A Market Analyst’s Perspective On US Industry Leadership

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Our Friend, The Market
World Aircraft Deliveries By Value, 1989-2017

2008-2017 CAGR: 3.7%

2008-2017 CAGR: 2%

Military

Civil

Teal Group Corporation
## Aircraft Markets, Through Good And Bad Years

<table>
<thead>
<tr>
<th>World New Deliveries</th>
<th>CAGR '03-'08</th>
<th>CAGR '08-'14</th>
<th>Change '14-'16</th>
<th>Change '16-'17</th>
</tr>
</thead>
<tbody>
<tr>
<td>In 2017 (2018 $)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large Jetliners ($102.2 b)</td>
<td>7.5%</td>
<td>9.9%</td>
<td>7.1%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Business Aircraft ($20.3 b)</td>
<td>17.2%</td>
<td>-2.2%</td>
<td>-15.8%</td>
<td>-0.8%</td>
</tr>
<tr>
<td>Regionals ($7.1 b)</td>
<td>4.6%</td>
<td>-3.2%</td>
<td>0.4%</td>
<td>-8.3%</td>
</tr>
<tr>
<td>Civil Rotorcraft ($4.1 b)</td>
<td>19.8%</td>
<td>-1.3%</td>
<td>-30.1%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Military Rotorcraft ($12.9 b)</td>
<td>9.8%</td>
<td>8.9%</td>
<td>-20.2%</td>
<td>-7.0%</td>
</tr>
<tr>
<td>Military Transports ($6.1b)</td>
<td>3.2%</td>
<td>-0.7%</td>
<td>7.3%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Fighters ($18.6 b)</td>
<td>1.9%</td>
<td>1.1%</td>
<td>-3.7%</td>
<td>9.1%</td>
</tr>
<tr>
<td>All Civil ($133.8 b)</td>
<td>10.1%</td>
<td>5.0%</td>
<td>1.0%</td>
<td>0.3%</td>
</tr>
<tr>
<td>All Military ($41.1 b)</td>
<td>3.9%</td>
<td>3.5%</td>
<td>-7.9%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Total ($175 b)</td>
<td>8.3%</td>
<td>5.1%</td>
<td>-1.2%</td>
<td>0.4%</td>
</tr>
</tbody>
</table>
Cyclicality, Our Long-Forgotten Nemesis

- '68-'77: -11 CAGR; 65% peak-to-trough
- '80-'84: -13.9% CAGR; -45% peak-to-trough
- '84-'91: 16.1% CAGR
- '91-'95: -12.5% CAGR; 41% peak-to-trough
- '95-'99: 20.8% CAGR
- '01-'03: -10.7% CAGR; 28.8% peak-to-trough
- '99-'03: -11 CAGR; 65% peak-to-trough
- '04-17: 8% CAGR
  A 13-Year Super Cycle
Oil Prices And Interest Rates: The End Of A Strange Moment

Interest Rates (%) vs. Oil Price in 2016$/BBL

- Interest Rates (red line)
- Oil Prices (blue line)

Graph shows historical data from 1980 to 2018.
Y/Y Traffic: Well Above Trend

2017 Totals: RPKs 7.6% (10-year average: 5.5%), FTKs 9% (best since 2010 recovery)

2016: RPKs 6.3%, ASKs 6.2%, FTKs 3.8%; 2015: RPKs 6.5%, ASKs 5.6%, FTKs 2.2%

Source: IATA
BRIC Deliveries: Peaked, Except For China

- China
- Russia
- India
- Brazil
"It Was Different That Time," We Hope To One Day Say
The US’s Commanding Presence
GLOBAL AEROSPACE INDUSTRY WORTH $838 BILLION; US> NEXT 25 BIGGEST COUNTRIES

