

## Global Aerospace

## BofA Commercial Aerospace: Global dedicated freight improved strongly WoW

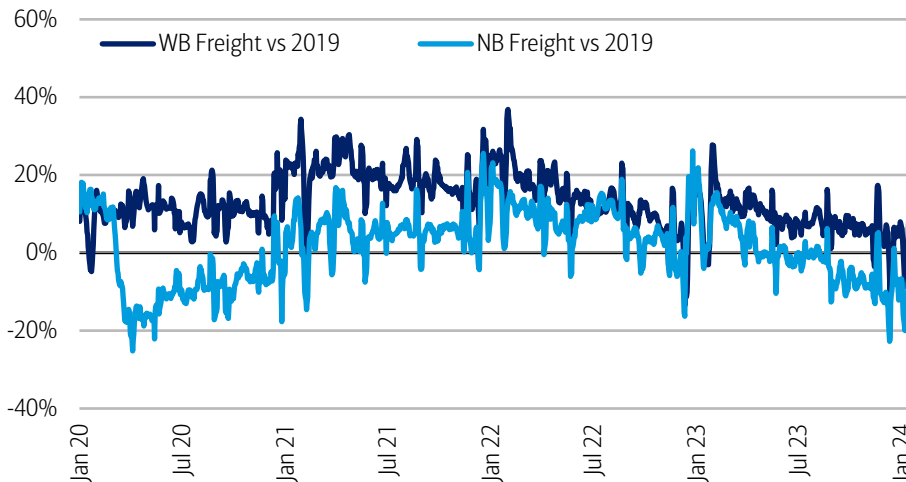
## Industry Overview

## Global dedicated freight cycles improved strongly WoW

Global dedicated freighters 7-day average cycles vs 2019 improved strongly to +5.9% this week, +16.5ppts improvement vs -10.6% last week driven by strong improvement in both narrowbody and widebody dedicated freighters. Narrowbody dedicated freighters and widebody dedicated freighters 7-day average cycles vs 2019 improved by +14.4ppts and +17.2ppts to -5.5% and +10.1% this week, vs -20% and -7% last week resp.

**Exhibit 1: Narrowbody vs Widebody dedicated freighter flights tracked 7 day avg. YoY %**

Global dedicated freighters 7-day average cycles vs 2019 improved strongly driven by strong improvement in both narrowbody and widebody dedicated freighters.



Source: BofA Global Research, Flightradar24

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## APAC cycles vs 2019 improved driven by strong improvement in China cycles WoW

Global commercial 7-day average cycles vs 2019 improved by +2.3ppts to -7.3% this week, vs -9.6% last week. APAC 7-day average cycles vs 2019 improved the most by +4.7ppts to +0.9% this week, vs -3.8% last week driven by +18.5ppts strong improvement in China 7-day average cycles vs 2019 to +18.6% this week, vs +0.1% last week. India 7-day average cycles vs 2019 also improved by +2.8ppts to -2.8% this week, vs -5.5% last week. Similarly, Middle East, Europe and North America 7-day average cycles vs 2019 also improved by +2ppts, +1.4ppts and +0.2ppts to +10.4%, -9.4% and -2.4% this week, vs +8.4%, -10.8% and -2.6% last week resp. Africa and Latam 7-day average cycles vs 2019 on the flip side declined by -2.3ppts and -1.3ppts to +8.1% and +5.4% this week, vs +10.4% and +6.7% last week respectively.

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Refer to important disclosures on page 23 to 24.

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**Benjamin Heelan >>**  
Research Analyst  
MLI (UK)  
[benjamin.heelan@bofa.com](mailto:benjamin.heelan@bofa.com)

**Virginia Montorsi >>**  
Research Analyst  
MLI (UK)

**Carlos Iranzo Peris >>**  
Research Analyst  
MLI (UK)

**Apoorv Gupta >>**  
Data Science Rsch Analyst  
MLI (UK)

**Ronald J. Epstein**  
Research Analyst  
BofAS

**Nathan Gee, CFA >>**  
Research Analyst  
Merrill Lynch (Singapore)

**Andrew G. Didora, CFA**  
Research Analyst  
BofAS

**Muneeba Kayani >>**  
Research Analyst  
MLI (UK)

**Andrew Obin**  
Research Analyst  
BofAS

**Ken Hoexter**  
Research Analyst  
BofAS

WoW: Week over Week

# Contents

Engine cycles tracker	3
Airbus: Airframe flight cycles	9
Boeing: Airframe flight cycles	11
Global commercial flight cycles	13
Global freighter cycles	14
Cargo airline cycles	15
Commercial flights regional split	16
Monthly flight cycles data tables	17
What is the BofA Commercial Aerospace Tracker?	21
What is Flightradar24?	21
How does BofA Research process Flightradar24’s data?	21
Data exceptions	22



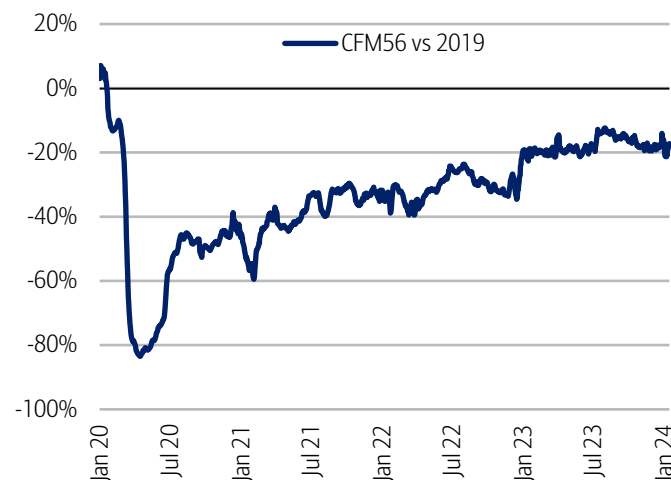
# Engine cycles tracker

Engine cycles historically have tended to be better indicators for engine aftermarket trends than flight hours, as take offs & landings are where most stress is placed on engine components.

- **CFM56 family** 7 day rolling avg. daily flights improved to 10.2% YoY and improved to -17.2% vs 2019 this week, a 5.7 pts improvement and 3.3 ppts improvement vs 4.5% and -20.5% respectively last week.

## Exhibit 2: CFM56 family 7-day avg. daily flights tracked YoY %

The CFM56 family made gradual progress through FY23



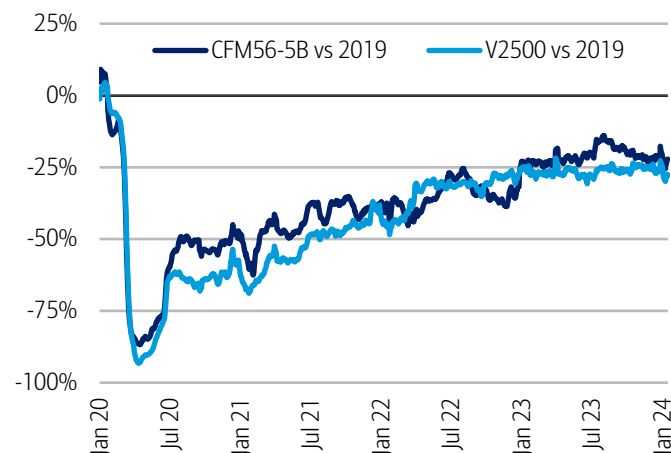
Source: BofA Global Research, Flightradar24

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- **CFM56-5B (A320ceo)** 7 day rolling avg. daily flights improved to 10.9% YoY and improved to -22.1% vs 2019 this week, a 5.5 pts improvement and 2.8 ppts improvement vs 5.5% and -25% respectively last week. This compares to **V2500 (A320ceo)**, which improved to 0.9% YoY and improved to -27.8% vs 2019 this week, a 4 pts improvement and 1.1 ppts improvement vs -3.1% and -28.9% respectively last week.

## Exhibit 4: CFM56-5B (A320ceo) vs V2500 (A320ceo)– 7 day avg. YoY

CFM56-5B and the V2500 are now broadly in line

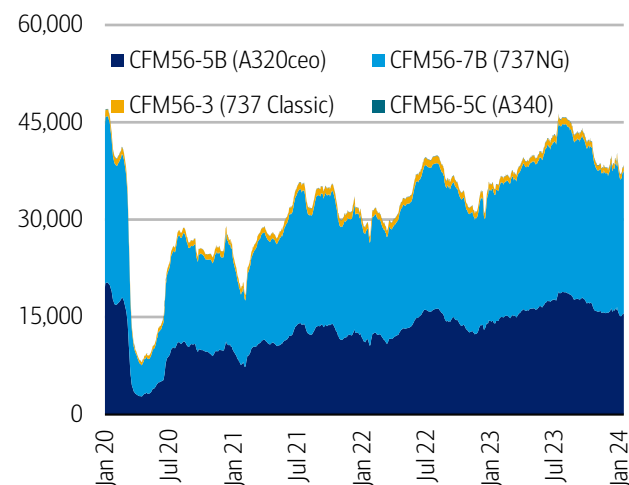


Source: BofA Global Research, Flightradar24

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## Exhibit 3: CFM56 family 7-day avg. daily flights total

5B and 7B have the largest share of fleet on Boeing/Airbus narrowbody

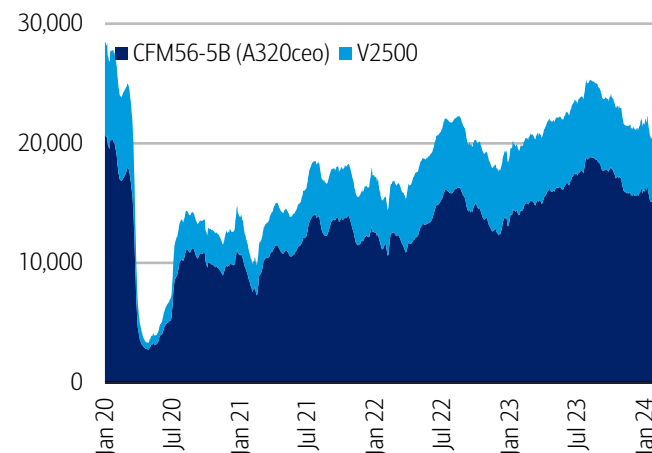


Source: BofA Global Research, Flightradar24

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## Exhibit 5: CFM56-5B (A320ceo) vs V2500 (A320ceo)– 7 day avg. daily flights total

CFM56 has higher market share vs V2500 on the A320ceo



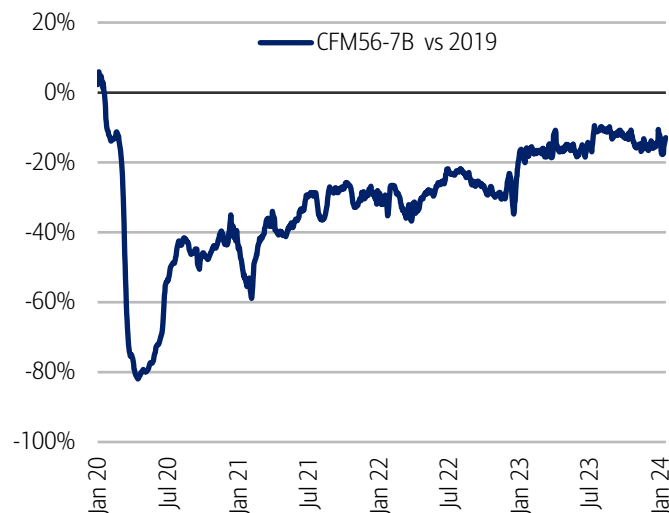
Source: BofA Global Research, Flightradar24

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- **CFM56-7B (737 NG)** 7 day rolling avg. daily flights improved to 10.4% YoY and improved to -12.9% vs 2019 this week, a 5.9 pts improvement and 3.9 ppts improvement vs 4.5% and -16.7% respectively last week.

