Airport Characteristics: Part 1

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Airport Characteristics

- **Objective:**
  - To provide background and an overview on the diversity of airport characteristics
- **Topics:**
  - Discussion of geometric characteristics of major airports
  - Introduce useful background and terminology
  - Critical aspects of airport layouts
  - Some international comparisons

Reference: Chapter 9 [esp. 9.1-9.4], de Neufville+Odoni

Most of the pictures in this presentation were obtained from airport websites or through Google Maps

What *Was* a (Major) Airport…

- Infrastructure facility ("terminal + runway") serving originating + terminating passengers and some freight (… up to mid-1970s); few commercial or other services
- Practically all airports had one or two runways (… up to 1970s)
- Government-owned (national, regional or local) facilities, managed by either government organizations or by special-purpose Airport Authorities (… up to 1986)
- Often heavily subsidized by national governments, especially w.r.t. to capital investments (… up to 1980s)
- Security was not an issue (… up to late 1960s) and not a dominant concern (… up to 1990s)
- Environmental concerns (beginning in 1960s) centered on airport noise

…and What *Is* a (Major) Airport

- "The Airport City"
  - Very large complex of diverse facilities
  - Big volumes of O-D and connecting passengers and high-value freight
  - Level-of-service varies widely (airline type, market)
  - Extensive commercial, logistic and supporting services
  - Increasingly an inter-modal node
- Often privatized or semi-privatized, operating largely along private sector lines
- Self-sufficient economically and typically profitable
- Security is paramount
- Emissions and climate impacts are primary environmental concerns, in addition to noise