Source: AeroDynamic Advisory & Teal Group
US Aircraft Industry Output

Value in 2018 $ Billions

Total US Deliveries By Value

US Output % of World
Firm Order Backlog Values

2018 $Billions

Boeing: 130.0, 107.8, 79.5, 199.1, 300.4, 271.1, 270.0, 300.1, 316.8, 365.3, 421.9, 413.8, 399.7, 403.1, 410.9
Airbus: 48.6, 112.9, 115.5, 173.0, 281.8, 268.2, 277.6, 309.5, 321.6, 397.4, 436.3, 456.7, 463.0, 436.8, 475.5
Bombardier: —, —, —, —, —, 2.0, 3.5, 5.2, 5.8, 7.1, 9.5, 9.5, 9.2, 13.1, —
US Aerospace Trade: A Consistent Surplus

Thousands of dollars

Imports
Exports

A Brief History of Failure, And What Could Bring It
Illustrated Thoughts On Failure

• Tactical Failure:
  – Magical Thinking.
  – Failure to Think Globally with new products.

• Strategic Failure:
  – Government ownership.
  – Failure to reach across borders.
  – Autarky, government ownership, national vertical integration.
The Brief, Terrifying Reign Of The VLJ/Air Taxi
Boeing Commercial IR&D: More With Market Growth

BCA IR&D As % of BCA Sales

IR&D in Then-Year $ Bns

% Of Sales
Airbus Commercial IR&D: More Spend, Less Discipline...Until Now

Airbus IR&D
As % of Airbus Commercial Sales

IR&D in Then-Year € Bns
% of Sales

'00 '01 '02 '03 '04 '05 '06 '07 '08 '09 '10 '11 '12 '13 '14 '15 '16 '17
Things To Worry About
Global Economic Growth Outpaced By Travel Demand
Will Anything Change This...Like Millennials? Or The Environment?

CAGRs:
2012-2017:
RPMs 6.9%
GDP 3.3%
2008-2017:
RPMs 6.0%
GDP 3.2%
This May (Or May Not) Be An Issue
Boeing Emphasizing Returns (And Cash Flow)

Dividends and Buybacks as a Percentage of Cash Flow

Share Buyback Spending

Dividend Spending
Another Possible Issue: Boeing, And The Supply Chain

• Vertical integration reduces risk, retains secrets, and helps grow revenue/profits, but in a downturn they mean risk and overhead.

• New business initiatives (APUs, avionics, actuators, propulsion buildup, etc.) sounds great, but these turn into expensive cost centers in a downturn.

• All of the above can tie engineers’ hands, keeping them from buying best-in-class equipment.

• PFS may have a serious impact on suppliers’ ability to raise cash for new technology and capacity.
Potentially Disruptive Ideas/Opportunities For The Future
And What Could Promote Or Quash Them

**Ideas**

- **Likely (next 25 years):**
  - Biofuels
  - Electric systems power
  - Hybrid power

- **Possible:**
  - Radical new shapes
  - SSBJ
  - Ultra-High Bypass engines

- **Conceivable, at best:**
  - Airliner SST
  - Hydrogen fuel cells

- **Probably Not:**
  - Solar
  - Commercial scramjets
  - Electric/battery power for primary propulsion
  - Mass adaptation of UAM

**Variables**

- Fuel prices
- Air Travel Demand
- Technology Maturation
- Public funding initiatives
- Environmental issues
- Consumer acceptance
- Investor sentiment (and occasional irrationality)
What Could Possibly Go Horribly Wrong?

• Starving the supply chain turns out to have unintended consequences.
  —Already there.
• Further production snafus.
  —Sure.
• Trade wars, tariffs, retaliatory tariffs, Brexit, general chaos, and the new in-vogue US Sinophobia, or China’s self-imposed isolation/Russia alliance.
  —Be afraid.
• General economic downturn.
  —Always possible, but traffic seems to have a mind of its own.
• Interest rates.
  —Medium risk, but long term trend looks good.
• Oil.
  —No longer as big a problem as it once was.