**Exhibit 6: CFM56-7B (737NG) 7 day avg. daily flights tracked YoY %**

CFM56-7B shown gradual improvement through 2023

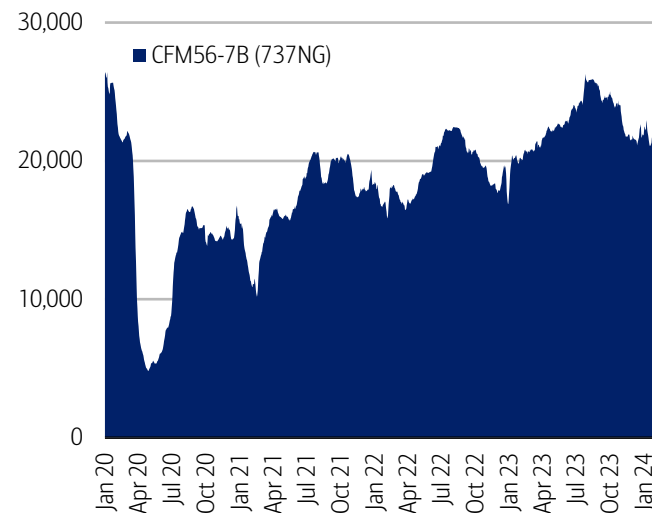


Source: BofA Global Research, Flightradar24

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**Exhibit 7: CFM56-7B (737NG) 7 day avg. daily flights total**

CFM56-7B cycles are almost back at pre COVID levels



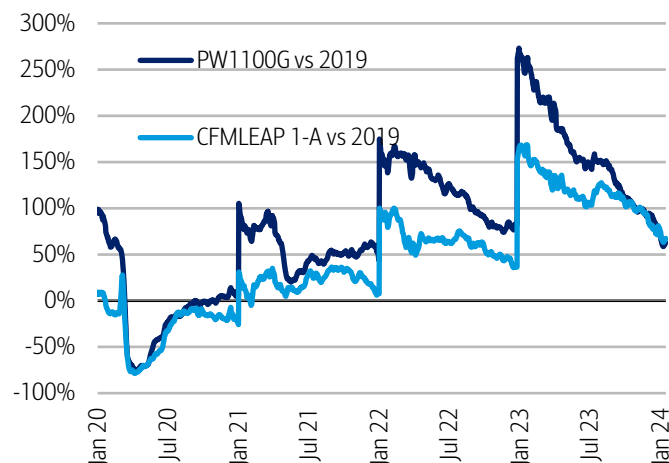
Source: BofA Global Research, Flightradar24

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- **CFM LEAP-1A (A320neo)** 7 day rolling avg. daily flights improved to 20.9% YoY and improved to 67.5% vs 2019 this week, a 3 pts improvement and 2.4 ppts improvement vs 17.9% and 65% respectively last week. This compares to **PW1100G (A320neo)**, which improved to -11.9% YoY and improved to 62.9% vs 2019 this week, a 2.2 pts improvement and 3.7 ppts improvement vs -14.1% and 59.2% respectively last week.

**Exhibit 8: CFM LEAP-1A (A320neo) vs PW1100G 'GTF' (A320neo) 7 day avg. daily flights tracked YoY %**

PW1100G 'GTF' cycles have been higher than LEAP 1-A on A320neo

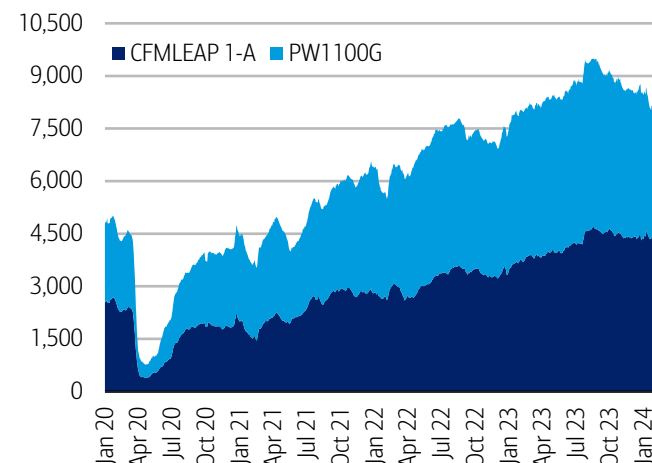


Source: BofA Global Research, Flightradar24

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**Exhibit 9: CFM LEAP-1A(A320neo) vs PW1100G 'GTF' (A320neo) 7 day avg. daily flights total**

LEAP1-A fleet is slightly smaller than the GTF



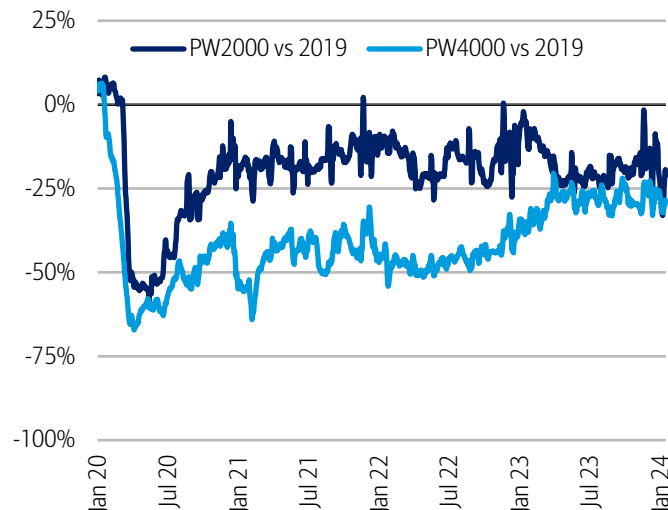
Source: BofA Global Research, Flightradar24

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- **PW2000 (757)** 7 day rolling avg. daily flights improved to -13.6% YoY and improved to -21.1% vs 2019 this week, a 10.6 pts improvement and 10 ppts improvement vs -24.2% and -31% respectively last week. This compares to **PW4000 (A300, A330, 747, 767, 777, MD-11)**, which improved to 22.9% YoY and improved to -28.4% vs 2019 this week, a 12.3 pts improvement and 3 ppts improvement vs 10.6% and -31.4% respectively last week.

**Exhibit 10: PW2000 (757) vs PW4000 (A300, A330, 747, 767, 777, MD-11) 7 day avg. daily flights tracked YoY %**

PW2000 has large freight/military exposure, driving resilience



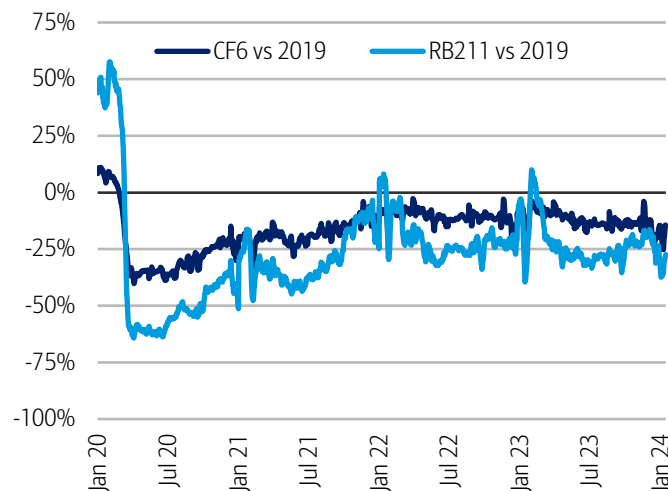
Source: BofA Global Research, Flightradar24

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- **CF6 (A300, A310, A330, 747, 767)** 7 day rolling avg. daily flights improved to 6.9% YoY and improved to -14.4% vs 2019 this week, a 17.1 pts improvement and 9.7 ppts improvement vs -10.1% and -24.2% respectively last week. This compares to **RB211 (747, 757, 767)**, which improved to 70.3% YoY and improved to -27.5% vs 2019 this week, a 64.1 pts improvement and 7.9 ppts improvement vs 6.2% and -35.3% respectively last week.

**Exhibit 12: CF6 (A300, A310, A330, 747, 767) vs RB211 (747, 757, 767) 7 day avg. daily flights tracked YoY %**

CF6 and RB211 have shared freight exposure on 747 and 767

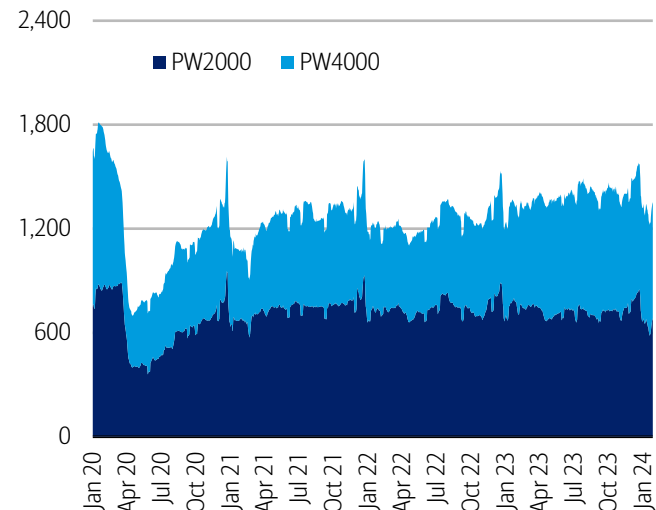


Source: BofA Global Research, Flightradar24

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**Exhibit 11: PW2000 (757) vs PW4000 (A300, A330, 747, 767, 777, MD-11) 7 day avg. daily flights total**

Pre-COVID, PW2000 cycles were c.800 per day vs c.600 in Nov-22

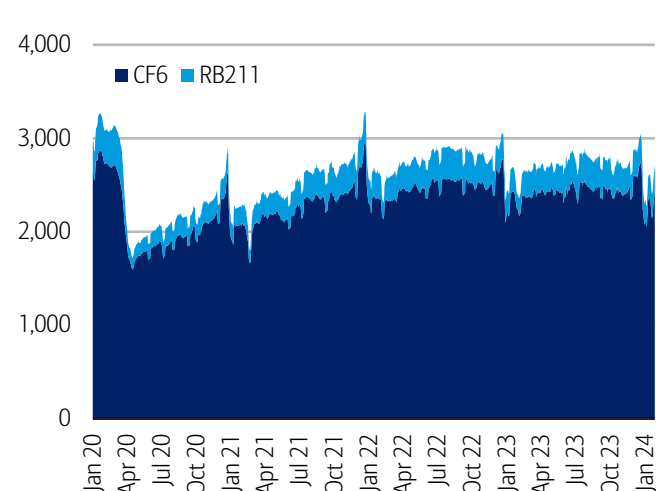


Source: BofA Global Research, Flightradar24

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**Exhibit 13: CF6 (A300, A310, A330, 747, 767) vs RB211 (747, 757, 767) 7 day avg. daily flights total**

CF6 has a substantially larger fleet than RB211



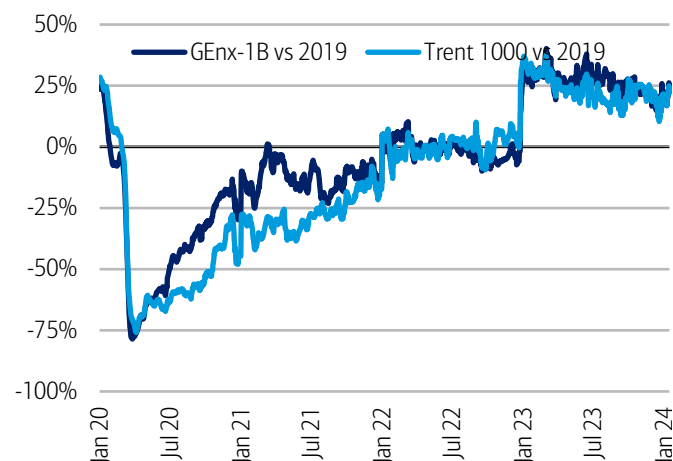
Source: BofA Global Research, Flightradar24

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- **GENX (787)** 7 day rolling avg. daily flights improved to 16.3% YoY and improved to 24.5% vs 2019 this week, a 5.1 pts improvement and 3.6 ppts improvement vs 11.2% and 20.8% respectively last week. This compares to **Trent 1000 (787)**, which improved to 15.7% YoY and improved to 21.9% vs 2019 this week, a 2.9 pts improvement and 1 ppts improvement vs 12.8% and 20.9% respectively last week.

**Exhibit 14: GENX (787) vs Trent 1000 (787) 7 day avg.**

Trent 1000 cycles had been weaker than GEnx-1B but now inline

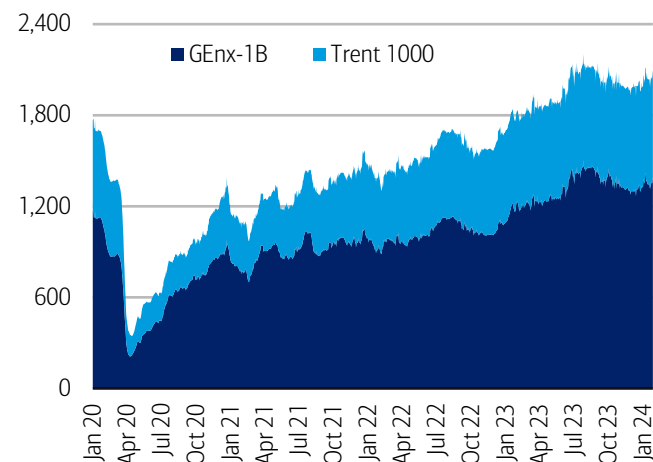


Source: BofA Global Research, Flightradar24

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**Exhibit 15: GENX (787) vs Trent 1000 (787) 7 day avg. daily flights total**

Trent 1000 has smaller exposure than GEnx-1B on 787



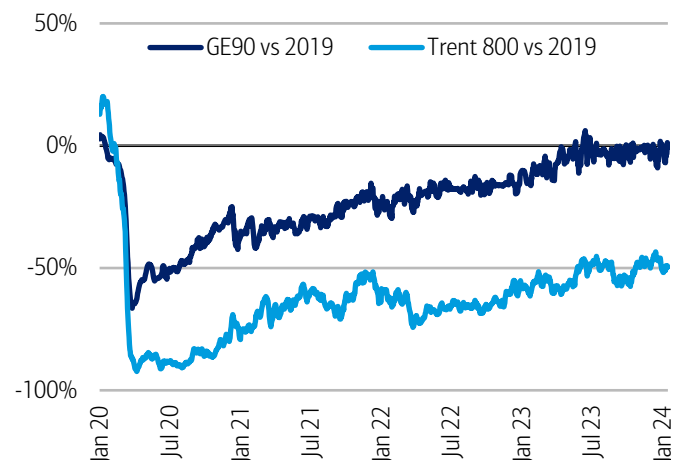
Source: BofA Global Research, Flightradar24

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- **GE90 (777)** 7 day rolling avg. daily flights improved to 18.7% YoY and improved to -0.9% vs 2019 this week, a 7.3 pts improvement and 2.5 ppts improvement vs 11.4% and -3.4% respectively last week. This compares to **Trent 800 (777)**, which improved to 43.5% YoY and improved to -49.6% vs 2019 this week, a 6.9 pts improvement and 1 ppts improvement vs 36.6% and -50.6% respectively last week.

