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Southwest Airlines

Reno RNAV/RNP Development



# Topics

- NextGen
- RNAV/RNP Development Goals
- Benefits of RNAV/RNP
- Departures – SIDS
- Arrivals – STARS
- RNP Approaches

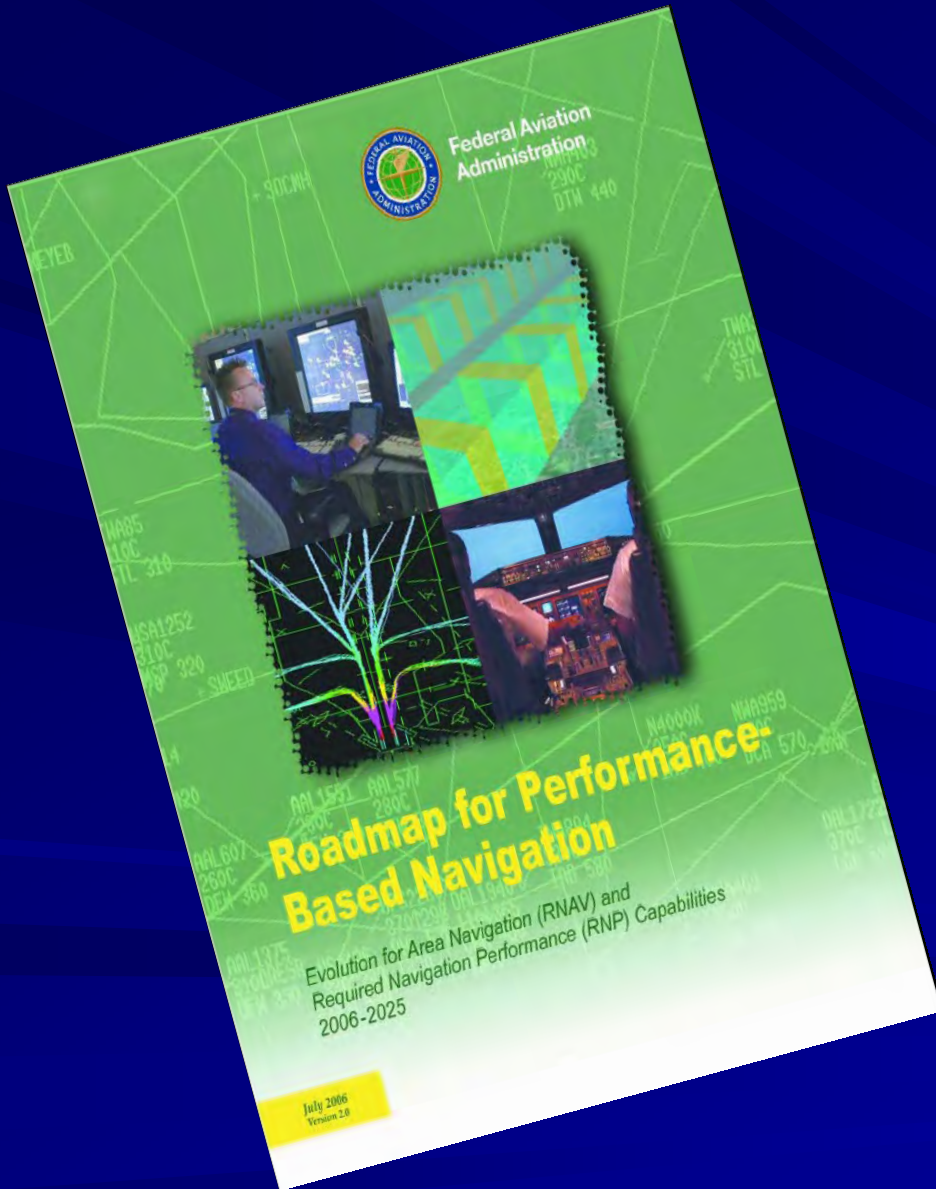


# Acronyms

- SIDS – Standard Instrument Departure
- STARS – Standard Terminal Arrival Route
- RNP – Required Navigation Performance
- RNAV – Area Navigation



# Navigation to NextGen





# Federal Emission Standards

Question?

**Save 3NM or 1 Minute at each Destination**

Over One Million Flights per Year

900,000 Metric Tons of CO<sub>2</sub>

SWA Investment – \$175 Million

Williams Trophy - 2010



# Goals and Expectations

## ■ RNAV/RNP Project Goals

- Maintain or Increase current level of Safety
- Decrease Emissions
  - RNP Instrument Procedures
  - Shorter Flight Paths
  - Unrestricted Climbs
  - Utilize Optimized Profile Descents

## ■ RNAV/RNP Project Expectations

- Optimized Flight Procedures = Reduced Emissions
- Reduced Emissions = Reduced Noise
- **Become a Carbon Negative Airline**



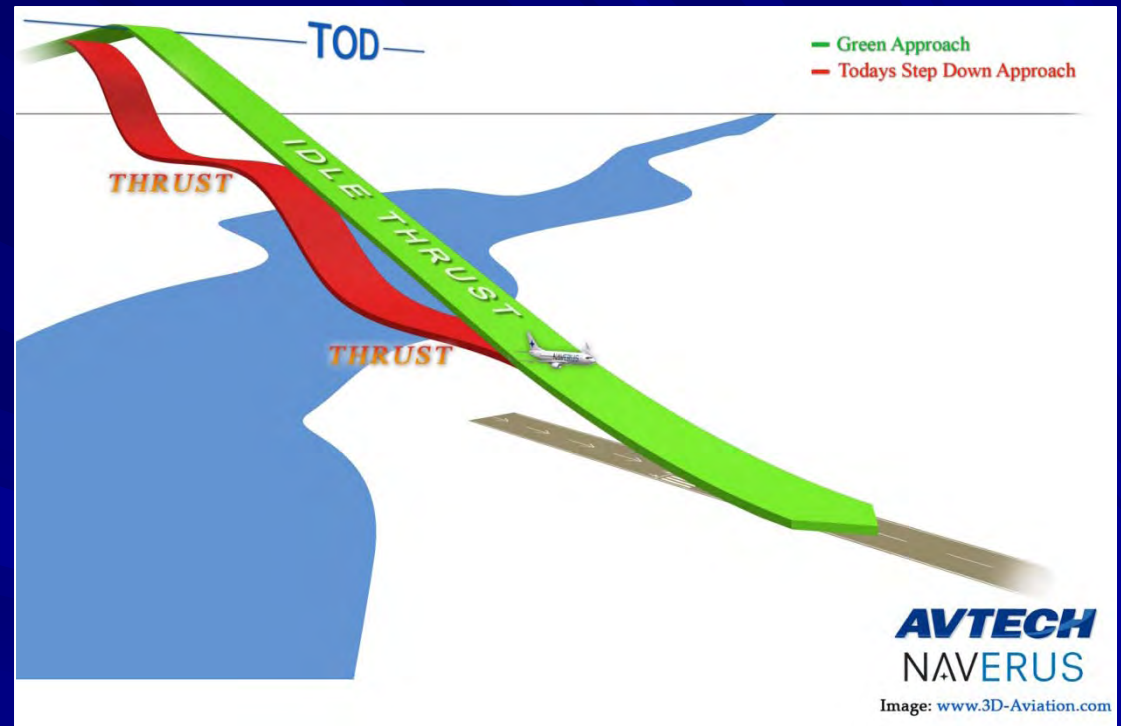
# Achieving the Benefits

- Departures
  - Unrestricted Climbs
  - Managing crossing traffic
  
- Arrivals
  - Optimized Profile Descents
  - Use RNP Approaches
  
- Minimize Pilot/Controller Variables



# BENEFITS OF RNAV/RNP

- Fuel
  - Track mile reduction
- Noise
  - Low thrust approaches
  - Better control of noise avoidance tracks
- Emissions
  - Reduced track miles
  - More efficient thrust management



