

# Regional Air Mobility Market Demand Study

## ARMD Systems Analysis Symposium

Jacob Wishart

Economist, Economic Analysis Division, Volpe Center

November 2, 2022

# Introduction – Volpe Research

- Research objective to identify and measure potential demand for regional air mobility (RAM), in addition to providing emission profiles of competing transportation modes.
- **Initial research steps:**
  1. Define the RAM market space and drivers of demand based on economic theory
  2. Analyze existing aviation and long distance trip data to determine current scope and size of the RAM market across all modes
  3. Estimate aircraft and vehicle emissions profiles by source
  4. Leverage existing datasets to empirically model potential RAM demand

# Regional Air Mobility Market Background

- **RAM Market Objective:** utilize the supply of under-served regional airports with regional traffic demand from multiple modal sources.

## Regional Air Mobility

- Small (<20 seats) electric aircraft (Part 23)
- Average trips around 200 miles (range from 50 to 350-500 miles)
- Multiple markets: leisure, commuter, business, feeder service to larger airports, cargo
- Substitute for cars and bus/train service



## Supply: Utilize Smaller Regional Airports

- Local access
- Limited security/less congestion
- Aircraft on demand

## Demand: Regional Air Mobility Traffic

- Type: Passenger (business/household), cargo
- Location: region, corridor
- Drivers of demand – economic/demographic/spatial
- Existing regional demand (car/bus/train) or new/latent demand

# Defining Traffic Demand

## Demand

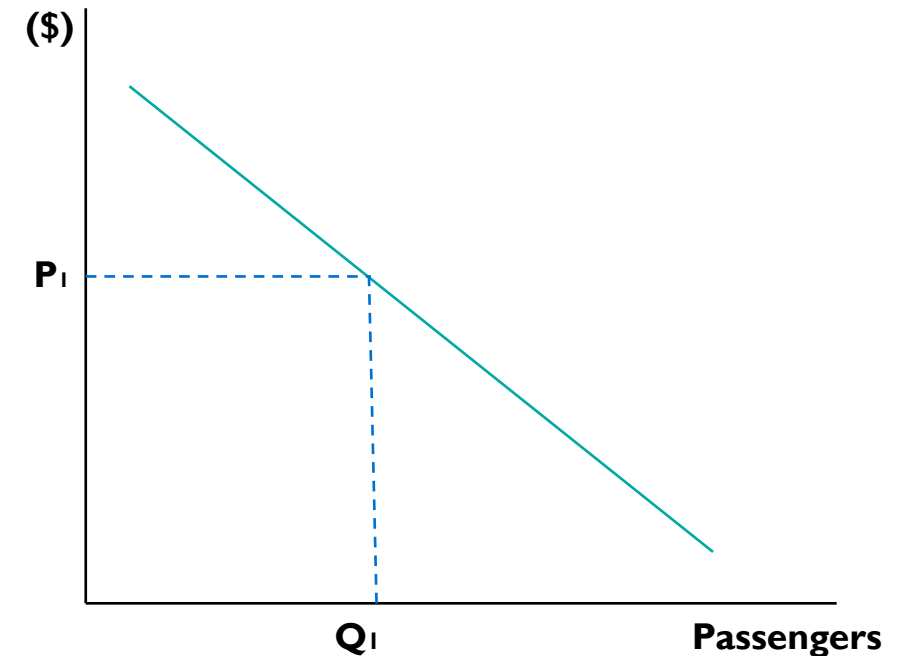
- Willingness to pay for a good/service and quantity purchased at given price (ceteris paribus)
- Lower operating costs (price) can open new markets

## Generalized Cost of Travel

- **Personal:** fuel, maintenance, operating costs, value of driver/passenger time, time cushion (for variability), other non-price attributes (service frequency, schedules)
- **Cargo:** fuel, crew, vehicle depreciation, maintenance, loading/unloading, inventory cost (time), service frequency, schedules, etc.

## Derived Demand

- Demand for travel derived from households/businesses consuming another good/service (holiday, conference, etc.)
- Travelers do not directly demand travel – will select mode that provides highest utility (price, service, schedule, time, comfort, etc.) to meet primary demand