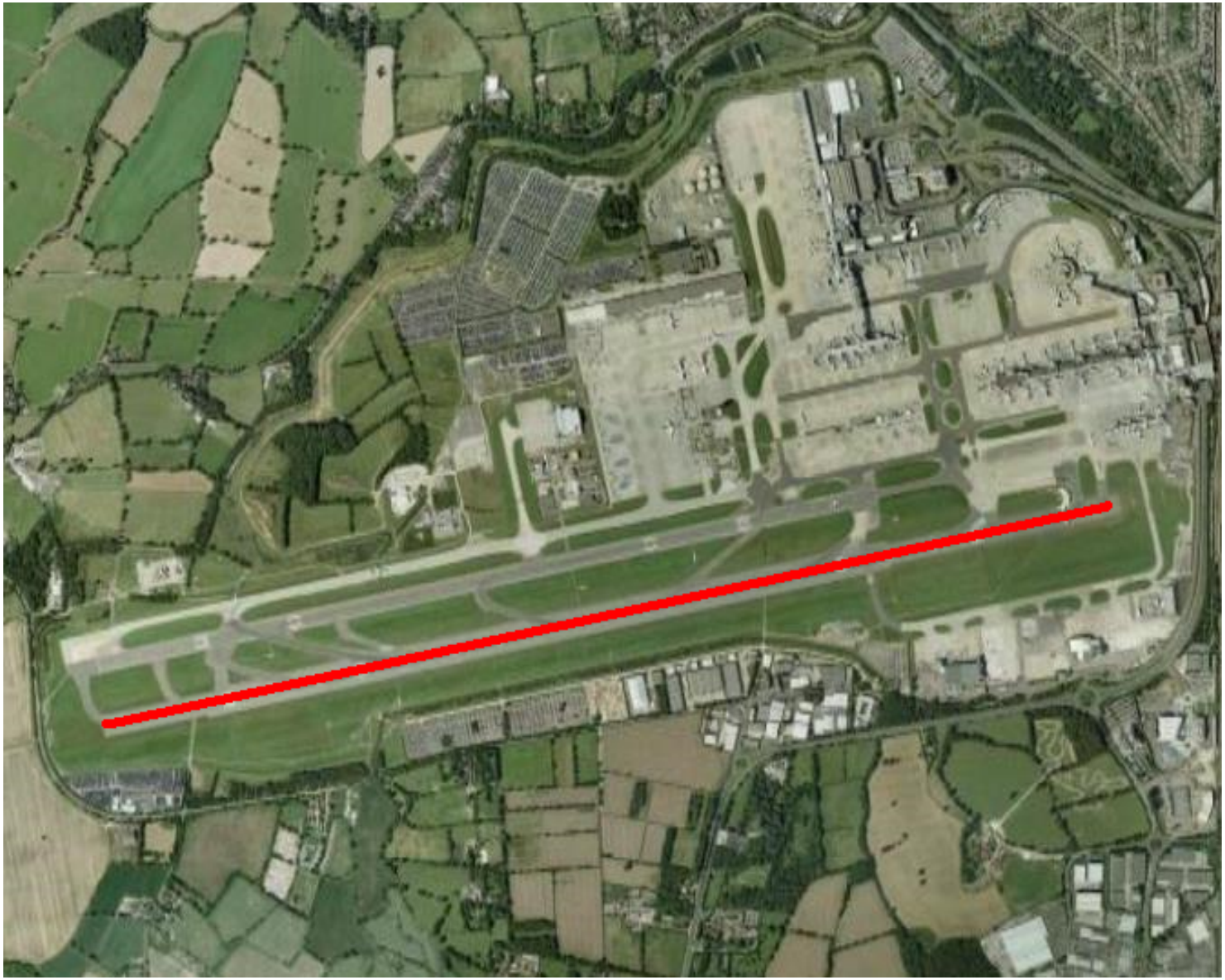
Growth of Traffic Worldwide

- Number of passengers worldwide has tripled in 30 years
  - ~ 3 billion enplanements in 2014
- Despite two global "shocks", 25% growth since 2000
  - Uneven distribution of growth
    - Mostly Asia (esp., China + India + Middle East)
    - Across airports, largely driven by airlines
- Prospect: Continued significant growth worldwide (~4%) driven by fast growth in Asia and South America (~6%+); much slower growth in North America and Europe
- Top 30 airports ~30% of passengers; top 100 ~67%
- Major job generators: "1000 employees per million pax"
- Busy airports are "perpetual construction sites"