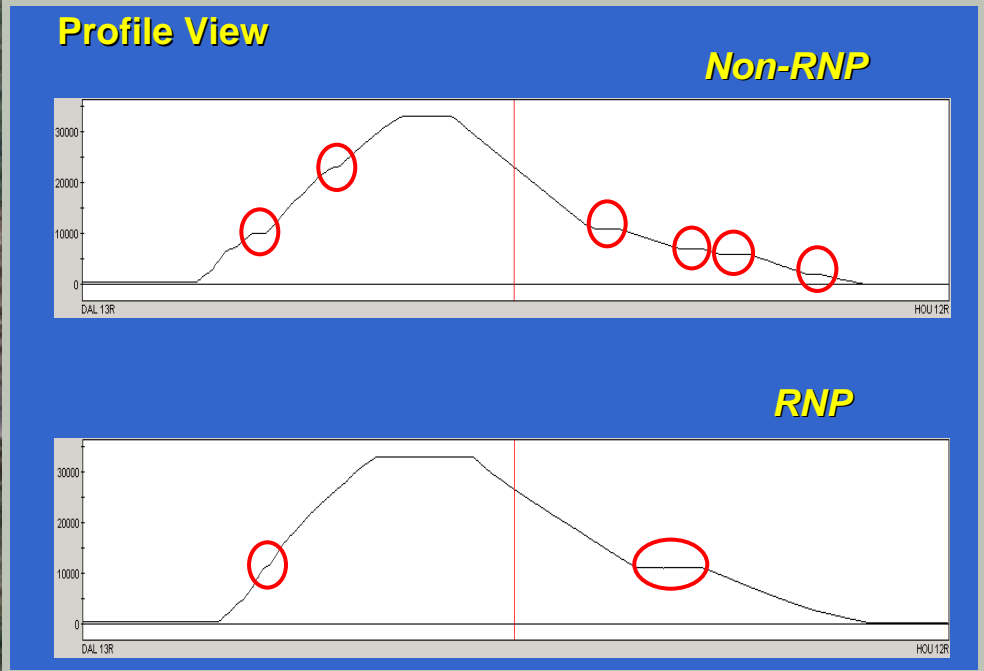
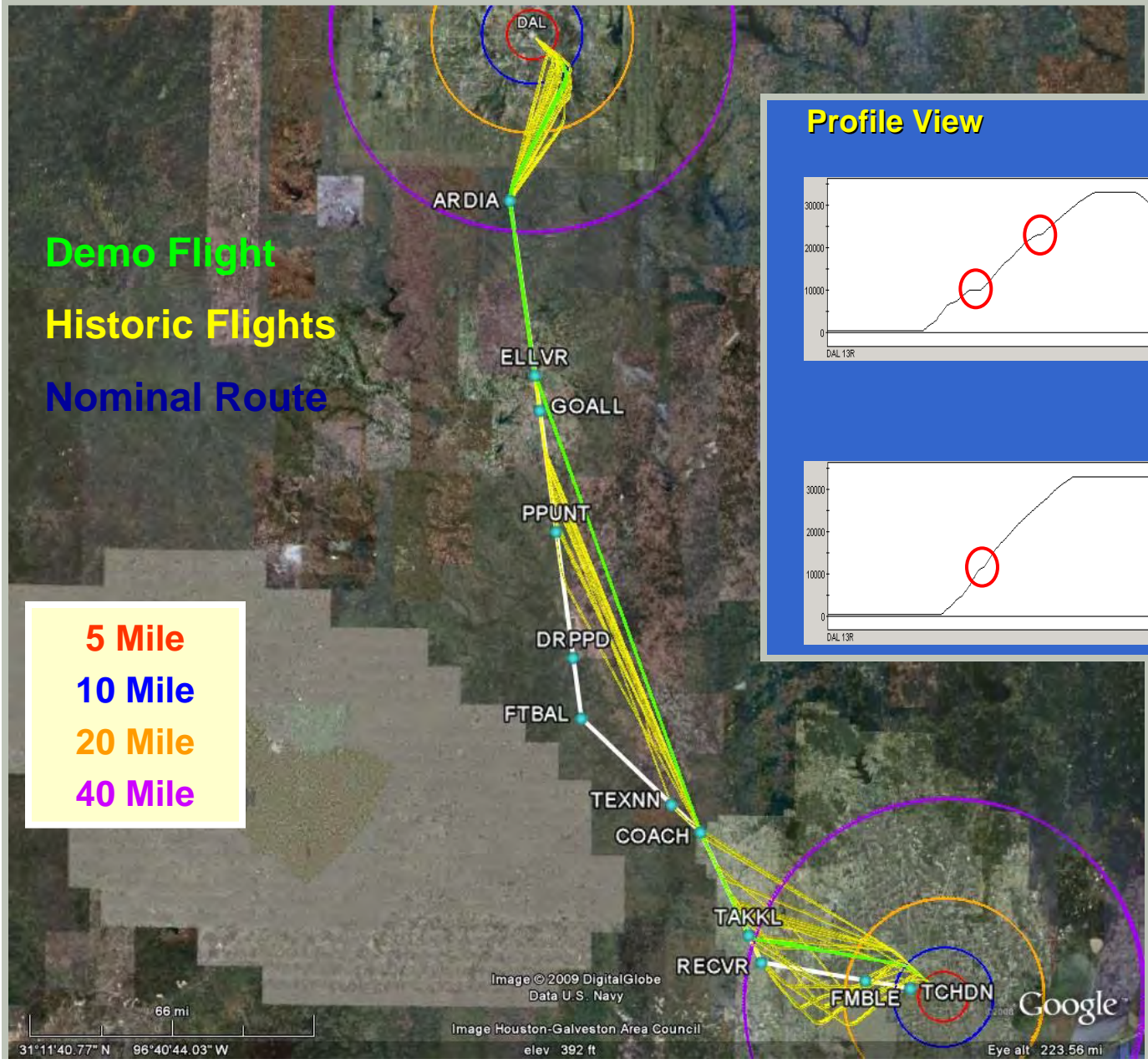


