



# **Homeland Security**

## **- Airline Passenger Risk Assessment -**

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# - Program Objectives and Approach -



# Objectives

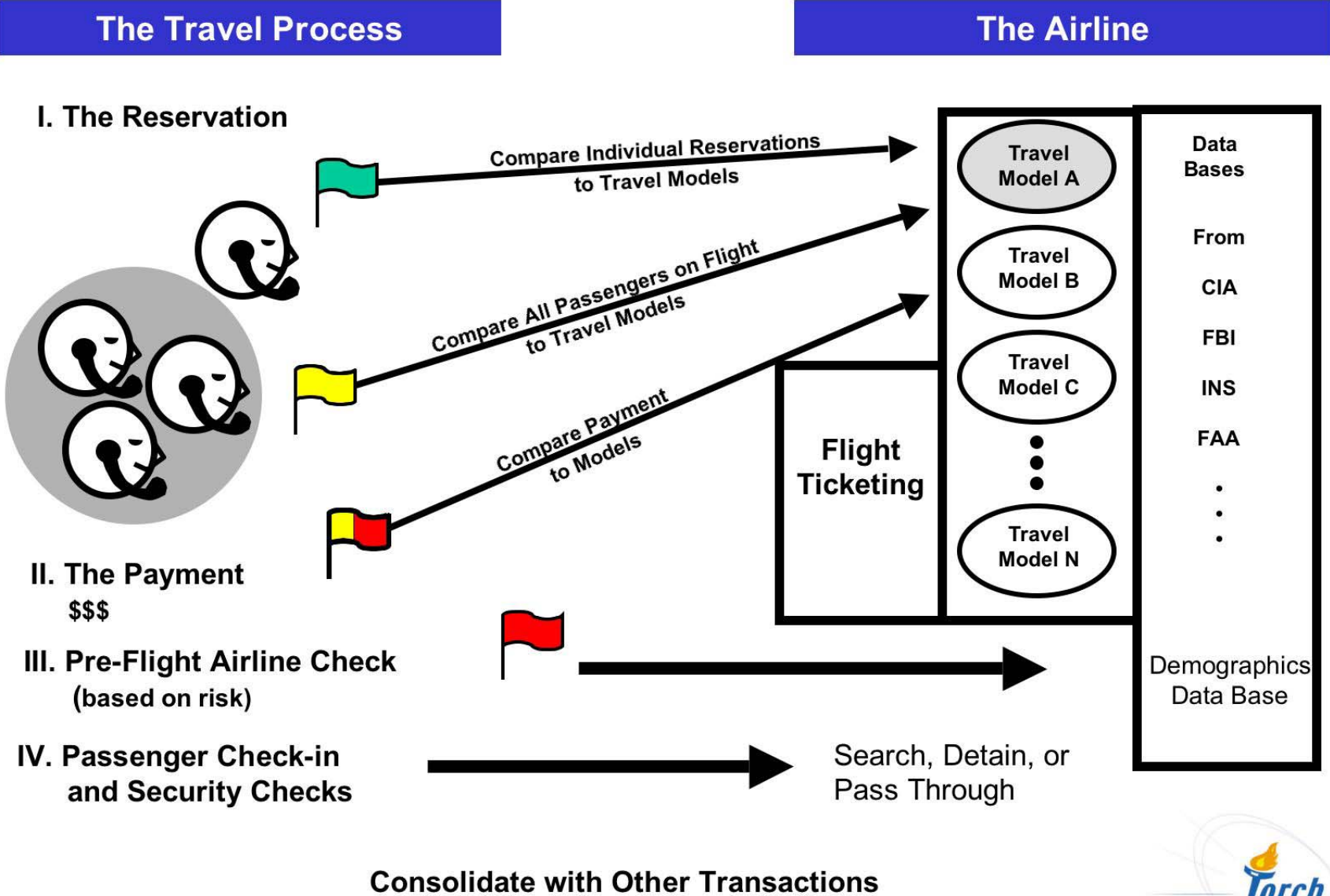
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- **Demonstrate that Airline Passenger and Reservation Data Can Be Clustered to Form Groups of Conventional Travelers.**
- **Characterize Each Group of Travelers.**
- **Show How This Type of Characterization, When Extended to a More Complete and Representative Data Base, Can Be Used to Identify High Risk Passengers.**



