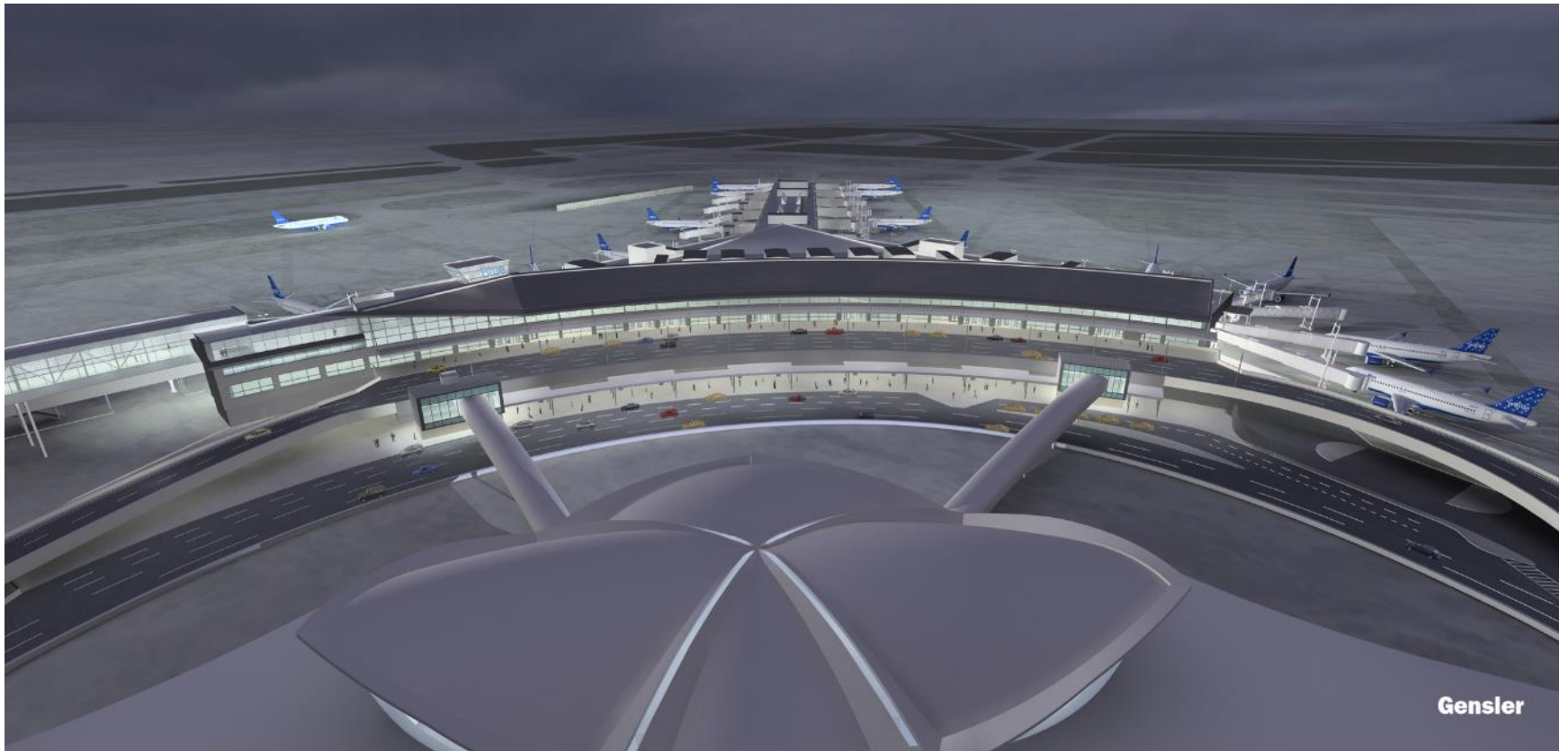
---



Jetblue terminal New York/Kennedy

Slides courtesy of Gensler

# Landside and Airside



Jetblue terminal New York/Kennedy

Slides courtesy of Gensler

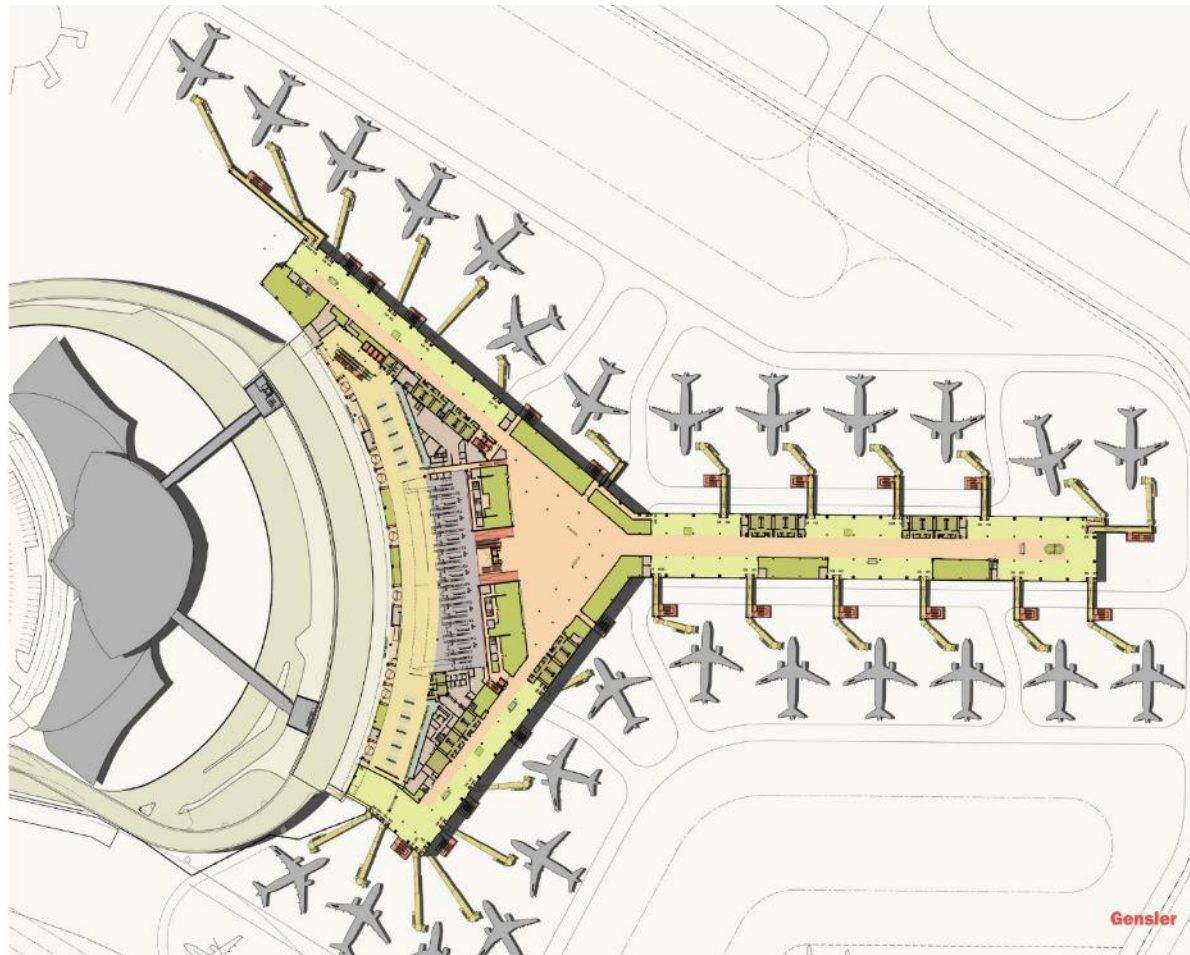
# Airside



Jetblue terminal New York/Kennedy

Slides courtesy of Gensler

# Plan view, passenger level



**Note the shared departure areas!**

Jetblue terminal New York/Kennedy

Slides courtesy of Gensler

# Check-in Area

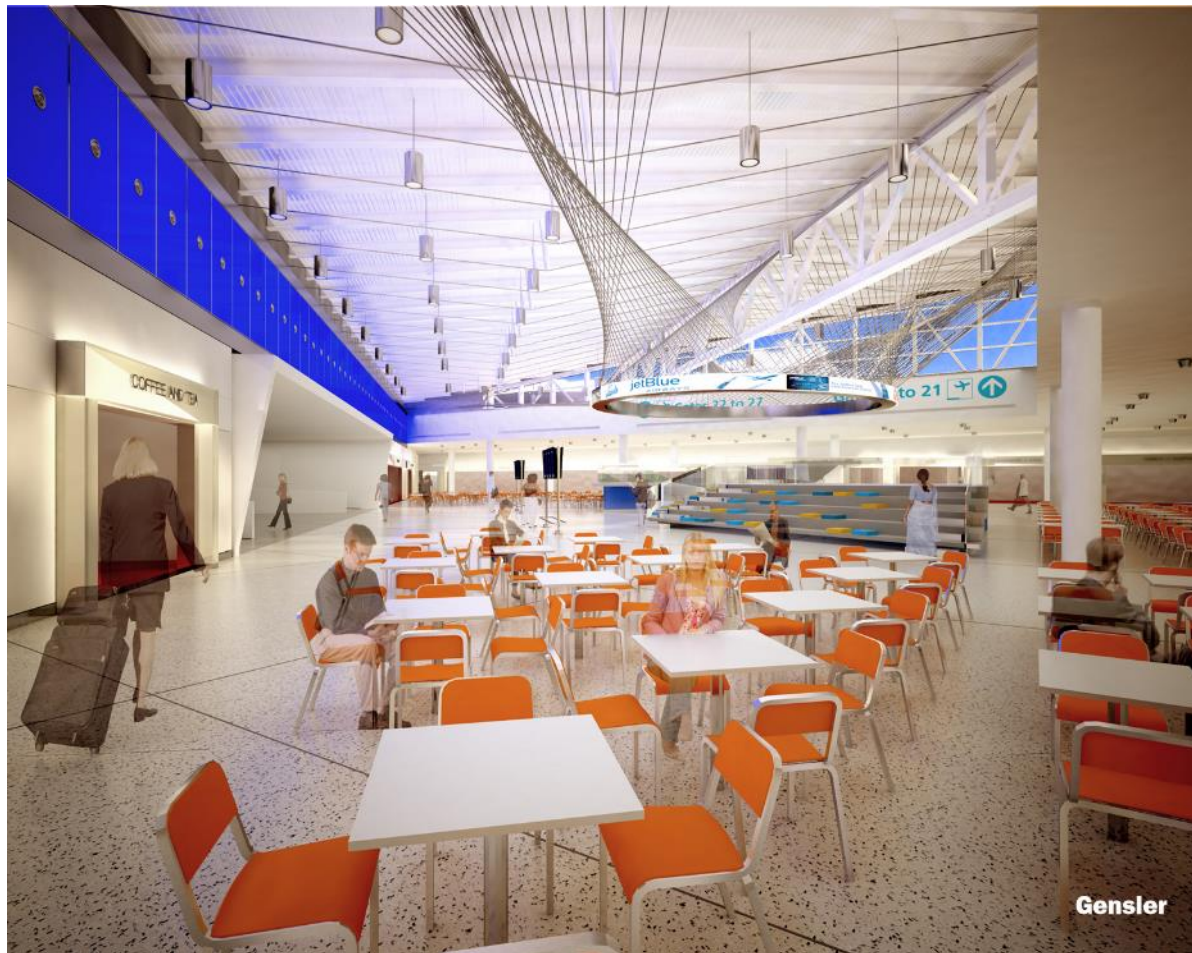


Jetblue terminal New York/Kennedy

Slides courtesy of Gensler



# Courtyard past security



Jetblue terminal New York/Kennedy

Slides courtesy of Gensler

# Alternate view past security



Jetblue terminal New York/Kennedy

Slides courtesy of Gensler

# Down corridor onto field

---



Jetblue terminal New York/Kennedy

Slides courtesy of Gensler

**At departure gates, instead of rows of uncomfortable seats filled with grumpy passengers ... travelers find clusters of seats around counters, where they can order food on a touch-screen monitor and have it delivered in the gate area.**



**Instead of being on the floor, passengers sit comfortably and charge their electronic devices at conveniently placed outlets**

# JetBlue Wooftop



# Technological Developments

---

## Two important elements to discuss today

- **People movers**

- These are automated “trains” that connect passengers in groups across 500 to about 5000m.
- They have revolutionized the configuration and design of large modern airports.