# RAM Data Review – Understanding the Current RAM Market

## RAM Data Requirements for Demand Analysis

Aviation Market  
Details

Mode Choice

Long-Distance Trip  
Data

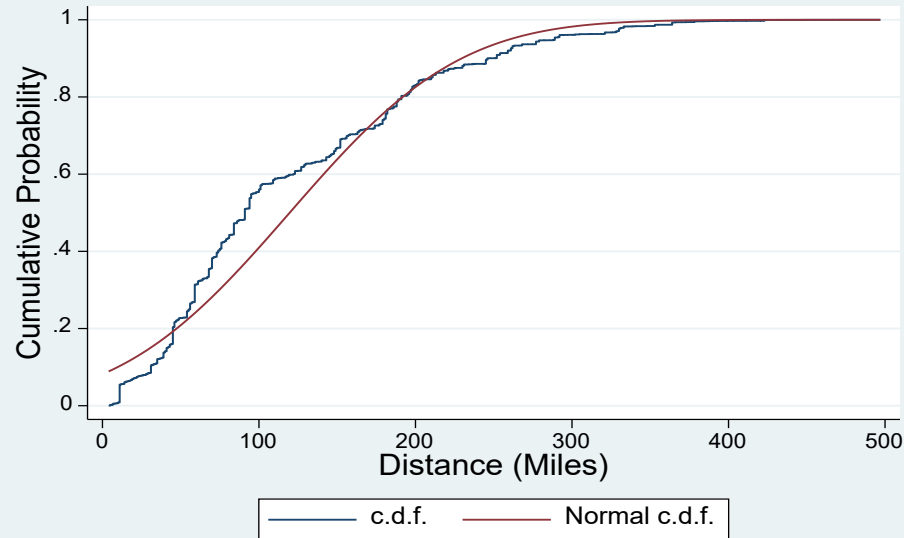
Emission  
Profiles

## RAM Data Sources

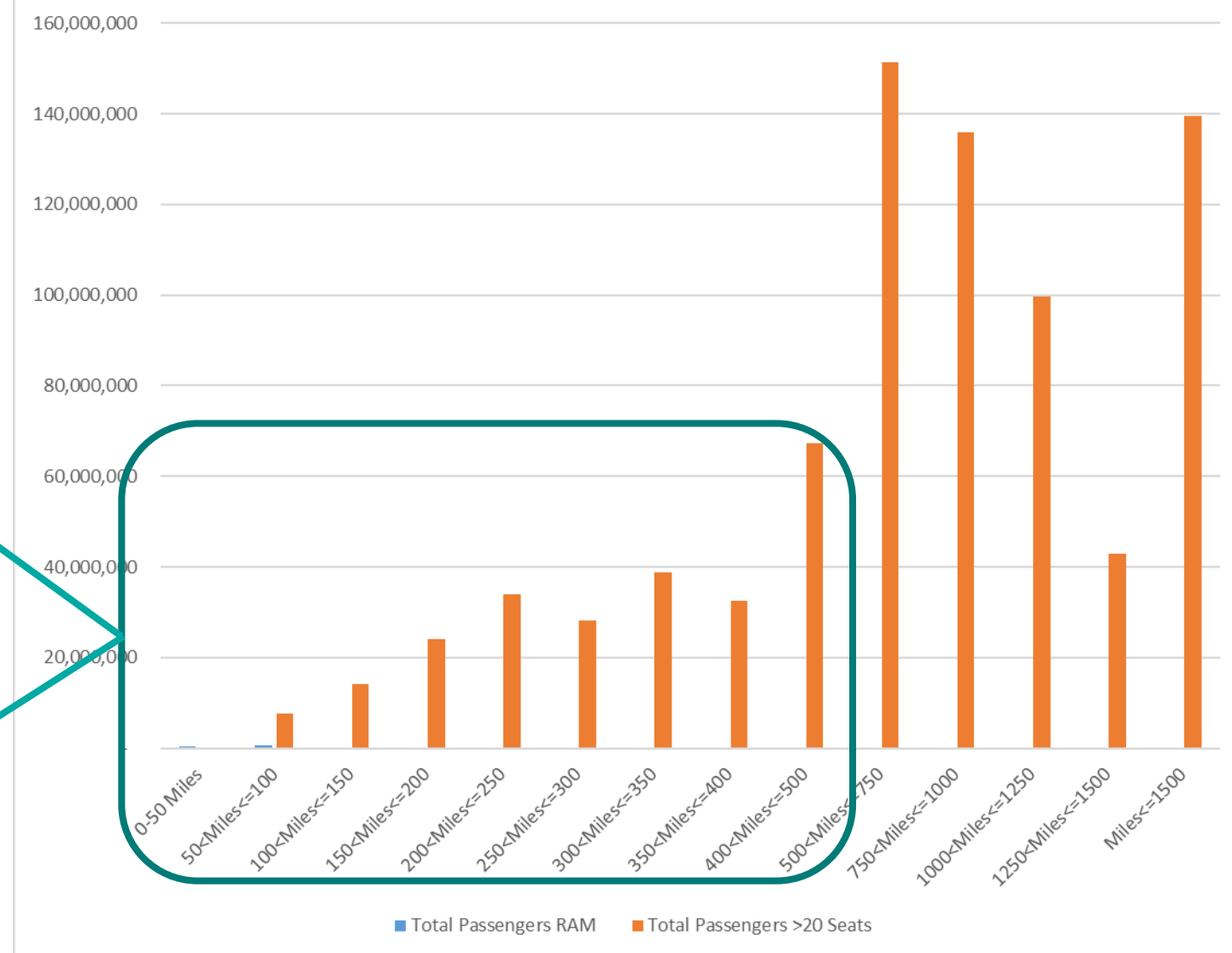
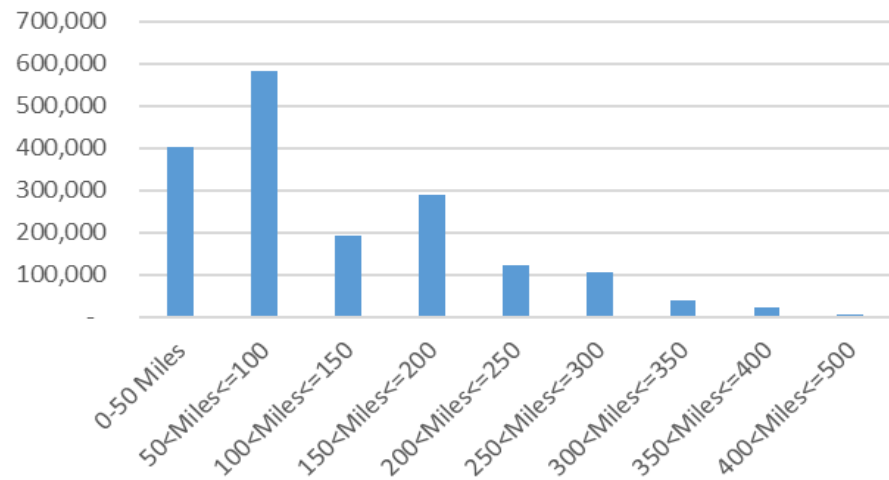
- Passenger and cargo network operations and fare data
  - Source: BTST-100 and DBIB
- Modal distribution of trips by distance
  - Source: FHWA TAF
- National trip distance totals
  - Source: BTS and FHWA NHTS NextGen
- Modal emission profiles and sources
  - Source: GREET tool