# Concept for Airline Ticketing Transactions

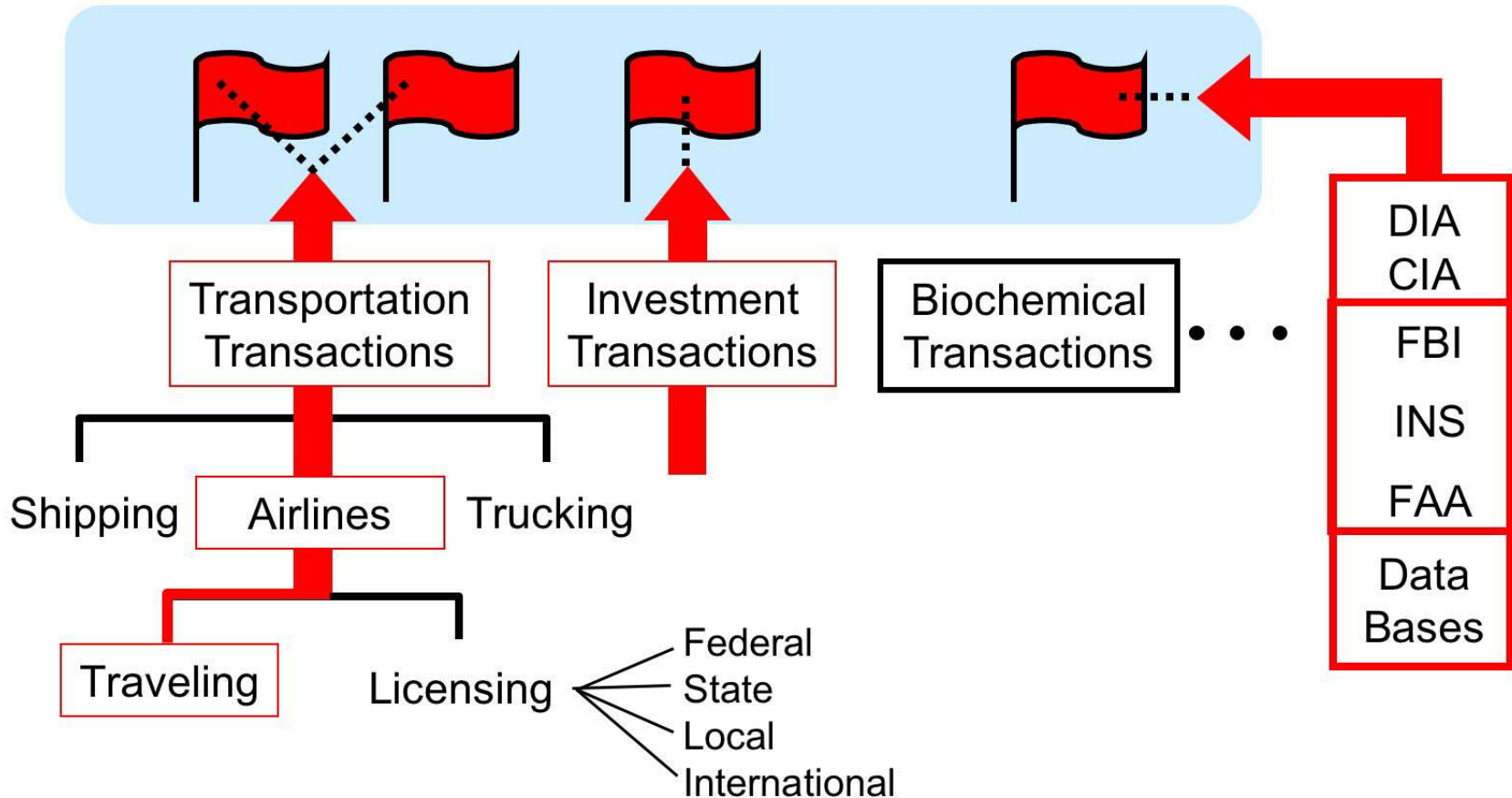
## - The Risk Assessment Process -



# Employ Transactions Across Broad Spectrum

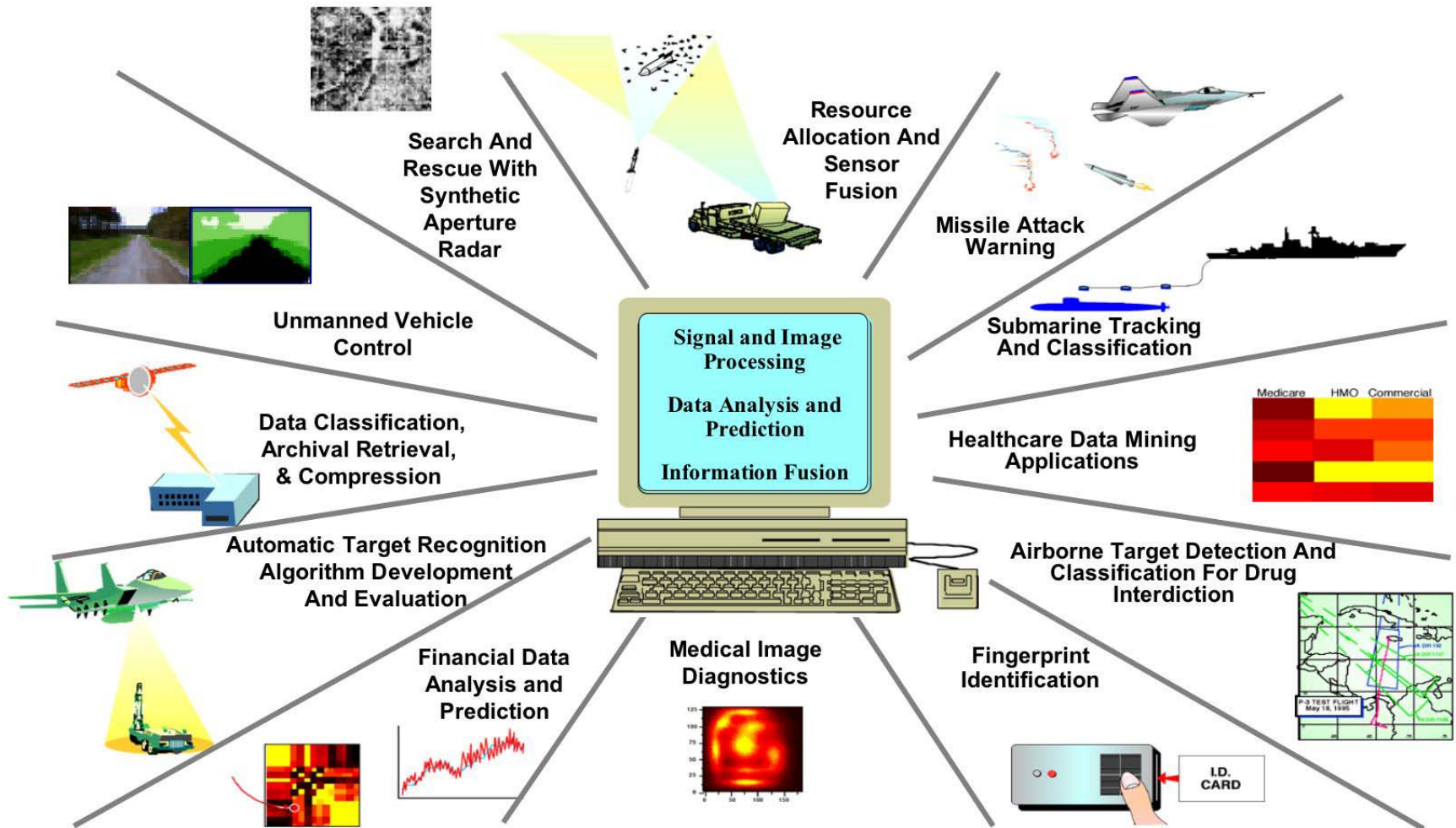
- Deviations From Normal Behavior Point To Terrorists -

Deviations Represent Suspect Actions or Flags!



Find a "Needle in a haystack"  
without knowing what the needle looks like!

# Previous Applications of ACUMEN Technology



**ACUMEN technology is mature and has been successfully demonstrated applied to many problems**

# **- Data Base Delays Forced Modified Approach -**

# It Took a Long Time to Get Data!

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- Dec '01 – Jan '02: Initial Overtures Made to Airlines to Obtain Data (Delta, American, . . .)

March – Contract Funded

- April 11: First Meeting with DOT, Mr. Jim Yeager
- April – May: Congressional Liaison Arranged Meeting with TSA
- June: First DOT-TSA Meeting Addressed Proposed Project.
- July: Given Assurance That We Would Receive the Necessary Data Base Being Used By CAPPS II Contractors in Weeks.
- August: Informed We Would Receive the jetBlue Data Base. We Indicated That This Would Probably Be Very Limited.
- September: Received the jetBlue Data Base. Confirmed Limitations.
- October: Purchased Acxiom Data Base on Passenger Demographics.



# Airline Passenger Data Base

## - jetBlue P&R and Demographics -

### Complexity of Data Base

- Fifty-Three Dimensional Data Base
- Five Million P&R Records

### P&R Data

- Airline Serves Only Eighteen Airports
- Principal Hub at JFK
- Trips Primarily
  - (1) Within New York
  - (2) New York to Florida
  - (3) New York to West Coast

### Demographic Data

- Demographic Data Available for 40% of Passengers
- Not Security Quality

**Data Base Limited: “Tourist-Like” Passengers; Limited Origins and Destinations;  
Lack Passenger Travel History; . . .**

# jetBlue Routes



# The Passenger Demographics Data Base

## - Acquired from Acxiom -

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**For Approximately 40% of the Passengers, the Following Demographic Information Could Be Extracted:**

### Name

1. Gender
2. Home Specifics – Owner/Renter, . . .
3. Years at Residence
4. Economic Status – Income, . . .
5. Number of Children
6. Social Security Number
7. Number of Adults
8. Occupation
9. Vehicles