- **Information Technology for Passengers**

- Remote (at home or office) check-in or via kiosks. This has largely made big check-in halls obsolete
- Use of Wi-fi throughout with need of sufficient support (bandwidth and charging stations)

# People Movers

---

- **Solution to central issue for airport design:**
  - Need to connect passengers from
  - Central ticket, metro, parking, shop areas
  - To many gates, widely separated, long distances
- **People movers at all new airports in top 10.**
  - Los Angeles is planning people mover as part of its Landside Modernization Program
  - Tokyo/Haneda has a monorail to airport
- **People movers connect central facility to:**
  - Aircraft gates, satellite terminals (airside)
  - Rental car, Parking facilities, Railroads (landside)

# IT for Passengers

---

- **Electronic Ticketing, check-in**

- Big Savings ~\$3 billion each year
- \$1 per E-ticket vs. ~\$10 per paper ticket
- Less staff, less space, less rent...
- LCCs forced “100%”: Southwest, JetBlue, Ryanair.
- Nearly all tickets worldwide
- Kiosks complement check-in from home, office

- **Wi-Fi for all, everywhere, all the time**

- Airlines and Passengers expect Wi-fi throughout for passenger control and convenience
- Needs support (bandwidth and charging stations)



# Major “New Airport” Projects

---

- **Istanbul:** 5-Runway Greenfield Airport
- **Rome:** 12 billion Euro makeover in prospect
- **Dubai:** Al Maktoum Second 4-Runway airport. Officially “open” ~ 1 million pax /year...
- **Berlin/Brandenburg:** 2018 opening? Disastrous history – now 7 years behind schedule.
- **Mexico City:** Second Airport contract award Jan ‘17
- **Beijing:** Daxing Second Major Airport to open 2019 constructed for 45 million pax, later to 100 million

# Beijing 2<sup>nd</sup> Major Airport Daxing



**Design  
for  
Terminal  
by  
ADPI  
Aéroports  
de Paris  
Internat'l**

**4 Runways  
(6 later?)**

# Major Runway Projects

---

- **Chicago/O'Hare:** “airport modernization program” completely reconfigures many runways
- **Brisbane:** Second parallel runway
- **Singapore:** Third parallel commercial runway (a fourth is reserved for military use)
- **Calgary:** Opened second parallel 4,267mi (14,000ft) runway in 2014. Longest in Canada.
- **Projects projected:** Melbourne, Munich, Perth, Prague, etc.

# Major Terminal Building Projects

---

- **Singapore:** New T4, redo of T1, Massive T5
- **Shanghai/Pudong:** New satellite Terminal
- **Seoul/Incheon:** New T2, open 2017...
- **London/Heathrow:** New T2
- **London/Gatwick:** £2.8b (\$4billion) makeover
- **Frankfurt:** Construction on new T3 (for 2023?)
- **Los Angeles/International:** All Terminals ...
- **New York/LaGuardia:** Complete makeover
- **Brazil:** 2016 Olympics extensions at São Paulo, Rio de Janeiro/Jobim, Campinas/Viracopos

# Image for Frankfurt Terminal 3



# Seoul/Incheon T2 (plan)



**Design  
for  
Terminal  
by  
ADPI  
Aéroport  
S  
de Paris  
Internat'l**

# Take aways

---

- **Top Airports, Passengers and Cargo feature transfer hubs.**
- **Shifts to Asia, Middle East**
- **Rise of Low Cost Carriers drives growth of second airports, push for ‘low cost’ design of airport terminals**
- **Technological developments feature widespread use of people movers, and emphasis on convenient IT and Wi-fi**
- **Continual Stream of Major Airport Projects**