COVID-19 And Civil Aviation Markets
A Bit Like Falling Off A Cliff, Only Without the Nice View

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Fourth Update; June 8, 2020
Last Month’s Developments
Through June 5; Bottoming Out?

- Slight improvements in apocalyptic traffic numbers; IATA still at -48% for 2020; TSA numbers improve from -95% to -86%.
- Increasingly confrontational relationship between primes and customers.
  - Airbus: undelivered orders and default notices.
  - Qatar threatens future orders if deferrals aren’t granted.
  - Emirates “unable to commit” to existing orders.
- Airbus did not cut rates further;
- Boeing re-started MAX production; 31/month by late 2021?
  - Another round of deferrals/cancelations...the single most vulnerable program due to MAC clause.
- Rolls-Royce cut to junk by S&P; 17% of workforce cut.
- Mitsubishi freezing SpaceJet; risk of death (but CRJ support business acquisition finalized).
- Three business jet OEMs (BBD, GD, TXT) have announced major layoffs.
- Continued disconnect between relief measures, industry production plans and the downturn’s likely depth and duration.
COVID-19 And Aero Markets
Issues And Impact

• Apparently, these things come in pairs:
  • The fuel price shock is as important as traffic.
  • Or trios. Recession too.
  • Also, traffic de-link from economics already in play.
  • And China – economy, relations with the West, likelihood that it goes its own way in aviation, diminished air travel growth, etc.…

• What’s different this time:
  • Airlines in better shape (going into the crisis).
  • Government more aggressive about response, so far.
  • No more interest rate stimulus; third party finance stimulus also unrepeatable.
  • Growth accelerated post 2008 due to several unusual factors (interest rate/fuel price bifurcation, emerging markets-particularly China); none are in play today.

• The state aid question, and strings attached.
  • With state aid, a “synthetic market” pulls demand forward.

• Impact on R&D budgets likely to be profound.
  • Both for new models, and advanced tech development.
“You don’t make the timeline, the virus makes the timeline.” (Dr. Fauci)

- The economy, and people’s willingness to fly, depends on Coronavirus, and really nothing else.
  - Limited air travel recovery due to secondary outbreaks until vaccine, or effective post-infection drug or herd immunity.
  - Vaccine development/distribution is an 18-24-month process.
  - Therapeutic drugs may arrive sooner.
  - Key growth markets might be hit later, and worse, than China and the West.
- The most likely air traffic scenario is an L-shaped market, with an upward-angled floor, lasting 2-3 years.
- Another possibility scenario is a U-shaped recovery, with the floor lasting about two years. **But it’s not a V.**
- Return to traffic peak in 2023, we hope.
## Aircraft Markets, In Good And Bad Years

<table>
<thead>
<tr>
<th>World New Deliveries In 2019 (2020 $)</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>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>
## Aviation Segments By Damage

### Most to Least

<table>
<thead>
<tr>
<th>Segment</th>
<th>Description</th>
</tr>
</thead>
</table>
| Twin aisle jetliners  | International traffic hit hardest and longest.  
                           | Already an overcapacity situation.  
                           | Secular shift towards single aisles already underway.                                         |
| Single aisle jetliners| Fuel prices a big problem.  
                           | China comeback uncertain.  
                           | Some relief due to deferred Airbus ramp, and MAX stop.                                          |
| Business Jets          | Large cabin strongly correlated with oil prices.  
                           | Small/medium strongly correlated with corporate profits, equities indices.                    |
| Civil Rotorcraft       | Oil and gas segment (large) hit again, before recovery even began.                              |
| Military Programs      | Emphasis on “shovel-ready.”  
                           | Advance development programs at greater risk.  
                           | Pure-play contractors in best shape; suppliers with most defense in best shape.                |
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
- Or '99-'03: -11 CAGR; 65% peak-to-trough
- '04-'18: 8% CAGR

A 14-Year Super Cycle

The 2019 MAX problem; not a market problem (until...
Traffic: Like Nothing We've Ever Seen Before