# DAL-HOU Path and Profile

March 8, 2009

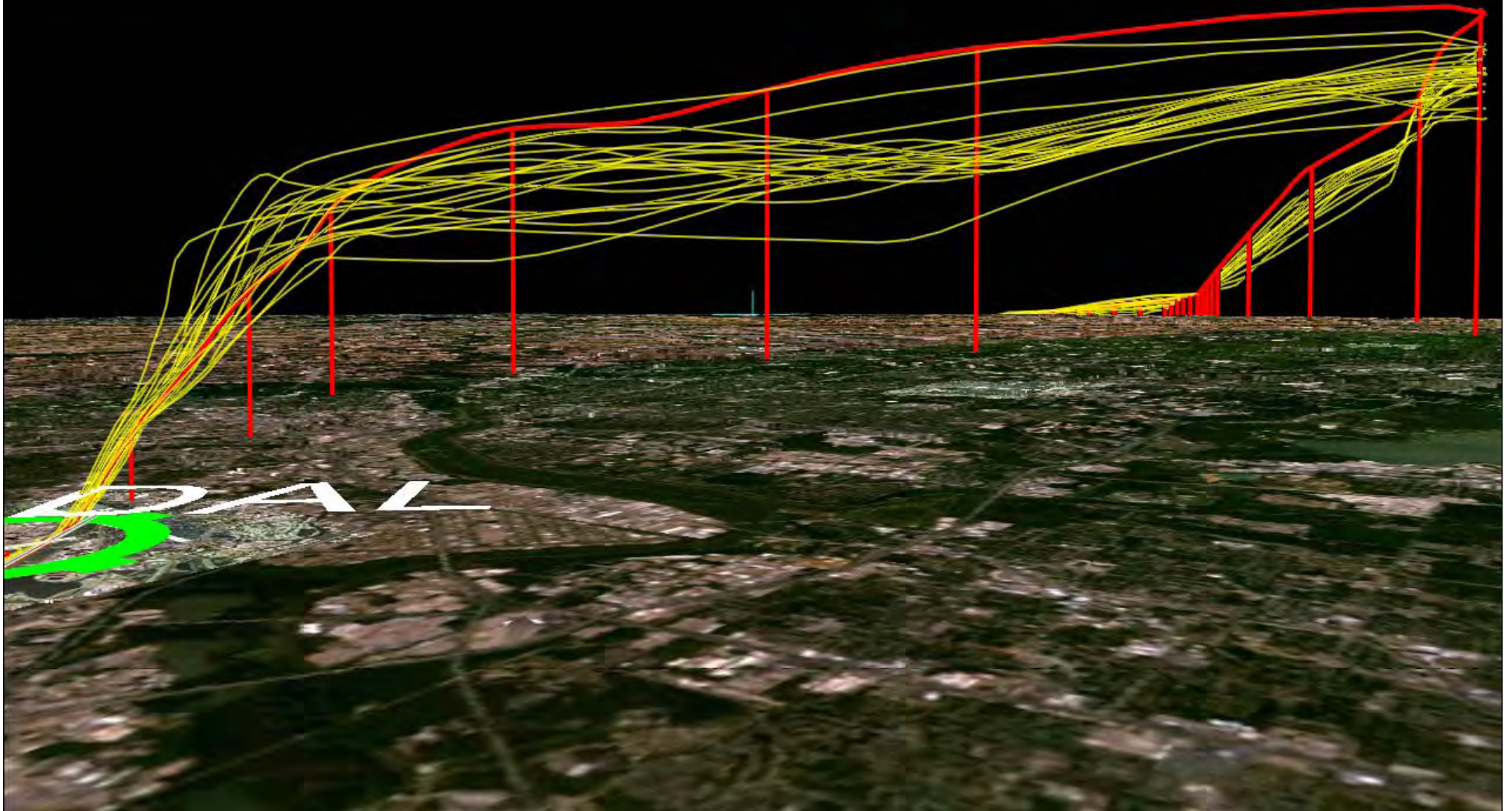
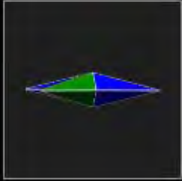
Demo Flight  
Historic Flights  
Nominal Route