# Analysis of Aviation Passenger Market – RAM Market in 2019

Cumulative Distribution of Passengers by Distance for RAM

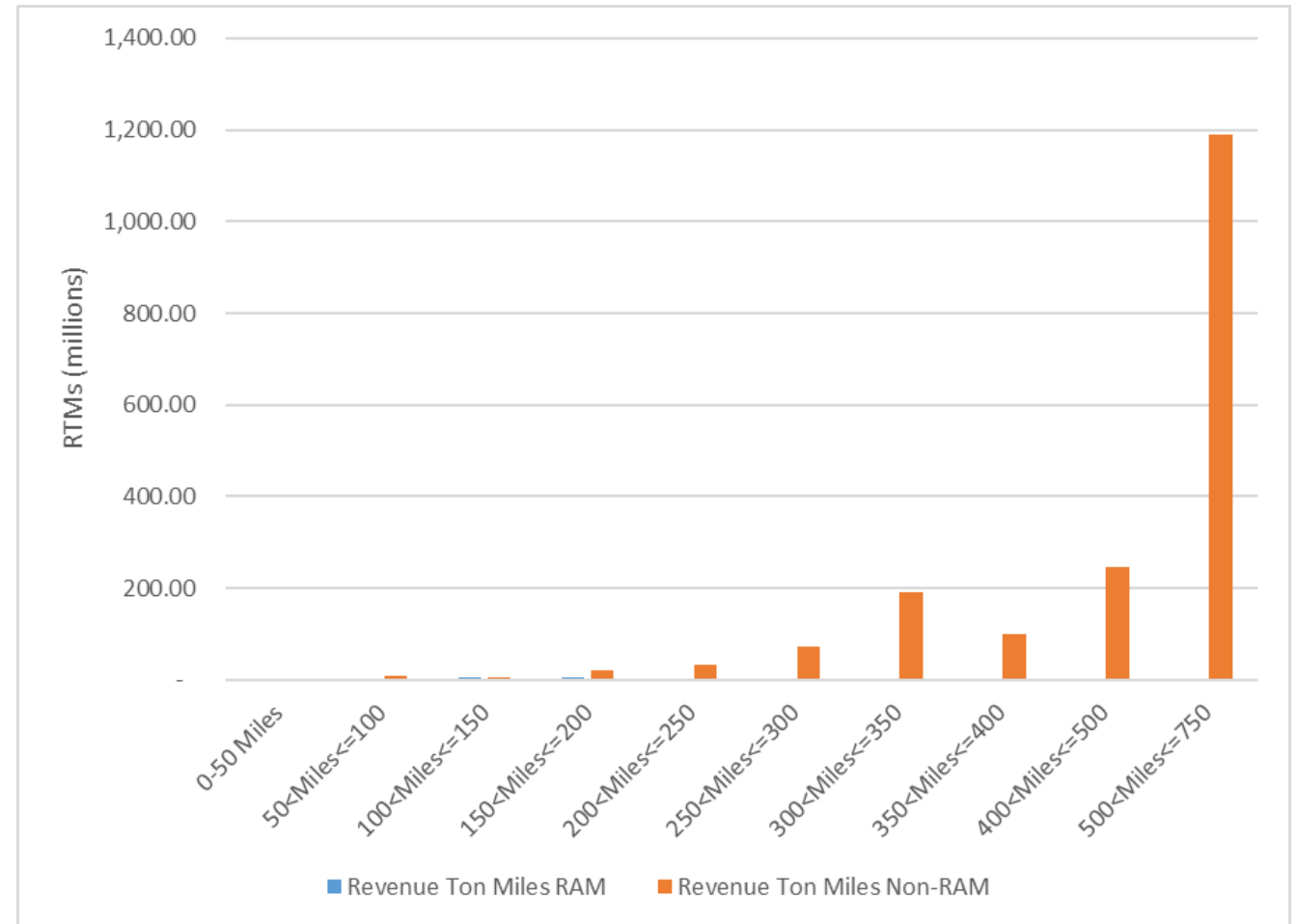
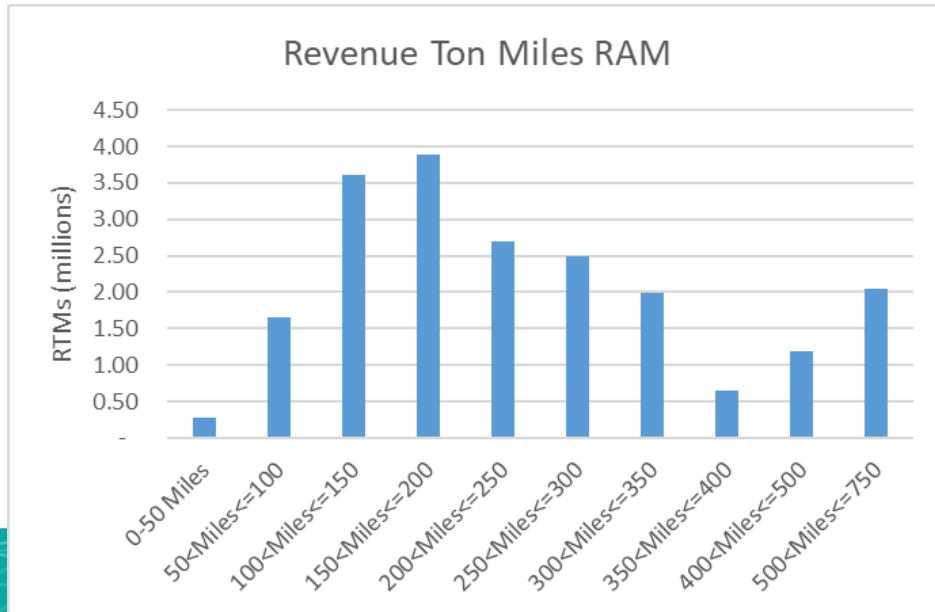
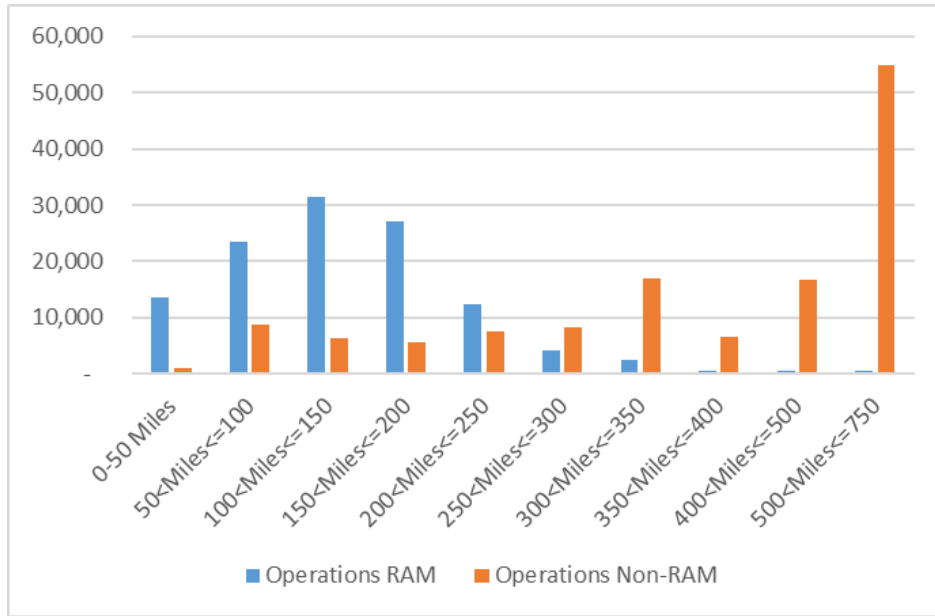


