A Discussion of Capacity Supply-Demand Balance

Based on Boeing Whitepaper:
A Discussion of the Capacity Supply-Demand Balance within the Global Commercial Air Transport Industry

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Objectives

– To provide a technical reference for the industry
– To establish a basis for future discussions on overcapacity in public domain

Highlights

1. Defines the states of the air transport industry
2. Discusses the issues and complexity in capacity planning
3. Identifies a straight-forward systemic matrix to assess the industry
4. Evaluates current status of the industry capacity supply-demand balance

→ Industry capacity supply and demand is in balance currently
“A problem well-stated is a problem half-solved.”

Charles Kettering (1876-1958), American inventor, engineer, businessman and holder of 186 patents

Industry reports in recent months do not attempt to genuinely define the various potential states of the industry before asserting their diagnoses that the industry is in a state of persistent structural “overcapacity.”

BCA ASA* identifies three states of the industry:

1. balance
2. overcapacity
3. under-capacity

And the most relevant indicators to assess current status

* Aviation System Analysis is an independent team within Boeing Commercial Airplanes, tasked to bring influential, timely, objective and innovative thought leadership on important issues to the attention of leaders of The Boeing Company and to the industry.
The industry responds to systemic signals and exogenous influences

A multifaceted industry with multiple stakeholders interacting and responding to supply and demand of capacity…

• As an indispensable part of the global economy, the air transport system is subject to the ups and downs of the exogenous macro environment

• Multiple states of balance & imbalance will exist

• To understand if overcapacity exists one must first define the scope and measurements necessary to assess capacity
Capacity planning is complex and imprecise

Capacity planning is complex due to the dynamic nature of the market
- Competition
- Passenger demand
- Externalities – exogenous events

Lead times vary with stakeholder/sector and nature of capacity changes

*Examples of stakeholder capacity adjustments and typical lead times (quarters)*
The chart shows absolute levels for ASK and RPK and ASK growth trend

- Importantly, changes in ASK are closely associated with (almost) simultaneous RPK demand growth changes …

Thus …

- Any abnormal capacity growth that would lead to potential overcapacity is only relevant if it significantly decouples from demand growth.
Capacity balance assessment requires a nominally balanced range

- **Capacity supply and demand** is deemed **in-balance** as long as most of the relevant indicators are within their nominal ranges.

- **The Nominal range** is defined as **25th to 75th** percentile of year-over-year variations, around their underlying long-term trend or mean values.

- **Only** when all or most relevant indicators have fallen **out of their nominal ranges** for a period of time, can capacity supply and demand be declared out of balance, i.e. in a state of **over- or under-capacity**.
Key indicators in the capacity supply-demand balance assessment matrix

1. **Available Seats Kilometers (ASK)* growth rate**, which measures the rate of change in supply of airline network capacity. [*or Available Seat Miles (ASM)]

2. **Passenger Load Factor (PLF)**, which measures the proportion of the network capacity filled by ticket-buying passengers (demand) versus the supplied capacity ASK.

3. **Aircraft Utilization**, which assesses the active (revenue-generating) time of aircraft asset use across the fleet and is primarily measured in average flight hours per day.

4. **Net Commercial Fleet growth rate**, which measures the rate of change or net growth of the commercial fleet size, the combined effect of new airplane deliveries, churn of the parked fleet, and retirement of aging and/or inefficient airplanes.
Indicator (1) – Available Seat Kilometers (ASK) growth rate

ASK growth

- ASK growth rate has averaged ~5.2% per year historically.
- The balance range extends from approximately ~3.2% to ~7.2%.
- The period over which growth is outside of the nominal range is indicative of momentum.
- A three-year moving average (red-line) is a useful way to cross check indicator status and potential future direction.
- Since ASK is made up from components of *seats*, *distance* and *frequency*, we can also gain additional perspective from the subcomponents – Frequency, in this case, as this is likely to provide most obvious indication of ASK changes.
Passenger Load Factor (PLF)

- Global passenger load factor has been on an increasing trend, the PLF is defined by the proportion of capacity filled and can be calculated as RPK/ASK.