IATA’s 48% Decline in 2020 Very Unlikely At This Point

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
And Now, Unprecedented Numbers

- Traffic decline, parked fleet like no previous shock.
  - Per Paul Krugman, reflect a world economy in a “medically-induced coma.”
  - Again, traffic recovery is determined by the virus, not politicians or economics.
- Backlogs holding up (MAX a concern), but meaningless in a downturn.
  - Just 1% of January backlog has cancelled; over one third has deferred.
- Many early retirements coming, particularly twin aisles.
  - Primarily twin aisles; A380 bloodbath.
- Aftermarket catastrophe.
  - ~48% ASMs (60-70%, really), de-stocking, deferred maintenance/upgrades, plentiful USM with early retirements.

World Jet Fleet: Now ~60% Unemployed

World Air Traffic (RPM Bns)

IATA’s 48% y/y 2020 decline still optimistic about a 4Q recovery
Lower Utilization Can Help With Overcapacity
But A 48%+ Traffic Drop Is Another Story

Source: Airline Monitor
Interest Rates And Oil Prices: Less Than 4%, And $50-85/bbl, Ideally; But The Ratio Matters Most

COVID-19 Pressuring Both Downward
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
Large Jetliner Orders And Deliveries
Book-To-Bill No Longer A Thing
The Air Transport Market By Segment
(As of January)

Deliveries In 2020 $ Billions

- Regionals
- Single Aisles
- Twin Aisles

Some kind of correction, inevitably; also, wait for next gen

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

737MAX Problem, and flood

The Correction Decade; shift towards single aisles; A321neo effect

Regionals, The Land Of Misery

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The Air Transport Market By Segment (June 8)

Deliveries in 2020 $ Billions

Regionals
Single Aisles
Twin Aisles

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

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

Return to peak: 2024

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

Return to peak: after 2029... probably

Now With Greater Misery

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Single Aisle Deliveries: Protected By MAX Return, and By Shift Away From Twin Aisles
Twin Aisles: Formerly Hot; Now Crowded And Depressed
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.
<table>
<thead>
<tr>
<th>Year</th>
<th>Boeing</th>
<th>Airbus</th>
<th>Bombardier</th>
</tr>
</thead>
<tbody>
<tr>
<td>1h 1997</td>
<td>130.0</td>
<td>48.6</td>
<td>—</td>
</tr>
<tr>
<td>1h 2001</td>
<td>107.8</td>
<td>112.9</td>
<td>—</td>
</tr>
<tr>
<td>End 2004</td>
<td>79.5</td>
<td>115.5</td>
<td>1.9</td>
</tr>
<tr>
<td>End 2006</td>
<td>199.1</td>
<td>173.0</td>
<td>3.3</td>
</tr>
<tr>
<td>End 2008</td>
<td>300.4</td>
<td>281.8</td>
<td>4.9</td>
</tr>
<tr>
<td>End 2009</td>
<td>271.1</td>
<td>268.2</td>
<td>5.5</td>
</tr>
<tr>
<td>End 2010</td>
<td>270.0</td>
<td>277.6</td>
<td>6.7</td>
</tr>
<tr>
<td>End 2011</td>
<td>300.1</td>
<td>309.5</td>
<td>9.0</td>
</tr>
<tr>
<td>End 2012</td>
<td>317.0</td>
<td>321.6</td>
<td>9.0</td>
</tr>
<tr>
<td>End 2013</td>
<td>365.3</td>
<td>399.9</td>
<td>8.7</td>
</tr>
<tr>
<td>End 2014</td>
<td>421.2</td>
<td>439.9</td>
<td>8.5</td>
</tr>
<tr>
<td>End 2015</td>
<td>412.9</td>
<td>461.2</td>
<td>—</td>
</tr>
<tr>
<td>End 2016</td>
<td>398.9</td>
<td>468.1</td>
<td>—</td>
</tr>
<tr>
<td>End 2017</td>
<td>402.1</td>
<td>441.8</td>
<td>—</td>
</tr>
<tr>
<td>End 2018</td>
<td>408.0</td>
<td>481.6</td>
<td>—</td>
</tr>
<tr>
<td>End 2019</td>
<td>378.8</td>
<td>463.6</td>
<td>—</td>
</tr>
<tr>
<td>1Q 2020</td>
<td>367.3</td>
<td>470.6</td>
<td>—</td>
</tr>
</tbody>
</table>
Airbus, Boeing Jetliner Backlogs (April 1)

