About As Bad As We Feared. Maybe Worse.

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Fifth Update; September 17, 2020
## Aviation Segments By Damage

### Most to Least Annotated, Six Months In

<table>
<thead>
<tr>
<th>Segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Jets</td>
<td>Large cabin strongly correlated with oil prices. Small/medium strongly correlated with corporate profits, equities indices. Might recover quickly; still a 2020/21 downturn</td>
</tr>
<tr>
<td>Civil Rotorcraft</td>
<td>Oil and gas segment (large) hit again, before recovery even began. About right...wait and see.</td>
</tr>
<tr>
<td>Military Programs</td>
<td>Emphasis on “shovel-ready.” Advance development programs at greater risk. Pure-play contractors in best shape; suppliers with most defense in best shape. All good. In fact, better.</td>
</tr>
</tbody>
</table>
## Aircraft Markets, In Good And Bad Years

<table>
<thead>
<tr>
<th>World New Deliveries</th>
<th>CAGR '03-'08</th>
<th>CAGR '08-'14</th>
<th>CAGR '14-18</th>
<th>Change '18-'19</th>
</tr>
</thead>
<tbody>
<tr>
<td>In 2019 (2020 $)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Jetliners-SA ($46.2 b)</td>
<td>9.7%</td>
<td>6.9%</td>
<td>5.0%</td>
<td>-23.9%</td>
</tr>
<tr>
<td>Jetliners-TA ($55.3 b)</td>
<td>5.0%</td>
<td>13.5%</td>
<td>1.7%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Regionals ($5.8 b)</td>
<td>3.9%</td>
<td>-3.1%</td>
<td>-5.2%</td>
<td>-5.1%</td>
</tr>
<tr>
<td>Business Aircraft ($22.4 b)</td>
<td>16.7%</td>
<td>-2.2%</td>
<td>-5.0%</td>
<td>15.6%</td>
</tr>
<tr>
<td>Civil Rotorcraft ($3.9 b)</td>
<td>18.5%</td>
<td>-2.5%</td>
<td>-7.4%</td>
<td>-6.6%</td>
</tr>
<tr>
<td>Military Rotorcraft ($13.3 b)</td>
<td>10.6%</td>
<td>9.6%</td>
<td>-11.8%</td>
<td>16.9%</td>
</tr>
<tr>
<td>Military Transports ($4.9 b)</td>
<td>3.2%</td>
<td>-0.9%</td>
<td>0.2%</td>
<td>-1.2%</td>
</tr>
<tr>
<td>Fighters ($24 b)</td>
<td>1.6%</td>
<td>0.8%</td>
<td>2.5%</td>
<td>25.5%</td>
</tr>
<tr>
<td>All Civil ($133.8 b)</td>
<td>9.7%</td>
<td>5.6%</td>
<td>1.4%</td>
<td>-7.6%</td>
</tr>
<tr>
<td>All Military ($45.5 b)</td>
<td>3.9%</td>
<td>4.0%</td>
<td>-3.3%</td>
<td>16.6%</td>
</tr>
<tr>
<td>Total ($179.3 b)</td>
<td>8.0%</td>
<td>5.2%</td>
<td>0.3%</td>
<td>-2.4%</td>
</tr>
</tbody>
</table>
Traffic: Like Nothing We've Ever Seen Before

63% Decline in 2020?

2019 Totals: RPKs 4.2%, ASKs 3.4%, FTKs -3.3%

2018 Totals: RPKs 6.5%, FTKs 5.4%; 2017: RPKs 7.6%, FTKs 9%

Source: IATA
More Unprecedented Numbers

- Traffic decline, parked fleet like no previous shock.
  - Per Paul Krugman, reflect a world economy in a “medically-induced coma.”
  - Traffic recovery is determined by the virus, not politicians or economics.
  - Back to peak in late 2023.
- Backlogs holding up (MAX a concern), but meaningless in a downturn.
  - Just 1% of January backlog has cancelled; nearly half deferred.
- Many early retirements coming, particularly twin aisles.
  - Primarily twin aisles; A380 bloodbath.
- Aftermarket catastrophe.

