Beyond Our Vision? The Future of Airports

Canadian Airports Council

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AIRPORTSCANADA AÉROPORTS2007

Beyond Our Vision? The Future of Airports

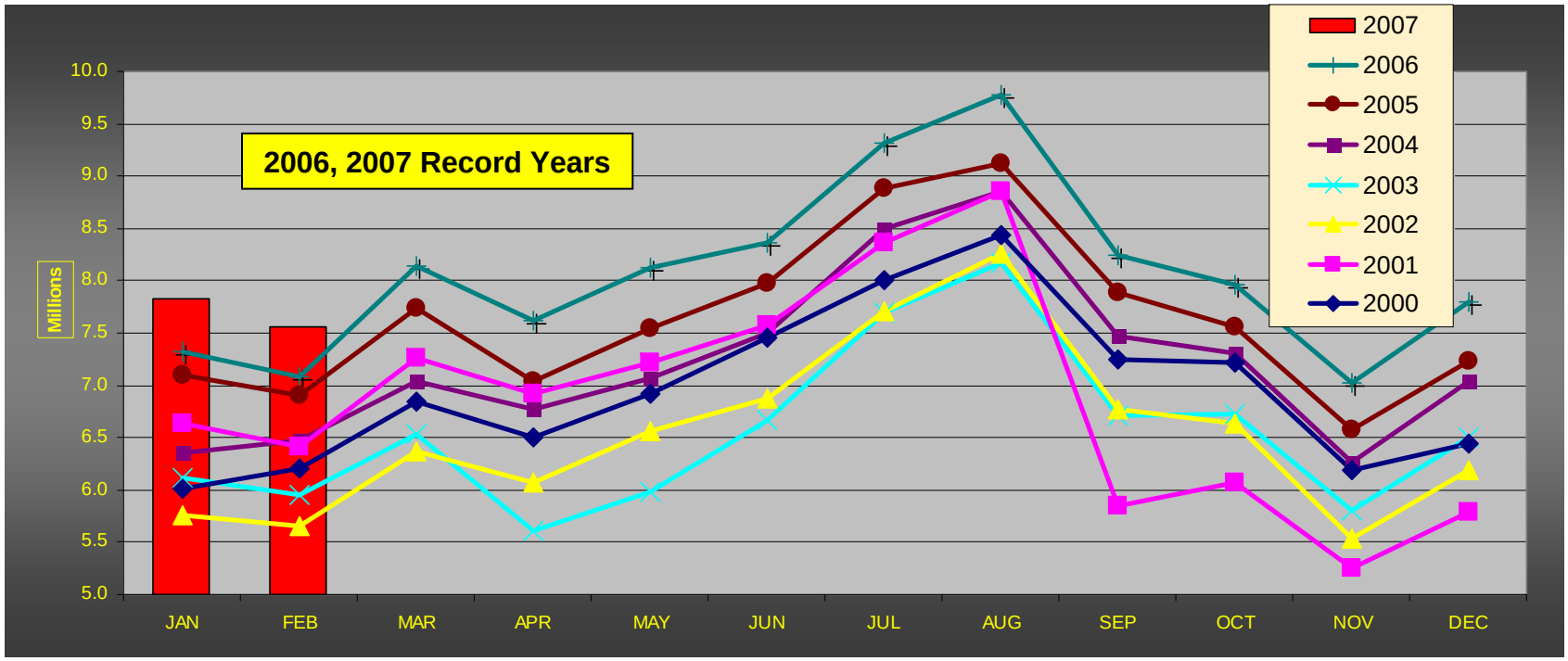
1. **The Future Opportunity of Aviation**
   - How much traffic?
   - Where is it coming from?
   - Liberalization
2. **The Need to Serve Passengers**
   - The challenge of 2X-3X
   - Branding and product differentiation
   - Airline and airport views
3. **The Capacity and Infrastructure Challenges**
   - Airports
   - Air Traffic
   - Environment
4. **The Airport-Centric Future?**

Issues of the Last 30 Years vs. the Next 30 Years for North American airports

Last 30 Years ("Out")	Next 30 Years ("In")
Federal and Local Airports	Airport Authorities
Airline Deregulation	International Liberalization
National Airlines	Multinational Airlines
New Airports	More Efficient Airports
Radars	RNP/RNAV
Ticket as Commodity	Price and Service Choice
U.S. & Canada	North American
Aviation	Multimodal
Security Screening	Border Clearance
Noise	Climate Change
Long Term Leases	Short Term or No Lease

1. The Future Opportunity of Aviation

Total Enplaned and Deplaned Pax 2000-Feb. 2007 (Transport Canada)



In January and February 2007, the Canadian market grew 6.9% and 6.7%, with international traffic continuing to be the strongest segment.

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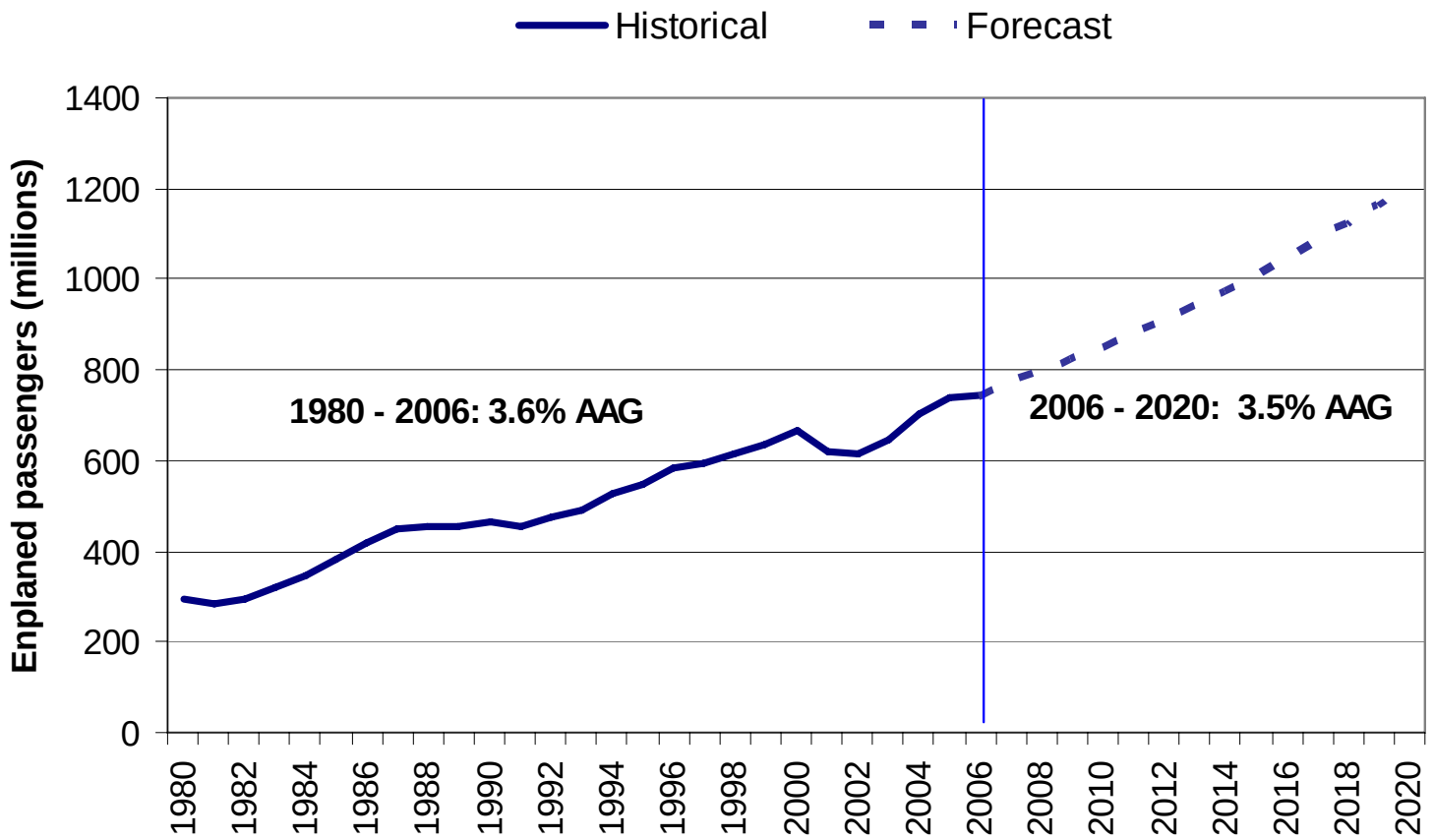
U.S. Passenger Traffic (1980- 2020)
Federal Aviation Administration, 2007