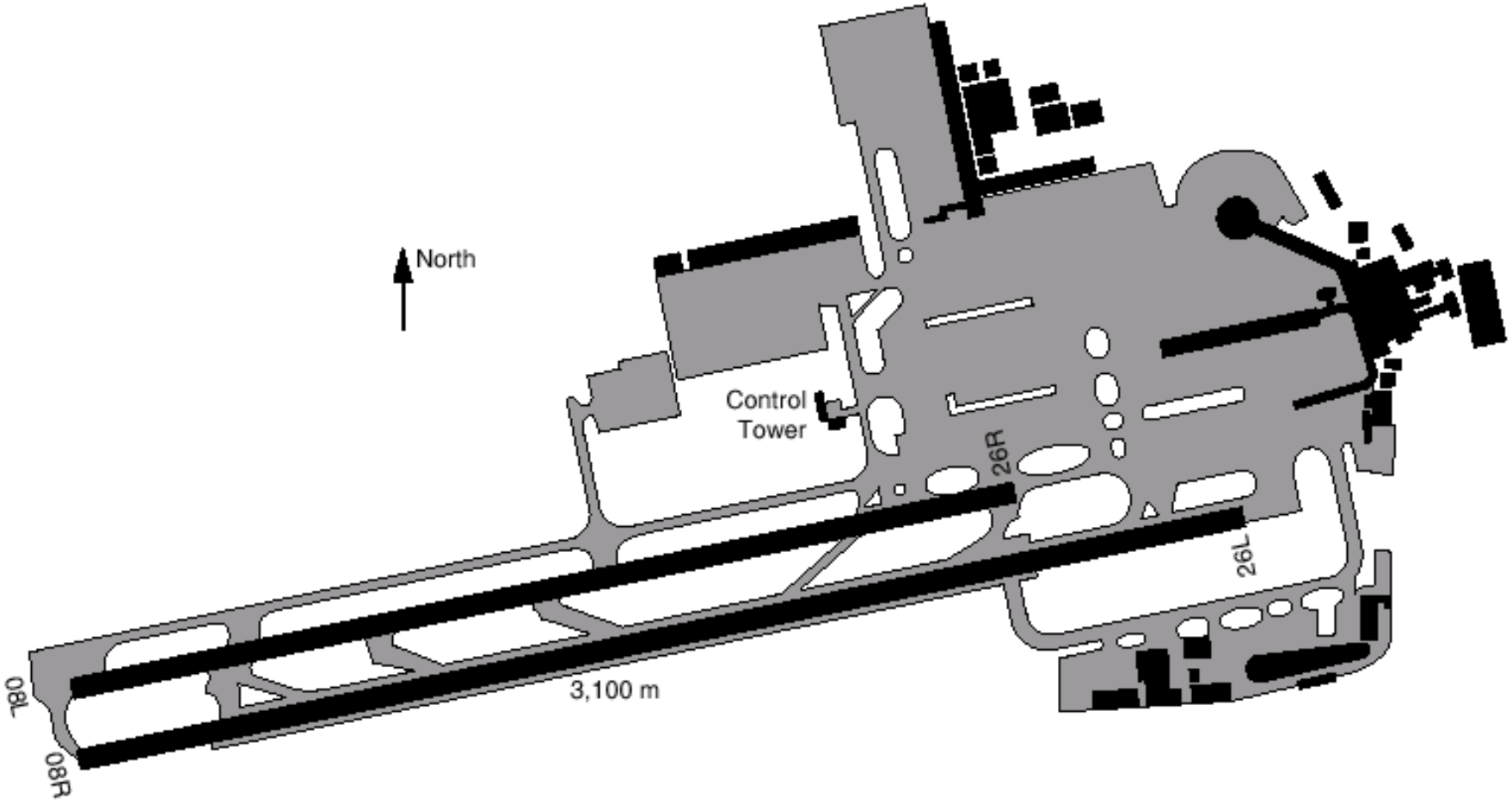
Airport Physical Layouts

- Airport layouts exhibit enormous variability (general arrangement of facilities, no. of runways, geometric configuration of runways, length of runways, location and configuration of terminal facilities)
- Range from very simple to complex geometries
- Area occupied is only mildly correlated with traffic volumes
- Layouts are greatly influenced by historical and local factors
- Some common configurations:
  - 1 runway
  - 2 intermediate parallels
  - 2 close + 1 independent
  - 2 intersecting runways
  - 2 close parallels
  - 2 independent parallels
  - 2 independent close pairs