Total Passengers RAM



Source: BTS T-100 Domestic Segments

# Analysis of Aviation Cargo Market – RAM Market in 2019

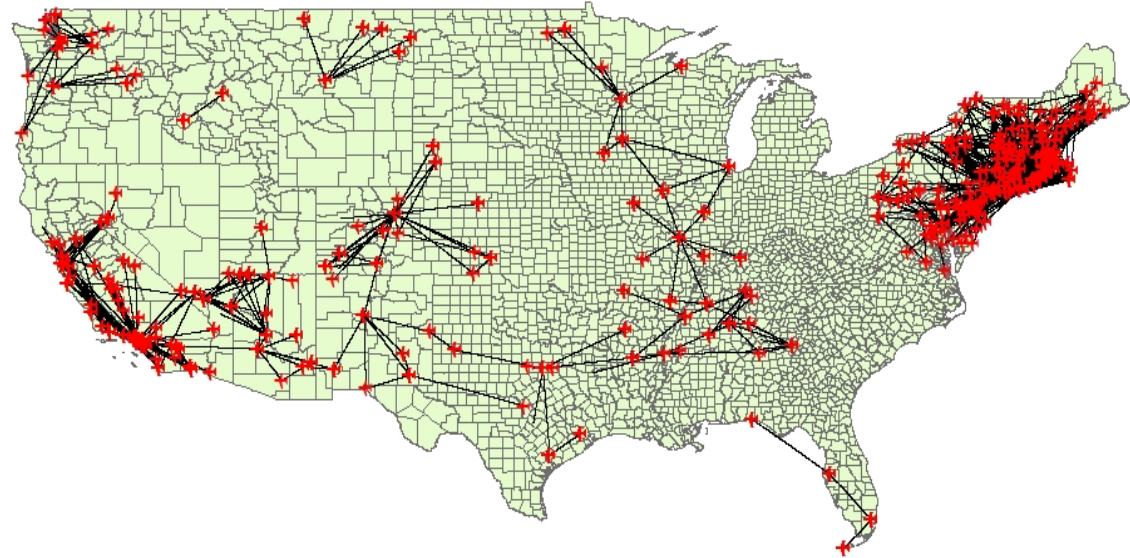


Source: BTS T-100 Domestic Segments

# Passenger Aviation Network Review: Top OD Pairs for RAM Market by Distance Range in 2019

**Top 10 OD Pairs Less than 50 Miles**

| Origin                | Destination      | Total Passengers |
|-----------------------|------------------|------------------|
| Nantucket, MA         | Hyannis, MA      | 34,024           |
| Boston, MA            | Provincetown, MA | 19,592           |
| Friday Harbor, WA     | Eastsound, WA    | 5,447            |
| Martha's Vineyard, MA | Nantucket, MA    | 1,325            |
| Martha's Vineyard, MA | Hyannis, MA      | 859              |
| Martha's Vineyard, MA | New Bedford, MA  | 476              |
| Block Island, RI      | Westerly, RI     | 69               |
| Marble Canyon, AZ     | Page, AZ         | 59               |
| Las Vegas, NV         | Boulder City, NV | 33               |
| Oakland, CA           | Napa, CA         | 24               |



**Top 10 OD Pairs 50-100 Miles**

| Origin           | Destination           | Total Passengers |
|------------------|-----------------------|------------------|
| Boston, MA       | Nantucket, MA         | 49,529           |
| Boulder City, NV | Peach Springs, AZ     | 30,158           |
| Boston, MA       | Martha's Vineyard, MA | 27,711           |
| Seattle, WA      | Friday Harbor, WA     | 13,865           |
| Whitmore, AZ     | Boulder City, NV      | 9,258            |
| Eastsound, WA    | Seattle, WA           | 8,618            |
| New Bedford, MA  | Nantucket, MA         | 7,917            |
| Johnstown, PA    | Pittsburgh, PA        | 7,725            |
| Pittsburgh, PA   | DuBois, PA            | 7,308            |
| Morgantown, WV   | Pittsburgh, PA        | 6,696            |

