Future Visions – Commercial Air Travel

Washington D.C.
There is a large ecosystem in commercial aerospace, representing a quarter trillion $ of manufacturing activity ...
Commercial air traffic and commercial aircraft production has been on a long uptrend with cycles around that uptrend...no indication of change.

### Historical Global Passenger Traffic and Commercial Aircraft Deliveries

- **Legend:**
  - Decline in RPM traffic growth
  - RPMs (billions)
  - Aircraft deliveries

### Key Events:
- **1973-74 Oil Embargo**
- **1979 Oil Shock**
- **1990-91 Gulf War**
- **9/11**
- **2008 Financial Crisis**

### Sources:
- Ascend, ICAO, IATA, Airline Monitor, Boeing, Wall Street analysts, RSAdvisors analysis
Over the last two decades the commercial industry narrowed to 5 OEMs, with Boeing and Airbus becoming the major players...

**Commercial Unit Deliveries by OEM**  
(1980-2015)

- **EMB enters comm. aero market, 1985**
- **BBD acquires de Havilland, 1992**
- **LMT leaves comm. aero market, 1981**
- **BBD acquires Canadair, 1986**
- **Boeing acquires McDonnell Douglas, 1997**

Note: Other is comprised of legacy commercial western manufacturers (e.g. Lockheed Martin, BAE, Fairchild, Fokker) relevant nonwestern manufacturers (i.e Sukhoi and AVIC)  
Sources: Ascend, Teal, RSAdvisors analysis
However, there are new entrants looking to create competition, particularly China

<table>
<thead>
<tr>
<th>OEM</th>
<th>Aircraft</th>
<th>Backlog</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BOMBARDIER</strong></td>
<td>CSeries</td>
<td>360</td>
<td>• CSeries delayed for 5th time, with EIS in ‘16</td>
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<td></td>
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<td>• ~2 years later than initial plans</td>
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<td></td>
<td>ARJ21</td>
<td>300</td>
<td>• ARJ21 delayed, EIS in ‘16, 14 yrs after launch</td>
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<td>• ~8 years later than initial plans</td>
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<tr>
<td><strong>COMAC</strong></td>
<td>C919</td>
<td>282</td>
<td>• C919 delayed for the 2nd time, with EIS in ‘20+</td>
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<td></td>
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<td>• ~2 years later than initial plans</td>
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<tr>
<td><strong>MITSUBISHI</strong></td>
<td>MRJ</td>
<td>243</td>
<td>• MRJ delayed again, with EIS in Q2 2018</td>
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<td>AIRCRAFT CORP.</td>
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<td>• ~5 years later than initial plans</td>
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<td>SSJ</td>
<td>75</td>
<td>• EIS 2011, although faced initial production and performance issues</td>
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<td>• 3 years later than initial plans</td>
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<td><strong>SUHKHOI</strong></td>
<td>MS-21*</td>
<td>175</td>
<td>• MS-21 delayed in 2008; EIS remains in question, although expected in 2020</td>
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<td><strong>IRKUT</strong></td>
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<td>• ~2-4 years later than initial plans</td>
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Sources: RSAAdvisors analysis
Commercial aerospace is in its “mature phase”...and there is mounting pressure to “restart the cycle”

Industry Lifecycle

- Number of Competitors/Competitive Intensity
- Speed
- Range
- Time

Emergence of standard/dominant design (System Development)
Shakeout (Produce/Upgrade)
Stability/Decline (Sustain/retire)

Sources: Utterback, Pierre Chao, Renaissance Strategic Advisors
Breaking out of the speed/range/size “box” requires innovation across multiple fronts

- **Supersonics**
- **Hypersonic/Suborbital**
- **Blended Wing Body**
- **Autonomous**
- **All Electric Aircraft**
- **Air Taxi**