IATA’s 63% y/y 2020 decline still optimistic about a 4Q recovery.
Two Metrics To Watch
One Crisis May Be Peaking; The Next Might Be Starting
BRIC Deliveries: Peaked; Watch China Growth May Not Resume For A Few Years

2000: China is 2% of world Market

2018: China is 23% of world Market

China | Russia | India | Brazil

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Large Jetliner Orders And Deliveries
Book-To-Bill No Longer A Thing
The Air Transport Market By Segment

Deliveries In 2020 $ Billions

Return to peak: 2024

737MAX Problem, and flood; includes delivery of ~450 already-built jets

Too much, too sudden (A330s, 777s, 787s, Gulf carriers, etc.)

Hit Hardest and Longest; Capacity hangover, international traffic problems, and shift towards single aisles

Return to peak: after 2029... probably

Now With Greater Misery
Firm Order Backlog Values (July 1): Boeing Taking A Hit

2020 $Billions

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</thead>
<tbody>
<tr>
<td>Boeing</td>
<td>130.0</td>
<td>107.8</td>
<td>79.5</td>
<td>199.1</td>
<td>300.4</td>
<td>271.1</td>
<td>270.0</td>
<td>300.1</td>
<td>317.0</td>
<td>365.3</td>
<td>421.2</td>
<td>412.9</td>
<td>398.9</td>
<td>402.1</td>
<td>408.0</td>
<td>378.8</td>
<td>356.5</td>
</tr>
<tr>
<td>Airbus</td>
<td>48.6</td>
<td>112.9</td>
<td>115.5</td>
<td>173.0</td>
<td>281.8</td>
<td>268.2</td>
<td>277.6</td>
<td>309.5</td>
<td>321.6</td>
<td>399.9</td>
<td>439.9</td>
<td>461.2</td>
<td>468.1</td>
<td>441.8</td>
<td>481.6</td>
<td>463.6</td>
<td>465.1</td>
</tr>
<tr>
<td>Bombardier</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>1.9</td>
<td>3.3</td>
<td>4.9</td>
<td>5.5</td>
<td>6.7</td>
<td>9.0</td>
<td>9.0</td>
<td>8.7</td>
<td>8.5</td>
<td>—</td>
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</tr>
</tbody>
</table>
Jetliner Types And Fleets
Trends And Themes

- Downsizing trend: demand for jets offering equivalent functionality and equal/better economics, fewer seats, than older models.
  - Thus, A321neo will do well as replacement for older, mid-range twin aisles; A220 will do well as replacement for older 737s and A319/320s.
- Boeing single aisle product line now boxed in; MAX8 fine, but outflanked from above and below.
  - A321neo increasingly dominant in 180/220-seat segment; CDB MAX10 order conversion further indication that larger MAXs uncompetitive.
  - Embraer JV termination means Boeing abandoning 100/130-seat segment.
  - BA 25% R&D cut announced in 1Q call not a good sign for product development.
  - MAX8 lease rates, orders (particularly lessor orders) also taking a hit.
  - Boeing, in short, is therefore at risk of losing out due to airline downsizing.
- E-Jets will lose market share and/or profit without a large partner against A220, but E175 might control its segment.
- A330neo increasingly at risk of MD-11-like fate.
- Almost all remaining quadjet fleets look set to retire young (1/3 of 380 fleet so far).
- Large twins (777X, A350-1000) look marginal for most of decade.
Airbus, Boeing Jetliner Backlogs (July 1)