  - Many others (local factors)

London Gatwick (LGW): single runway



London Gatwick (LGW)



Designation of Runways

- Runways are identified by a two-digit number, which indicates the magnetic azimuth of the runway in the direction of operations to the nearest 10º
- When parallel runways are involved the indication R (“right”), L (“left”) and, with three runways, C (“center”) is also used (e.g., Runway 22R)
- Note that 22R is 04L in the opposite direction
- With 4-6 runways, one pair or triple is marked to the nearest 10º and the other pair or triple to the next nearest 10º

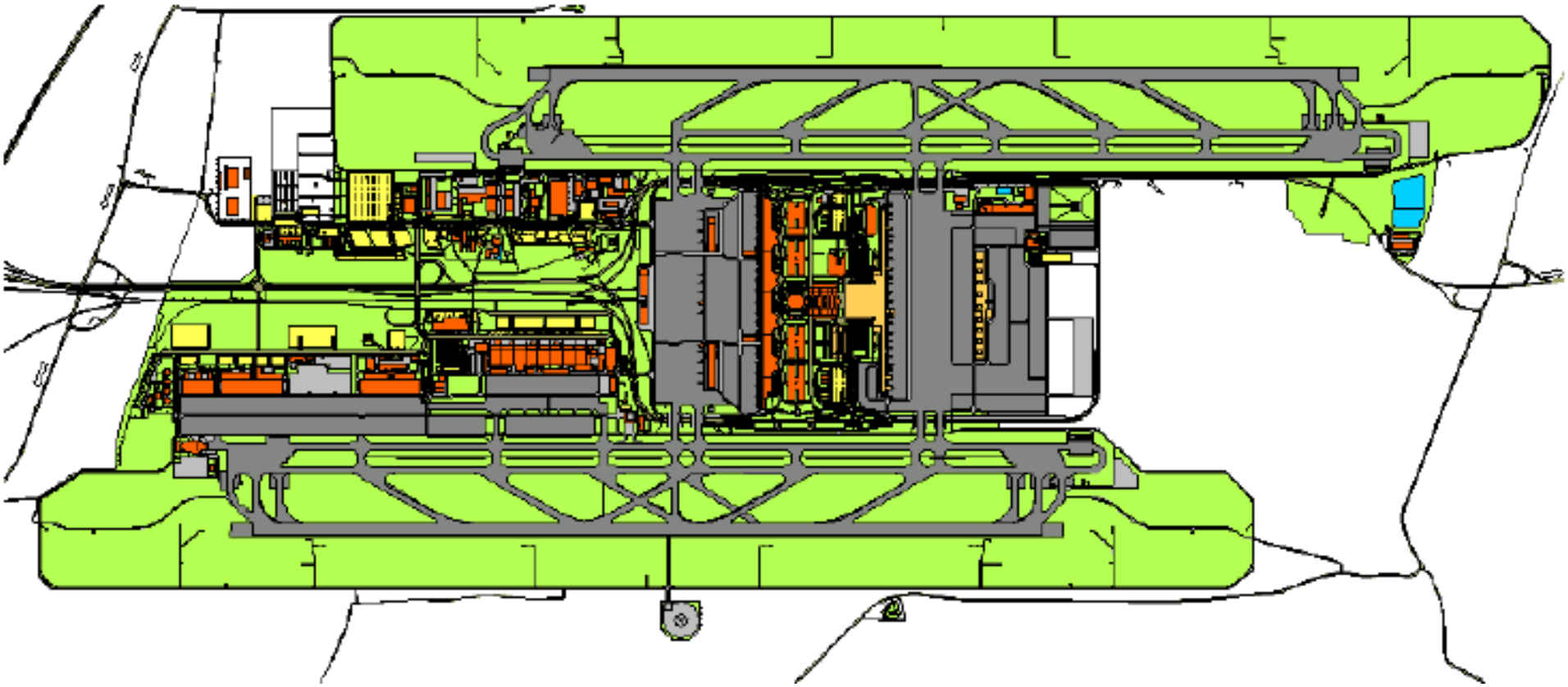
Dusseldorf International Airport (close parallels)