- 5 Mile
- 10 Mile
- 20 Mile
- 40 Mile





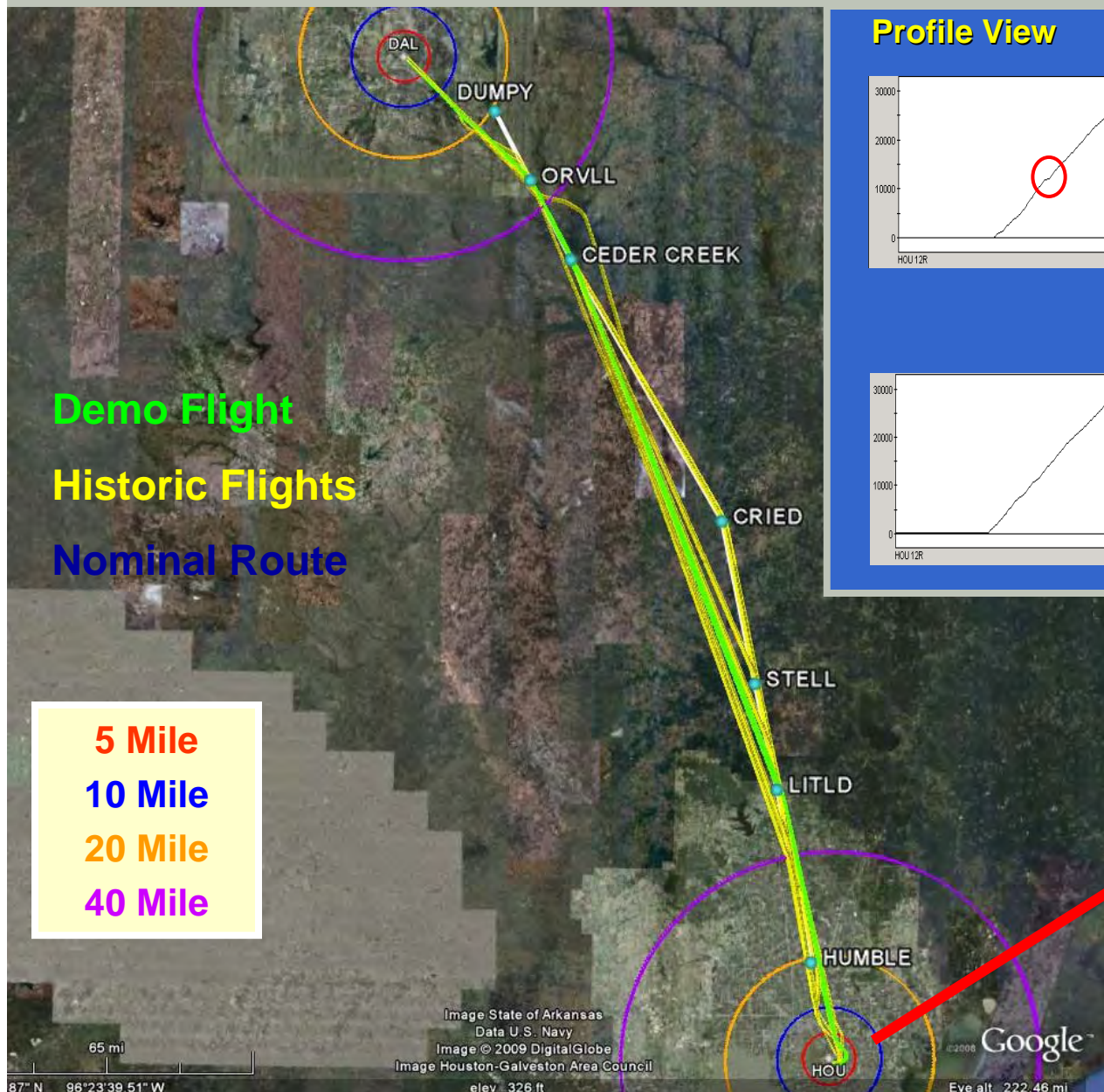
# RNP DAL Departure



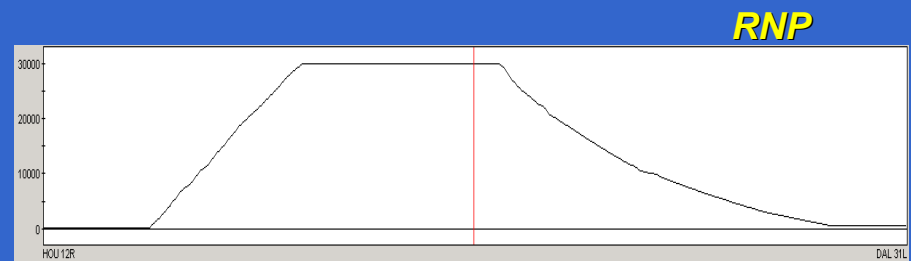
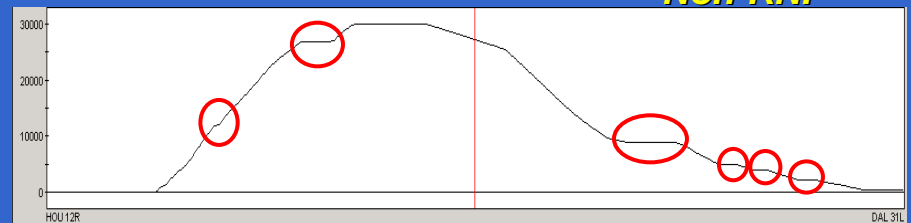


# HOU-DAL Path and Profile

March 8, 2009

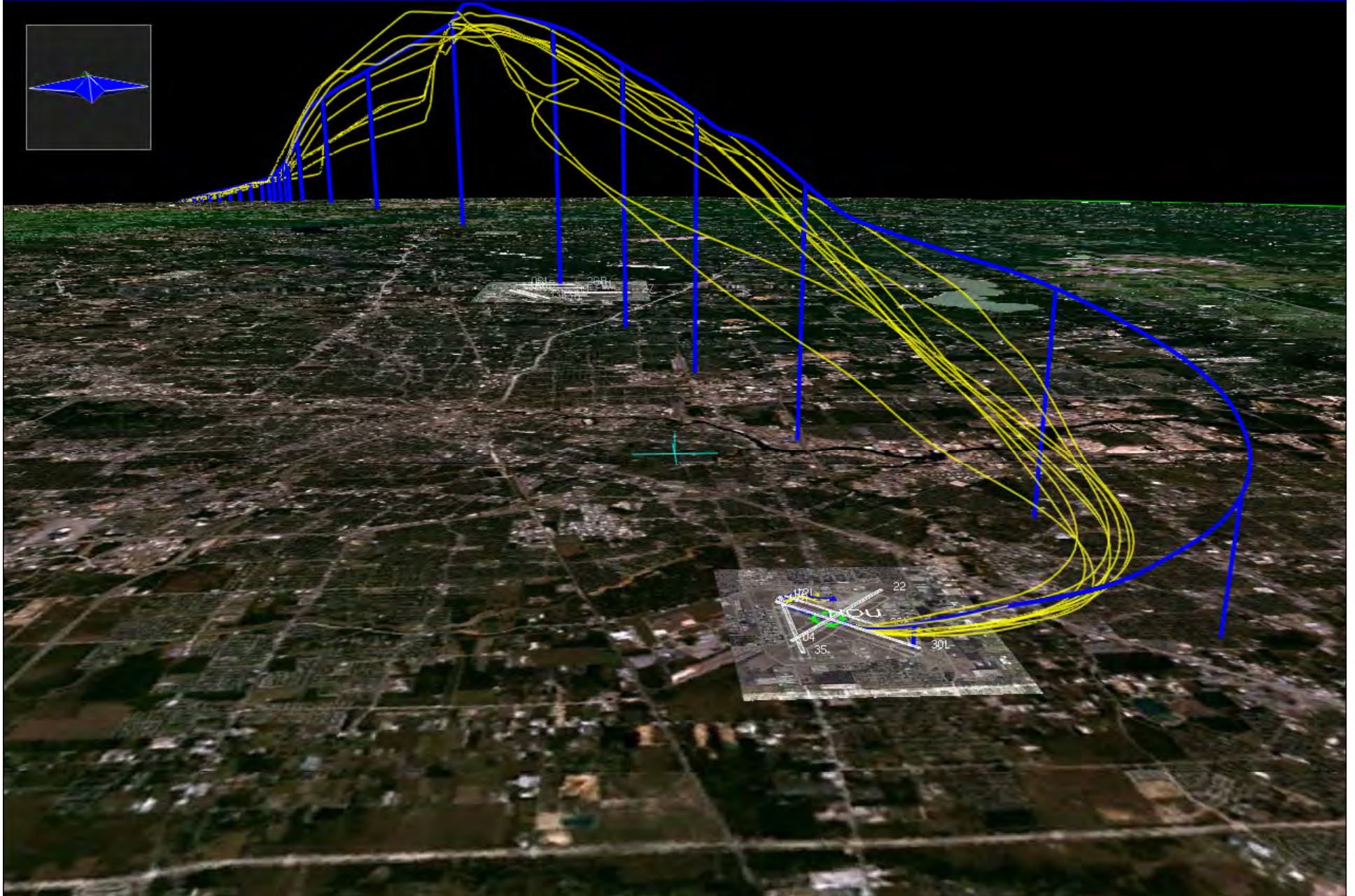
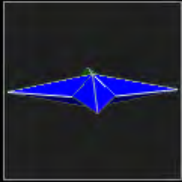


## Profile View





# HOU Departure





# 6% Fuel and Carbon Reduction

## March 8, 2009 Demo Flight Results

	<i>Fuel Reduction</i>		<i>CO<sub>2</sub> Reduction</i>	
	Demo Flight	Full Year <sup>①</sup>	Demo Flight	Full Year <sup>①</sup>
DAL to HOU	-228 lbs, -34.03 gals <sup>②</sup>	-317,533 gals	-718 lbs	-6,698,378 lbs
HOU to DAL	-59 lbs -8.81 gals <sup>②</sup>	-81,640 gals	-186 lbs	-1,722,199 lbs
<b>City Pair Total</b>	<b>-287 lbs, -42.84 gals <sup>②</sup></b>	<b>-399,173 gals</b>	<b>-904 lbs</b>	<b>-8,420,577 lbs</b>

*Did You Know,  
In 2008 . . .*

- U.S passenger and cargo airlines consumed 12.7 billion gallons of jet fuel for domestic operations. <sup>③</sup>
- SWA consumed 1.5 billion gallons of fuel. <sup>④</sup>