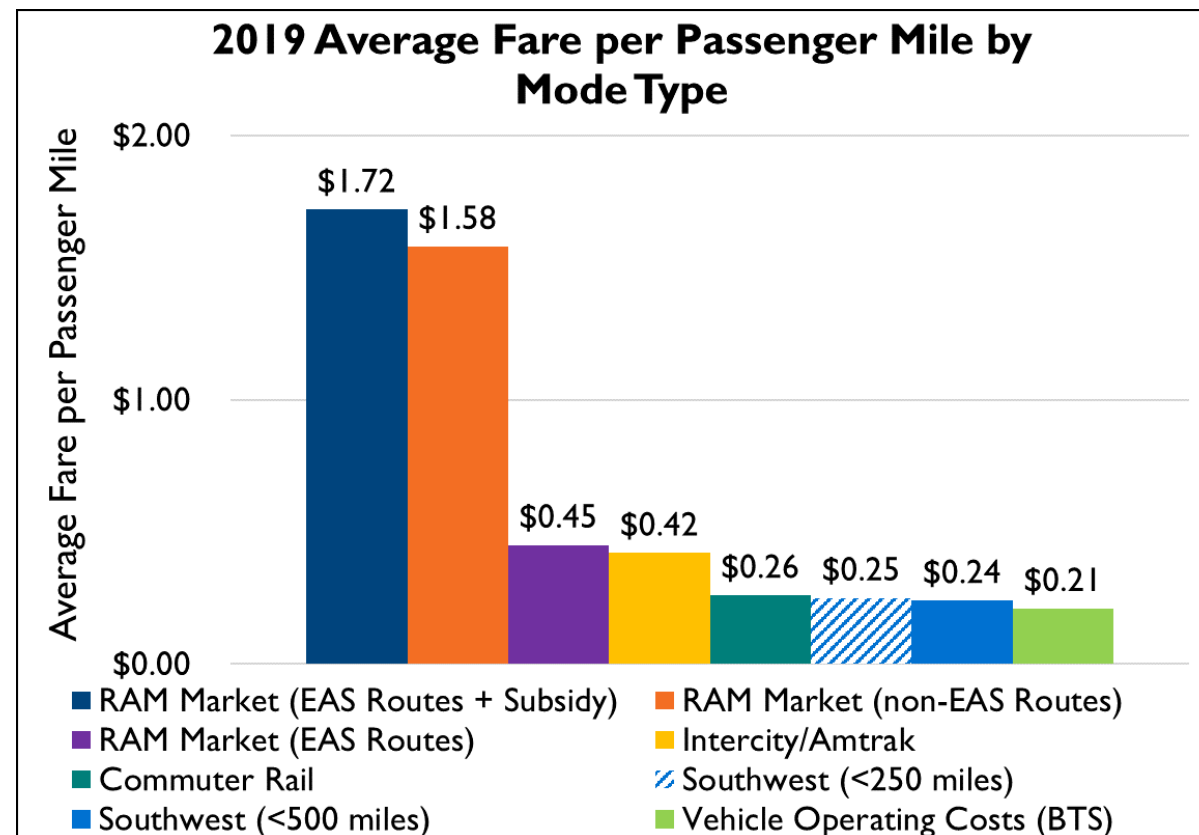
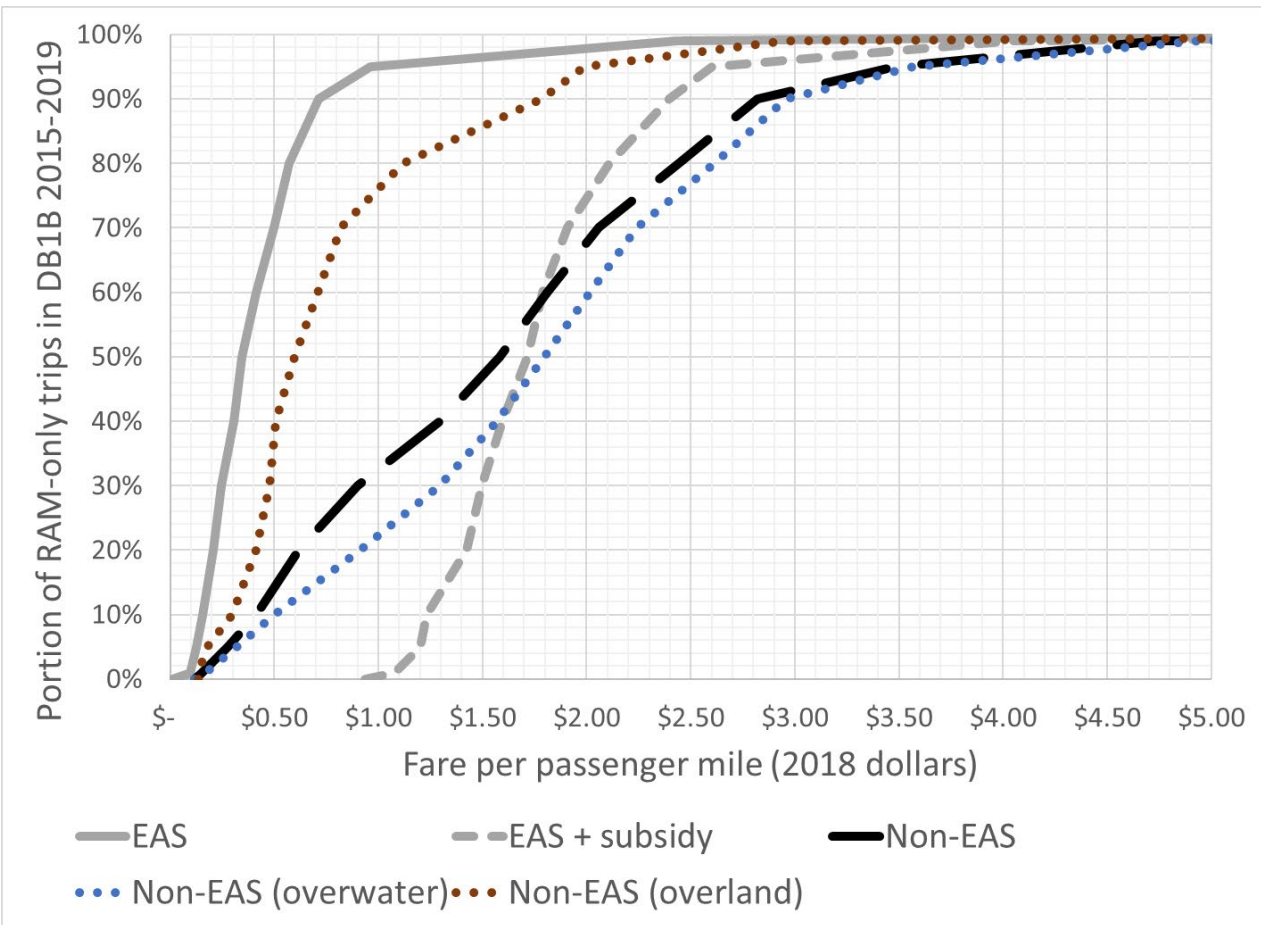
**Top 10 OD Pairs 101-150 Miles**