**Exhibit 16: GE90 (777) vs Trent 800 (777) 7 day avg. daily flights tracked YoY %**

GE90 historically competed with the Trent 800 and PW4000 on 777

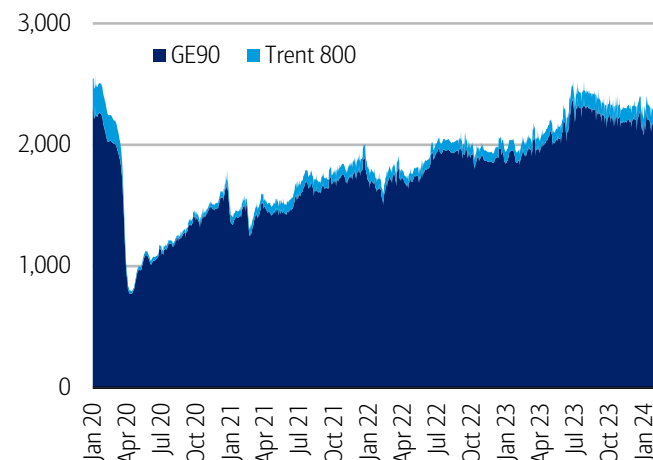


Source: BofA Global Research, Flightradar24

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**Exhibit 17: GE90 (777) vs Trent 800 (777) 7 day avg. daily flights total**

GE has sole position on later 777 variants (e.g. -300ER, -200LR)



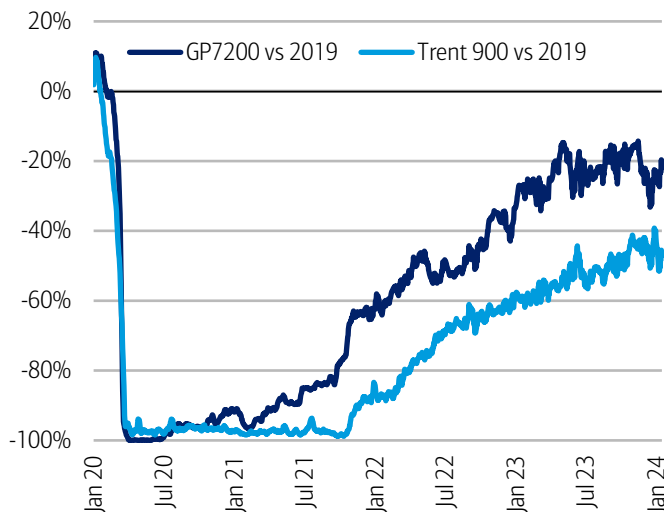
Source: BofA Global Research, Flightradar24

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- **GP7200 (A380)** 7 day rolling avg. daily flights improved to 17.6% YoY and improved to -21.9% vs 2019 this week, a 1 pts improvement and 2 ppts improvement vs 16.6% and -23.9% respectively last week. This compares to **Trent 900(A380)**, which improved to 36.8% YoY and improved to -47.1% vs 2019 this week, a 3.1 pts improvement and 2 ppts improvement vs 33.7% and -49.1% respectively last week.

#### Exhibit 18: GP7200 (A380) vs Trent 900 (A380) 7 day avg. daily flights tracked YoY %

The A380 has recovered strongly since 2022 but is still well below pre COVID levels



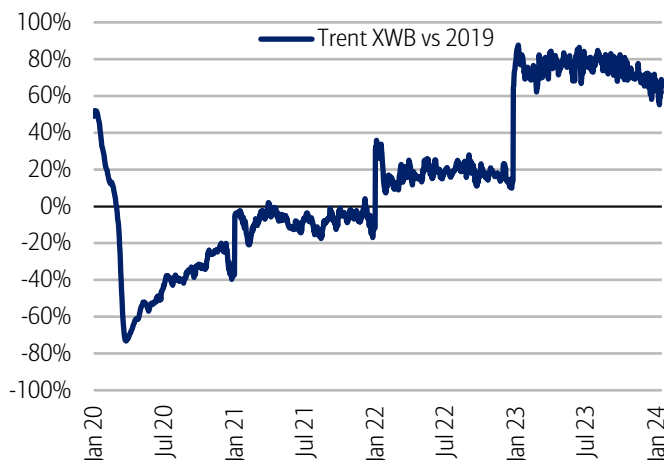
Source: BofA Global Research, Flightradar24

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- **Trent XWB (A350)** 7 day rolling avg. daily flights improved to 37.1% YoY and improved to 65.8% vs 2019 this week, a 6.5 pts improvement and 4.4 ppts improvement vs 30.6% and 61.4% respectively last week.

#### Exhibit 20: Trent XWB (A350) 7 day avg. daily flights YoY %

Trent XWB has strongly recovered driven in part by new deliveries



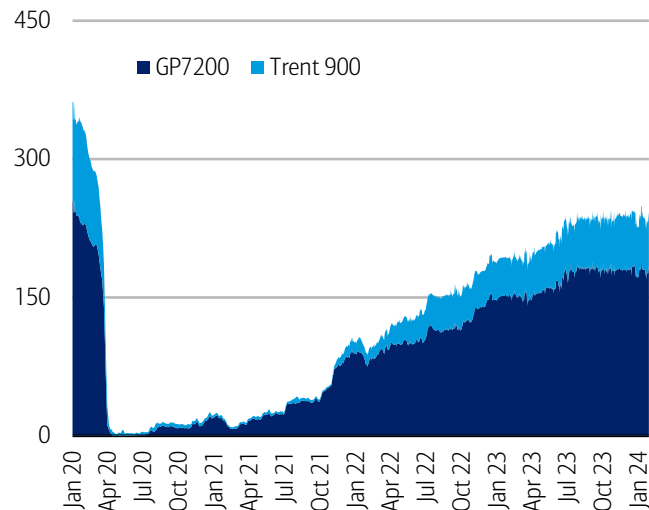
Source: BofA Global Research, Flightradar24

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- **Trent 700 (A330)** 7 day rolling avg. daily flights improved to 24.8% YoY and improved to -26.7% vs 2019 this week, a 15.2 pts improvement and 4.5 ppts improvement vs 9.6% and -31.2% respectively last week.

#### Exhibit 19: GP7200 (A380) vs Trent 900 (A380) 7 day avg. daily flights total

GP7200 cycles have led Trent 900 during the limited recovery of A380

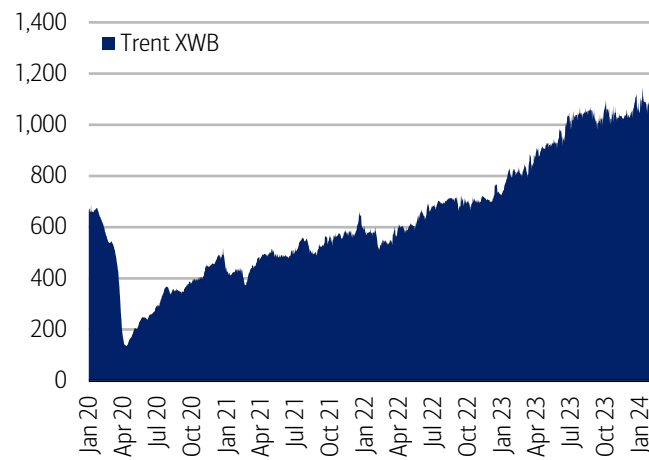


Source: BofA Global Research, Flightradar24

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#### Exhibit 21: Trent XWB (A350) 7 day avg. daily flights total

Pre COVID, Trent XWB daily cycles peaked at c.630

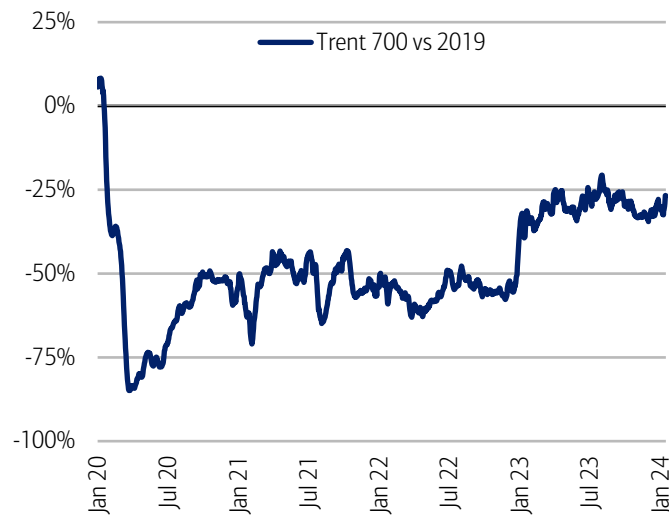


Source: BofA Global Research, Flightradar24

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### Exhibit 22: Trent 700 (A330ceo) 7 day avg. daily flights tracked YoY %

Trent 700 is the market leader on A330ceo (c.65% of total fleet)

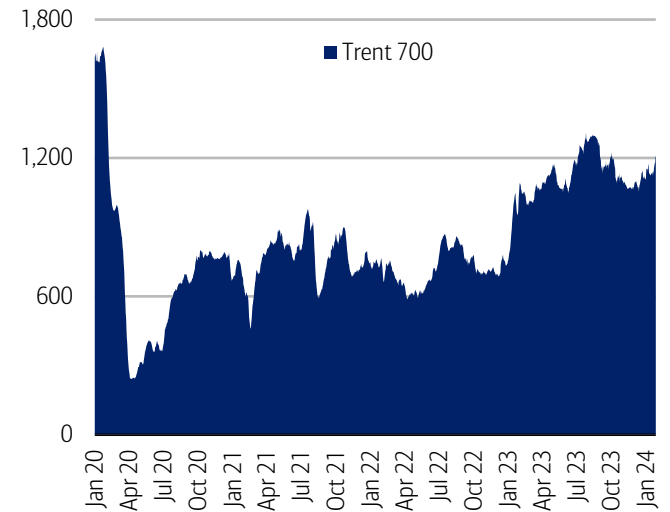


Source: BofA Global Research, Flightradar24

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### Exhibit 23: Trent 700 (A330ceo) 7 day avg. daily flights total

Trent 700 daily cycles were c.1600 before COVID-19 pandemic

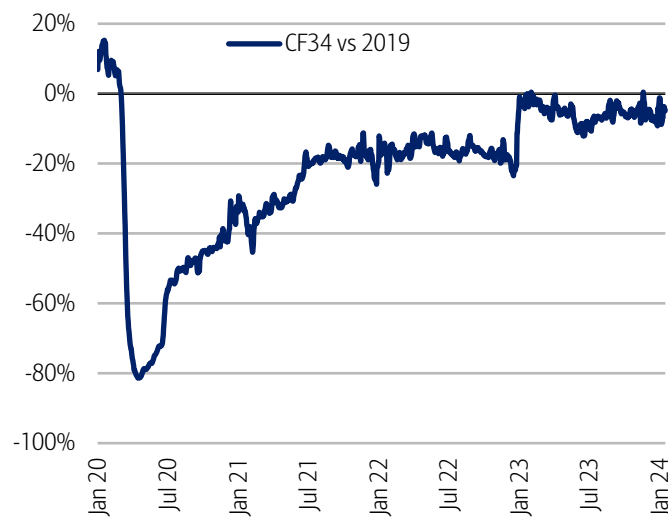


Source: BofA Global Research, Flightradar24

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### Exhibit 24: GE CF34 (E-Jet) 7 day avg. daily flights YoY %