# **- Results of ACUMEN Analysis -**

# Travel Patterns Are Unremarkable

## Travel Patterns:

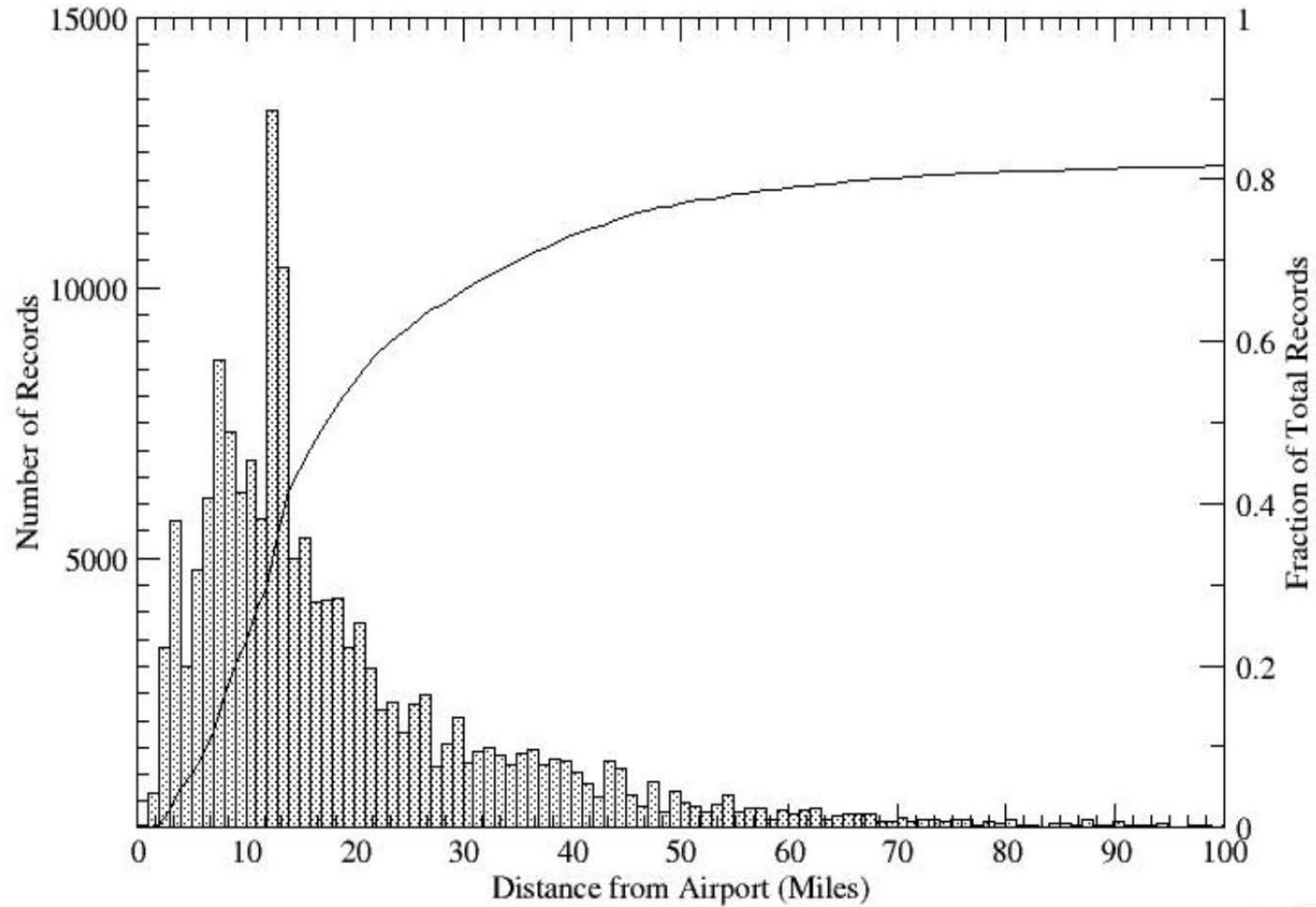
- Long and Short Commutes
- Long and Short Trips
- Round Trips and One-Ways