During the 2006-2020 period, international traffic is projected to grow 4.9% AAG and transborder 3.6% AAG. While operations are projected to grow more slowly this is predicated on (1) upgauging and (2) moderate growth in general aviation

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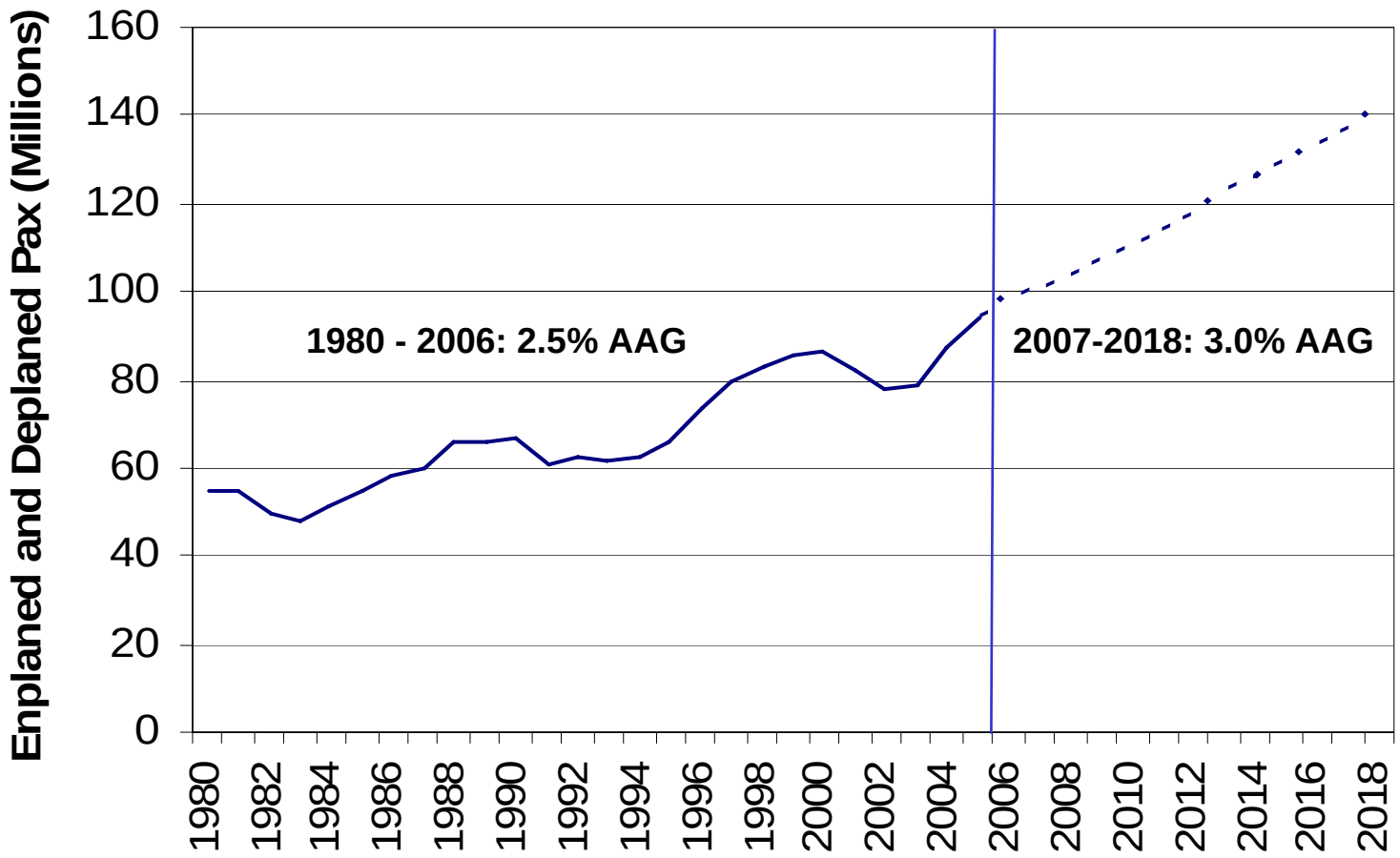
Canadian Passenger Traffic (1980-2018)
Transport Canada Economic Analysis, 2007



Continuing growth among Canadian carriers is very dependent on the transborder and international segments, representing (in 2007) approximately 45% of traffic (88% of U.S. traffic is domestic).

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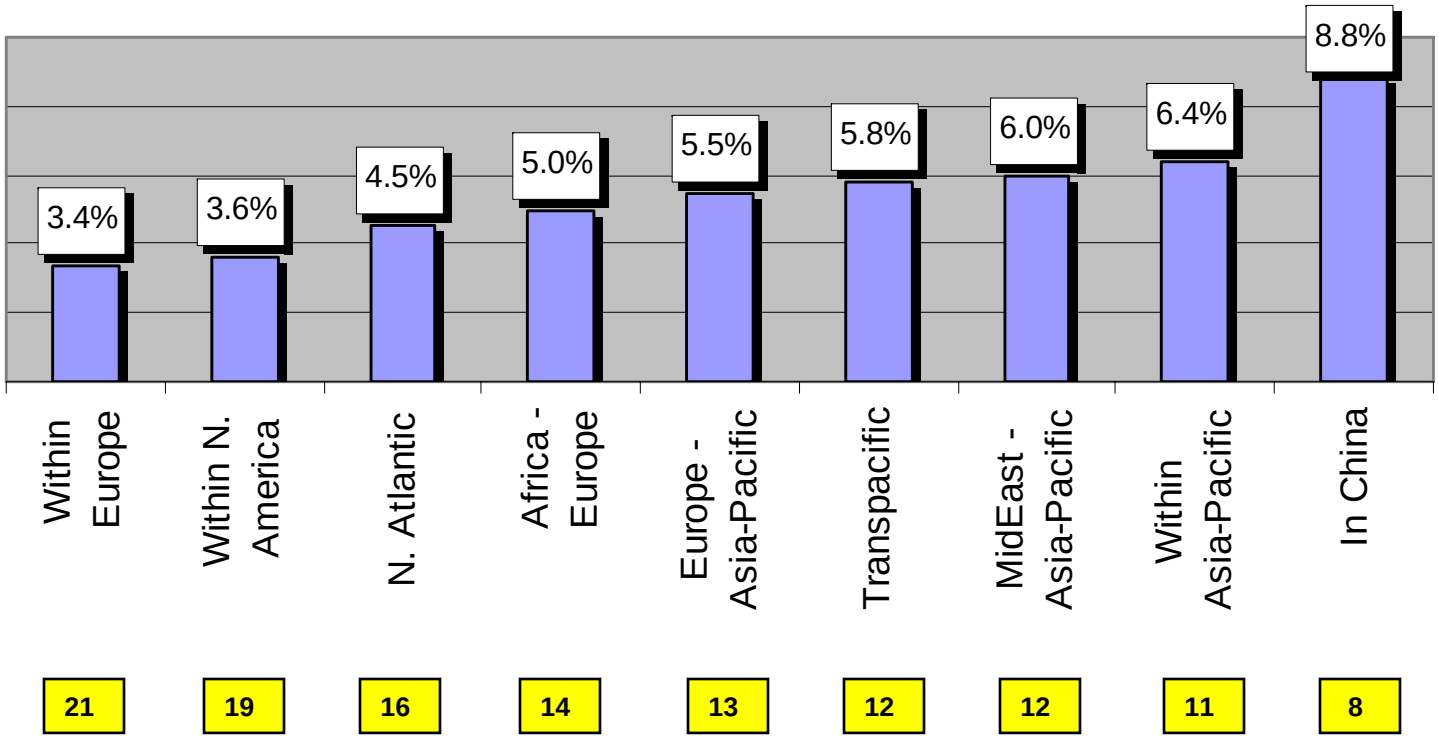
Boeing's 2006 Current Market Outlook: Projected Growth Rates (2005-2025)

Global projection 4.9%



Years for Traffic to Double	21	19	16	14	13	12	12	11	8

Boeing's forecast is yet more evidence that while growth in North America is projected to be robust over the next decades (e.g. one billion enplanements for U.S. by 2015), growth rates in the rest of the World (except within Europe) will be higher, some much higher.