The CF34 available on Embraer E-170 and E-190 family aircraft

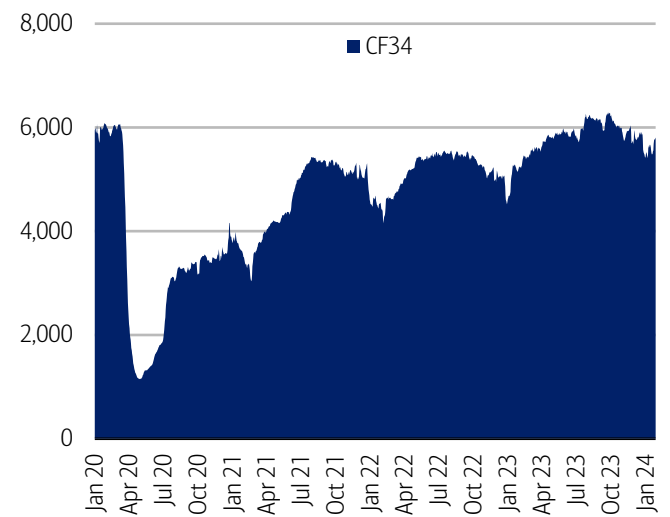


Source: BofA Global Research, Flightradar24

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### Exhibit 25: GE CF34 (E-Jet) 7 day avg. daily flights total

CF34 is back at pre-COVID levels



Source: BofA Global Research, Flightradar24

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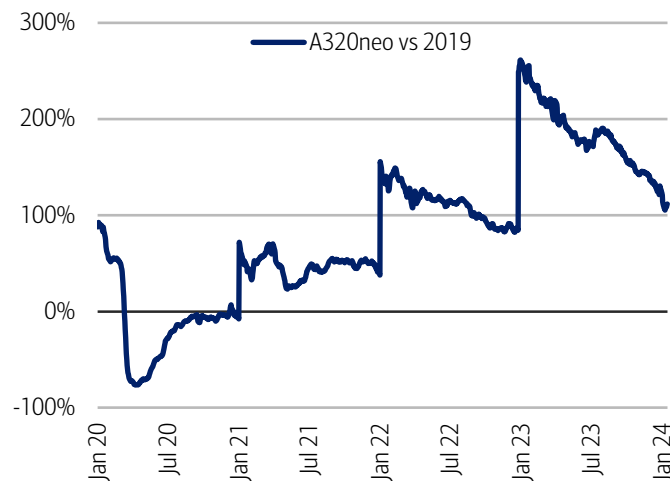


# Airbus: Airframe flight cycles

- **Airbus A320neo** 7 day avg. daily flights were 14.3% YoY and 111.6% vs 2019 improving 3.1 ppts YoY and improving 4.3 ppts over 2019 vs 11.2% YoY and 107.3% over 2019 last week and comparing to a 2020 low of -76.5%.
- **Airbus A320ceo** 7 day avg. daily flights were 9.6% YoY and -18.3 % vs 2019 improving 4.8 ppts YoY and improving 2.5 ppts over 2019 vs 4.8% YoY and -20.7% over 2019 last week and comparing to a 2020 low of -88.9%.

## Exhibit 26: Airbus A320neo – 7 day avg. daily flights YoY %

A320neo fleet is much larger vs 2019 levels

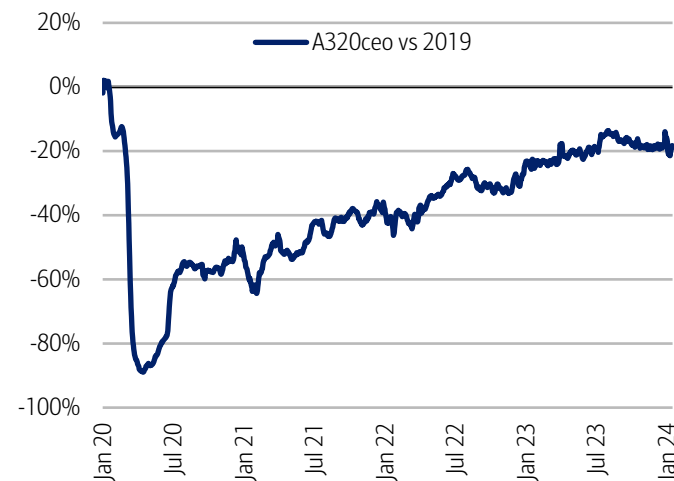


Source: BofA Global Research, Flightradar24

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## Exhibit 27: Airbus A320ceo – 7 day avg. daily flights YoY %

A320ceo cycles have been gradually recovering



Source: BofA Global Research, Flightradar24

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- **Airbus A330 family** 7 day avg. daily flights were 23.5% YoY and -15.9 % vs 2019 improving 10.7 ppts YoY and improving 2.7 ppts over 2019 vs 12.8% YoY and -18.6% over 2019 last week and comparing to a 2020 low of -84.9%.
- **Airbus A340 family** 7 day avg. daily flights were 45.5% YoY and -27.4 % vs 2019 improving 12.5 ppts YoY and improving 7 ppts over 2019 vs 33% YoY and -34.4% over 2019 last week and comparing to a 2020 low of -89.5%.

## Exhibit 28: Airbus A330 family – 7 day avg. daily flights YoY %

A330 family cycles have stabilized at c.-20% vs 2019 levels

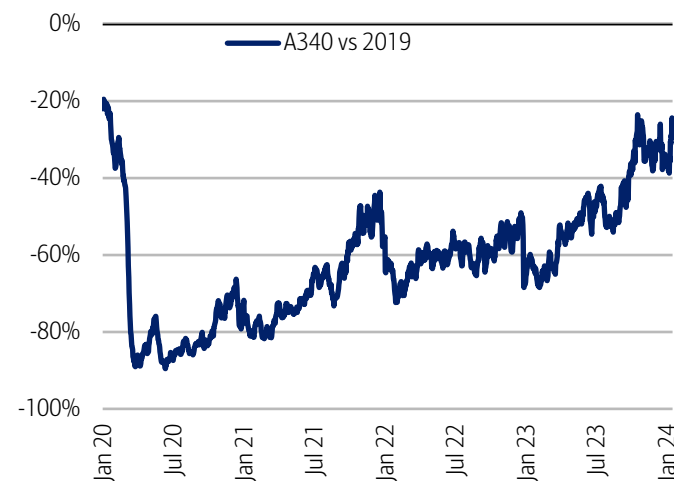


Source: BofA Global Research, Flightradar24

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## Exhibit 29: Airbus A340 family – 7 day avg. daily flights YoY %

A340 has four engines – we expect platform to face high retirements



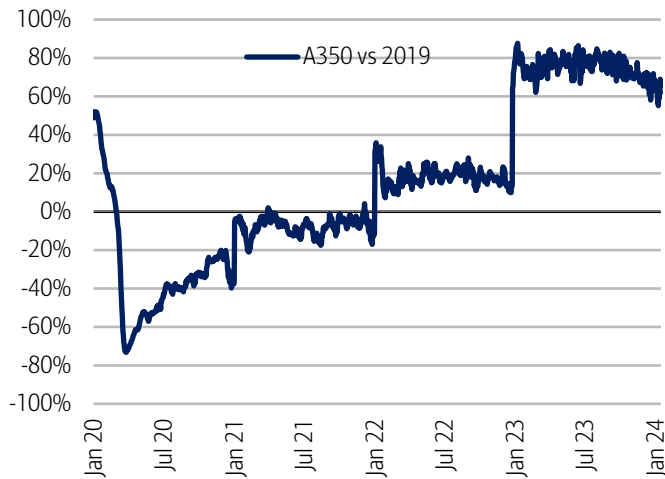
Source: BofA Global Research, Flightradar24

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- **Airbus A350** 7 day avg. daily flights were 37.1% YoY and 65.8 % vs 2019 improving 6.5 ppts YoY and improving 4.4 ppts over 2019 vs 30.6% YoY and 61.4% over 2019 last week and comparing to a 2020 low of -73.2%.
- **Airbus A380 family** 7 day avg. daily flights were 21.7% YoY and -29.9 % vs 2019 improving 1.4 ppts YoY and improving 2 ppts over 2019 vs 20.3% YoY and -31.9% over 2019 last week and comparing to a 2020 low of -99.4%.

#### Exhibit 30: Airbus A350 family – 7 day avg. daily flights YoY %

A350 is a 'next gen' widebody and has outperformed older platforms

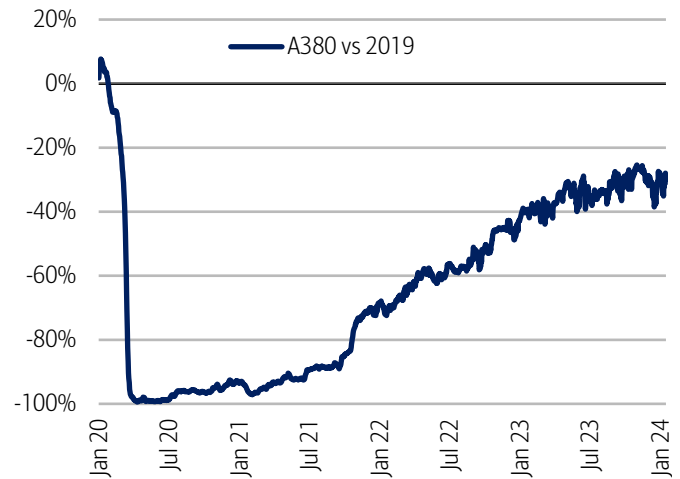


Source: BofA Global Research, Flightradar24

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#### Exhibit 31: Airbus A380 family – 7 day avg. daily flights YoY %

A380 is still very weak but we see a progressive recovery trend



Source: BofA Global Research, Flightradar24

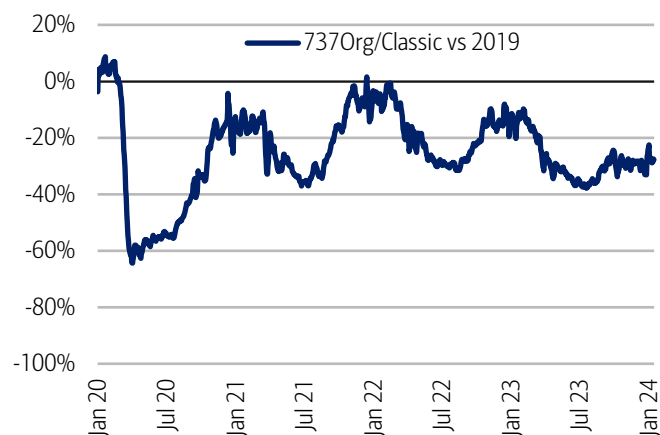
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## Boeing: Airframe flight cycles

- **Boeing 737 Original/Classic** 7 day avg. daily flights were -7.2% YoY and -27.7 % vs 2019 improving 5.7 ppts YoY and improving 0 ppts over 2019 vs -12.9% YoY and -27.7% over 2019 last week and comparing to a 2020 low of -64.4%.
- **Boeing 737 NG** 7 day avg. daily flights were 10.4% YoY and -12.9 % vs 2019 improving 5.9 ppts YoY and improving 3.9 ppts over 2019 vs 4.5% YoY and -16.7% over 2019 last week and comparing to a 2020 low of -82%.

### Exhibit 32: Boeing 737 Original/classic – 7 day avg. flights YoY %

Older 737s and 737 Classics have a large freight concentration

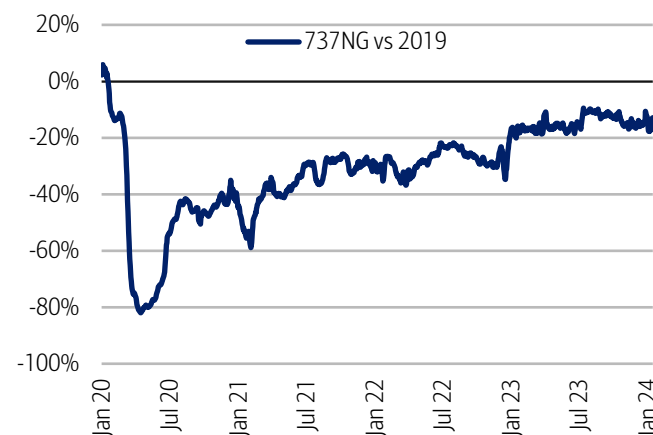


Source: BofA Global Research, Flightradar24

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### Exhibit 33: Boeing 737NG– 7 day avg. daily flights YoY %

737NG recovery has gradually recovered



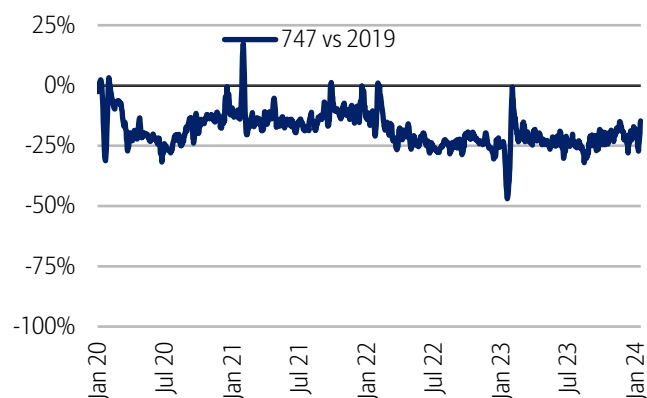
Source: BofA Global Research, Flightradar24

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- **Boeing 747** 7 day avg. daily flights were 37.1% YoY and -14.7 % vs 2019 improving 35.4 ppts YoY and improving 9 ppts over 2019 vs 1.8% YoY and -23.7% over 2019 last week and comparing to a 2020 low of -31.7%.
- **Boeing 757** 7 day avg. daily flights were -1.9% YoY and -17.5 % vs 2019 improving 15.3 ppts YoY and improving 9.4 ppts over 2019 vs -17.2% YoY and -27% over 2019 last week and comparing to a 2020 low of -65.6%.
- **Boeing 767** 7 day avg. daily flights were 10.2% YoY and 0 % vs 2019 improving 15.8 ppts YoY and improving 12.3 ppts over 2019 vs -5.6% YoY and -12.3% over 2019 last week and comparing to a 2020 low of -46%.