- On average, annual growth in PLF% has been approximately 0.9% per year.

- A definitive PLF limit of 100% exists and there is much discussion in the industry about the practical limit for PLF. No conclusive practical limit has been defined recently, as previous postulated values have since been exceeded.

- The difference in growth around the trend is shown in the bottom right chart. The nominal range for PLF % growth per year is plus or minus 1.2%.

Source: ICAO, BCA analysis
Aircraft Utilization

- Passenger airplane utilization, measured in average flight hours per day, has increased in the past decade for both single-aisle and wide-body.

- Average daily flight hours fluctuate up and down – demonstrating airlines’ constant effort to match capacity supply with demand - this is depicted in the variation of the actuals from the trend.

- The nominal range (25th to 75th percentile) of delta is +/- 0.2 flight hours per day for single-aisle and +/- 0.3 for wide-body.
Indicator (4) – Net Commercial Fleet growth rate

Commercial Aircraft Fleet

- The aircraft fleet is a central piece in balancing capacity supply and demand. Its dynamics involve multiple elements. Chart (a) illustrates that the in-service single-aisle fleet has nearly tripled between 1980 and 2012, averaging 3.4% CAGR.

- Adding new airplane deliveries chart (b) ~6%, subtracting the net increase in parked fleet chart (c) ~0.2%, and subtracting airplane retirements chart (d) ~2% - 3%, gives the net growth rate of the commercial single-aisle fleet ~3.4%.

Source: Flightglobal Ascend database, BCA Analysis

+ New airplane deliveries ~6%
- Net increase in parked fleet ~0.2%
- Airplane retirements ~2-3%
Net Single-Aisle Jet Fleet = ~3.4%
Indicator (4) – Net Commercial Fleet growth rate (cont’d)

Commercial Aircraft Fleet

- The in-service fleet of all western-built commercial jets has grown from 5,600 units in 1980 to nearly 19,900 units in 2012, averaging net fleet growth of 4% per year (right – top)
- The year-over-year net fleet growth rate varies around 4%, with the nominal range (25th to 75th percentile) of +/- ~1%.

Source: Flightglobal Ascend database, BCA Analysis
Assessment of current capacity status

Using our definition of the status of the industry and the relevant indicator matrix to assess the current state of the air transport industry … we find …

- The indicators are currently within their nominal ranges
- The industry capacity supply and demand is in balance at this time

**ASK growth** is in balance based on growth recorded by ICAO, moving-average momentum moving from previous overcapacity to current balance state.

**PLF** is in balance with delta from trend, based on ICAO data, moving-average momentum remaining relatively flat and in balance.

**Utilization Flight hours /day trend delta** is in balance for single-aisle (SA) and wide-body (WB) aircraft at 0 and -0.1 respectively with momentum relatively flat and in balance.

**Year over year net fleet** growth is in balance, since the moving average momentum is moving from previous state of overcapacity to current balance status.
Conclusion

- Assessing the capacity balance in the global air transportation system requires:
  - An understanding of the complexities of the system and the interactions among the many entities that comprise the system.
  - A comprehensive assessment of a number of relevant system metrics is required.

- Use of anecdotal data, local perceptions, a single metric or a single-state definition to assess or describe the capacity balance in the aviation system is fundamentally flawed and can be misleading at best.

- As the industry continues to evolve, one needs to stay aware of emerging alternatives, improved data or new indicators that may provide additional insight and improved analysis, while watching for ancillary indicators that may aid assessments.

- The authors recommend vigilant tracking and monitoring of the suggested indicators, and continued research of industry status and the factors impacting it.

- Based on a current assessment of the system using the collection of industry-relevant indicators, we find that the indicators are within their nominal ranges; there is no evidence of a persistent systemic overcapacity; and the industry capacity supply and demand is in balance at this time.
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