Effects of Novel Coronavirus (COVID-19) on Civil Aviation: Economic Impact Analysis

Montréal, Canada
10 March 2020
Introduction and Background

Scenario Analysis: Mainland China

Scenario Analysis: Hong Kong SAR of China and Macao SAR of China

Summary of Scenario Analysis and Additional Estimates: China

Scenario Analysis: Republic of Korea

Scenario Analysis: Italy

Scenario Analysis: Iran (Islamic Republic of)

Appendix
Estimated impact of COVID-19 outbreak on scheduled **international passenger** traffic during **1Q 2020** compared to originally-planned:

- **China (including Hong Kong/Macao SARs)**: 42 to 43% seat capacity reduction, 24.8 to 28.1 million passenger reduction, USD 6.0 to 6.9 billion loss of gross operating revenues of airlines

- **Republic of Korea**: 27% seat capacity reduction, 6.1 to 6.6 million passenger reduction, USD 1.3 to 1.4 billion loss of gross operating revenues of airlines

- **Italy**: 14% seat capacity reduction, 3.6 to 4.3 million passenger reduction, USD 0.5 to 0.6 billion loss of gross operating revenues of airlines

- **Iran (Islamic Republic of)**: 25% seat capacity reduction, 580,000 to 630,000 passenger reduction, USD 92 to 100 million loss of gross operating revenues of airlines
Introduction and Background
Air traffic has been vulnerable to external factors including disease outbreaks
What can we learn from past experience? SARS, Aviation flu and MERS

History shows that SARS has the most serious impact on traffic. At the height of the outbreak (May 2003), monthly RPKs of Asia-Pacific airlines were 35% lower than their pre-crisis levels. Overall in 2003, Asia-Pacific airlines lost 8% of annual RPKs and $6 billion of revenues.

Source: IATA Economics’ Chart of the Week (24 January 2020)
**Total number of passenger moved through Chinese airports**

**2003-2018**

(million of passengers)

**Passengers move to/from Chinese airports**

**2003 vs 2018**

- **Domestic passengers**
  - 2003: 50
  - 2018: 702

- **International Passengers**
  - 2003: 138
  - 2018: 114

**Annual average growth rate:** **9.6%**

**Source:** ICAO-ACI Airport traffic data
Chinese economic size quadrupled since 2003 but growth rate slowed down.
China is more integrated in the global economy

**Share of China in world**

<table>
<thead>
<tr>
<th>%</th>
<th>2002</th>
<th>2019</th>
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<tbody>
<tr>
<td>Global GDP</td>
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<td>Global trade</td>
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<td>Global FDI</td>
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<td>Global tourists</td>
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**Computers, electronics and electrical equipment sector**

- Value added export dependence to China, % of country’s sector output
- Value added import dependence from China, % of country’s sector output
- Share of world value added by the sector

Value added trade flows between China and key partners

**Source:** OECD Interim Economic Outlook dated 2 March 2020
The drop in Chinese travellers will hit hard
Air connectivity of China in terms of O-D passenger movement

Major international air traffic originating from People's Republic of China in 2018

Source: ICAO-ICM MIDT data
Air connectivity of Wuhan airport in terms of O-D passenger movement

Source: ICAO-ICM MIDT data
COVID-19 outbreak caused a substantial setback in flight bookings for Chinese New Year

Chinese air arrivals in worldwide regions for Chinese New Year, before vs one week after the travel restrictions

- CNY2019 final
- CNY2020 as of 19 Jan
- CNY2020 as of 26 Jan

Source: forwardkeys.com
Flight cancellation has exceeded actual operations since 31 January 2020

Number of originally-planned flights

Number of actual operations

Number of cancellation

Note: The above includes a) international from mainland China, Hong Kong SAR of China, Macao SAR of China, Taiwan, Province of China; b) domestic within mainland China, and c) regional between mainland China and Hong Kong SAR, Macao SAR and Taiwan Province

Source: CARNOC.com (retrieved on 9 March 2020)
Scenario Analysis: Mainland China

This is a preliminary analysis. Figures and estimates herein will be updated with the situation evolving and more information available.
**Scope of analysis: Mainland China**

- **“International”** refers to scheduled international passenger services from/to mainland China excluding:
  - scheduled passenger services between mainland China and Hong Kong Special Administrative Region (SAR) of China, Macao SAR of China and Taiwan, Province of China; and
  - scheduled international passenger services from/to Hong Kong SAR, Macao SAR of China and Taiwan, Province of China

- **“Regional”** refers to scheduled passenger services:
  - between mainland China and Hong Kong SAR of China
  - between mainland China and Macao SAR of China; and
  - between mainland China and Taiwan, Province of China
Number of seats offered by airlines (monthly, 2019)