| Origin                 | Destination    | Total Passengers |
|------------------------|----------------|------------------|
| Marion/Herrin, IL      | St. Louis, MO  | 19,751           |
| Lebanon-Hanover, NH    | Boston, MA     | 12,634           |
| Boston, MA             | Rutland, VT    | 10,966           |
| Augusta/Waterville, ME | Boston, MA     | 10,820           |
| St. Louis, MO          | Kirksville, MO | 10,261           |
| Show Low, AZ           | Phoenix, AZ    | 9,003            |
| Bradford, PA           | Pittsburgh, PA | 8,266            |
| Decatur, IL            | St. Louis, MO  | 6,100            |
| Burlington, IA         | St. Louis, MO  | 4,891            |
| Victoria, TX           | Houston, TX    | 5,444            |

**Top 10 OD Pairs 151-250 Miles**

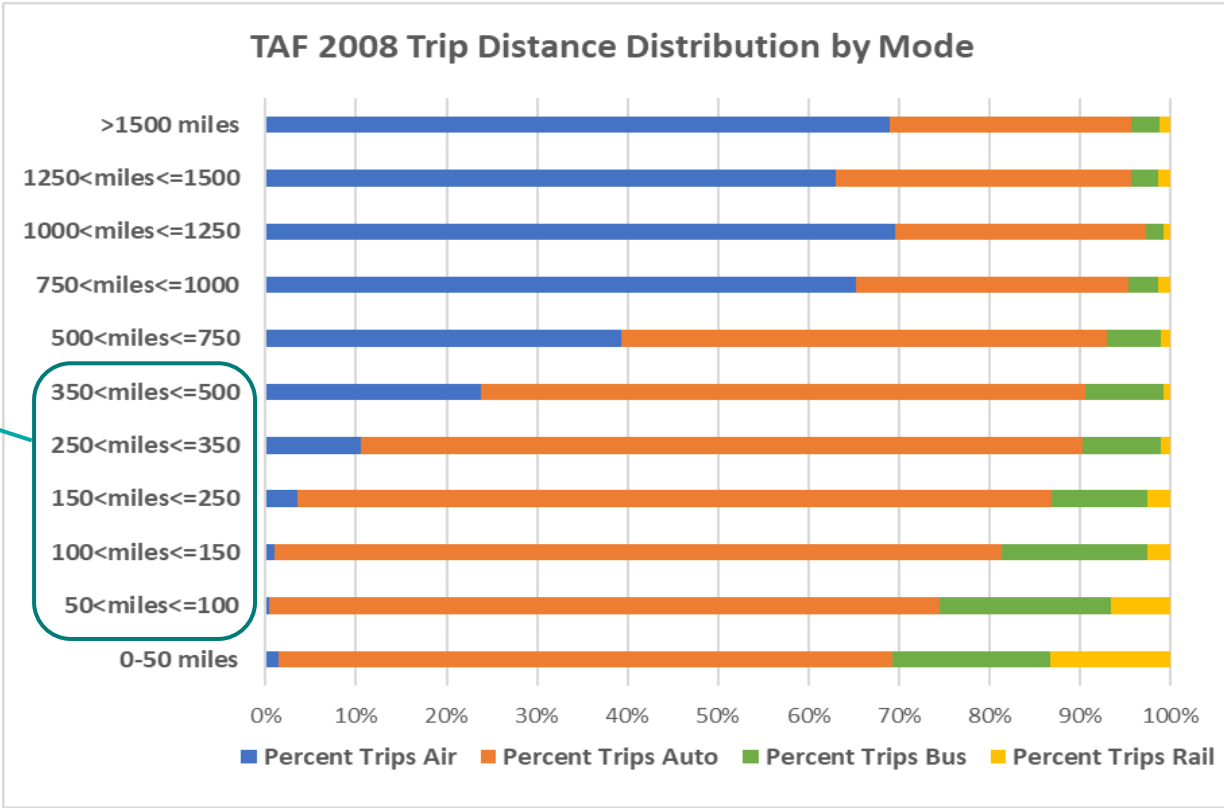
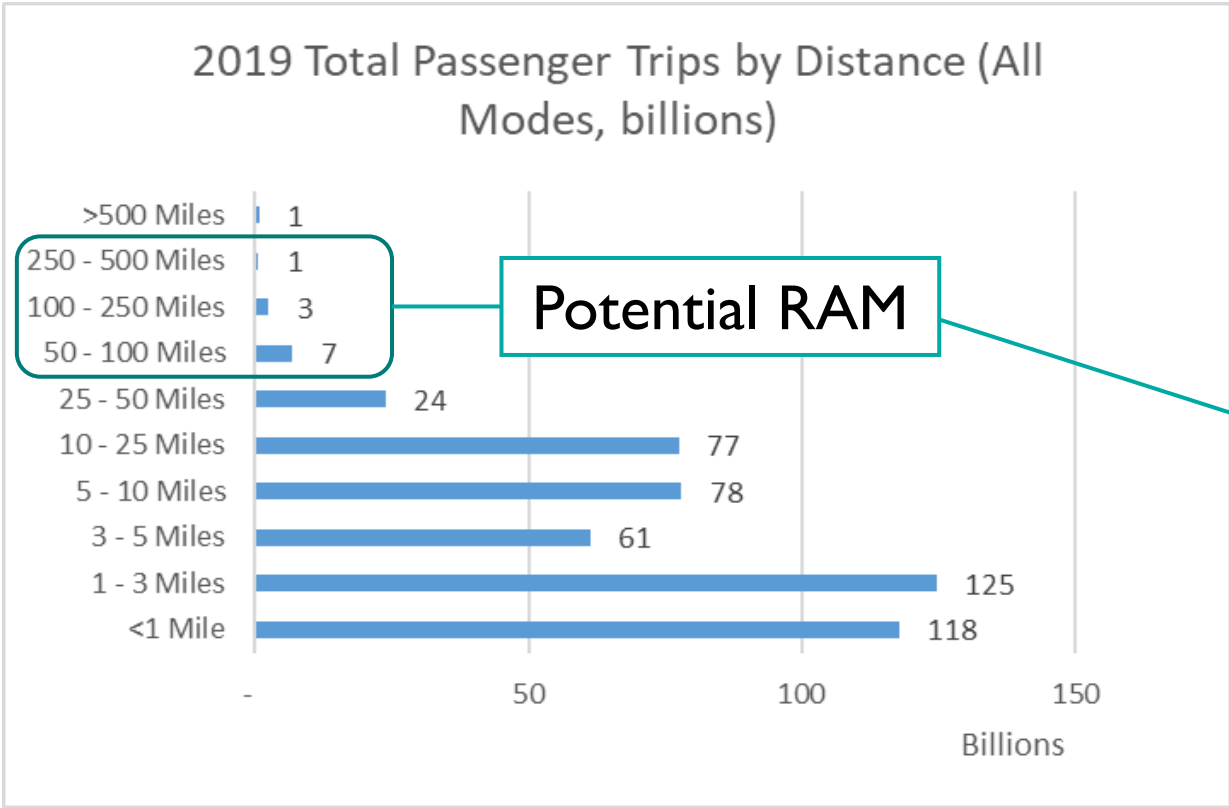
| Origin            | Destination      | Total Passengers |
|-------------------|------------------|------------------|
| Boulder City, NV  | Grand Canyon, AZ | 25,163           |
| Billings, MT      | Sidney, MT       | 18,908           |
| Alamosa, CO       | Denver, CO       | 15,116           |
| Boston, MA        | Rockland, ME     | 13,522           |
| Pendleton, OR     | Portland, OR     | 13,394           |
| Muscle Shoals, AL | Atlanta, GA      | 11,236           |
| El Centro, CA     | Los Angeles, CA  | 10,756           |
| Decatur, IL       | Chicago, IL      | 10,546           |
| Owensboro, KY     | St. Louis, MO    | 10,156           |
| Jonesboro, AR     | St. Louis, MO    | 10,017           |