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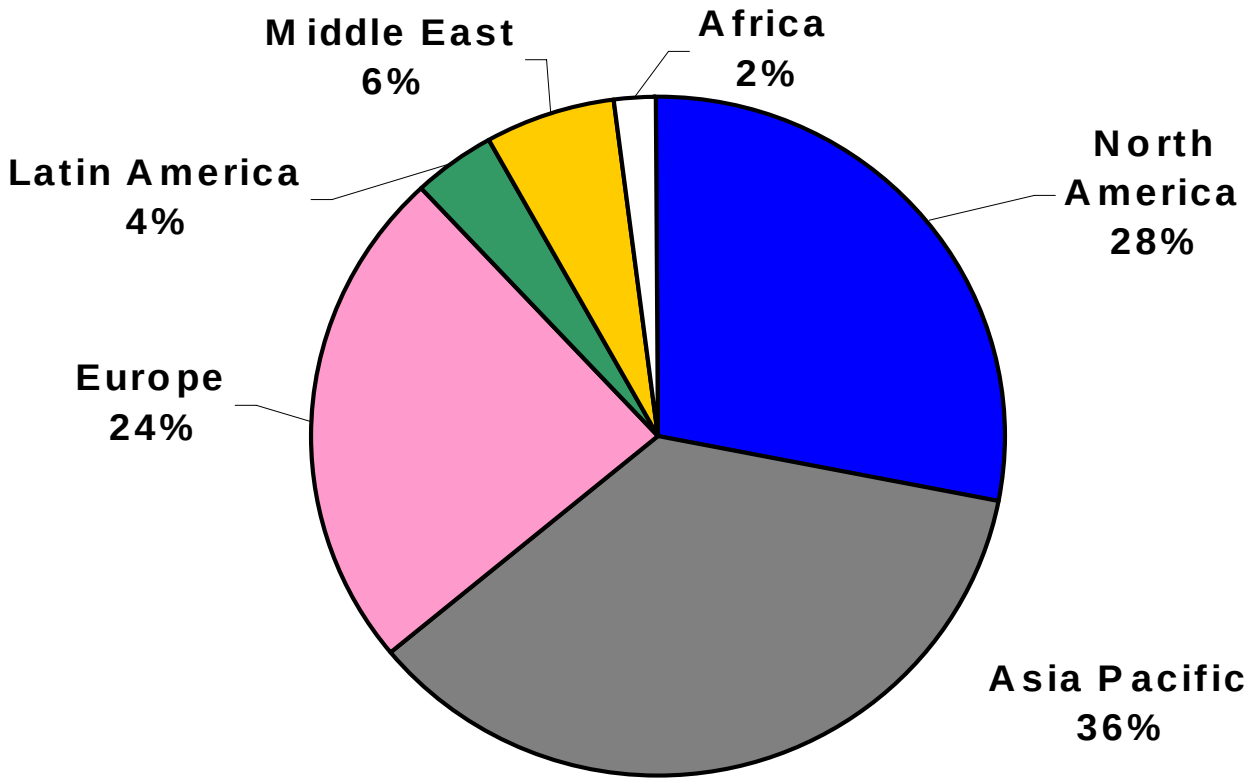
Regional Market Value for 27,210 New Airplanes (to 2025), Boeing



72% of the value of new aircraft will be delivered outside of North America during the next two decades. Underlying this growth is the growth of middle-classes in the developing world and the related recent growth in low-cost carriers. Especially so in this area, forecasts include substantial risk, relying as they do on political stability, economic growth, and security issues.

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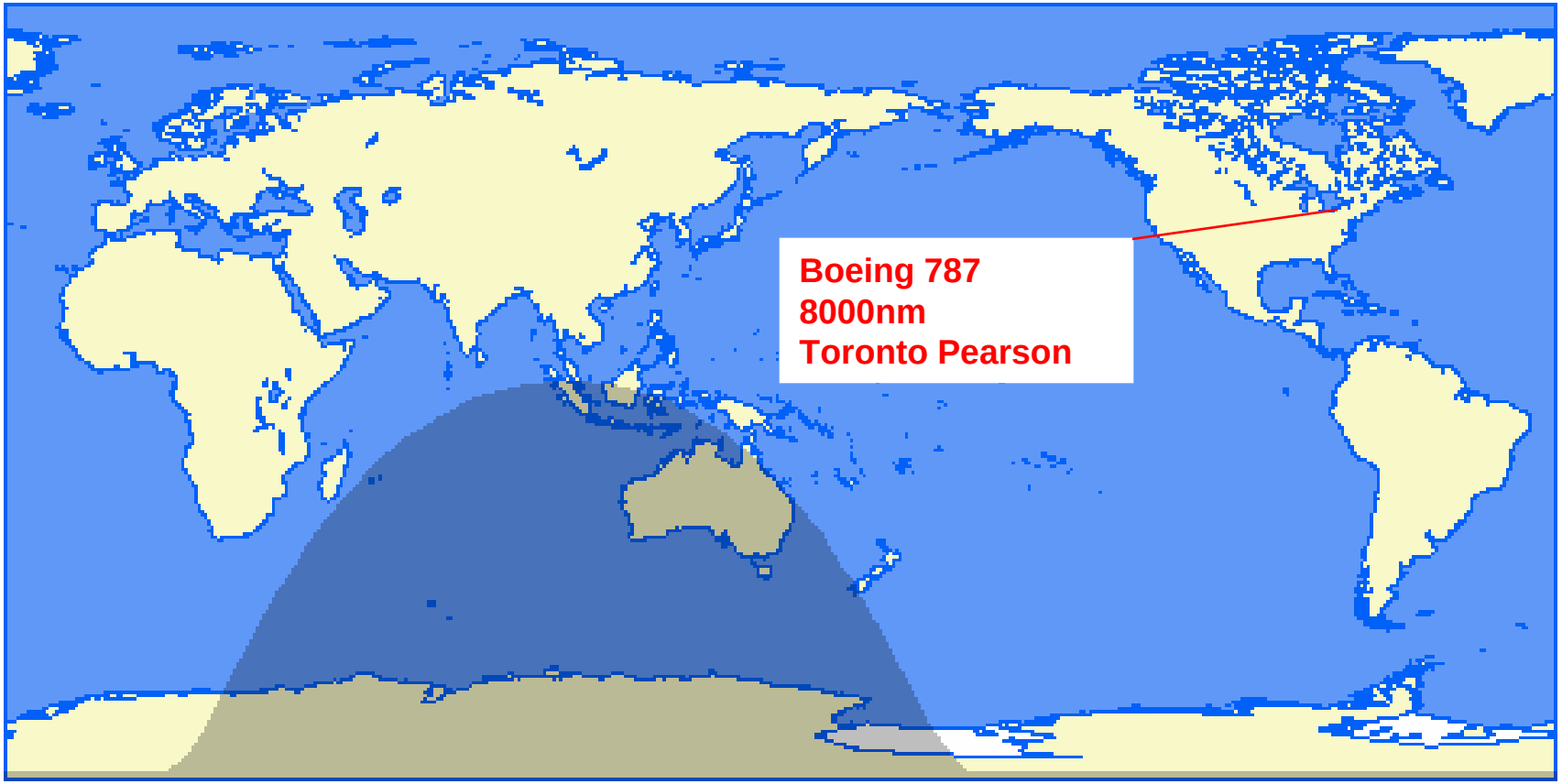
New Aircraft, Combined with Liberalization, Offer Air Carriers/Airports New Market Opportunities



Together with successful liberalization, new generations of all classes of aircraft promise to open up new non-stop markets, restructure air carrier and alliance strategies, and stimulate competition.

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Elvis and Caution about Future Growth Projections

"When Elvis Presley died in 1977, there were an estimated 37 Elvis impersonators in the world. By 1993, there were 48,000 Elvis impersonators, an exponential increase. Extrapolating from this, by 2010 there will be 2.5 billion Elvis impersonators. The population of the world will be 7.5 billion by 2010. Every 3rd person will be an Elvis impersonator by 2010."

(Herb Caen, San Francisco Chronicle, 27 October 1993).

Liberalization: The "Airline Deregulation" of the Next 30 Years?

- Almost all nations, including the U.S. and Canada, have limited foreign ownership in their airlines and access to each nation's internal markets. Applying this to U.S. airlines, the New York Times opined on April 5:

  "Embedded in these rules is a pessimistic assumption that American airlines would suffer in a competition with foreign ones. The United States has been at the forefront of aviation since the Wright Brothers flew at Kitty Hawk … The industry should go back to thinking like the free-marketeers this country has always encouraged and valued."