Capacity share 2019

- 45%: International by Chinese carriers
- 37%: International by foreign carriers
- 9% Regional (mainland China - Hong Kong SAR)
- 3% Regional (mainland China - Macao SAR)
- 7% Regional (mainland China - Taiwan Province)

Source: OAG Scheduled data
Number of seats offered by airlines
(1Q 2020 originally-planned)

Capacity share 1Q 2020

- 48%: International by Chinese carriers
- 36%: International by foreign carriers
- 7% Mainland China - Hong Kong SAR
- 3% Mainland China - Macao SAR
- 6% Mainland China - Taiwan Province

Source: OAG Scheduled data
Over 130 airlines reduced international services or cancelled all operations from/to mainland China.

**International (136)**

- Beijing Capital Airlines
- British Airways*
- Cambodia Airways Co. Ltd
- Cambodia Angkor Air*
- Cebu Pacific Air*
- Chengdu Airlines
- China Eastern Airlines
- China Express Airlines
- China Southern Airlines
- China United Airlines
- China West Air*
- Chongqing Airlines*
- Citilink Indonesia
- Delta Air Lines*
- Donghai Airlines*
- Eastar Jet
- Egyptair**
- El Al Israel Airlines*
- Emirates
- Lanmei Airlines
- Lao Airlines
- Ethihad Airways
- Finnair*
- Garuda Indonesia*
- Guangxi Beibu Gulf Airlines
- Hainan Airlines
- Hebei Airlines*
- Himalaya Airlines*
- Iberia*
- IndiGo*
- IrAero*
- Iraqi Airways*
- Japan Airlines
- JC Cambodia Intl Airlines
- Jeju Airlines
- Jetstar Asia*
- Jetstar Japan*
- Jetstar Pacific Airlines*
- Jin Air*
- Juneyao Airlines
- Kenya Airways*
- KLM-Royal Dutch Airlines*
- Korean Air
- Kumming Airlines
- Lanmei Airlines
- LOT - Polish Airlines*
- Lucky Air Co. Ltd.
- Lufthansa German Airlines*
- Mahan Air*
- Malaysia Airlines
- Malindo Airways
- MIAT - Mongolian Airlines*
- Myanmar Airways Intl*
- Myanmar National Airlines*
- Neos Air*
- Nok Air*
- NokScoot Airlines Co Ltd*
- NordStar*
- Okay Airways*
- Oman Air*
- Pakistan Intl Airlines*
- PAL Express*
- Peach Aviation Limited*
- Pegasus Fly*
- Philippine Airlines*
- Philippines AirAsia Inc.*
- Qantas Airways*
- Qatar Airways*
- Qingdao Airline Co, Ltd
- Royal Air Maroc*
- Royal Brunei Airlines*
- Royal Flight Airlines*
- Ruili Airlines
- SAS Scandinavian Airlines*
- Saudi Arabian Airlines*
- Scoot*
- Shandong Airlines
- Shanghai Airlines
- Shenzhen Airlines
- Siberia Airlines*
- Sichuan Airlines
- SilkAir
- Singapore Airlines
- Sky Angkor Airlines
- Somon Air*
- Spring Airlines
- Spring Airlines Japan
- SriLankan Airlines
- SWISS*
- Thai Air Asia X
- Thai AirAsia
- Thai Airways International
- Thai Lion Air
- Thai Smile Airways*
- Tianjin Airlines*
- Tibet Airlines*
- Turkish Airlines**
- Turkmenistan Airlines*
- T’way Air*
- Ukraine Inter Airlines*
- United Airlines*
- Ural Airlines
- Urumqi Airlines*
- US-Bangla Airlines
- Shandong Airlines
- Shanghai Airlines
- Vietnam Airlines*
- Virgin Atlantic Airways*
- Xiamen Airlines Company
- Yakutia*
- Zhejiang Loong Airlines

**Regional (25)**

- Air China
- Air Macau
- Cathay Dragon
- Cathay Pacific Airways
- China Airlines
- China Eastern Airlines
- China Southern Airlines
- Chongqing Airlines
- Air New Zealand
- Delta Air Lines*
- Juneyao Airlines
- Peach Aviation Limited*
- Philippine Airlines*
- Qantas Airways*
- Thai Airways China Airlines
- Ukraine Inter Airlines*
- United Airlines*
- Hong Kong Airlines
- Ural Airlines
- Shanghai Airlines
- Vietnam Airlines*
- HK Express
- Mandarin Airlines
- Shandong Airlines
- Shanghai Airlines
- Shenzhen Airlines
- Sichuan Airlines
- Tigerair Taiwain Co. Ltd
- Uni Airways
- Zhejiang Loong Airlines