jetBlue Passengers Appear to Be Largely Upper Middle Class Tourists

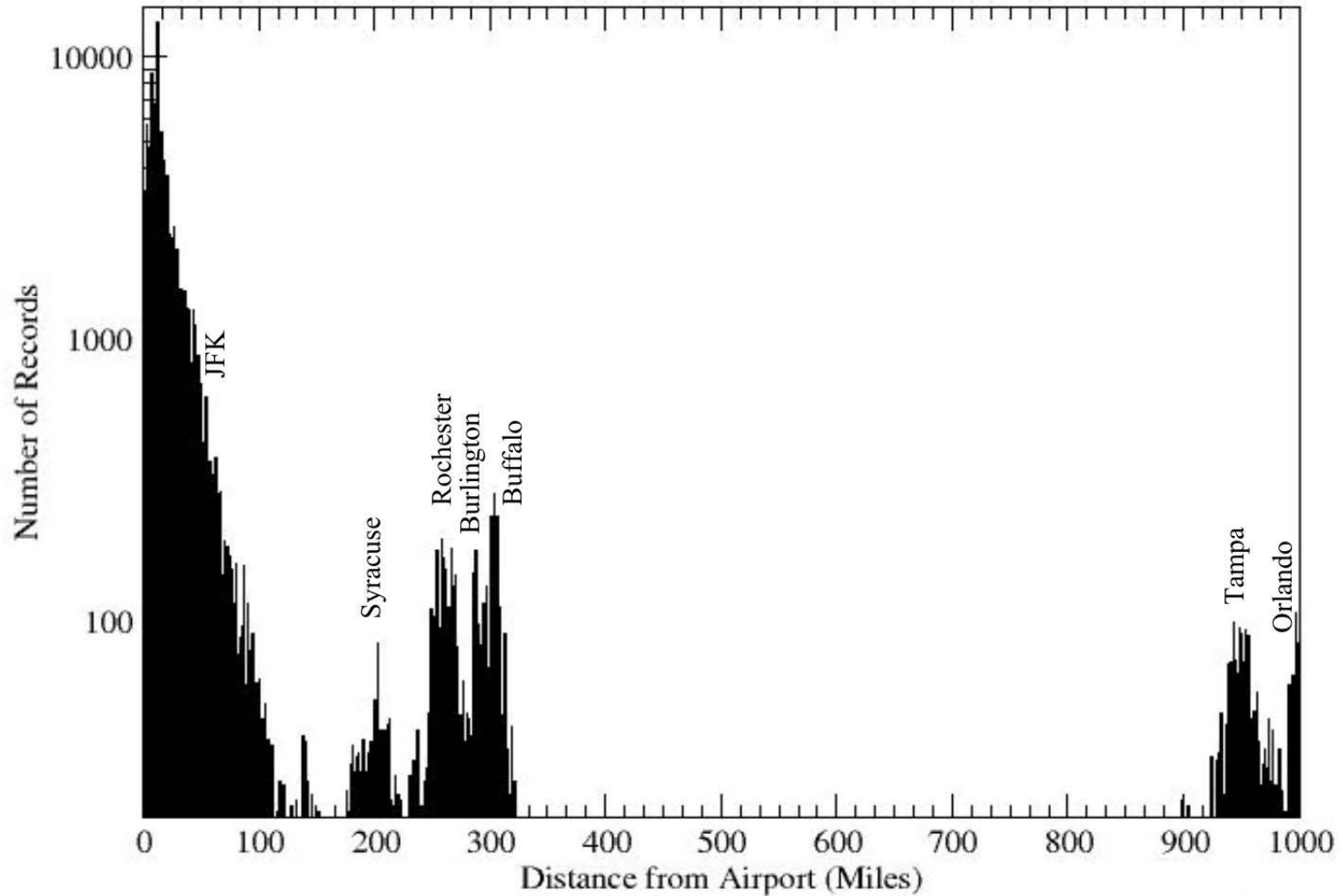
# Distance from Airport

- Approximately 80% of Travelers Have Less Than 50 Mile Commute to Airport -



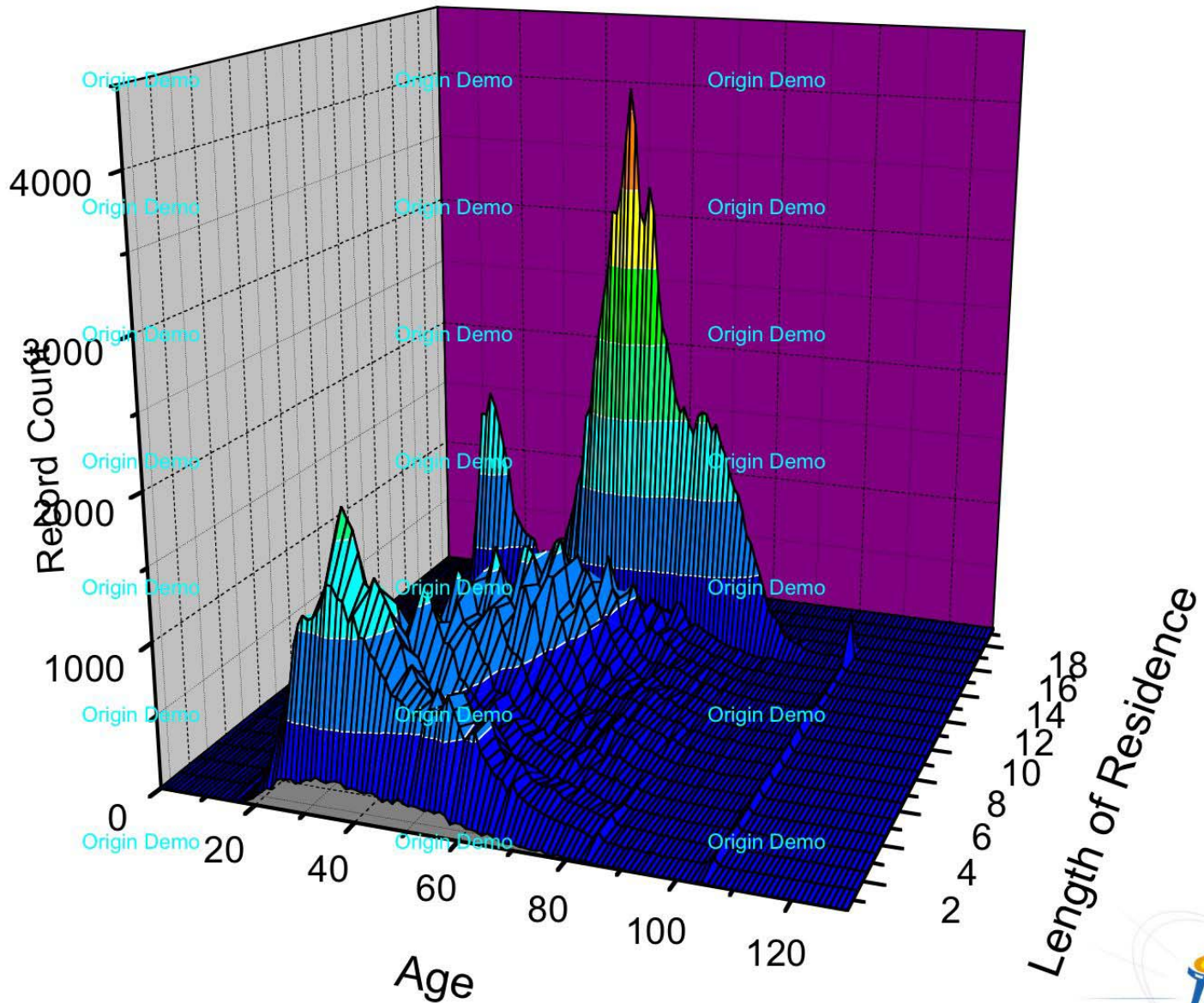
# Distance from Airport

- Outliers Fly Out of Nearby Airport or Fly One-Way Home -

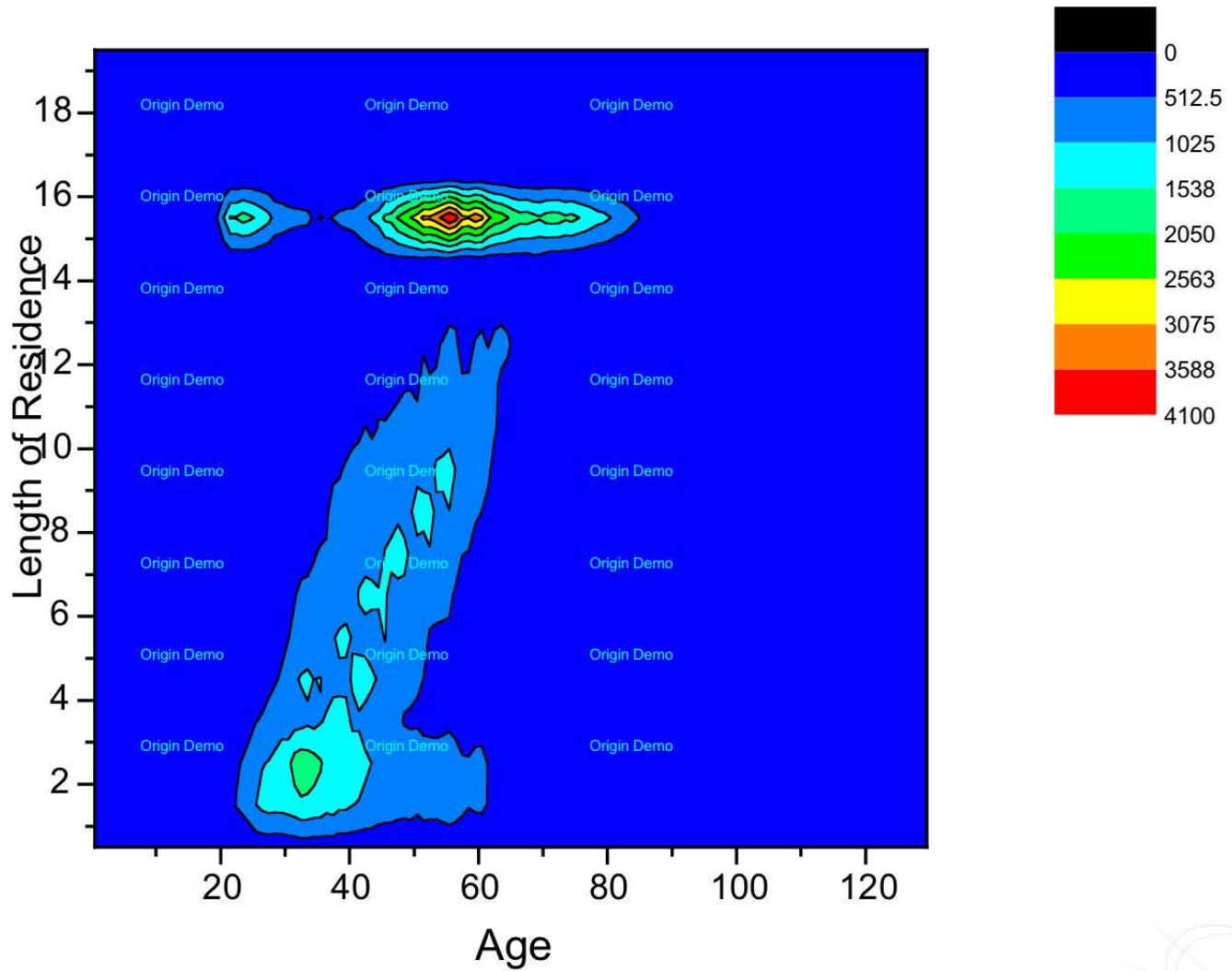




# Passenger Demographic Groupings

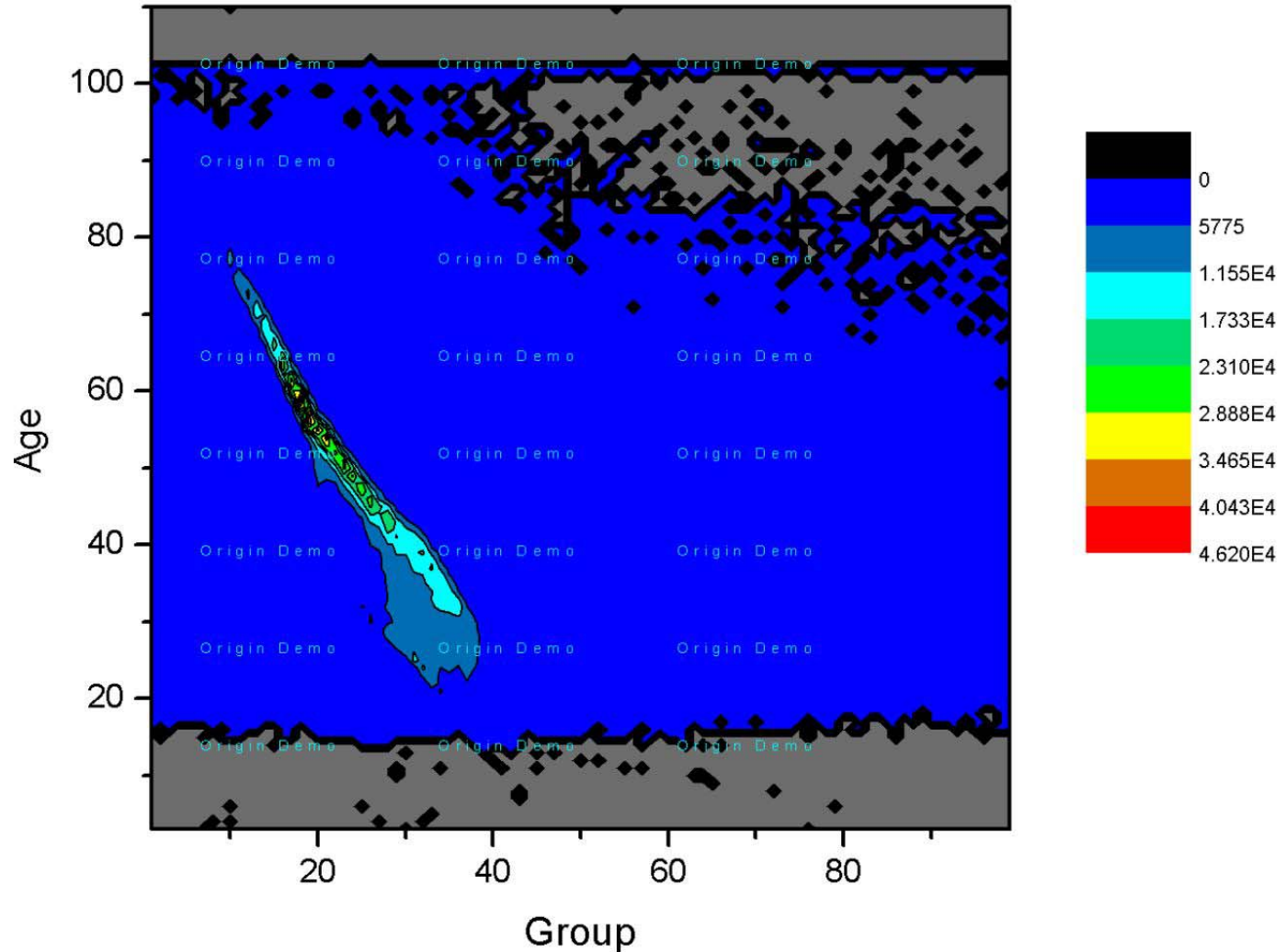






# Correlation of SSN Group and Age

- jetBlue Travelers -



**A Strong SSN Group-Age Correlation Exists Within a Given Geographic Locale**

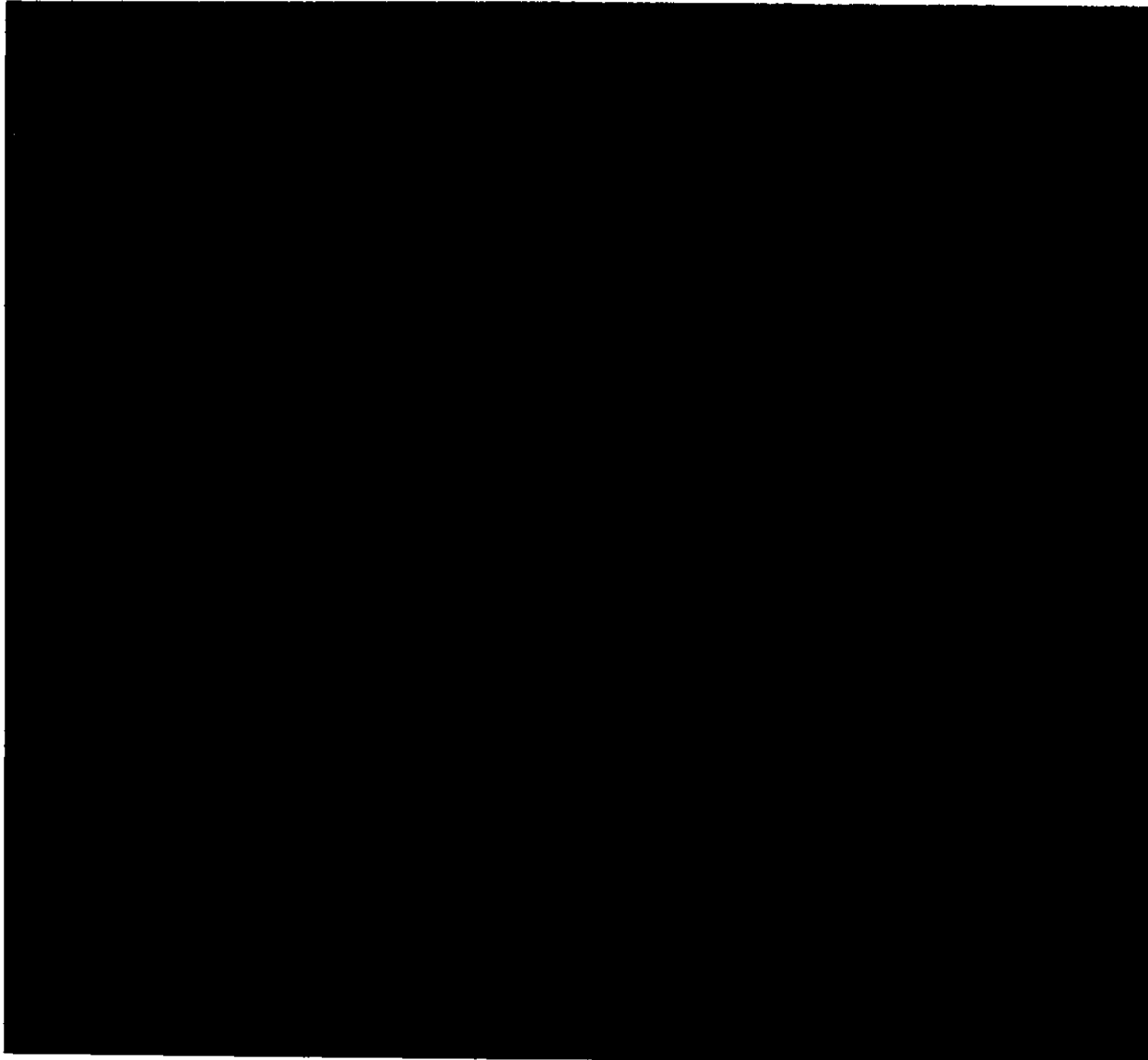