- Gaining access to growing international markets will require additional liberalization, enhanced access to our markets, and an updating of the Chicago Convention (U.S.-E.U. and Canada-U.S. agreements good starts). Allowing truly international airlines to emerge will also precipitate new competition, traffic growth and consolidation.

- Start with an Open Aviation Area in North America?

2. The Need to Serve Passengers

Security and Border Clearance: Meeting the Challenge of 2X the Passengers

Security

- U.S. government has shown it is incapable of financing the capital and operating investments necessary for maximizing the efficiency of the security operation. Alternatives necessary to meet future demand.
- Canadian government taxes passengers for security, but returns only a portion for the operation of its function. This, and high ticket taxes (most revenue not used for aviation purposes), disadvantages the Canadian industry, burden service, and portend poorly for the future.

Border Clearance

- Process remarkably cumbersome. Harmonization of immigration laws and common databases best way of promoting North American and international industry.
- Seamless growth and connectivity to international markets threatened by security concerns. Common data bases and security protocols still in their infancy and raise privacy concerns.
- **Will governments meet the challenges? What functions should airports assume?**

Branding and Product Differentiation: Air Traveler Choices Greater Than Ever

jetBlue AIRWAYS

MaxJet

SKYTEAM

Emirates

skybus

Virgin america

Views on the Traveler: Airline, Airport & Government

- **Airlines**: Goal to make a profit. Unbundling service offerings targets willingness and ability to pay. Airline services provided at airports (e.g., ticketing, preferential access at security, boarding priorities, clubs) predicated on unequal treatment, under the guise of loyalty, based on willingness to pay.
- **Airports**: Goal of air and passenger Service. Provide a good customer experience so that the airport is effectively perceived as the community's gateway. "User pays" generally limited to concessions—takes on a more expansive approach at privately operated airports.
- **Federal Governments:** Goal to provide for the safety and security of all passengers. Risk-management programs that give preferences funded by user fees (e.g., NEXUS, Registered Traveler) can have a public purpose if correlated with goals.
- **Future**: What part of the airports should be perceived as public (i.e., where a value of equity rules)? What are the effects of greater commercialization and privatization on airports' views of their obligations? Where do commercial priorities begin and concerns about community image and equity end?

3. The Capacity and Infrastructure Challenges

U.S. Infrastructure: Federal investment, Heavy Regulation. Challenges are Federal Policy, Air Traffic Control

- The U.S. Government Accountability Office's (GAO) "High Risk List 2007" identifies the following:
  - **FAA Air Traffic Modernization**
  - **Financing the Nation's Transportation System**
  - **Implementing and Transforming the Department of Homeland Security**
- Larger U.S. airports (n=60-150) generally financially self-sufficient (capital and operating).
- Smaller airports (n=4000) generally operationally self-sufficient, but require capital subsidies supported by federal government with proceeds from Airport & Airway Trust Fund (under strain).
- The long-term trend is away from federal capital support for larger airports and more delegated authority to local operators to raise revenue. Still, airports remain heavily regulated, including on the economic side.
- U.S. fiscal imbalances make current aviation infrastructure financing unsustainable. Airports will continue to assume more and more of the burden.

Canada's Infrastructure: Commercial Approach Challenges are Legacy Rents Policy and Access

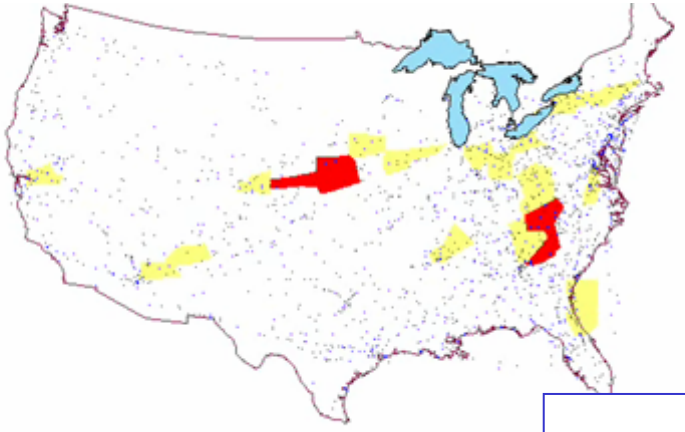
- Larger airports part of the National Airports System (NAS), n=26, self-sufficient and net providers of revenue under their leases with the federal government.
- Airport rents challenge Canadian airports and air carriers, especially as the aviation system is becoming more liberal and international growth is outpacing domestic.
- Canada's small and regional airports have access to the Airport Capital Assistance Program (ACAP) for limited support for capital projects (e.g. safety), but it does not provide a steady source of reliable "entitlements" to small airports as does funding under the FAA's Airport Improvement Program (AIP).
- Canadian airports have much greater commercial freedom to set rates and charges and raise revenue than U.S. airports.
- NAV CANADA is proving to be an effective, customer focused, and cost-based model for air traffic control—what the U.S. does not have.

The Airport Infrastructure Challenge: Where do we go from here?

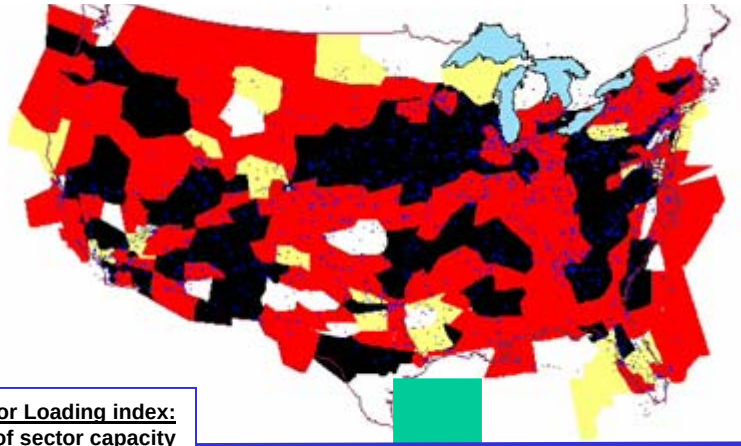
- In the next 15 years, few new airports are being built or are expected to be built (Las Vegas' Ivanpah Valley Airport a notable exception). As a result, in the next 10 years, more congestion management (e.g., pricing and auctions) to meter access a certainty—already LGA, ORD—more airports to come.
- Ground connectivity, both to airports from population centers and to interconnect regional airports (to take advantage of alternative airports) will be required -- a very expensive undertaking for North American airports and regional transportation organizations.
- Expansion will generally have to occur within existing footprints, requiring greater terminal area productivity as well as substantial investments in capital equipment for air traffic control modernization. *Needed: solutions to airports with closely spaced parallel runways and or airports that want to add runways at space constrained airports.*
- Terminals, especially the public areas, going through the biggest changes given evolving security requirements, e-ticketing, cost concerns, and the ability to perform many traditionally on-airport functions off-airport.

U.S. Air Traffic Management
Distribution of Available Capacity and Demand

Baseline Demand (2002)
Current Sector Capacities



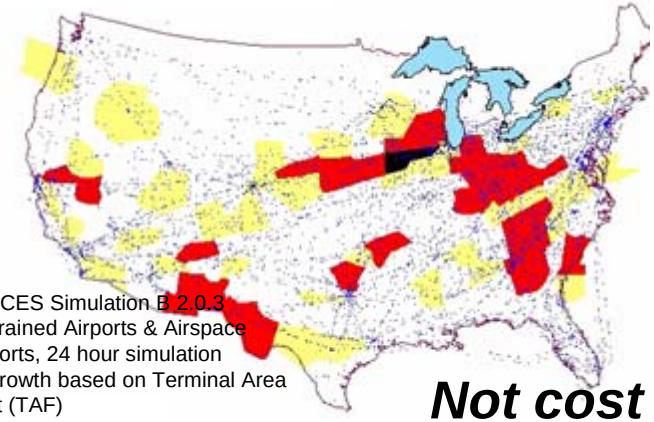
2X Future Demand
Current Sector Capacities