- <150 Single aisle
- 150 Single aisle
- 200 Single Aisle
- 250-300 Twin aisle
- >300 Twin aisle

Boeing: 
Airbus:

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Jetliner Market Shares By Deliveries
Airbus Seizes The Middle Market and First Place; Covid-19 Accelerates shift to Middle Market
Embraer JV Fallout

Winners, Losers, Questions

• **Winners**
  • Airbus.
  • Mitsubishi, unless they decide to exit.

• **Winner/Loser**
  • Boeing.
    • Lose: Airbus wins 100/130-seat segment, KC-390 cooperation in danger.
    • Win: $4 bn instant liquidity boost, no worries about optics if USG aid needed.

• **Losers**
  • Embraer jetliners. But E175 might now be in a very strong position and faces no competitive threat from Airbus.

• **Big Questions**
  • State aid for Embraer?

• **Biggest Question**
  • About Embraer’s future…hard to see anyone but Boeing as an acquirer, but smaller partners possible on specific programs.
Oil Prices And Top Half Business Jet Deliveries

Deliveries in 2020 $ Bns

Oil Price in 2016 $/BBl

Top Half Deliveries

Oil Prices

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Business Jet Market Has Lagged Global Equities For Last Decade, But A Downturn Will Still Hurt

ACWI is a global equity markets index; 2020 is forecast for jets, April 1 for ACWI

MSCI ACWI
Market Value

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Bottom Half Bizjet Segment vs. Top Half

Market Value in '20 $Billions

- Bottom Half (<$26M) January
- Top Half (>=$26M) January
- Bottom after March
- Top after March

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Civil Helicopter Demand May Worsen For Large Models, Depending On Energy Prices
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>-26.3%</td>
<td>33.2%</td>
<td></td>
<td>Includes some already-built MAXs. Watch China, fuel, traffic.</td>
</tr>
<tr>
<td>Jetliners-TA</td>
<td>-39.2%</td>
<td>-14.1%</td>
<td></td>
<td>Overcapacity, slow international recovery, secular shift to SAs</td>
</tr>
<tr>
<td>Regionals</td>
<td>-13.3%</td>
<td>-10.6%</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>-21.2%</td>
<td>-7.7%</td>
<td></td>
<td>Another hit after many false starts over a disappointing decade.</td>
</tr>
<tr>
<td>Civil Rotorcraft</td>
<td>-6.7%</td>
<td>-9.0%</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>-3.5%</td>
<td>3.0%</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>-14.7%</td>
<td>34.4%</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>-29.6%</td>
<td>4.6%</td>
<td></td>
<td>SAJetliner snapback due to MAX, weakness in other segments; more overcapacity risk.</td>
</tr>
<tr>
<td>All Military</td>
<td>-10.5%</td>
<td>18.2%</td>
<td></td>
<td>Global insecurity, Tension, Malice. Special mission also boosts topline.</td>
</tr>
<tr>
<td>Total Industry</td>
<td>-24.7%</td>
<td>8.7%</td>
<td></td>
<td>No strong recovery until 2023</td>
</tr>
</tbody>
</table>
Believe It Or Not… There’s Good News If You Look Hard Enough

• A much bigger industry and market – % v. numbers.
• 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 and export demand.
• Defense: industrial support.
  • Companies: all about balance.
• Financial sector stronger going into this crisis.
• Less business jet frothiness.
• Globalization redeemed. Different, but redeemed.
COVID-19 And Civil Aviation Markets

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