# Passenger Demographics

Distribution Mode	# Records	Age	Income	Length of Residence	Home: Owners/Renters	Gender: Male/Female	Adults	Children	SSN Group
Mode #1 "Younger Affluent"	88,000	43 yrs. $\sigma = 16$	\$41K $\sigma = 13$	2.7 yrs. 60% > 1 year	54% Own 2% Rent	$\frac{25\%}{22\%}$	2.8 $\sigma = 0.52$	0.58 $\sigma = 0.27$	49 $\sigma = 29$
Mode #2 "Older Affluent"	112,000	51 yrs. $\sigma = 16$	\$50K $\sigma = 18$	3.8 yrs. 74% > 1 year	72% Own 1% Rent	$\frac{34\%}{32\%}$	3.4 $\sigma = 0.54$	0.53 $\sigma = 0.26$	48 $\sigma = 29$



# Anomalous Demographic Information for One Passenger

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Address	City	State	Zip	SSN	DOB	LOR
						

LOR = Length of Residence

## **- Conclusions -**

# Conclusions

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- **The jetBlue Airline Passenger and Reservation (P&R) Data Base Provided Is Very Limited**
- **To Develop An Acceptable Data Base, the jetBlue P&R Data Was Augmented with Passenger Demographics**
- **Passenger Demographics - Analysis Indicates Largely Homogeneous Distribution With Two Groupings:**
  - (1) Young Middle Income Home Owners with Short Length-of-Residence
  - (2) Older Upper Income Home Owners with Longer Length-of-Residence
  - (3) A Grouping of Passengers Also Exists with Anomalous Records, Whether Through Erroneous Entry, Fraud, or Mischief
- **Passenger Travel - Several Distinctive Travel Patterns Were Identified. Demographic Groupings Appear Common to Each**
- **Known Airline Terrorists Appear Readily Distinguishable from the Normal jetBlue Passenger Patterns**
- **If a More Comprehensive P&R Data Base Were Available, It Is Expected that Analysis Could Identify and Characterize All Normal Travel Patterns**

# Risk Assessment Potential

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- **Several Data Elements Have Been Identified Which Best Distinguish Normal jetBlue Passengers from Past Terrorists.**
- **These “Passenger Stability Indicators” Include Social Security Number, Length-of-Residence, Income, and Home Ownership. Two Additional Elements If Available Would Likely Be Good Indicators: Namely, Miles Flown Annually and Lifetime.**