**Applying a 6%  
reduction to the  
U.S. airline  
industry . . .**

	<i>Fuel Reduction</i>		<i>CO<sub>2</sub> Reduction</i>	
	Used in 2008 (Gallons)	6% Reduction (Gallons)	Pounds	Metric Tons
SWA	1.5 Billion	-90.6 Million	-1.9 Trillion	-867 Thousand
U.S.	12.7 Billion	-760 Million	-16 Trillion	-7.3 Million

<sup>①</sup> Based on 2008 data

<sup>②</sup> Based on fuel density of 6.7lbs/gal

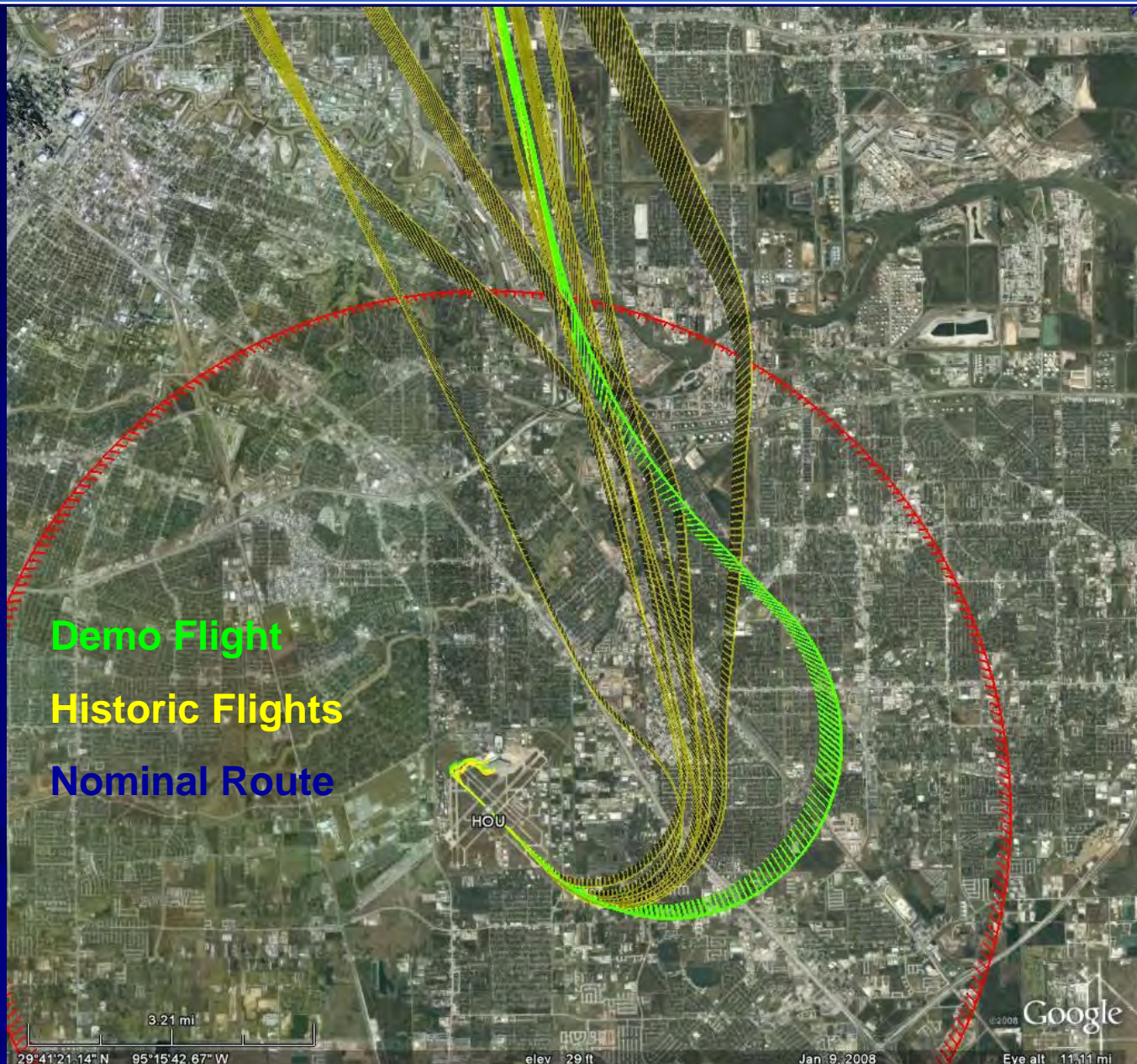
<sup>③</sup> Source: ATA

<sup>④</sup> Source: SWA Fuel Committee



# HOU-DAL / HOU Departure

March 8, 2009



**Demo Flight**  
**Historic Flights**  
**Nominal Route**

**5 Mile**  
**10 Mile**  
**20 Mile**  
**40 Mile**

29°41'21.14" N 95°15'42.67" W

elev 29 ft

Jan 9, 2008

Eye alt 11,911 mi

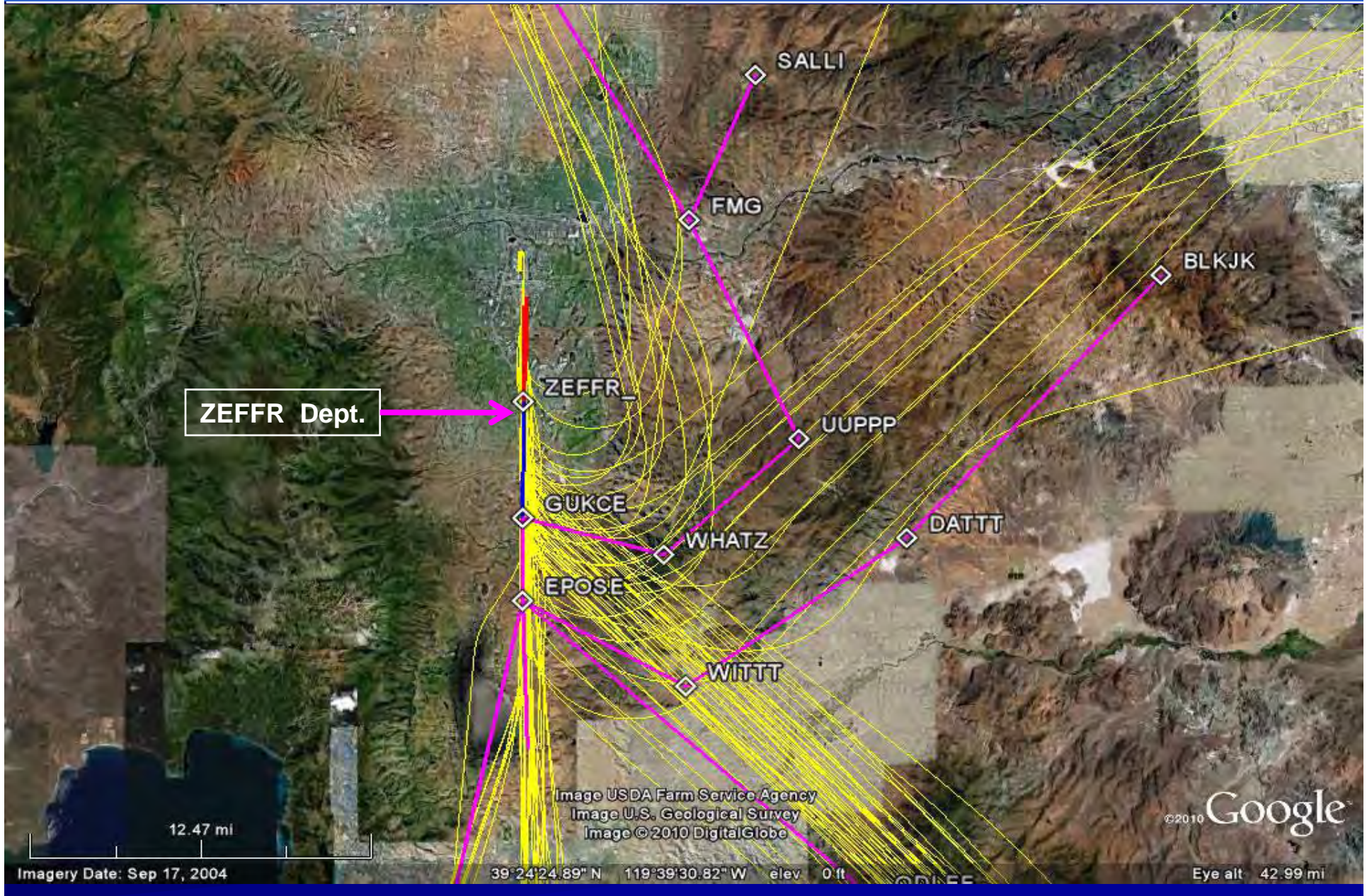


# RNO Operations

- South Flow
  - 75 Percent of Operations
- North Flow
  - 25 Percent of Operations