1620 ft (494 m) between runways

Milan Malpensa: medium-spaced parallels

2640 ft (805 m) between runways

Munich: independent parallels



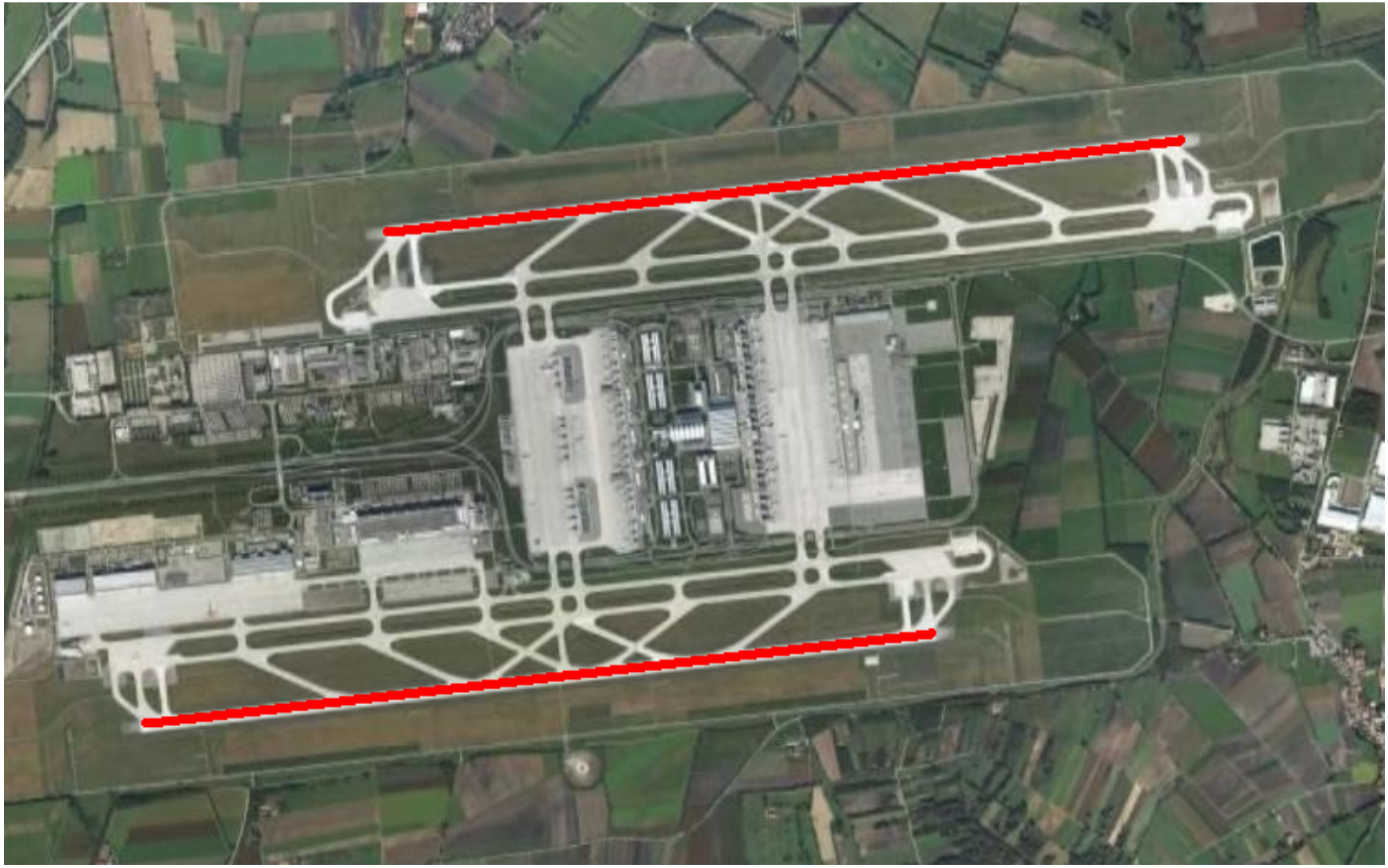
7530 ft (2296 m) between runways

Parallel Runways (IFR)

Separation between runway centerlines	Arrival/ arrival	Departure/ departure	Arrival/ departure	Departure/ arrival
Closely-spaced 1200 – 2500 ft (366 – 762 m)	As in single runway	As in single runway	Arrival touches down	Departure is clear of runway
Medium-spaced 2500 – 5000* ft (762 – 1525* m)	1.5 nmi (diagonal)	Indep’nt	Indep’nt	Indep’nt
Independent > 5000* ft (> 1525* m)	Indep’nt	Indep’nt	Indep’nt	Indep’nt

* 3400 ft (1035 m) or 4300 ft (1310 m) are alternative limits

Munich: independent parallels



7530 ft (2296 m) between runways

London Heathrow Airport (LHR)

4560 ft (1390 m) between runways

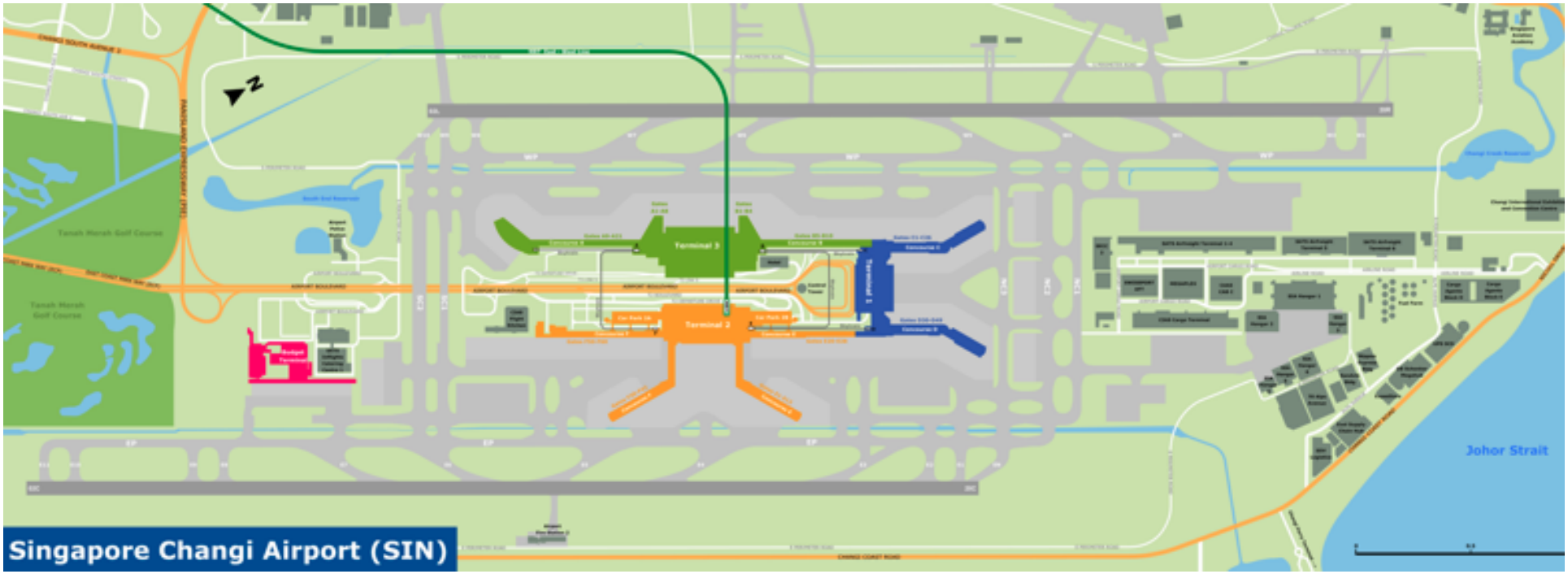
Osaka Kansai International Airport (KIX)