*Announced since late January 2020; Duration varies*

*: Airlines with all service cancelled*

**: Airlines with all service cancelled but gradual resumption**

**Source:** Routes Online, OAG and airline websites (as of 10 March 2020)
Scenario analysis of COVID-19 outbreak impact for 1Q 2020

- **Baseline (hypothetical situation without COVID-19 outbreak)**
  - Seat capacity: used "originally-planned" winter schedule
  - Load factor: used 2018 actual results of airlines (average)

- **Scenario 1 (mild)**
  - Seat capacity: estimated by airlines' schedule changes
  - Load factor: used 2018 actual results of airlines except Hong Kong SAR of China

- **Scenario 2 (severe)**
  - Seat capacity in January and February: estimated by airlines' schedule changes
  - Seat capacity in March: assumed summer schedules not starting from 29 March
  - Load factor: 12 – 22 and 7 – 17 percentage points lower in February and March from January, respectively
## Scenario analysis: Assumptions

### Seat capacity reduction from originally-planned

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Baseline</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
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</thead>
<tbody>
<tr>
<td>Seat capacity reduction from originally-planned</td>
<td>Passenger load factor</td>
<td>Passenger load factor</td>
<td>Passenger load factor</td>
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<tr>
<td><strong>January 2020</strong></td>
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<tr>
<td>International from/to mainland China (Chinese carriers)</td>
<td>0%</td>
<td>-1%</td>
<td>-1%</td>
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<tr>
<td>International from/to mainland China (Foreign carriers)</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Regional between mainland China and Hong Kong SAR of China</td>
<td>0%</td>
<td>0%</td>
<td>70%</td>
</tr>
<tr>
<td>Regional between mainland China and Macao SAR of China</td>
<td>0%</td>
<td>-1%</td>
<td>80%</td>
</tr>
<tr>
<td>Regional between mainland China and Taiwan, Province of China</td>
<td>0%</td>
<td>-1%</td>
<td>80%</td>
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<tr>
<td><strong>February 2020</strong></td>
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<tr>
<td>International from/to mainland China (Chinese carriers)</td>
<td>0%</td>
<td>-57%</td>
<td>-57%</td>
</tr>
<tr>
<td>International from/to mainland China (Foreign carriers)</td>
<td>0%</td>
<td>-64%</td>
<td>-64%</td>
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<tr>
<td>Regional between mainland China and Hong Kong SAR of China</td>
<td>0%</td>
<td>-65%</td>
<td>70%</td>
</tr>
<tr>
<td>Regional between mainland China and Macao SAR of China</td>
<td>0%</td>
<td>-67%</td>
<td>80%</td>
</tr>
<tr>
<td>Regional between mainland China and Taiwan, Province of China</td>
<td>0%</td>
<td>-60%</td>
<td>80%</td>
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<td><strong>March 2020</strong></td>
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<tr>
<td>International from/to mainland China (Chinese carriers)</td>
<td>0%</td>
<td>-77%</td>
<td>-80%</td>
</tr>
<tr>
<td>International from/to mainland China (Foreign carriers)</td>
<td>0%</td>
<td>-80%</td>
<td>80%</td>
</tr>
<tr>
<td>Regional between mainland China and Hong Kong SAR of China</td>
<td>0%</td>
<td>-82%</td>
<td>70%</td>
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<tr>
<td>Regional between mainland China and Macao SAR of China</td>
<td>0%</td>
<td>-70%</td>
<td>80%</td>
</tr>
<tr>
<td>Regional between mainland China and Taiwan, Province of China</td>
<td>0%</td>
<td>-77%</td>
<td>80%</td>
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</tbody>
</table>
Baseline: 10% seat capacity increase compared to 1Q 2019

A total of YoY 10% seat capacity increase originally planned for 1Q 2020 despite the reduction of capacity between mainland China and Hong Kong SAR and Taiwan Province.
Scenarios 1 & 2:
46% seat capacity reduction from Baseline

Scenario 1: for 1Q 2020 a total of 40% reduction compared to 1Q 2019 and 46% reduction from Baseline

Scenario 2: for 1Q 2020 a total of 41% reduction compared to 1Q 2019 and 46% reduction from Baseline

Source: ICAO estimates
16.3 to 18.0 million “international” passenger reduction in 1Q 2020 compared to Baseline