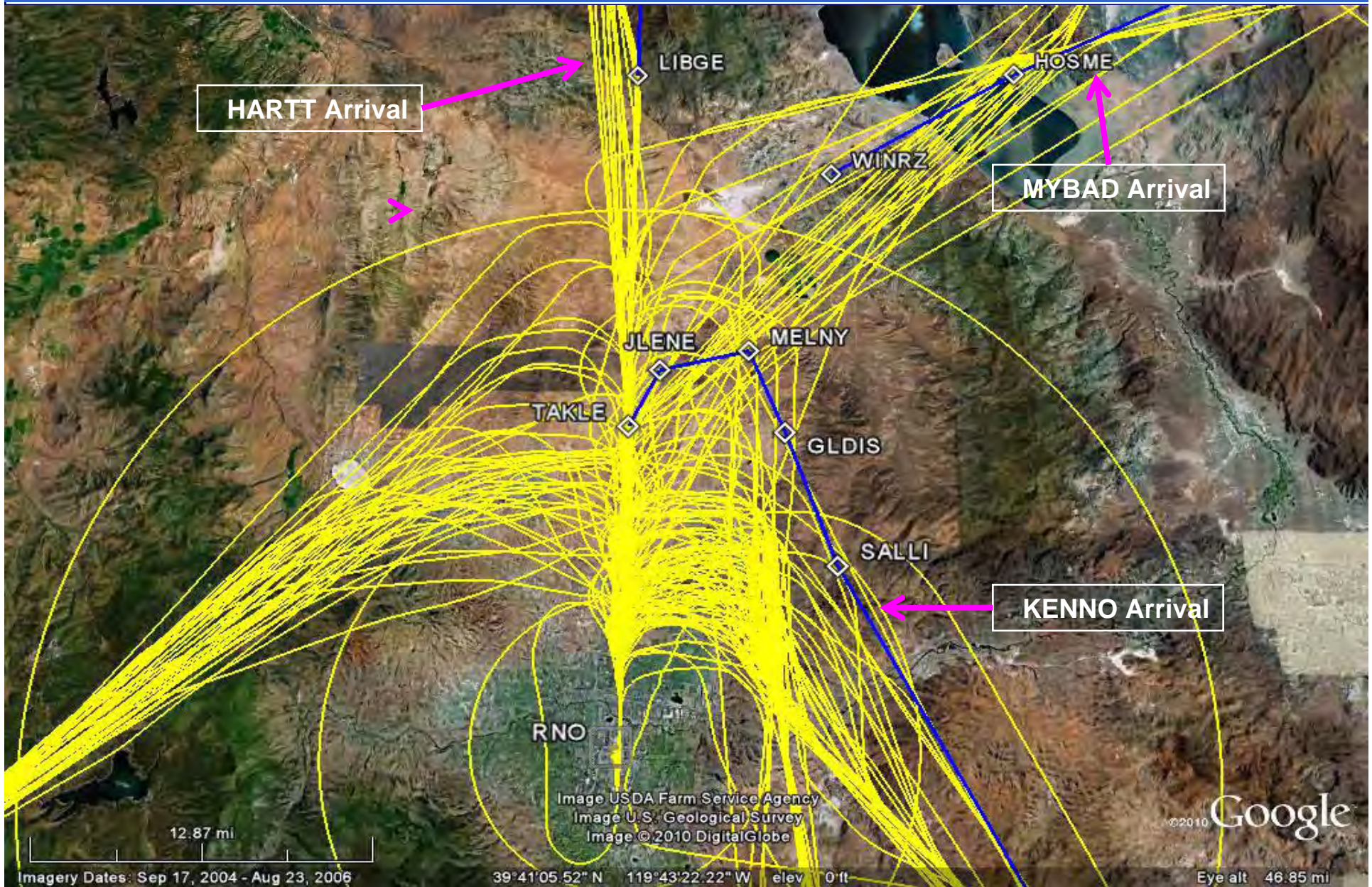


# Departure – South Flow



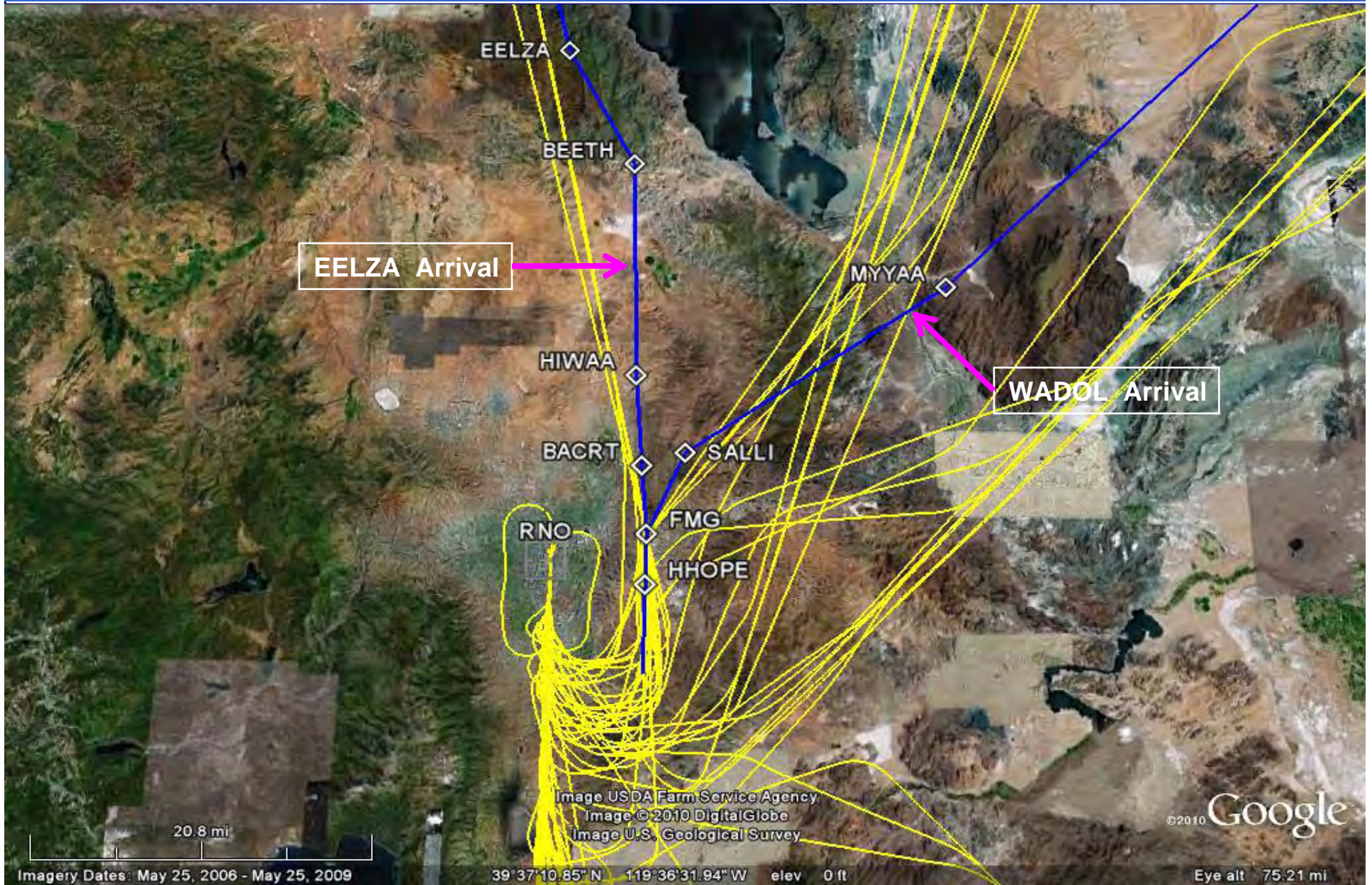


# Arrivals – South Flow



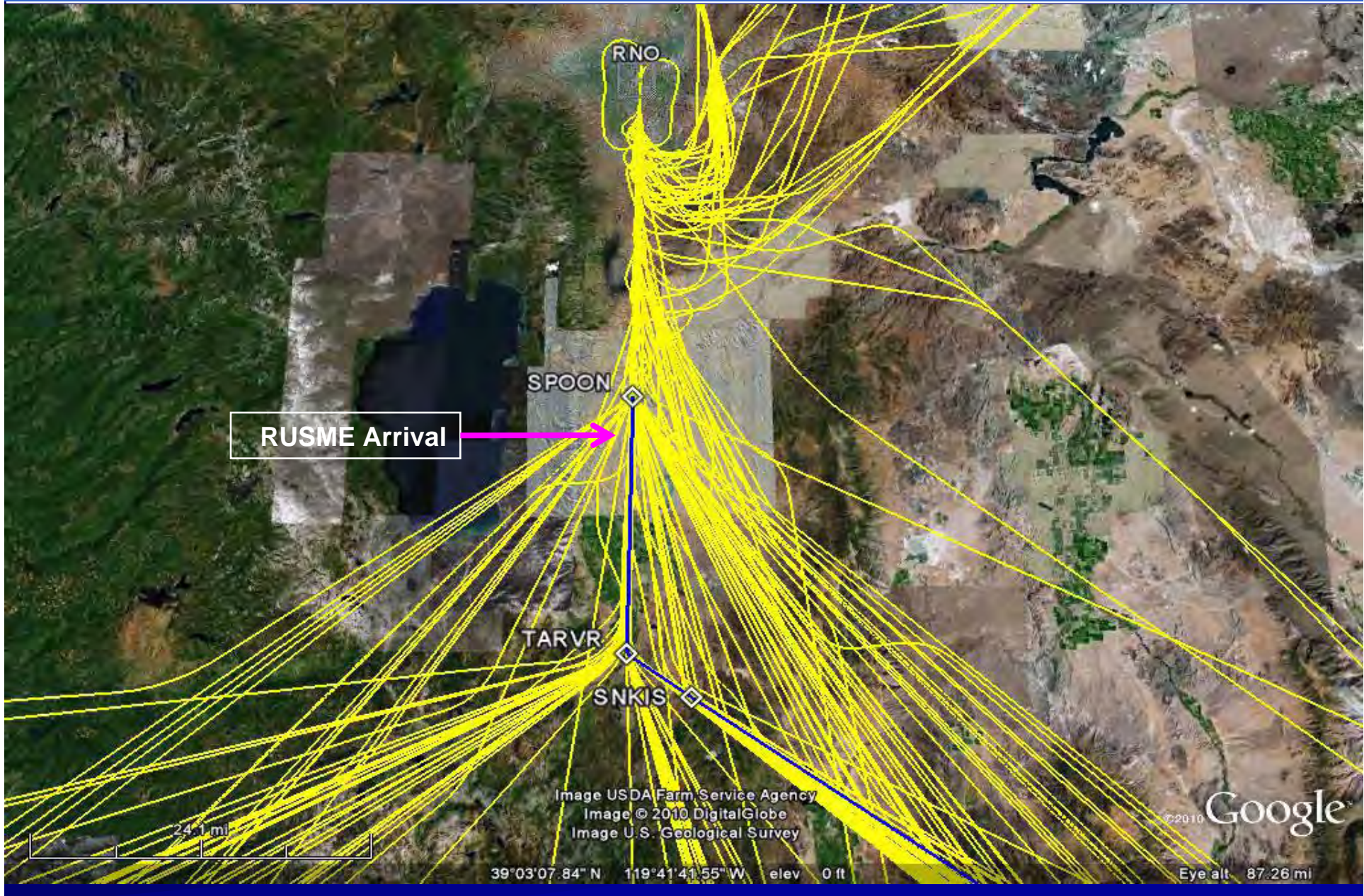