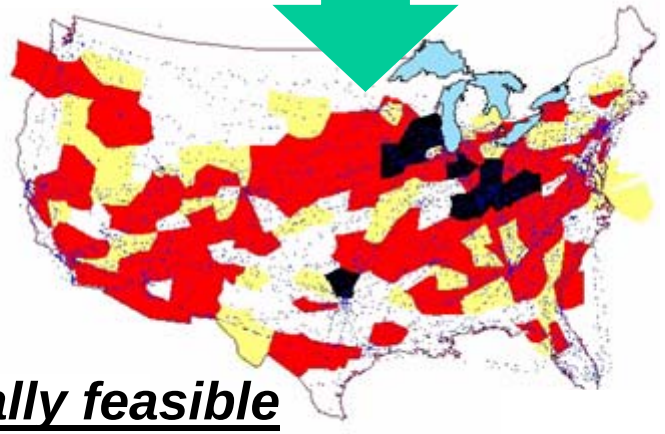
Sector Color Loading index:

Yellow:	80 – 125% of sector capacity
Red:	125 - 200% of sector capacity
Black:	> 200% of sector capacity

3X the number of Sectors and Controllers



2X the number of Sectors and Controllers

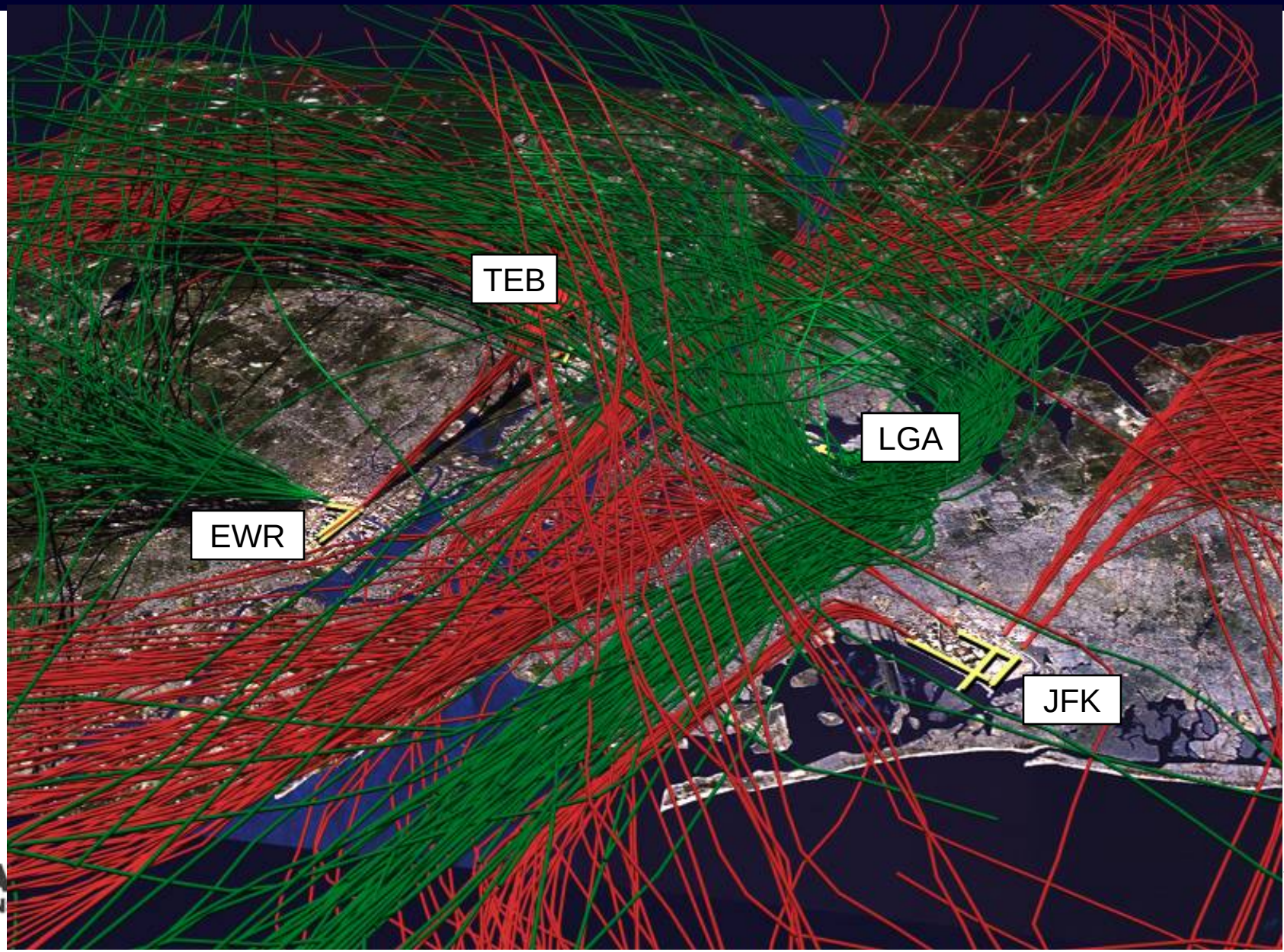


VAMS ACES Simulation B 2.0.3
Unconstrained Airports & Airspace
250 Airports, 24 hour simulation
Future growth based on Terminal Area Forecast (TAF)

2002: ~27K flights total
Future 2X: ~54K flights total

Not cost and technically feasible under the current paradigm

New York Congested Airspace
Radar Flight Tracks Showing Existing Interactions

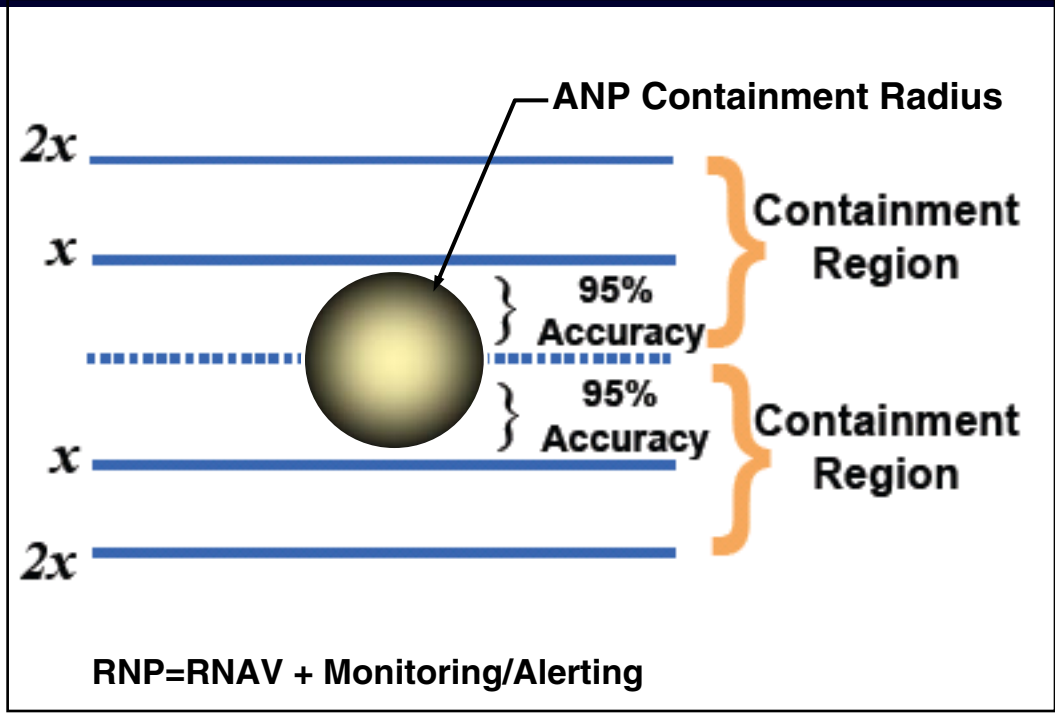


Performance-Based Navigation: The Use of RNAV and RNP to Efficiently Use Airspace and Airports

- Area Navigation (RNAV) -- Method of navigation that permits operation on any desired flight path, independent of ground-based navaid location.
- Required Navigation Performance (RNP) -- Statement of navigation performance accuracy necessary for operation within a defined airspace
- RNP is RNAV with on-board navigation monitoring and alerting
  - Dual flight management system computers (requires equipage in aircraft)
  - Monitor actual navigation performance (ANP)
  - Alerts when the RNP operational requirement cannot be met
- Wake Turbulence limiting factor for separating aircraft. Research into propagation ongoing.