### Exhibit 34: Boeing 747– 7 day avg. daily flights YoY %

747 has been stronger than A380 due to high freight usage in fleet

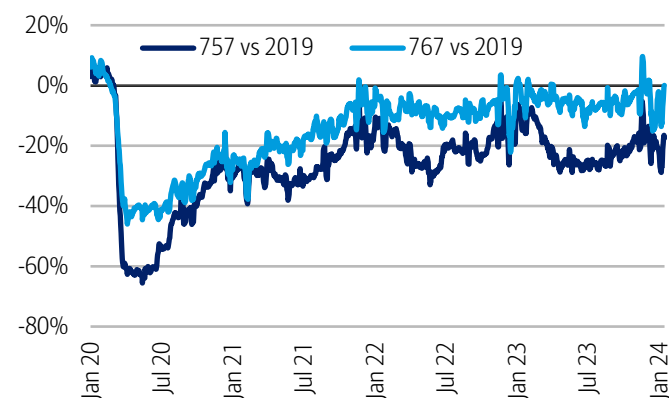


Source: BofA Global Research, Flightradar24

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### Exhibit 35: Boeing 757/767– 7 day avg. flights YoY %

757/767 are both legacy pax platforms with high freight utilisation



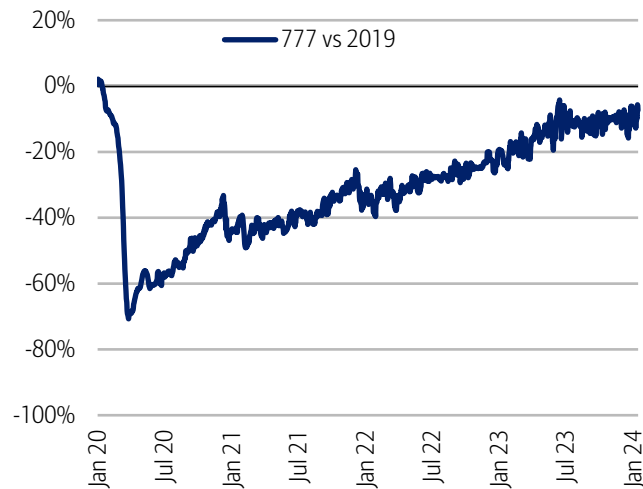
Source: BofA Global Research, Flightradar24

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- **Boeing 777** 7 day avg. daily flights were 20.8% YoY and -7.4 % vs 2019 improving 6.8 ppts YoY and improving 2.1 ppts over 2019 vs 13.9% YoY and -9.5% over 2019 last week and comparing to a 2020 low of -70.7%.
- **Boeing 787** 7 day avg. daily flights were 16.3% YoY and 25.4 % vs 2019 improving 4.4 ppts YoY and improving 2.7 ppts over 2019 vs 11.9% YoY and 22.8% over 2019 last week and comparing to a 2020 low of -76.3%.

**Exhibit 36: Boeing 777 – 7 day avg. daily flights YoY %**

Newer models (e.g. -300ER, -200LR) have been driving a steady recovery of flight cycles

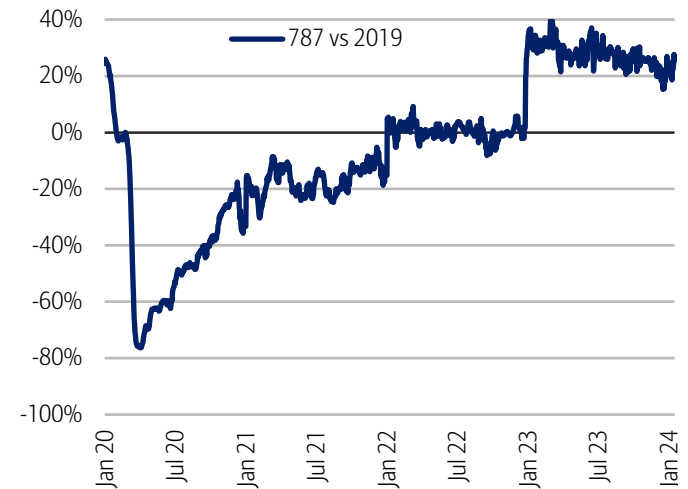


Source: BofA Global Research, Flightradar24

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**Exhibit 37: Boeing 787 – 7 day avg. daily flights YoY %**

787 is already exhibiting >2019 levels through 2023

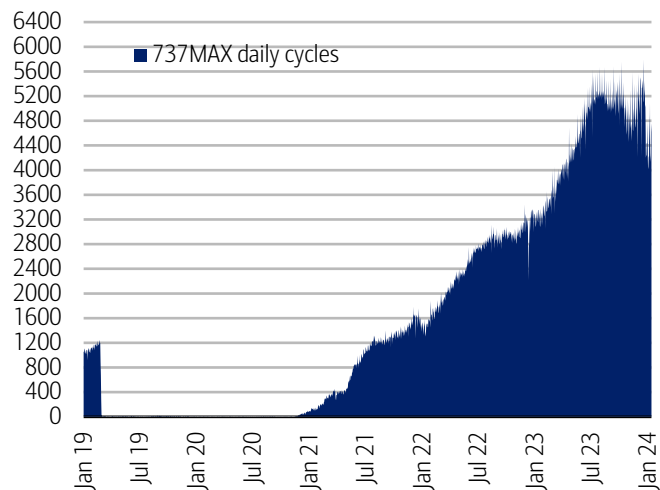


Source: BofA Global Research, Flightradar24

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**Exhibit 38: Boeing 737 MAX daily flight cycles**

MAX daily cycles have seen a very strong recovery

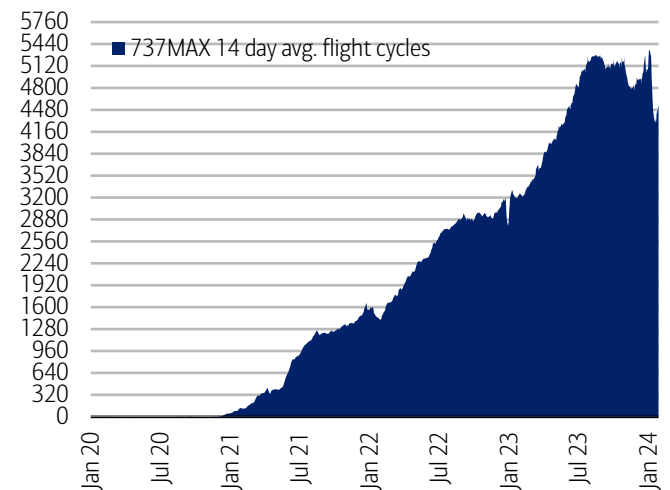


Source: BofA Global Research estimates, Flightradar24

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**Exhibit 39: Boeing 737 – 14 day avg. daily flight cycles**

Cycles have started to resume as regulators approve aircraft for service



Source: BofA Global Research, Flightradar24

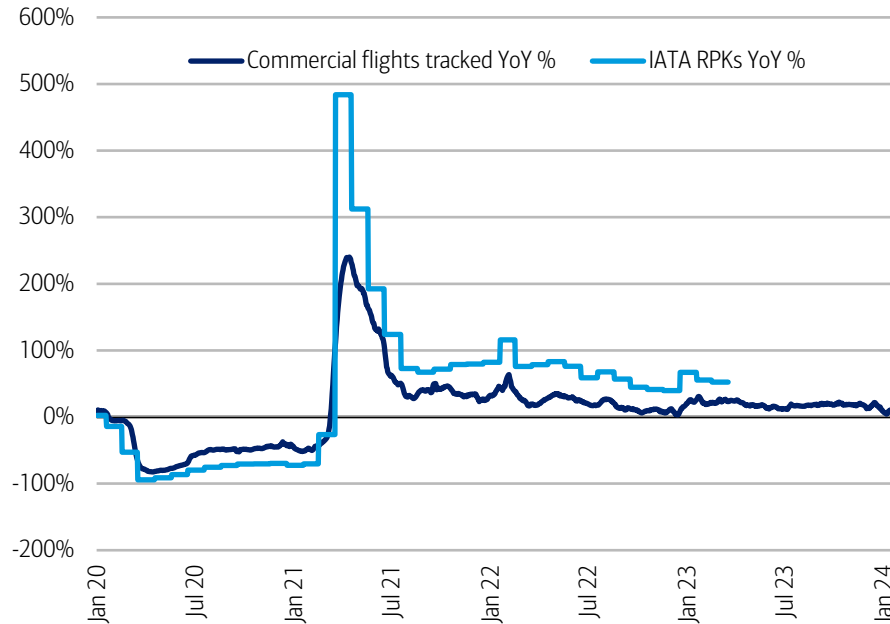
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# Global commercial flight cycles

- **Global commercial** 7 day avg. daily flights were 10.1% YoY and -7.3% vs 2019 improving 4.6 ppts and improving 2.3 ppts vs 5.4% and -9.6% respectively last week and comparing to a 2020 low of -82.5%.

## Exhibit 40: Global commercial flights tracked 7 day daily moving average YoY %

IATA RPKs have broadly followed Global commercial flight cycles

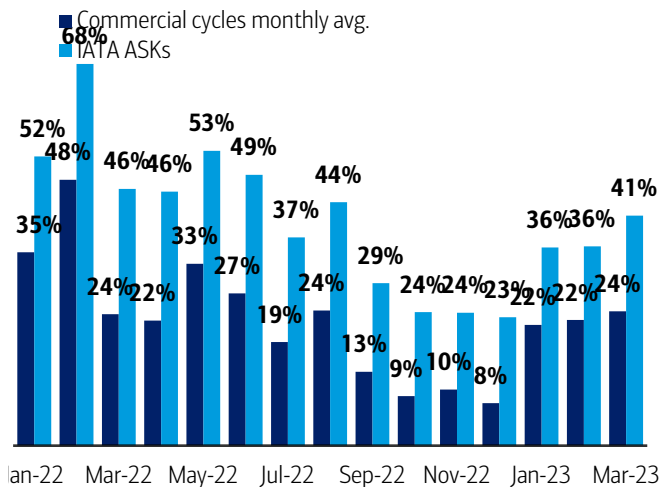


Source: BofA Global Research, Flightradar24

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## Exhibit 41: Commercial aircraft monthly daily cycles avg. YoY % vs IATA ASKs

Monthly flight cycles were similar to IATA Available Seat Kilometers ...

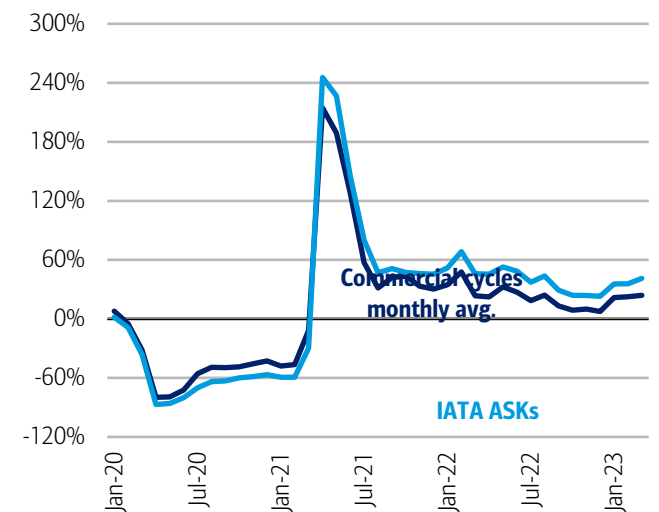


Source: BofA Global Research, Flightradar24

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## Exhibit 42: Commercial aircraft monthly daily cycles avg. YoY % vs IATA ASKs

ASKs cycles remain above commercial ones after converging in Apr-21



Source: BofA Global Research, Flightradar24

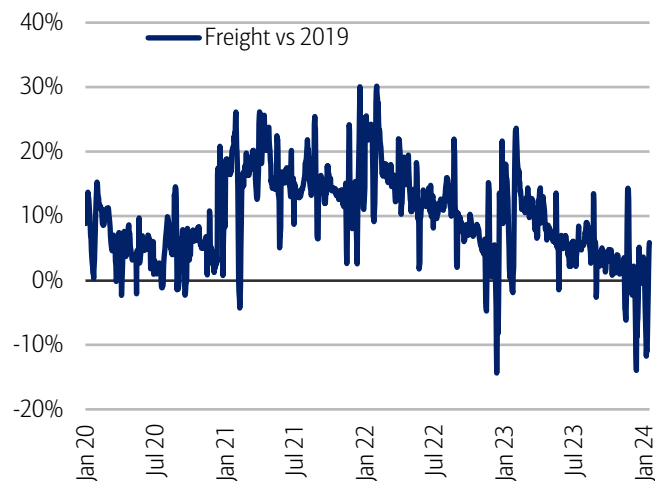
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# Global freighter cycles

- **Global dedicated freighter** 7 day avg. daily flights were 12.6% YoY and 5.9% vs 2019 improving 24.5 pts and improving 16.5 pts vs -11.9% and -10.6% respectively last week and comparing to a 2020 low of -2.3%.