- **<150 Single aisle**
  - Boeing: 100
  - Airbus: 500

- **150 Single aisle**
  - Boeing: 3500
  - Airbus: 2000

- **200 Single Aisle**
  - Boeing: 500
  - Airbus: 3000

- **250-300 Twin aisle**
  - Boeing: 500
  - Airbus: 600

- **>300 Twin aisle**
  - Boeing: 400
  - Airbus: 200
No Clear Relationship Between US Defense Spending, Economy
US Military Fixed Wing Aircraft Deliveries

The Last Jetliner Downturn

Deliveries in 2020 $ Billions

C-17 | AV-8B | F/A-18 | F-15 | F-16 | F-22 | T-45 | T-6 | C-130 | F-35 | T-7 | B-21

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Global Aircraft Market Outlook In One Page

<table>
<thead>
<tr>
<th>Segment</th>
<th>2020</th>
<th>’20-’21</th>
<th>Risk</th>
<th>Elevator Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jetliners-SA</td>
<td>-41.3%</td>
<td>55.0%</td>
<td></td>
<td>Includes some already-built MAXs. Watch China, fuel, traffic.</td>
</tr>
<tr>
<td>Jetliners-TA</td>
<td>-47.2%</td>
<td>-7.2%</td>
<td></td>
<td>Overcapacity, slow international recovery, secular shift to SAs</td>
</tr>
<tr>
<td>Regionals</td>
<td>-27.0%</td>
<td>-2.5%</td>
<td></td>
<td>No Boeing supply chain effect on E-2; Scope clause de-risked, but little growth.</td>
</tr>
<tr>
<td>Business Aircraft</td>
<td>-20.3%</td>
<td>-8.9%</td>
<td></td>
<td>Another hit after many false starts over a disappointing decade.</td>
</tr>
<tr>
<td>Civil Rotorcraft</td>
<td>-11.4%</td>
<td>-6.2%</td>
<td></td>
<td>Large civil hit again. Too many new models aimed at a weak segment (oil/gas).</td>
</tr>
<tr>
<td>Military Rotorcraft</td>
<td>-5.2%</td>
<td>2.6%</td>
<td></td>
<td>Programs end/slow; no risk of accelerated downturn; FVL beyond forecast, exc FARA.</td>
</tr>
<tr>
<td>Military Transports</td>
<td>-29.5%</td>
<td>4.7%</td>
<td></td>
<td>A seriously underperforming market.</td>
</tr>
<tr>
<td>Fighters</td>
<td>-22.0%</td>
<td>46.0%</td>
<td></td>
<td>I like this market. F-35 (after COVID disruption), plus strong Gen 4.5</td>
</tr>
<tr>
<td>All Civil</td>
<td>-38.7%</td>
<td>13.3%</td>
<td></td>
<td>SAJetliner snapback due to MAX, weakness in other segments; more overcapacity risk.</td>
</tr>
<tr>
<td>All Military</td>
<td>-17.4%</td>
<td>23.5%</td>
<td></td>
<td>Global insecurity, Tension, Malice. Special mission also boosts topline.</td>
</tr>
<tr>
<td>Total Industry</td>
<td>-33.3%</td>
<td>16.6%</td>
<td></td>
<td>No strong recovery until 2024.</td>
</tr>
</tbody>
</table>
Top 20 Aviation Programs; Volume Matters
Cumulative Deliveries Value in '20 $ Bns

Top 5 are 54% of total; next 15 are 22%; remaining 100+ are 24%
Concluding Observations, and a Few Consolations

• This situation might get worse.
• This is a synthetic market, not an organic one.
  • Deliveries mostly driven by exogenous factors: government aid, third-party and first party finance. These may not hold.
• Boeing faces a very serious mid market challenge.
• Defense companies have an opportunity to grow their civil side. Will they?
• There is some good news:
  • An airline paradise, except for the traffic.
    • Fuel, Jet costs, Crew costs, interest rates, government support (for most, and for now); Stimulate traffic, or restore profit?
  • Defense: budgets, export demand, industrial support.
  • Less business jet frothiness.
  • Financial sector stronger going into this crisis.
COVID-19 And Civil Aviation Markets

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