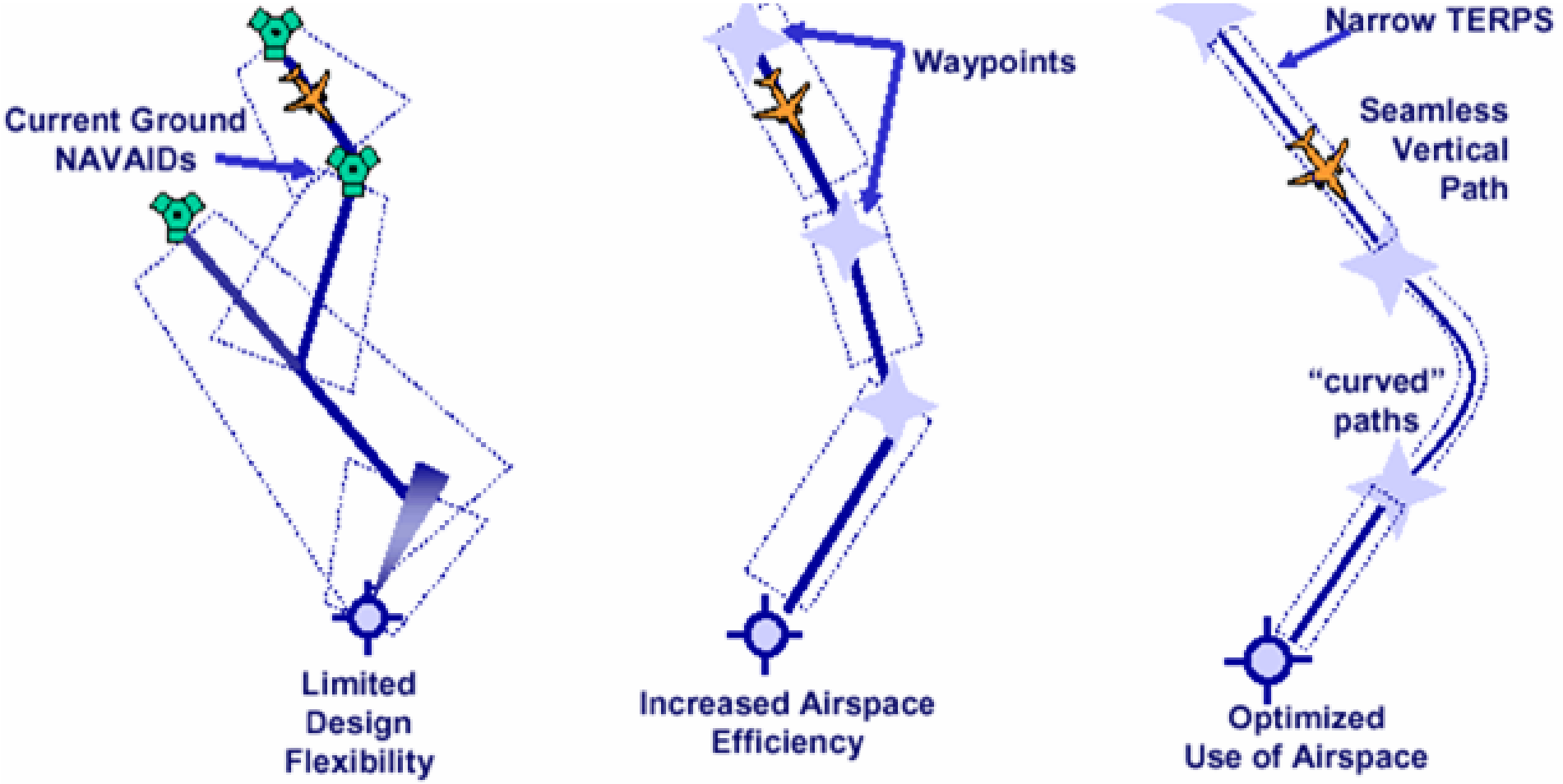
Required Navigation Performance: Establishing Position of Aircraft Using Avionics

- **Onboard avionics keep aircraft within a tightly specified airspace corridor**
- **"RNP-x" is navigation with accuracy "x" nm or better 95% of time**
- **RNP Containment Region is an area 2 x RNP-x on either side**
- **99.999% probability that aircraft is within containment region**
- **Challenges: aircraft equipage, FAA and NAV CANADA support**



Source: RNAV/RNP Program Update, Federal Aviation Administration

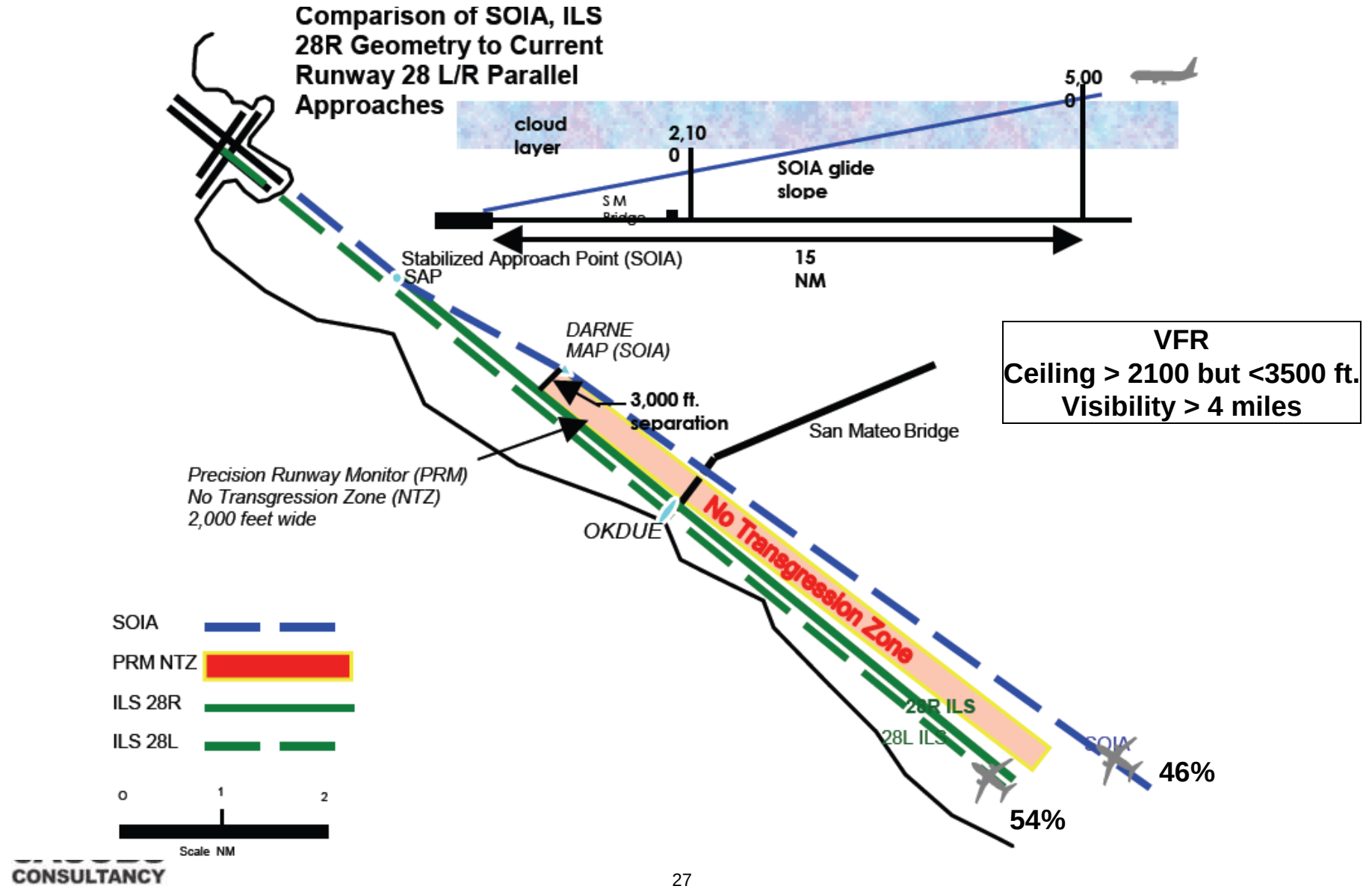
Using Performance Navigation to Optimize Use of the Airspace



Source: Federal Aviation Administration

Untangling the Airspace Spaghetti: Using RNP for the New York Airspace (illustration using RNP 0.3 nm)

Case Study for Improving Capacity at a Challenging Airport: The Solution for 28 L/R at SFO