2012: 108,000 movements, 17 mio pax

Source: Wikipedia (2012)

Osaka Kansai International Airport (KIX)

SIN – 2-runway configuration

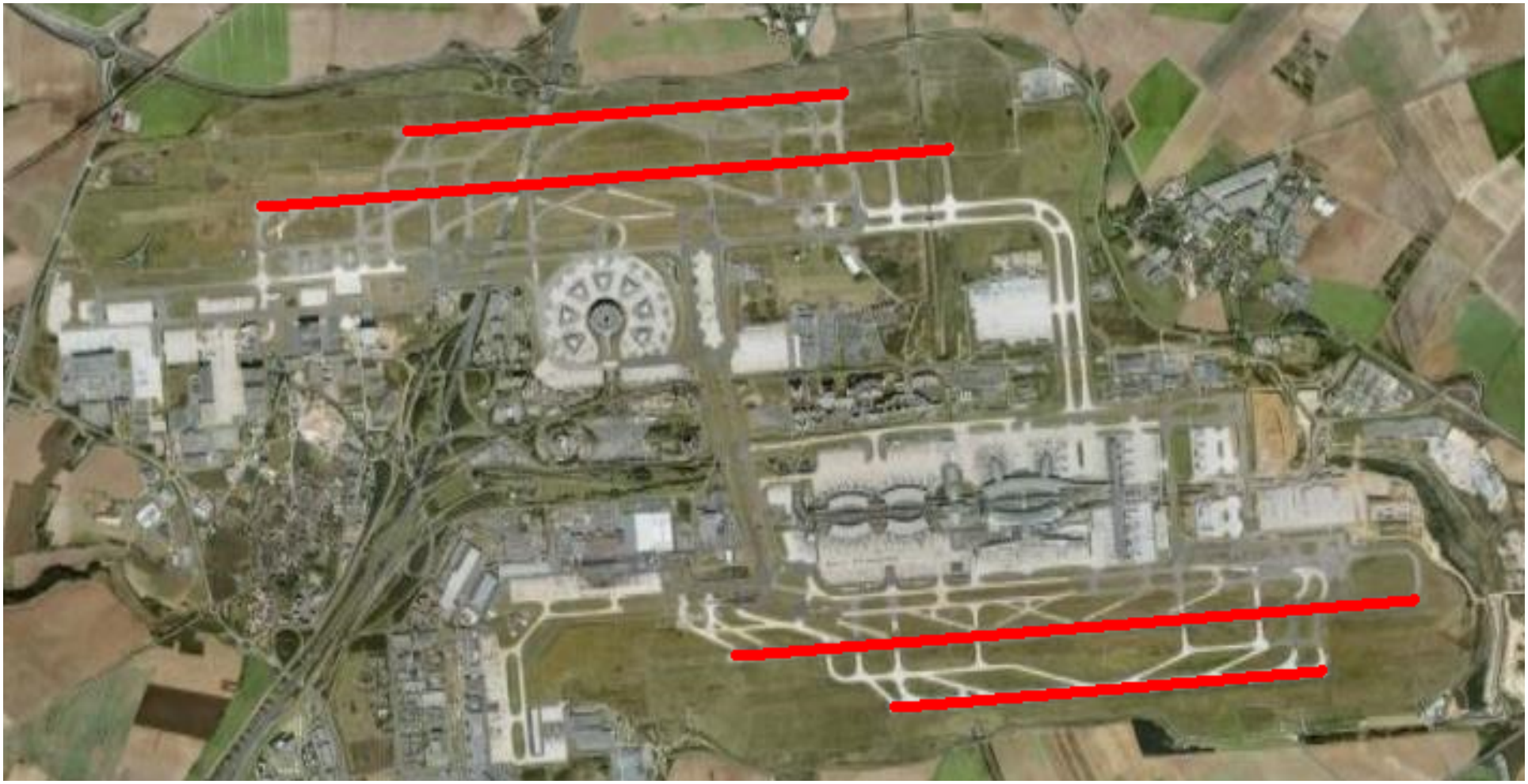


5750 ft (1750 m) between runway centerlines

Guangzhou International Airport (CAN)