## Exhibit 43: Global dedicated freighter flights tracked 7 day avg. YoY %

This excludes commercial aircraft used as freighter. It has become progressively weaker through 2022-23

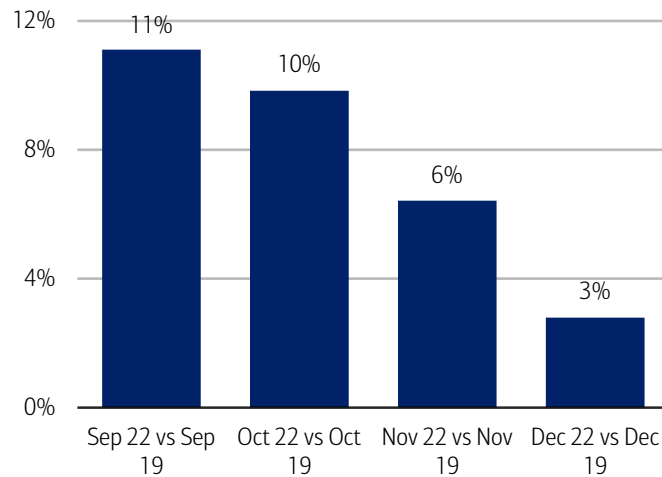


Source: BofA Global Research, Flightradar24

BofA GLOBAL RESEARCH

## Exhibit 44: Freight landings Sep – Dec 2022 vs 2019

Monthly average number of landings vs 2019 levels have cooled off since September 2022

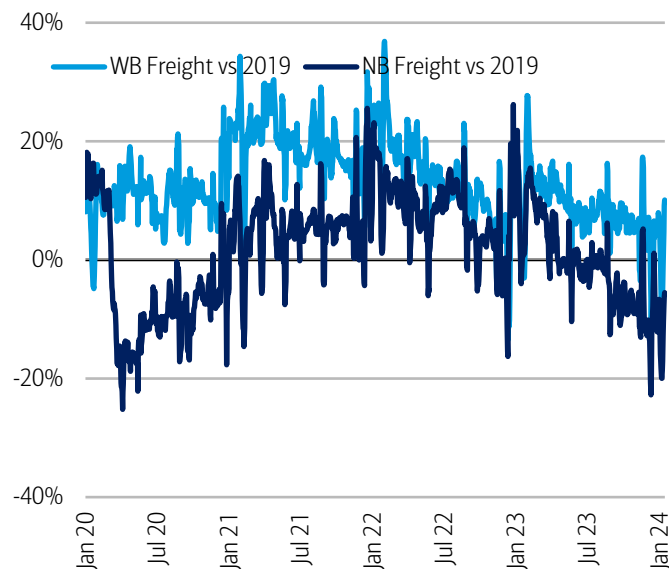


Source: BofA Global Research, Flightradar24

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## Exhibit 45: Narrowbody vs Widebody dedicated freighter flights tracked 7 day avg. YoY %

Narrowbody and Widebody freight have converged through 3Q22

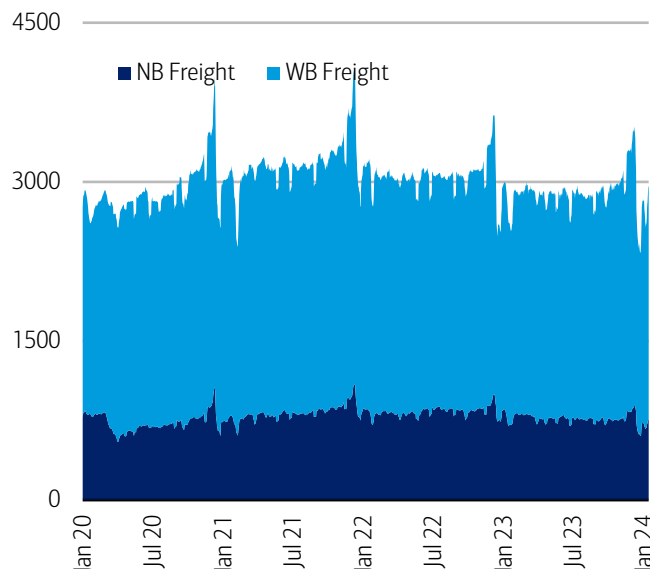


Source: BofA Global Research, Flightradar24

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## Exhibit 46: Narrowbody vs Widebody dedicated freighter flights daily

Freight cycles typically peak around the holiday period in December



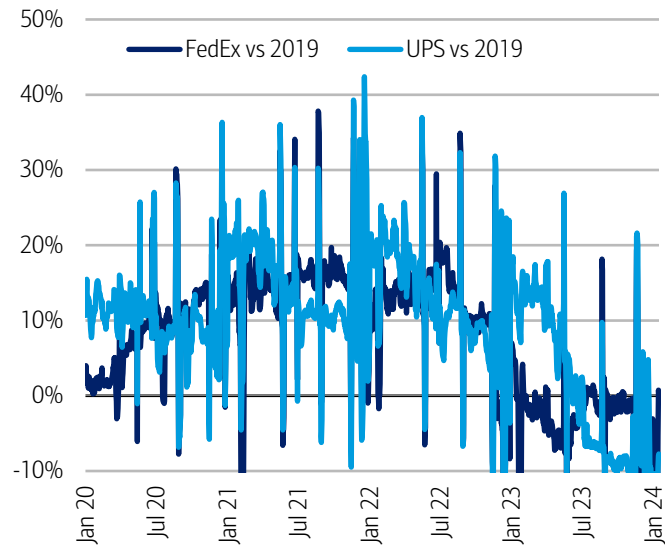
Source: BofA Global Research, Flightradar24

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## Cargo airline cycles

### Exhibit 47: FedEx & UPS 7 day avg. daily flights vs 2019

Fedex and UPS were the 1<sup>st</sup> and 2<sup>nd</sup> largest global cargo airlines in 2019

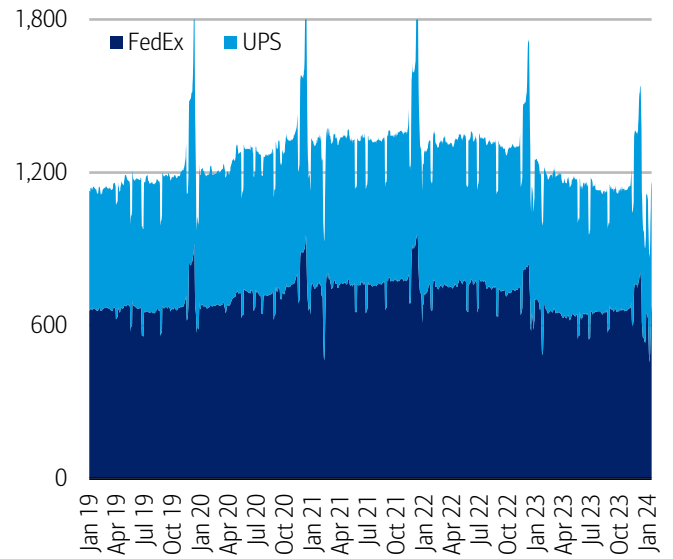


Source: BofA Global Research, Flightradar24

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### Exhibit 48: FedEx & UPS 7 day avg. daily flights total

Freight cycles have reduced slightly through FY22-23



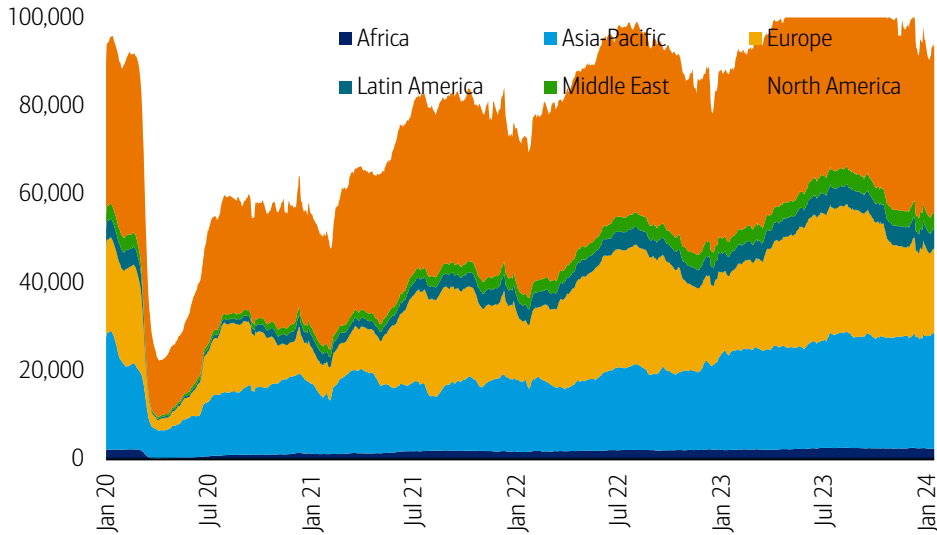
Source: BofA Global Research, Flightradar24

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## Commercial flights regional split

### Exhibit 49: Global commercial flights daily tracked 7 day avg. by region

North America is the largest region globally for daily flight cycles tracked

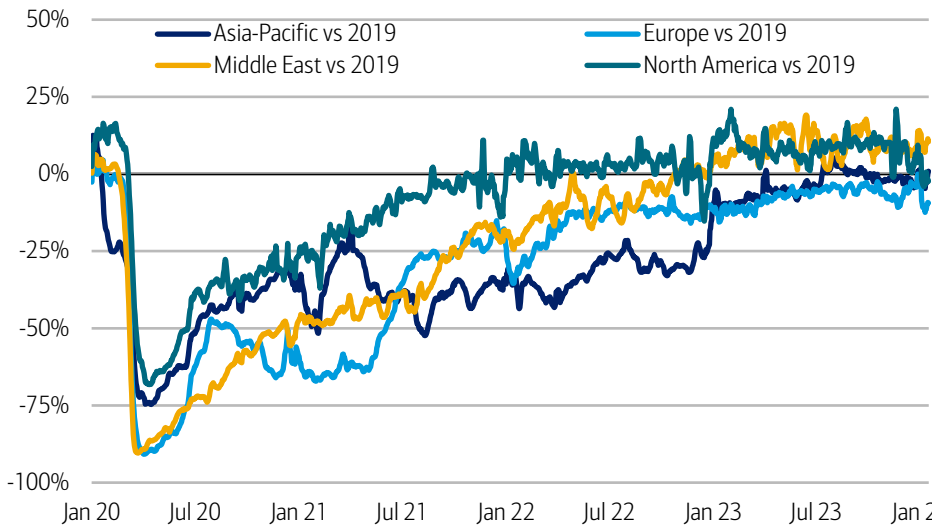


Source: BofA Global Research, Flightradar24

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### Exhibit 50: Global commercial flights daily tracked 7 day avg. vs 2019

North America have been the most resilient region throughout 2022-23, but all regions have continued to recover



Source: BofA Global Research, Flightradar24

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# Monthly flight cycles data tables