VFR
Ceiling > 2100 but <3500 ft.
Visibility > 4 miles

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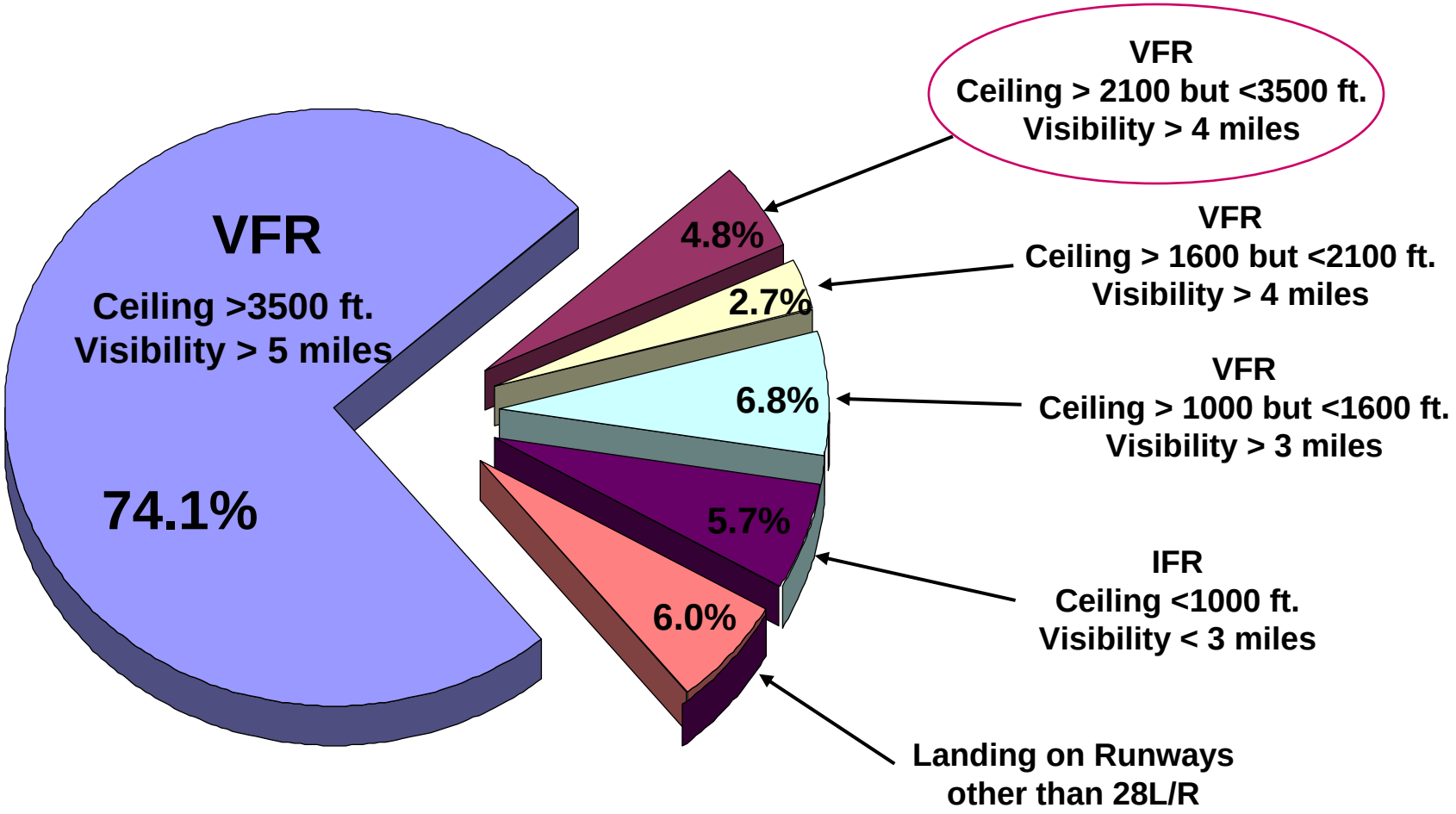
SFO Landing Runways 28L/R -- Weather Criteria



1989 - 2004 Weather Data, Source: NCDC and SFIA

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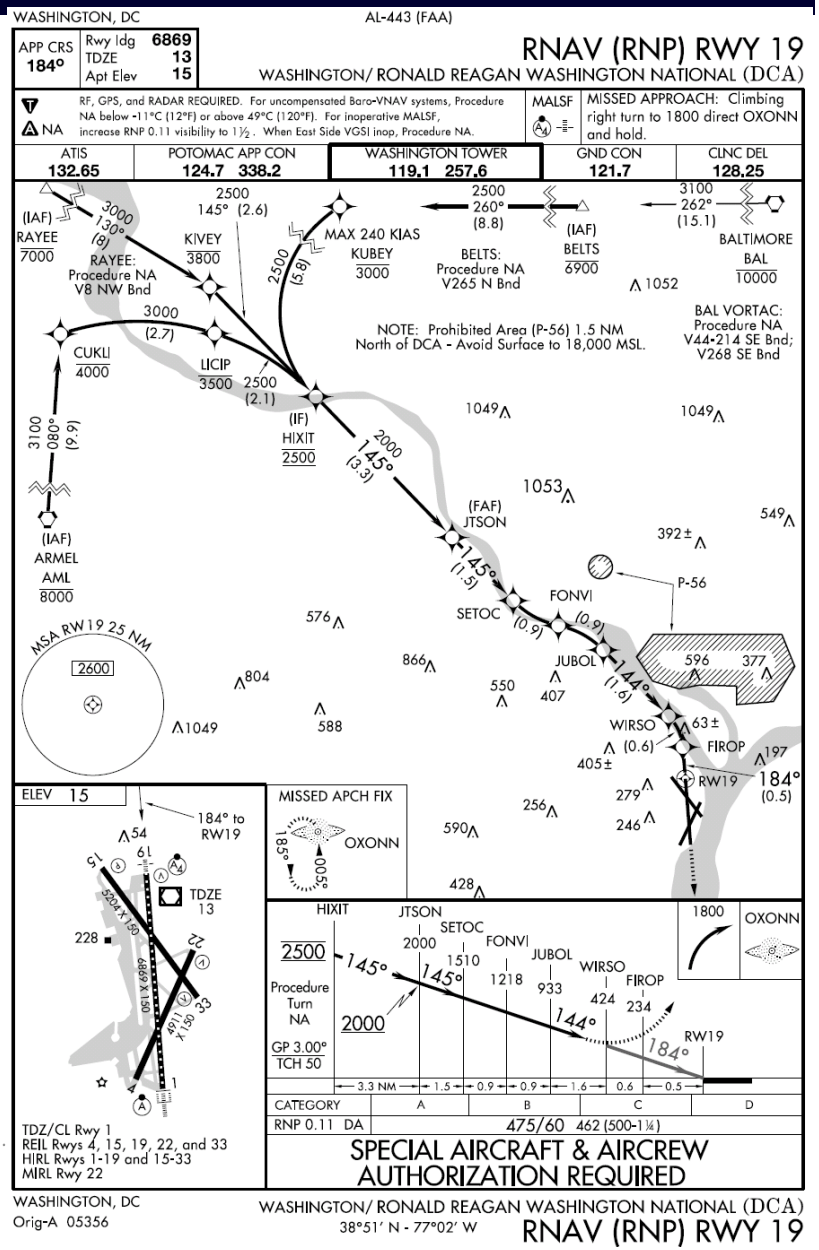
First Certified Public RNP SAAAR Approach to DCA's Runway 19

- **Established 9/28/05, RNP 0.11**
- **Alaska Airlines Flying**
- **Localizer Directional Aid approach requires**
  - 720 ft. decision altitude
  - 2.25 mi. visibility
- **RNP approach requires**
  - 475 ft. decision altitude
  - 1.25 mi. visibility
- **Meets security needs**
- **Noise friendly**
- **Reduces costs of diversions**