**Scenario 1**
16.3 million passenger reduction

**Scenario 2**
18.0 million passenger reduction

Source: ICAO estimates
3.4 to 3.7 million “regional” passenger reduction in 1Q 2020 compared to Baseline

**Scenario 1**

3.4 million passenger reduction

**Scenario 2**

3.7 million passenger reduction

Source: ICAO estimates
Approx. USD 4.8 to 5.3 billion potential loss of airline revenues for 1Q 2020 compared to Baseline

**Scenario 1: USD 4.8 billion reduction**
- Jan 2020: -1.18
- Feb 2020: -0.26
- Mar 2020: -0.33

**Scenario 2: USD 5.3 billion reduction**
- Jan 2020: -1.16
- Feb 2020: -0.41
- Mar 2020: -0.44

### Source: ICAO estimates

- **International (Chinese carriers):** calculated with an average fare of USD 250 per passenger based on traffic/financial reports of CA, CZ and MU;
- **International (Foreign carriers):** assumed 15% higher average fare than Chinese carriers;
- **Regional:** calculated with an average fare of USD 135 per passenger based on traffic/financial reports of CA, CZ and MU
The preliminary estimates indicate the impact in terms of scheduled international passenger traffic from/to mainland China (including between mainland China and Hong Kong SAR of China, Macao SAR of China and Taiwan, Province of China) during 1Q 2020 compared to originally-planned:

- Overall reduction of **46% of seats offered by airlines**
- Overall reduction of **19.7 to 21.7 million passengers**
- Approx. **USD 4.8 to 5.3 billion potential loss** of gross operating revenues of airlines

<table>
<thead>
<tr>
<th>Scope of analysis</th>
<th>Estimated Impact on Number of seats offered by airlines (000)</th>
<th>Estimated Impact on Number of passengers (000)</th>
<th>Estimated Impact on Gross operating revenues of airlines (USD, million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>International from/to mainland China (Chinese carriers)</td>
<td>-11,400 -44%</td>
<td>-11,600 -45%</td>
<td>-$2,230 -$2,510</td>
</tr>
<tr>
<td>International from/to mainland China (Foreign carriers)</td>
<td>-9,200 -47%</td>
<td>-9,300 -48%</td>
<td>-$2,120 -$2,280</td>
</tr>
<tr>
<td>Regional between mainland China and Hong Kong SAR of China</td>
<td>-1,900 -49%</td>
<td>-1,900 -50%</td>
<td>-$230 -$240</td>
</tr>
<tr>
<td>Regional between mainland China and Macao SAR of China</td>
<td>-700 -46%</td>
<td>-700 -47%</td>
<td>-$80 -$90</td>
</tr>
<tr>
<td>Regional between mainland China and Taiwan, Province of China</td>
<td>-1,500 -45%</td>
<td>-1,500 -46%</td>
<td>-$160 -$180</td>
</tr>
<tr>
<td>Total</td>
<td>-24,700 -46%</td>
<td>-25,100 -46%</td>
<td>-$4,820 -$5,300</td>
</tr>
</tbody>
</table>

Source: ICAO estimates
Scenario Analysis:
Hong Kong SAR of China and Macao SAR of China

This is a preliminary analysis. Figures and estimates herein will be updated with the situation evolving and more information available.
• “Hong Kong International” refers to scheduled international passenger services from/to Hong Kong Special Administrative Region (SAR) of China excluding:
  – scheduled passenger services between Hong Kong SAR of China and mainland China, Macao SAR of China and Taiwan, Province of China

• “Macao International” refers to scheduled international passenger services from/to Macao SAR of China excluding:
  – scheduled passenger services between Macao SAR of China and mainland China, Hong Kong SAR of China and Taiwan, Province of China

• “Cross-Strait” refers to scheduled passenger services among Hong Kong SAR of China, Macao SAR of China and Taiwan, Province of China excluding:
  – “Regional” already included in the mainland China analysis
Number of seats offered by airlines (monthly, 2019)

Capacity share 2019
- 78%: Hong Kong International
- 6%: Macao International
- 16%: Cross-Strait

Source: OAG Scheduled data
Number of seats offered by airlines (1Q 2020 originally-planned)

Capacity share 1Q 2020
- 76%: Hong Kong International
- 7%: Macao International
- 17%: Cross-Strait

Airlines originally planned to reduce seat capacity slightly due to the impact of Hong Kong protests and the continued trade tension.