## Exhibit 51: Major engine families monthly average flight cycles yoy growth

Most major engine cycles tracked in our data remained below vs 2019 in Dec-23

	CFM56 -5B (A320ceo)	CFM56 -7B (737NG)	CFM56 family	V2500	CFMLEAP	GTF family	Rolls-Royce commercial	P&W	GE	Total
Jan-20	6%	3%	4%	2%	7%	93%	19%	13%	10%	8%
Feb-20	-11%	-12%	-12%	-6%	-12%	68%	-8%	5%	3%	-5%
Mar-20	-40%	-35%	-37%	-37%	-17%	15%	-39%	-26%	-21%	-32%
Apr-20	-85%	-79%	-81%	-90%	-76%	-72%	-77%	-82%	-64%	-80%
May-20	-84%	-79%	-81%	-90%	-69%	-66%	-71%	-81%	-62%	-79%
Jun-20	-77%	-72%	-74%	-81%	-56%	-41%	-71%	-71%	-59%	-72%
Jul-20	-57%	-52%	-54%	-63%	-28%	-19%	-64%	-55%	-49%	-56%
Aug-20	-50%	-43%	-46%	-63%	-13%	-12%	-60%	-52%	-45%	-49%
Sep-20	-52%	-46%	-49%	-66%	-12%	-7%	-57%	-52%	-42%	-49%
Oct-20	-54%	-47%	-50%	-63%	-13%	-7%	-51%	-49%	-38%	-49%
Nov-20	-53%	-43%	-47%	-63%	-17%	-4%	-48%	-47%	-35%	-46%
Dec-20	-49%	-41%	-44%	-59%	-16%	0%	-47%	-42%	-31%	-43%
Vs 2019										
Jan '21 vs '19	-51%	-47%	-48%	-64%	-24%	79%	-44%	-41%	-28%	-44%
Feb '21 vs '19	-57%	-53%	-54%	-66%	-32%	62%	-51%	-44%	-33%	-49%
Mar '21 vs '19	-46%	-40%	-42%	-60%	14%	71%	-42%	-38%	-28%	-40%
Apr '21 vs '19	-46%	-38%	-41%	-56%	45%	63%	-38%	-36%	-26%	-38%
May '21 vs '19	-48%	-40%	-43%	-57%	38%	30%	-41%	-42%	-27%	-40%
Jun '21 vs '19	-46%	-35%	-40%	-55%	54%	29%	-43%	-40%	-25%	-37%
Jul '21 vs '19	-38%	-29%	-33%	-48%	77%	46%	-38%	-34%	-20%	-30%
Aug '21 vs '19	-43%	-35%	-38%	-49%	83%	47%	-46%	-33%	-21%	-33%
Sep '21 vs '19	-37%	-28%	-32%	-48%	91%	54%	-39%	-29%	-18%	-28%
Oct '21 vs '19	-36%	-27%	-31%	-46%	93%	54%	-35%	-26%	-18%	-26%
Nov '21 vs '19	-42%	-31%	-35%	-45%	87%	54%	-37%	-23%	-16%	-28%
Dec '21 vs '19	-39%	-29%	-32%	-41%	83%	61%	-34%	-19%	-15%	-25%
Jan '22 vs '19	-38%	-30%	-33%	-43%	72%	172%	-28%	-16%	-14%	-24%
Feb '22 vs '19	-38%	-29%	-32%	-45%	73%	159%	-34%	-17%	-15%	-25%
Mar '22 vs '19	-42%	-33%	-36%	-41%	123%	157%	-32%	-14%	-13%	-26%
Apr '22 vs '19	-41%	-33%	-36%	-33%	177%	152%	-35%	-9%	-13%	-24%
May '22 vs '19	-36%	-29%	-32%	-30%	191%	144%	-34%	-7%	-13%	-21%
Jun '22 vs '19	-33%	-26%	-29%	-31%	192%	132%	-32%	-8%	-13%	-20%
Jul '22 vs '19	-28%	-23%	-26%	-31%	195%	125%	-29%	-8%	-14%	-18%
Aug '22 vs '19	-28%	-23%	-25%	-31%	208%	119%	-29%	-7%	-15%	-17%
Sep '22 vs '19	-33%	-26%	-29%	-32%	195%	104%	-29%	-8%	-13%	-19%
Oct '22 vs '19	-34%	-28%	-30%	-30%	190%	94%	-31%	-8%	-15%	-20%
Nov '22 vs '19	-37%	-29%	-32%	-28%	179%	87%	-29%	-6%	-14%	-20%
Dec '22 vs '19	-34%	-28%	-31%	-28%	170%	86%	-28%	-5%	-16%	-20%
Jan '23 vs '19	-24%	-18%	-21%	-26%	183%	266%	-8%	9%	-5%	-8%
Feb '23 vs '19	-23%	-17%	-20%	-27%	170%	250%	-6%	6%	-2%	-8%
Mar '23 vs '19	-24%	-17%	-20%	-27%	262%	228%	-4%	6%	-2%	-8%
Apr '23 vs '19	-22%	-16%	-19%	-26%	354%	205%	-3%	5%	-4%	-7%
May '23 vs '19	-22%	-16%	-19%	-26%	350%	184%	-5%	5%	-4%	-7%
Jun '23 vs '19	-22%	-17%	-19%	-28%	347%	168%	-4%	2%	-5%	-8%
Jul '23 vs '19	-19%	-14%	-17%	-27%	353%	163%	-3%	2%	-6%	-6%
Aug '23 vs '19	-16%	-11%	-14%	-26%	376%	162%	-2%	4%	-5%	-3%
Sep '23 vs '19	-18%	-12%	-15%	-26%	352%	145%	-4%	4%	-3%	-4%
Oct '23 vs '19	-20%	-12%	-16%	-25%	341%	128%	-2%	2%	-4%	-4%
Nov '23 vs '19	-21%	-15%	-18%	-25%	315%	114%	-4%	2%	-3%	-5%
Dec '23 vs '19	-22%	-15%	-18%	-25%	294%	106%	-3%	0%	-6%	-6%

Source: BofA Global Research, Flightradar24

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**Exhibit 52: Airbus aircraft monthly average flight cycles yoy growth**

Airbus' newest platforms (A320neo, A350, A220) have outperformed legacy platforms (A320ceo, A330, A340, A380) in Dec-23

YoY %	Airbus								Airbus total
	A320neo	A320ceo	A330	A340	A350	A380	A300	A220	
Jan-20	87%	0%	-1%	-21%	48%	4%	-5%	67%	8%
Feb-20	56%	-14%	-30%	-33%	20%	-6%	-6%	62%	-9%
Mar-20	10%	-42%	-57%	-62%	-23%	-44%	-13%	-6%	-38%
Apr-20	-74%	-87%	-83%	-87%	-68%	-99%	-4%	-71%	-85%
May-20	-68%	-86%	-77%	-80%	-56%	-99%	-9%	-68%	-82%
Jun-20	-49%	-79%	-77%	-87%	-52%	-99%	0%	-44%	-75%
Jul-20	-25%	-60%	-71%	-86%	-42%	-98%	-4%	-19%	-57%
Aug-20	-12%	-55%	-65%	-84%	-40%	-96%	-11%	-18%	-51%
Sep-20	-7%	-57%	-62%	-83%	-37%	-96%	0%	-26%	-51%
Oct-20	-6%	-57%	-55%	-81%	-32%	-96%	-5%	-41%	-51%
Nov-20	-6%	-56%	-53%	-74%	-26%	-95%	-3%	-41%	-49%
Dec-20	-1%	-52%	-52%	-71%	-25%	-94%	5%	-41%	-45%
Vs 2019									
Jan '21 vs '19	63%	-56%	-59%	-79%	-6%	-94%	-4%	-12%	-46%
Feb '21 vs '19	44%	-61%	-65%	-79%	-14%	-97%	-6%	-17%	-52%
Mar '21 vs '19	60%	-52%	-53%	-80%	-7%	-95%	1%	-14%	-42%
Apr '21 vs '19	56%	-50%	-49%	-75%	-2%	-93%	-2%	-11%	-40%
May '21 vs '19	29%	-52%	-50%	-75%	-7%	-92%	-10%	-5%	-44%
Jun '21 vs '19	29%	-50%	-53%	-71%	-11%	-92%	-6%	10%	-42%
Jul '21 vs '19	45%	-42%	-47%	-66%	-7%	-89%	-11%	29%	-33%
Aug '21 vs '19	44%	-45%	-57%	-67%	-14%	-89%	-12%	40%	-36%
Sep '21 vs '19	53%	-41%	-48%	-67%	-7%	-88%	0%	38%	-31%
Oct '21 vs '19	53%	-39%	-42%	-57%	-5%	-84%	-10%	37%	-28%
Nov '21 vs '19	49%	-42%	-47%	-51%	-5%	-74%	-1%	48%	-30%
Dec '21 vs '19	51%	-38%	-43%	-49%	-3%	-71%	9%	46%	-26%
Jan '22 vs '19	149%	-41%	-47%	-64%	28%	-70%	-11%	136%	-25%
Feb '22 vs '19	140%	-41%	-49%	-70%	12%	-69%	-9%	120%	-25%
Mar '22 vs '19	129%	-42%	-48%	-65%	15%	-65%	-3%	119%	-26%
Apr '22 vs '19	118%	-39%	-50%	-60%	18%	-62%	-6%	125%	-24%
May '22 vs '19	120%	-34%	-49%	-61%	19%	-59%	-12%	114%	-19%
Jun '22 vs '19	115%	-32%	-45%	-61%	19%	-61%	-1%	110%	-17%
Jul '22 vs '19	113%	-28%	-42%	-58%	18%	-58%	-12%	104%	-14%
Aug '22 vs '19	114%	-27%	-42%	-60%	21%	-58%	-10%	101%	-13%
Sep '22 vs '19	100%	-31%	-42%	-61%	19%	-55%	-3%	91%	-16%
Oct '22 vs '19	93%	-31%	-42%	-59%	18%	-51%	-20%	88%	-17%
Nov '22 vs '19	85%	-32%	-43%	-54%	17%	-46%	-6%	102%	-17%
Dec '22 vs '19	87%	-29%	-41%	-54%	17%	-45%	-10%	90%	-14%
Jan '23 vs '19	252%	-24%	-31%	-64%	77%	-42%	-24%	218%	-1%
Feb '23 vs '19	234%	-24%	-29%	-66%	72%	-39%	-22%	226%	-1%
Mar '23 vs '19	218%	-23%	-26%	-63%	74%	-40%	-20%	204%	-1%
Apr '23 vs '19	203%	-21%	-22%	-55%	78%	-37%	-26%	192%	1%
May '23 vs '19	188%	-20%	-24%	-53%	77%	-33%	-26%	179%	1%
Jun '23 vs '19	177%	-20%	-23%	-48%	78%	-34%	-21%	175%	1%
Jul '23 vs '19	178%	-18%	-19%	-46%	77%	-35%	-30%	157%	4%
Aug '23 vs '19	186%	-15%	-19%	-52%	79%	-35%	-27%	159%	7%
Sep '23 vs '19	172%	-17%	-20%	-47%	76%	-32%	-24%	144%	5%
Oct '23 vs '19	157%	-17%	-19%	-33%	76%	-30%	-32%	143%	5%
Nov '23 vs '19	144%	-19%	-21%	-32%	71%	-27%	-20%	140%	3%
Dec '23 vs '19	135%	-19%	-20%	-33%	69%	-32%	-26%	137%	3%

Source: BofA Global Research, Flightradar24

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**Exhibit 53: Boeing aircraft monthly average flight cycles yoy growth**

