Implications of Very Light Jets for the Air Transportation System

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Motivation & Introduction

- **Business aviation industry**
  - Segment of the General Aviation industry:
    - 37 B$ annually (0.4% of 2000 GDP)
    - Employment: 511 000
  - Growing Industry
    - +67% in # of aircraft (turbine) over the last 10 years
  - Emerged Models in the 1980s:
    Fractional Ownership Programs

- **Future entry of Very Light Jets**
  - New opportunities:
    Large scale on-demand air networks
  - Need to understand the dynamics of entry of VLJs at the N.A.S. level and anticipate the potential impacts in order to allow a successful integration of these new models

* Data source: The National Economic Impact of Civil Aviation, DRI-WEFA Inc., 2002. (GA figures include Business Aviation and Air Taxi)
Very Light Jets (VLJs): A New Class of Aircraft

Max Take Off Weight (lbs)

Unit Price ($2003)

Million

Light Jets

Very Light Jets

Medium Jets

Heavy Jets

Data source: Jane's, All the World Aircraft, 2004-2005
### Very Light Jets in Development

| A/C name       | Company              | A/C type | Country       | Orders | as of:          | First Delivery*:
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<tr>
<td>Adam700</td>
<td>Adam Aircraft</td>
<td>Twin Jet</td>
<td>U.S.</td>
<td>75</td>
<td>July 2004</td>
<td>2006+</td>
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<tr>
<td>EMB-VLJ</td>
<td>Embraer</td>
<td>Twin Jet</td>
<td>Brazil</td>
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<tr>
<td>ProJet</td>
<td>Avocet Aircraft</td>
<td>Twin Jet</td>
<td>Israel / U.S.</td>
<td>not disclosed</td>
<td></td>
<td>2008</td>
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<tr>
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<td>Twin Jet</td>
<td>Israel / U.S.</td>
<td>not disclosed</td>
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<tr>
<td>Epic LT</td>
<td>Epic</td>
<td>Twin Jet</td>
<td>U.S.</td>
<td>Not disclosed</td>
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<tr>
<td>HondaJet</td>
<td>Honda</td>
<td>Twin Jet</td>
<td>Japan</td>
<td>No commercialization commitment</td>
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<td>Safire26</td>
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<tr>
<td>D-Jet</td>
<td>Diamond Aircraft</td>
<td>Single Jet</td>
<td>Austria/Canada</td>
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<td>2006</td>
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<td>Eviation EV-20</td>
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*expected
Potential Size of this Segment of the Industry

Data Source:
- Rolls-Royce outlook: [http://www.rolls-royce.com/civil_aerospace/overview/market/outlook/default.jsp](http://www.rolls-royce.com/civil_aerospace/overview/market/outlook/default.jsp)
Potential Modes of Operations

- **Owner flown** (≈ 900 aircraft)
  - Owned and operated by individuals or companies

- **Fractional Ownership Programs** (≈ 20 aircraft)
  - e.g. Our Plane (Canada & U.S.)

- **Clubs** (≈ 110 aircraft)
  - e.g. Aviace (Switzerland)

- **Large Scale On-Demand Air Networks** (≈ 1700 aircraft)
  - Charter: e.g. Pogo (U.S.)
  - Per Seat: e.g. DayJet (U.S.)
  - Mix Charter/Per Seat: e.g. LinearAir (U.S.)

- **Freight** (≈ ? aircraft)
  - Logistic Networks
    (e.g. Supply Chain Back Up Networks, Package delivery, etc)
With runway length requirements of 3000 ft VLJs will be able to have access to a larger set of airports

Runways greater than 3,000 ft

Data Source: FAA, Form 5010
Analysis of Traffic by Existing Business Jets: Traffic Share by Aircraft Type

40% of the total BJ traffic is performed by the subset of 7 aircraft types (Light Jets)

Data Source: ETMS traffic data
Horizontal Pattern Analysis

One day of traffic in the NAS by Light Jets

Density Plot: Courtesy of Aleksandra Mozdzanowska
Flights performed by the subset of aircraft (light jets: Cessna CJ1, CJ2, CJ3, Cessna Bravo, Excel, LearJet35, Hawker 400)
Light Business Jet Traffic* in 2003

*Traffic at 3400 public airports
Light Jets include: Cessna CJ1, CJ2, CJ3, Bravo, Excel, LearJet35, Hawker400

Data source: ETMS data (traffic) and FAA Form 5010 (airports)
Airport Utilization (by airport type)

30% of the total activity (departures and arrivals) is performed at airports part of the 16 metropolitan regions.

50% of all flights* have at least one end airport in one of 16 metropolitan regions.

*Flights performed by the subset of aircraft (Light Jets: Cessna CJ1, CJ2, CJ3, Cessna Bravo, Excel, LearJet35, Hawker 400)
Volume of Operations in the U.S.

Historical data and forecast

Historical Forecast

2016 Outlook (10 years after the entry of VLJs)

Entry of VLJs (2006)*

Very Light Jets
General Aviation
Commuter
Air Carrier
Military

* This scenario assumes a delivery rate of 500 very light jets per year starting in 2006.
Analysis of Traffic Distribution at the Regional Airport System Level

example of the New York Region*

*The analysis was performed for several regional airport systems in the U.S. (New York, Boston, Washington, Chicago, Miami, Los Angeles)
Historical and Forecasted Volumes of Traffic at Airports within the Regional Airport System
example of the New York Region*

* The analysis was performed for several regional airport systems in the U.S. (New York, Boston, Washington, Chicago, Miami, Los Angeles)
Conclusion

- In the short and medium term, VLJ traffic is unlikely to differ from existing LJ traffic.
- Concentration of traffic implies:
  - Outside high density metro areas: Not an issue, capacity exists
  - Inside high density metro areas
    - Some key airports will become even more congested
    - Capacity crisis at key airports will occur even without VLJs
  - Traffic redistribution mechanisms will take place
    - Core airports
    - Secondary airports; emergence of new secondary airports
    - Core GA reliever airports; strengthening of existing and emergence of new reliever airports
    - Surrounding GA airports; growth of business jet (and Very Light Jet) traffic

- Strengthened role of small regional airports within key metropolitan areas
- Need to promote the development of airport systems on a region wide basis

Future Directions of Research

- Investigating the feasibility and the implications of the integration of air carrier and on-demand air networks
Questions & Comments