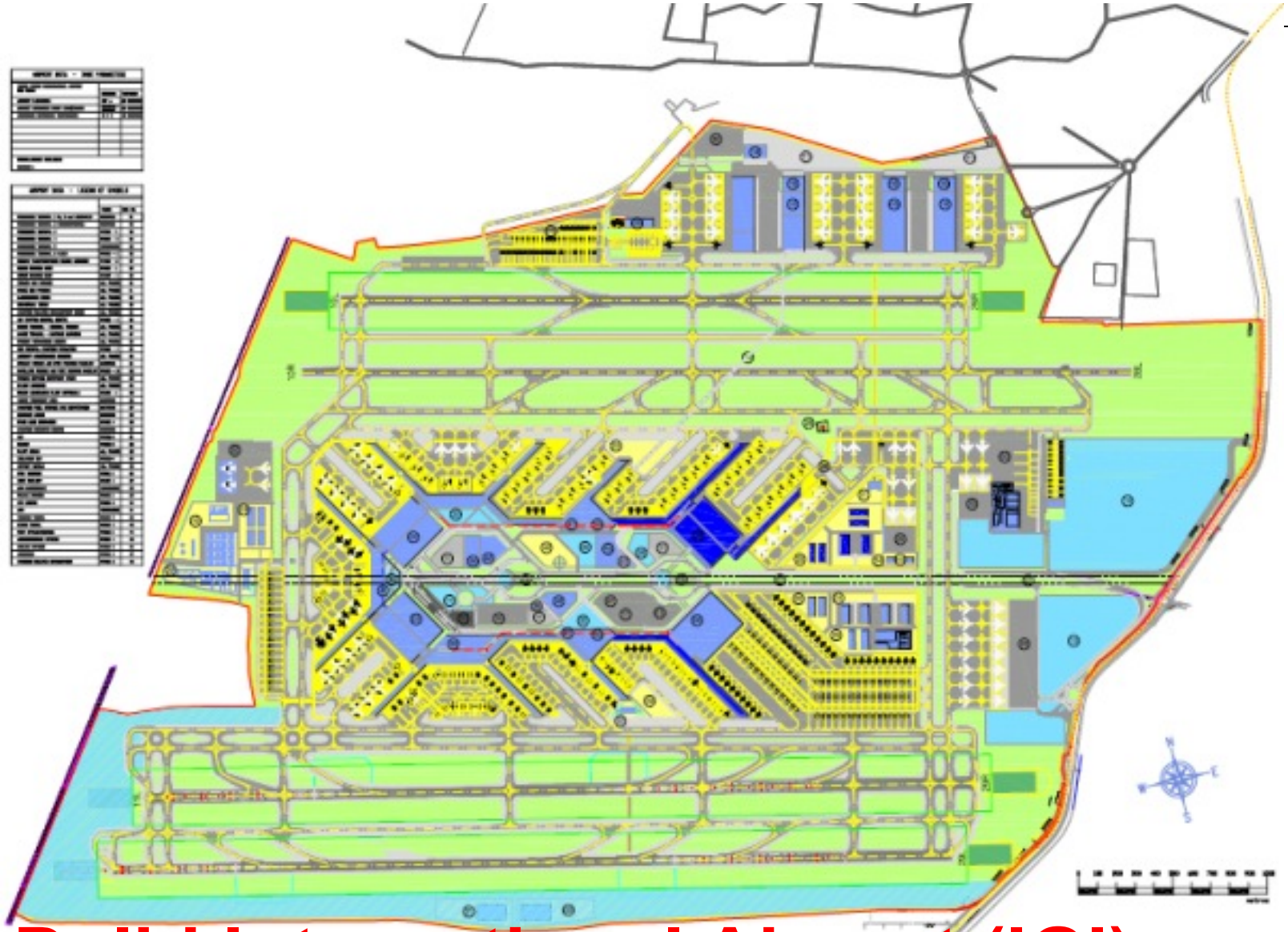
Seoul Incheon (close pair + 1)