Source: RNAV/RNP Program Update, Federal Aviation Administration

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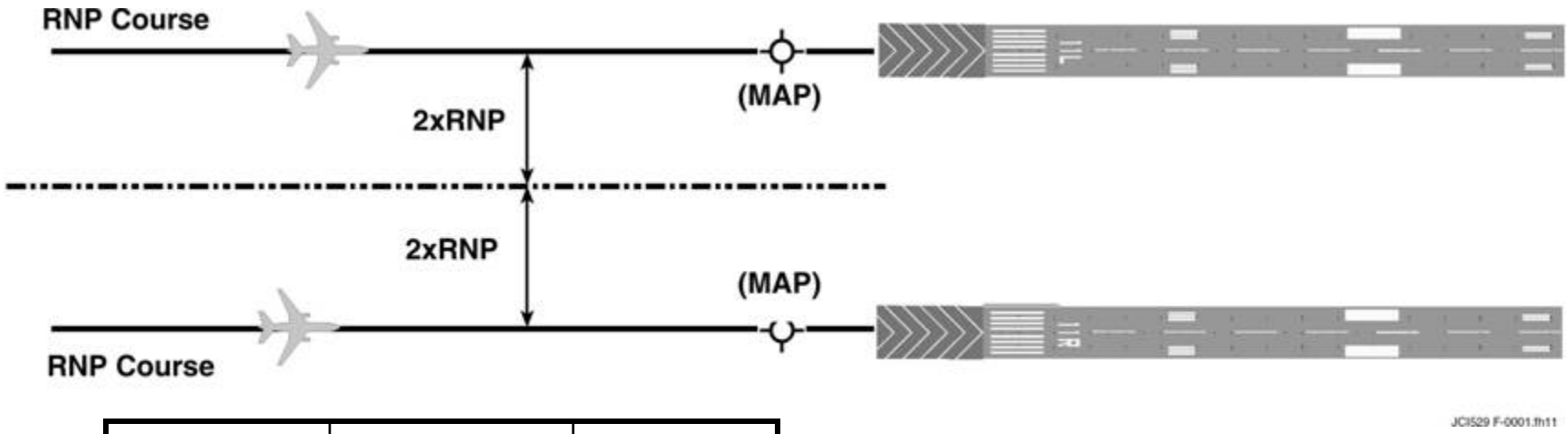
The Use of RNP on Parallel Runways: Potential Breakthroughs in Capacity



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ILS Backup

Level	4xRNP	Required Spacing (ft.)
RNP 0.2	2400 + 2400	4800
RNP 0.1	1200 +1200	2400
RNP 0.05	600 + 600	1200
RNP 0.03	360 + 360	720

10-15 of the Top 100 airports in the U.S. have parallel runways between 750 and 4300 feet apart. The use of RNP could result in a 60% increase in arrival capacity when airports otherwise must be in single runway operations. – Source FAA

Future Applications

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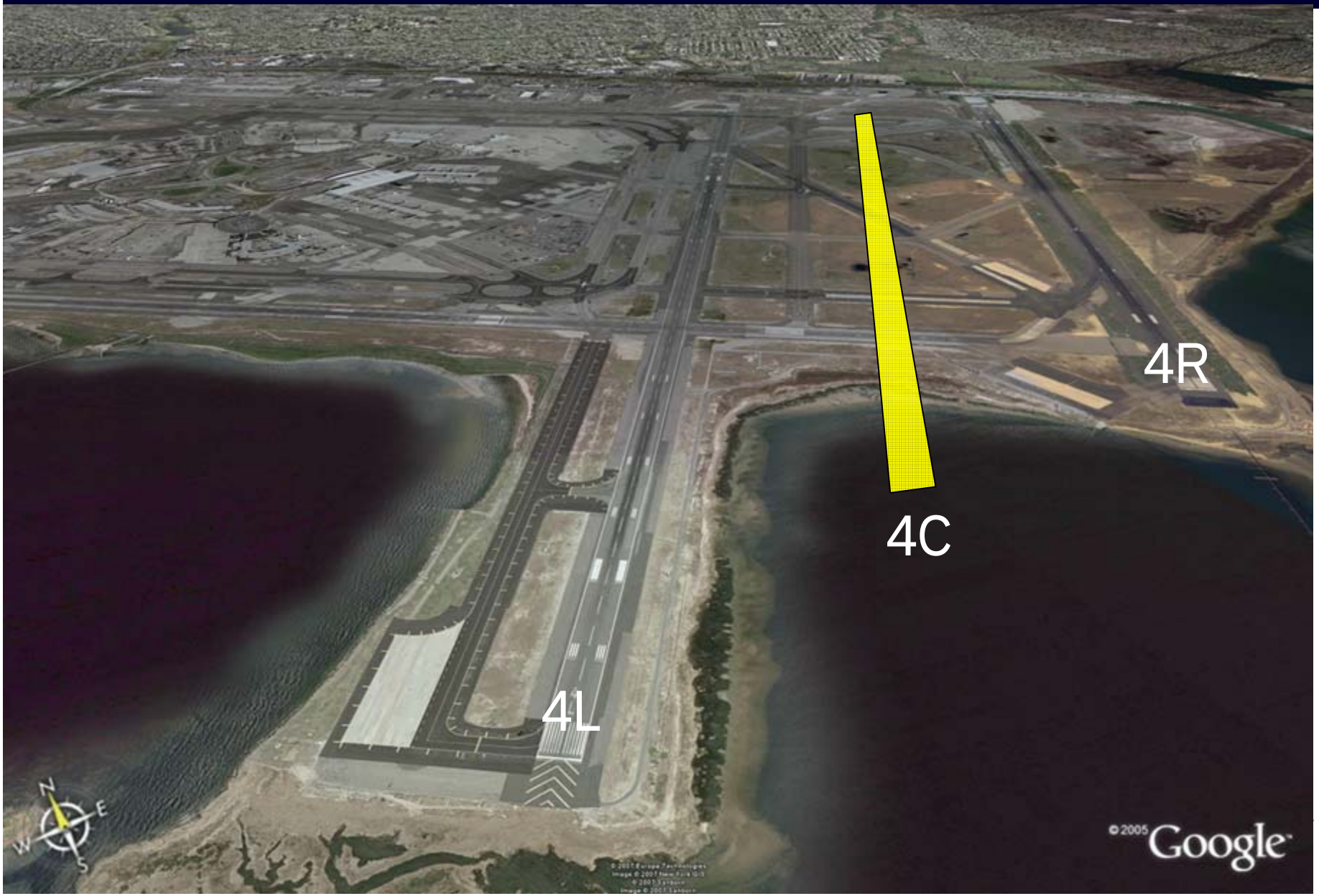
Paving Down the Middle with “4C” at JFK
(4L/4R separation 3000 ft., 4C requires approximate RNP of .06)



Managing Growth: Environmental Issues

- **Local air quality, clean water, and climate change matters of high politics at local, national, and global level. Just recently, climate change has become a significant political issues in the U.S.**
- **In varying degrees, aviation's externalities perceived as significant contributors to issues.**
- **Moderate aviation growth in the developed world together with fast growing industries in the newly developing nations will present growing challenges to aviation.**
- **Expect additional pressure for offsets and the creation of regimes such as the European Emissions Trading Scheme.**

ORBITZ and Carbonfund.org

IAD – SFO	Carbon Footprint	Offset Cost
4838 miles	.92 CO_2	$12.64

4. The Airport-Centric Future?

Bringing Vision to Reality
Six Challenges for Airports and the Aviation Industry

1. Issue: International competition among airlines and associated airports will be intense and dependent on services offered--and costs assessed—by airlines, airports and governments.

- *Solution: Aggressive airport-airline-travel industry efforts are necessary to sensitive governments to the critical roles they play in influencing the competitiveness of industry.*

2. Issue: Air Traffic Control services will be vital to meeting unconstrained forecasts. (NAV CANADA well positioned, the FAA recognizes the problem, but U.S. policymakers not yet willing to divest themselves of authority and make ATC more commercial.)

- *Solution: Governments and airports must invest in the staffing, procedures, and application of technologies required to make better use of airspace and terminal area infrastructure.*

3. Issue: The environment and climate change are aviation issues of high politics; future growth depends on the aviation community addressing them.

- *Solution: Airports and the greater industry need to get out in front and attempt to shape outcomes.*

Bringing Vision to Reality
Six Challenges for Airports and the Aviation Industry

4. Issue: Future air travel will be provided by a more diverse set of international airlines. Number of domestic airline hubs will decrease and others will be downsized.

- *Solution: Continuing long-term trends, the vast majority of airports should establish financial and operating plans predicated on origin and destination traffic and less on how individual airlines decide to base and utilize their fleets.*

5. Issue: Future government capital contributions to aviation and airport services unlikely to keep up with cost-inflation and growth.

- *Solution: Airports in areas such as infrastructure funding, terminal area ATC navaids, and security will have to take more financial and operational responsibilities. This requires intensive coordination with airlines and governments about ways to rebalance relationships.*

6. Issue: Even optimistic predictions for new airports and additional runways will not cover the additional forecasted demand.

- *Solution: More efficient use of existing and new infrastructure through advances in ATC, common-use and off-site processing, regional airports, and congestion management will be required—forecasts not self-executing.*

Questions & Comments