# Analysis of Aviation Market – Passenger Fares



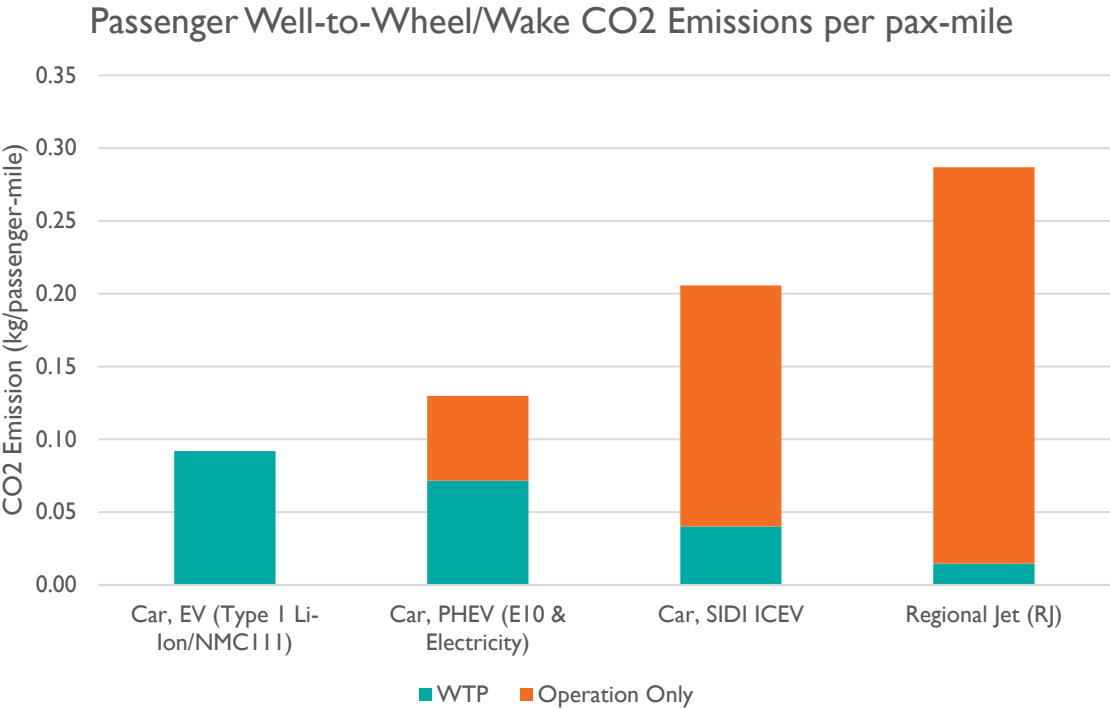
Source: BTS DB1B

# Trip Distance by Mode Type

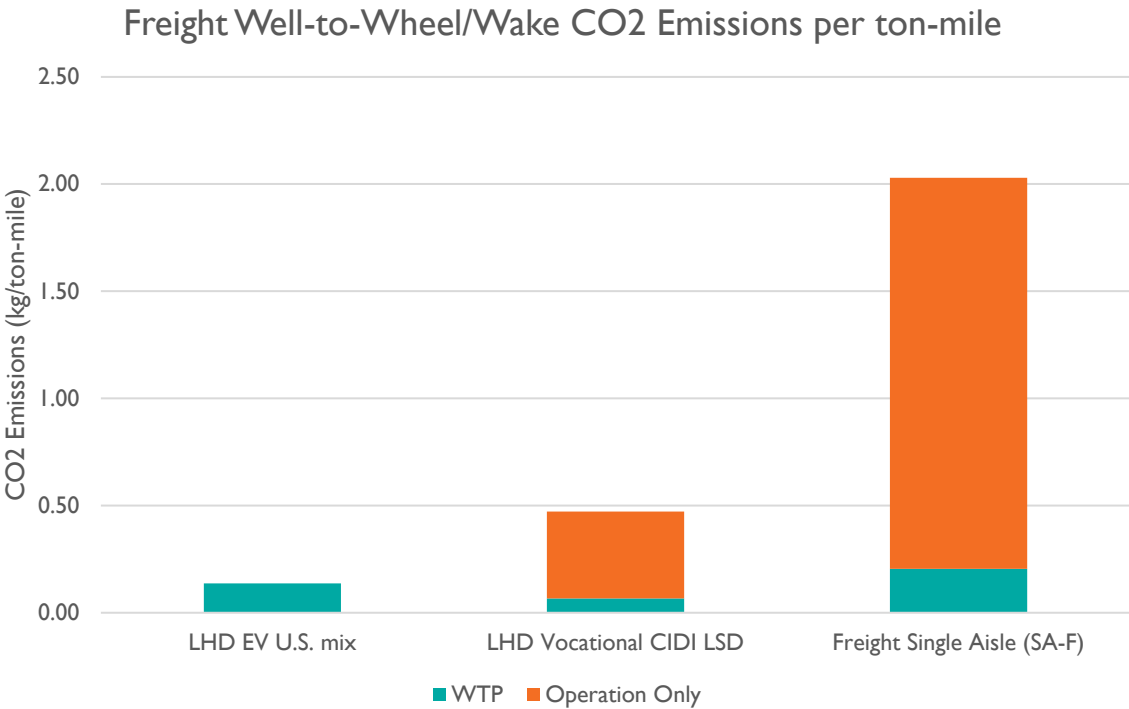


Source: BTS Daily Trips (2022) and FHWA TAF (2015)

# Modal Emission Sources and Profiles



| Passenger Vehicle Type                    | Fuel Type                            |
|-------------------------------------------|--------------------------------------|
| Car, EV (Type 1 Li-Ion/NMC111)            | Electricity - U.S. Mix               |
| Car, Plugin Hybrid Electric (PHEV)        | E10 and Electricity                  |
| Car, SIDI ICEV (E10)                      | E10 gasoline with 10% ethanol blend  |
| Regional Jet (RJ) (avg. 500 miles per op) | Conventional Jet Fuel from Crude Oil |



| Freight Vehicle Type                                | Fuel Type                            |
|-----------------------------------------------------|--------------------------------------|
| Light Heavy Duty (LHD) Electric Vehicle (EV)        | Electricity - U.S. Mix               |
| LHD Vocational CIDI LSD                             | Low-Sulfur Diesel (LSD)              |
| Freight Single Aisle (SA-F) (avg. 643 miles per op) | Conventional Jet Fuel from Crude Oil |

# Key Takeaways

- Current RAM passenger market is small and fills a niche role serving leisure travel and subsidized routes through EAS.
- Current RAM cargo market predominately feeder operations served by FedEx and UPS.
- Costs per passenger-mile vary considerably by type of aviation RAM trip – not currently cost competitive vs. vehicle travel on non-subsidized routes.