# Arrivals – North Flow



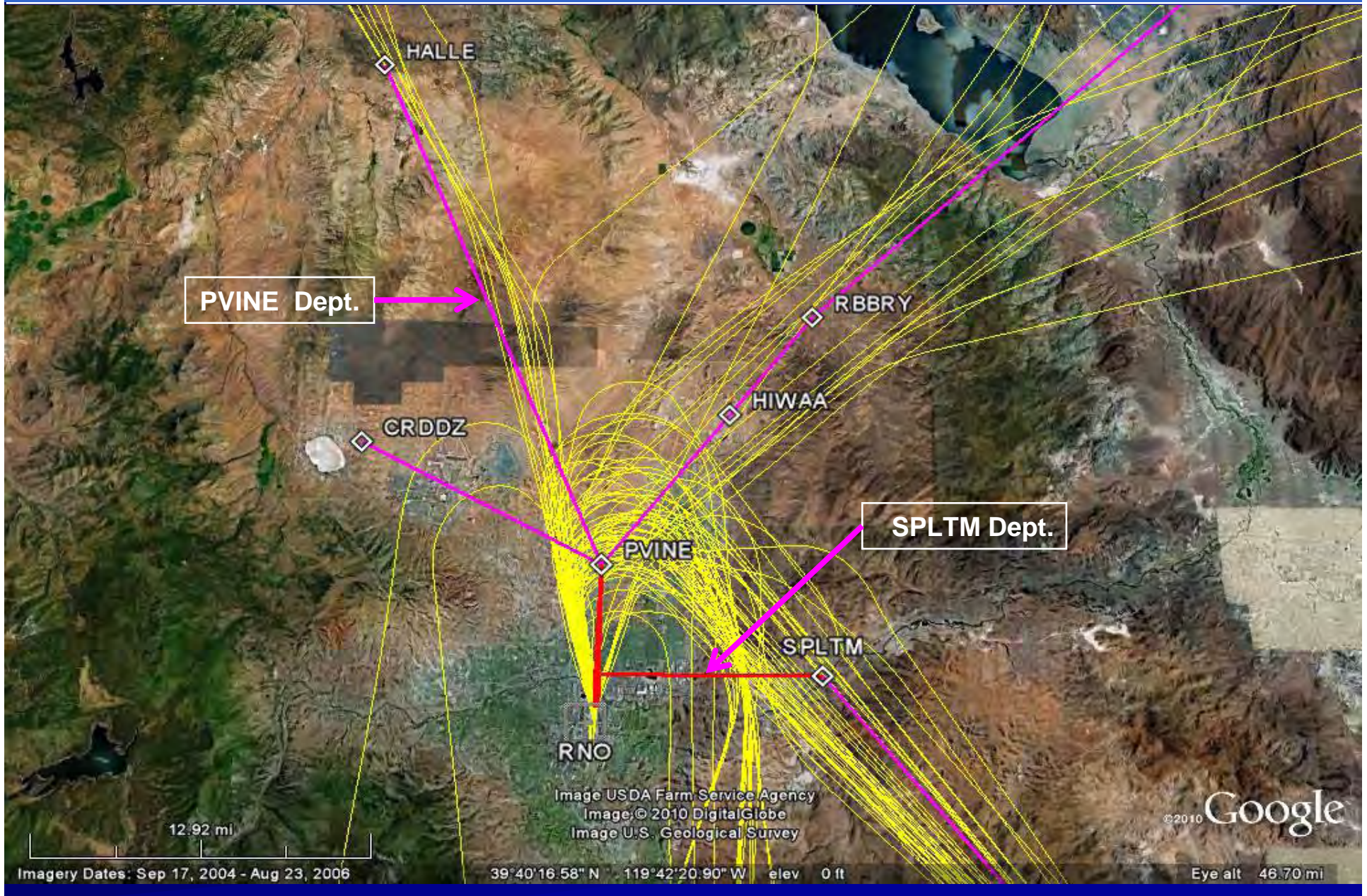


# Arrivals – North Flow



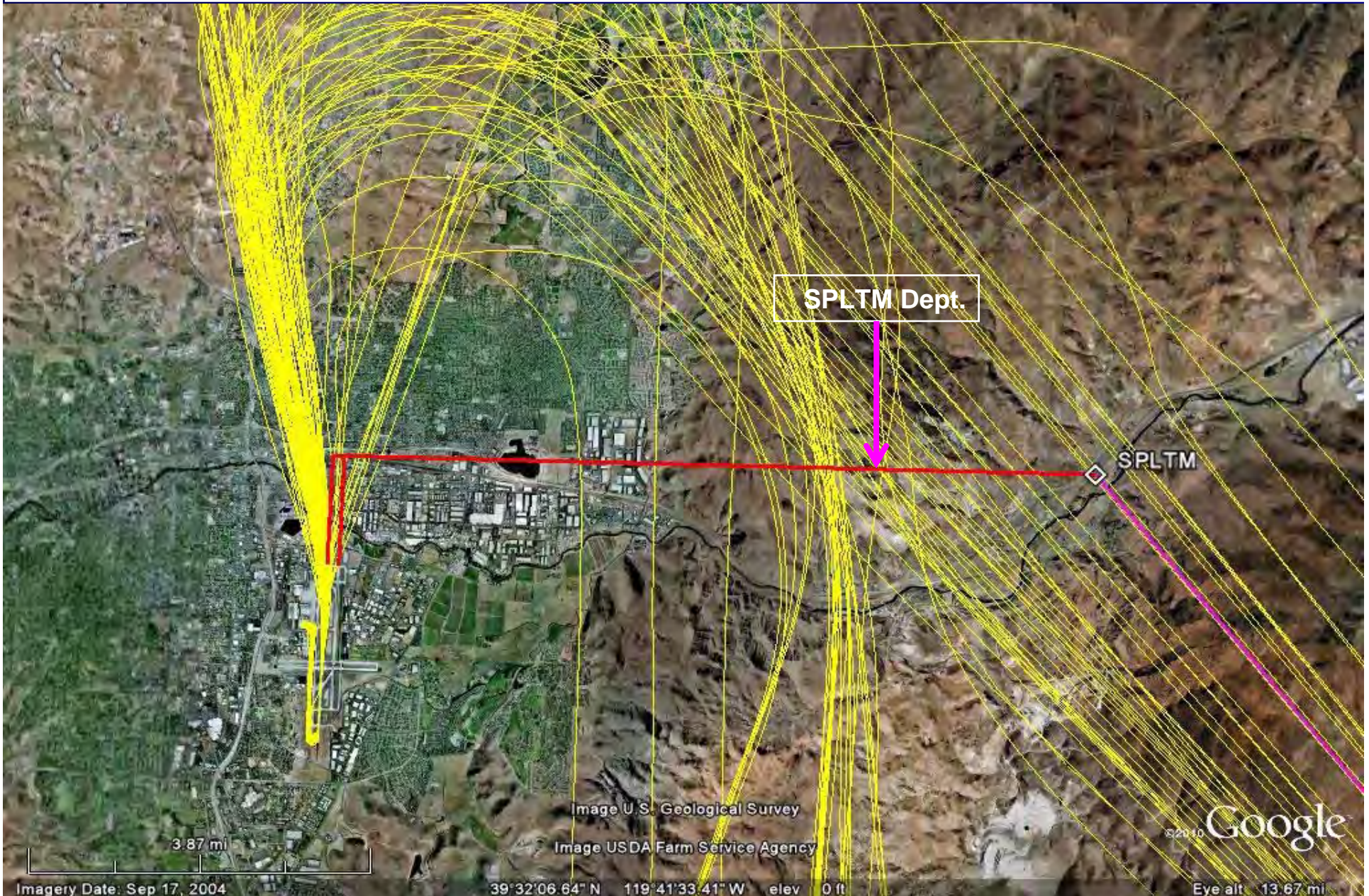


# Departures – North Flow





# SPLTM Departure



SPLTM Dept.

SPLTM

3.87 mi

Imagery Date: Sep 17, 2004

39° 32' 06.64" N 119° 41' 33.41" W elev 0 ft

Eye alt 13.67 mi

Image U.S. Geological Survey

Image USDA Farm Service Agency

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# RNP Approach 16R