Paris CDG: 2 independent close pairs



1260 ft between close parallel runways

SATURATION PHASE DEVELOPMENT PLAN

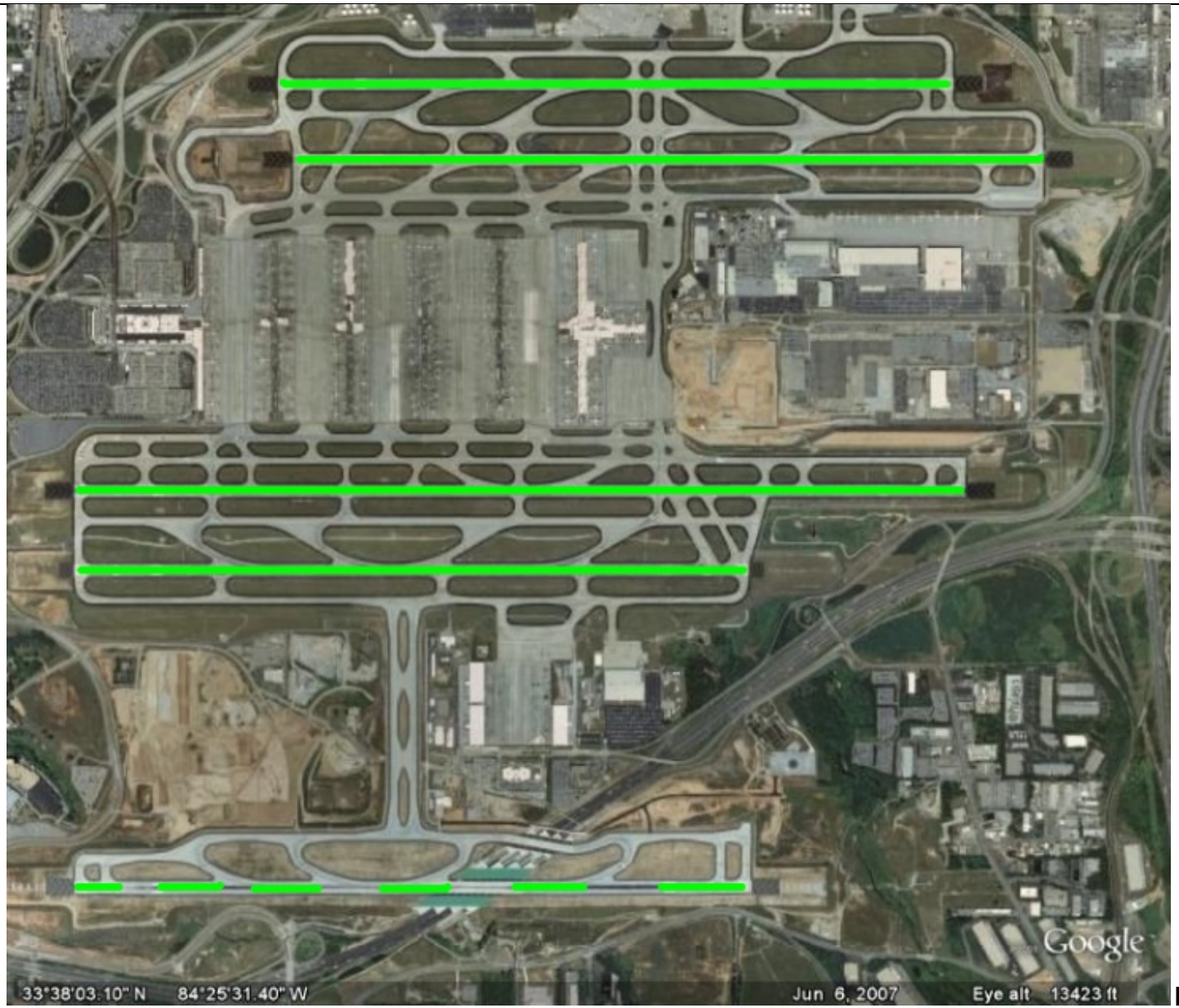


Delhi International Airport (IGI)

Los Angeles International: 2 independent pairs

700 and 800 ft between runways

Atlanta Hartsfield International (ATL)



Questions? Comments?