- Combining insights from modal trip distributions yields potentially large market; marginal mode shift away from surface travel would lead to dramatic expansion of the RAM market.
- Emissions from conventional jets currently exceed emissions from cars and trucks on a per passenger-mile or ton-mile basis.

# Next Steps

- Continue investigation into the new FHWA NHTS NextGen data sources
- Formalize econometric study to measure potential demand
- Participation in upcoming AAM/RAM workshops

# Q+A Session

Project Manager: Seamus M. McGovern, Ph.D.  
Aviation Systems Engineering Division  
617-494-2054 | [seamus.mcgovern@dot.gov](mailto:seamus.mcgovern@dot.gov)

Presenter: Jacob Wishart  
Economic Analysis Division  
617-494-2216 | [jacob.wishart@dot.gov](mailto:jacob.wishart@dot.gov)

John A. Volpe National Transportation Systems Center  
United States Department of Transportation  
55 Broadway | Cambridge Massachusetts 02142  
[www.volpe.dot.gov](http://www.volpe.dot.gov)



The graphic features the U.S. Department of Transportation Volpe Center logo at the top. Below it, the text 'Our Purpose' is followed by 'Advancing transportation innovation for the public good.' A banner labeled 'OUR CORE VALUES' lists five values, each with an icon: Public Service (classroom icon), Innovative Solutions (lightbulb icon), Collaboration and Partnering (handshake icon), Professional Excellence (star icon), and Employee Well-Being (hands holding people icon).

U.S. Department of Transportation  
**Volpe Center**

**Our Purpose**  
Advancing transportation innovation for the public good.

**OUR CORE VALUES**

-  **Public Service**
-  **Innovative Solutions**
-  **Collaboration and Partnering**
-  **Professional Excellence**
-  **Employee Well-Being**