787 exhibited the strongest performance in Dec-23

YoY %	737 Org/Classic	737NG	747	757	767	777	787	717	Boeing Total
Jan-20	3%	3%	-5%	3%	6%	0%	22%	8%	0%
Feb-20	4%	-12%	-9%	4%	4%	-9%	0%	7%	-12%
Mar-20	-18%	-35%	-12%	-17%	-12%	-35%	-27%	-20%	-32%
Apr-20	-60%	-79%	-21%	-60%	-41%	-67%	-73%	-79%	-73%
May-20	-60%	-79%	-20%	-64%	-42%	-58%	-64%	-82%	-73%
Jun-20	-55%	-72%	-23%	-60%	-40%	-60%	-61%	-72%	-67%
Jul-20	-54%	-52%	-27%	-53%	-41%	-57%	-52%	-54%	-51%
Aug-20	-51%	-43%	-23%	-46%	-37%	-54%	-47%	-56%	-44%
Sep-20	-40%	-46%	-18%	-41%	-33%	-50%	-44%	-60%	-45%
Oct-20	-33%	-47%	-15%	-38%	-31%	-46%	-38%	-62%	-45%
Nov-20	-20%	-43%	-14%	-33%	-26%	-42%	-28%	-58%	-40%
Dec-20	-14%	-41%	-12%	-24%	-22%	-38%	-23%	-55%	-37%
Vs 2019									
Jan '21 vs '19	-19%	-47%	-11%	-31%	-26%	-44%	-19%	-53%	-44%
Feb '21 vs '19	-15%	-53%	-9%	-31%	-29%	-45%	-24%	-54%	-48%
Mar '21 vs '19	-13%	-40%	-15%	-27%	-23%	-43%	-14%	-52%	-37%
Apr '21 vs '19	-25%	-38%	-14%	-27%	-19%	-43%	-13%	-53%	-35%
May '21 vs '19	-31%	-40%	-14%	-34%	-23%	-42%	-19%	-54%	-36%
Jun'21 vs '19	-31%	-35%	-16%	-31%	-19%	-42%	-22%	-47%	-32%
Jul'21 vs '19	-36%	-29%	-16%	-31%	-18%	-39%	-16%	-48%	-27%
Aug'21 vs '19	-33%	-35%	-16%	-29%	-16%	-41%	-23%	-50%	-30%
Sep'21 vs '19	-23%	-28%	-12%	-23%	-13%	-38%	-19%	-46%	-24%
Oct'21 vs '19	-17%	-27%	-8%	-24%	-14%	-34%	-13%	-46%	-22%
Nov'21 vs '19	-4%	-31%	-12%	-15%	-8%	-32%	-13%	-40%	-24%
Dec'21 vs '19	-6%	-29%	-9%	-14%	-4%	-29%	-10%	-40%	-21%
Jan'22 vs '19	-9%	-30%	-13%	-17%	-7%	-35%	2%	-36%	-25%
Feb'22 vs '19	-5%	-29%	-10%	-17%	-10%	-34%	1%	-39%	-24%
Mar'22 vs '19	-6%	-33%	-19%	-16%	-6%	-32%	4%	-33%	-24%
Apr'22 vs '19	-20%	-33%	-21%	-25%	-7%	-34%	-1%	-34%	-24%
May'22 vs '19	-23%	-29%	-23%	-29%	-11%	-30%	1%	-32%	-21%
Jun'22 vs '19	-26%	-26%	-23%	-26%	-8%	-29%	0%	-33%	-18%
Jul'22 vs '19	-31%	-23%	-26%	-22%	-12%	-28%	2%	-32%	-16%
Aug'22 vs '19	-30%	-23%	-25%	-21%	-9%	-28%	1%	-32%	-15%
Sep'22 vs '19	-26%	-26%	-25%	-18%	-7%	-26%	-2%	-30%	-16%
Oct'22 vs '19	-23%	-28%	-21%	-26%	-11%	-26%	-3%	-26%	-17%
Nov'22 vs '19	-13%	-29%	-23%	-13%	-5%	-25%	-1%	-20%	-17%
Dec'22 vs '19	-14%	-28%	-25%	-16%	-7%	-22%	2%	-27%	-16%
Jan'23 vs '19	-16%	-18%	-32%	-14%	-5%	-22%	30%	-19%	-9%
Feb'23 vs '19	-13%	-17%	-18%	-10%	-3%	-20%	31%	-23%	-7%
Mar'23 vs '19	-17%	-17%	-20%	-14%	-2%	-19%	34%	-23%	-5%
Apr'23 vs '19	-30%	-16%	-21%	-25%	-5%	-16%	27%	-27%	-4%
May'23 vs '19	-31%	-16%	-25%	-27%	-7%	-14%	27%	-29%	-3%
Jun'23 vs '19	-33%	-17%	-22%	-24%	-4%	-11%	31%	-29%	-3%
Jul'23 vs '19	-38%	-14%	-24%	-28%	-11%	-10%	30%	-30%	-1%
Aug'23 vs '19	-35%	-11%	-27%	-25%	-6%	-12%	27%	-32%	2%
Sep'23 vs '19	-30%	-12%	-24%	-21%	-5%	-12%	25%	-24%	2%
Oct'23 vs '19	-29%	-12%	-21%	-24%	-8%	-10%	28%	-21%	2%
Nov'23 vs '19	-28%	-15%	-19%	-15%	-1%	-10%	25%	-18%	1%
Dec'23 vs '19	-30%	-15%	-21%	-19%	-5%	-10%	22%	-24%	1%

Source: BofA Global Research, Flightradar24

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**Exhibit 54: Airbus aircraft quarterly average flight cycles yoy growth**

Airbus' newest platforms (A320neo, A350, A220) have outperformed legacy platforms (A320ceo, A330, A340, A380) as of 4Q23

	A320neo	A320ceo	A330	A340	A350	A380	A300	A220	Airbus total
1Q20	49%	-19%	-29%	-39%	14%	-16%	-8%	39%	-13%
2Q20	-63%	-84%	-79%	-85%	-58%	-99%	-4%	-61%	-80%
3Q20	-15%	-57%	-66%	-84%	-40%	-97%	-5%	-21%	-53%
4Q20	-4%	-55%	-53%	-76%	-27%	-95%	-1%	-41%	-48%
1Q21	5%	-46%	-42%	-66%	-20%	-94%	5%	-38%	-38%
2Q21	271%	206%	137%	75%	124%	549%	-2%	151%	199%
3Q21	73%	34%	46%	112%	50%	246%	-3%	71%	42%

**Exhibit 54: Airbus aircraft quarterly average flight cycles yoy growth**

Airbus' newest platforms (A320neo, A350, A220) have outperformed legacy platforms (A320ceo, A330, A340, A380) as of 4Q23

	A320neo	A320ceo	A330	A340	A350	A380	A300	A220	Airbus total
4Q21	58%	35%	20%	93%	32%	367%	0%	144%	40%
1Q22	53%	34%	26%	64%	30%	545%	-5%	162%	39%
2Q22	59%	32%	6%	48%	27%	425%	0%	119%	37%
3Q22	42%	25%	17%	22%	32%	283%	-1%	47%	29%
4Q22	25%	14%	4%	-7%	23%	123%	-12%	34%	17%
1Q23	40%	29%	37%	6%	47%	87%	-16%	40%	32%
2Q23	33%	21%	47%	22%	50%	65%	-20%	30%	26%
3Q23	34%	17%	39%	28%	48%	53%	-20%	27%	23%
4Q23	30%	19%	38%	52%	47%	34%	-16%	24%	23%
<b>Vs 2019</b>									
1Q21 vs 1Q19	56%	-56%	-59%	-79%	-9%	-95%	-3%	-14%	-46%
2Q21 vs 2Q19	37%	-51%	-51%	-73%	-7%	-92%	-6%	-1%	-42%
3Q21 vs 3Q19	47%	-43%	-51%	-67%	-9%	-89%	-8%	35%	-34%
4Q21 vs 4Q19	51%	-39%	-44%	-53%	-4%	-76%	0%	44%	-28%
1Q22 vs 1Q19	139%	-41%	-48%	-66%	19%	-68%	-8%	125%	-25%
2Q22 vs 2Q19	118%	-35%	-48%	-61%	19%	-61%	-6%	116%	-20%
3Q22 vs 3Q19	109%	-29%	-42%	-60%	20%	-57%	-9%	99%	-14%
4Q22 vs 4Q19	88%	-31%	-42%	-56%	17%	-47%	-12%	93%	-16%
1Q23 vs 1Q19	234%	-24%	-29%	-64%	74%	-40%	-22%	215%	-1%
2Q23 vs 2Q19	189%	-21%	-23%	-52%	78%	-35%	-24%	182%	1%
3Q23 vs 3Q19	179%	-16%	-20%	-48%	77%	-34%	-27%	153%	5%
4Q23 vs 4Q19	145%	-18%	-20%	-33%	72%	-30%	-26%	140%	4%

Source: BofA Global Research, Flightradar24

BofA GLOBAL RESEARCH

**Exhibit 55: Boeing aircraft quarterly average flight cycles yoy growth**

787 exhibited the strongest performance in 4Q23

	737 Org/Classic	737NG	747	757	767	777	787	717	Boeing Total
1Q20	-4%	-15%	-9%	-4%	-1%	-15%	-2%	-2%	-15%
2Q20	-58%	-76%	-21%	-61%	-41%	-62%	-66%	-78%	-71%
3Q20	-49%	-47%	-23%	-47%	-37%	-54%	-48%	-57%	-47%
4Q20	-23%	-43%	-13%	-32%	-26%	-42%	-30%	-59%	-41%
1Q21	-12%	-37%	-3%	-27%	-25%	-34%	-17%	-52%	-33%
2Q21	67%	164%	9%	79%	35%	50%	140%	117%	127%
3Q21	34%	31%	10%	36%	34%	32%	55%	20%	37%
4Q21	17%	26%	4%	20%	24%	18%	25%	40%	31%
1Q22	10%	29%	-3%	19%	25%	18%	26%	36%	33%
2Q22	9%	13%	-9%	6%	15%	20%	22%	38%	20%
3Q22	3%	10%	-12%	10%	8%	20%	24%	32%	16%
4Q22	-8%	1%	-15%	-1%	1%	11%	13%	31%	7%
1Q23	-9%	19%	-10%	5%	5%	20%	29%	22%	22%
2Q23	-11%	19%	-1%	2%	4%	25%	29%	6%	22%
3Q23	-8%	15%	1%	-6%	3%	21%	27%	4%	20%
4Q23	-15%	20%	3%	-1%	3%	19%	25%	4%	22%
<b>Vs 2019</b>									
1Q21 vs 1Q19	-16%	-46%	-12%	-30%	-26%	-44%	-19%	-53%	-43%
2Q21 vs 2Q19	-29%	-38%	-14%	-31%	-20%	-42%	-18%	-51%	-34%
3Q21 vs 3Q19	-31%	-31%	-15%	-28%	-16%	-39%	-19%	-48%	-27%
4Q21 vs 4Q19	-10%	-29%	-10%	-18%	-9%	-32%	-12%	-42%	-22%
1Q22 vs 1Q19	-7%	-31%	-15%	-17%	-8%	-33%	2%	-36%	-24%
2Q22 vs 2Q19	-23%	-29%	-22%	-27%	-9%	-31%	0%	-33%	-21%
3Q22 vs 3Q19	-29%	-24%	-25%	-21%	-9%	-27%	0%	-31%	-16%
4Q22 vs 4Q19	-17%	-28%	-23%	-18%	-8%	-24%	0%	-24%	-17%
1Q23 vs 1Q19	-15%	-17%	-23%	-13%	-3%	-20%	32%	-22%	-7%
2Q23 vs 2Q19	-32%	-16%	-23%	-25%	-5%	-14%	28%	-29%	-3%
3Q23 vs 3Q19	-34%	-12%	-25%	-25%	-7%	-12%	27%	-29%	1%
4Q23 vs 4Q19	-29%	-14%	-21%	-20%	-4%	-10%	25%	-21%	1%

Source: BofA Global Research, Flightradar24

BofA GLOBAL RESEARCH

## What is the BofA Commercial Aerospace Tracker?

In partnership with **BofA's Predictive Data Analytics** team, the BofA Commercial Aerospace Tracker analyses Flightradar24 data which tracks ADS-B positions from global commercial, freight, regional and business aircraft allowing daily tracking and analysis of flight activity. The dataset will provide a real-time insight into daily activity by **engine type, airframe, narrowbody vs widebody, commercial vs freight, region, airline** and **airport**.

Below we highlight the data we intend to regularly highlight which can help to provide a frame of reference for the COVID-19 recovery.

### Exhibit 56: Available data matrix – Flight Radar daily aircraft cycles data

Available data matrix

Usage	Equipment	Engine type	Region	Aircraft type
Bizjet	A220	CF6	Africa	Bizjet
Commercial	A320neo	CFM LEAP	Asia-Pacific	Narrowbody
Freight	A320ceo	CFM56	Europe	Regional
Light	A330	GE CF34	Latin America	Widebody
Regional	A340	GE90	Middle East	
	A350	GE9X	North America	
	A380	GENX		
	A300	GENX-2B		
	737 Original/Classic	GP7200		
	737NG	JT3D		
	737MAX	JT8D		
	747	JT9D		
	757	PW100		
	767	PW1100G 'GTF'		
	777	PW1500G		
	787	PW1900G		
	717	PW2000		
	ATR family	PW4000		
	Embraer 135/145	RB211		
	Embraer E-Jet Family	TRENT		
		TRENT 1000		
		TRENT 500		
		TRENT 700		
		TRENT 7000		
		TRENT 800		
		TRENT 900		
		TRENT XWB		
		V2500		

Source: BofA Global Research, Flightradar24

BofA GLOBAL RESEARCH

## What is Flightradar24?

**Flightradar24** is a global flight tracking service that provides real-time information about thousands of aircraft around the world. Flightradar24 has access to the largest ADS-B network in the world with over 20,000 connected receivers in the commercial fleet, tracking over 180,000 flights per day across commercial, freight, regional, light, military and more. Flightradar24 combines data from several data sources including ADS-B, MLAT and radar data. The ADS-B, MLAT and radar data is aggregated together with schedule and flight status data from airlines and airports. (Source: Flightradar24.com)

## How does BofA Research process Flightradar24's data?

In partnership with **BofA's Predictive Data Analytics** team, we apply an overlay to Flightradar24's daily flight data, stripping out takeoffs and landings by aircraft engine type, airframe, narrowbody vs widebody, commercial vs freight, region, airports and more. This allows us to track the daily evolution of cycles for different aircraft and group in different datasets and display timeseries trends.

## Data exceptions

**Flightradar24** has an extensive database detailing aircraft registration, Mode S address, age, aircraft type and more. Due to the large volume of data and continual updates there are occasionally minor inaccuracies. (Source: Flightradar24).

The Flightradar24 data analysed and presented by **BofA Research** in the charts may also have some minor inaccuracies. This reflects in some cases inability to determine engine type for wetleased aircraft flying under different airline ICAO tags. In some cases, older commercial aircraft do not have ADS-B transponders fitted and do not appear in the daily data. For security and privacy reasons information about some aircraft is limited or blocked. This includes most military aircraft and certain high-profile aircraft, like Air Force One. We therefore cannot guarantee the data we have analysed and displayed in the report is 100% representative of the number of flight movements for each platform/engine/region/use type, although we think it is a good indicator.

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