Source: OAG Scheduled data
### Hong Kong International (66)

<table>
<thead>
<tr>
<th>Airline Name</th>
<th>Country</th>
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<tbody>
<tr>
<td>Hong Kong International (66)</td>
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<tr>
<td>Aeroflot Russian Airlines</td>
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<tr>
<td>Air Astana</td>
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<td>Air Busan*</td>
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<td>Air Canada</td>
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<td>Air France</td>
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<td>Air India*</td>
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<td>Air Mauritius*</td>
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<td>Air Niugini</td>
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<td>Air Seoul, Inc*</td>
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<td>AirAsia</td>
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<td>All Nippon Airways</td>
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<td>American Airlines*</td>
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<td>Asiana Airlines</td>
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<td>Bangkok Airways</td>
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<td>Cathay Dragon</td>
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<td>Cathay Pacific Airways</td>
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<td>Cebu Pacific Air*</td>
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<td>Eastar Jet</td>
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<td>Egyptair</td>
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<td>El Al Israel Airlines*</td>
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<td>Emirates</td>
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<td>EZNIS AIRWAYS LLC*</td>
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<td>Hong Kong Airlines</td>
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<td>Japan Airlines</td>
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<td>Jeju Airlines</td>
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<td>Jetstar Asia*</td>
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<td>Jetstar Pacific Airlines*</td>
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<td>Jetstar Japan*</td>
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<td>KLM-Royal Dutch Airlines</td>
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<td>Korean Air*</td>
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<td>Lufthansa German Airlines</td>
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<td>Malindo Airways</td>
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<td>MIAT - Mongolian Airlines*</td>
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<td>Thai Airways International</td>
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<td>Thai AirAsia</td>
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<td>Virgin Australia Intl*</td>
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<td>Y'aire Air*</td>
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<td>Cross-Straits (9)</td>
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<td>Air Macau</td>
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<td>Mandarin Airlines*</td>
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<td>Tigerair Taiwan Co. Ltd*</td>
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Some 70 airlines cancelled all services or reduced services from/to Hong Kong SAR and Macao SAR

**Source:** Routes Online, OAG and airline websites (as of 10 March 2020)

Announced since late January 2020; Duration varies

*: Airlines with all service cancelled

*: Airlines with all service cancelled but gradual resumption
Scenario analysis of COVID-19 outbreak impact for 1Q 2020

- **Baseline (hypothetical situation without COVID-19 outbreak)**
  - Seat capacity: used "originally-planned" winter schedule
  - Load factor: used the same percentage as "International from/to mainland China (Foreign carriers)" and "Regional"

- **Scenario 1 (mild)**
  - Seat capacity: estimated by airlines' schedule changes
  - Load factor: used the same percentage as Baseline

- **Scenario 2 (severe)**
  - Seat capacity in January and February: estimated by airlines' schedule changes
  - Seat capacity in March: assumed summer schedules not starting from 29 March
  - Load factor: 22 and 17 percentage points lower in February and March from January, respectively
## Scenario analysis: Assumptions

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Baseline</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Seat capacity reduction from originally-planned</td>
<td>Passenger load factor</td>
<td>Seat capacity reduction from originally-planned</td>
</tr>
<tr>
<td><strong>January 2020</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hong Kong International</td>
<td>0%</td>
<td>80%</td>
<td>0%</td>
</tr>
<tr>
<td>Macao International</td>
<td>0%</td>
<td>80%</td>
<td>0%</td>
</tr>
<tr>
<td>Cross-Strait</td>
<td>0%</td>
<td>80%</td>
<td>1%</td>
</tr>
<tr>
<td><strong>February 2020</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hong Kong International</td>
<td>0%</td>
<td>80%</td>
<td>-25%</td>
</tr>
<tr>
<td>Macao International</td>
<td>0%</td>
<td>80%</td>
<td>-67%</td>
</tr>
<tr>
<td>Cross-Strait</td>
<td>0%</td>
<td>80%</td>
<td>-52%</td>
</tr>
<tr>
<td><strong>March 2020</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hong Kong International</td>
<td>0%</td>
<td>80%</td>
<td>-65%</td>
</tr>
<tr>
<td>Macao International</td>
<td>0%</td>
<td>80%</td>
<td>-78%</td>
</tr>
<tr>
<td>Cross-Strait</td>
<td>0%</td>
<td>80%</td>
<td>-86%</td>
</tr>
</tbody>
</table>
Baseline:

5% seat capacity reduction compared to 1Q 2019

A total of YoY 5% seat capacity reduction originally planned for 1Q 2020 due to the expectation of continued weak demand for Hong Kong SAR and Taiwan Province.
Scenarios 1 & 2: 33 to 34% seat capacity reduction from Baseline

**Scenario 1:** for 1Q 2020 a total of 37% reduction compared to 1Q 2019 and 33% reduction from Baseline

**Scenario 2:** for 1Q 2020 a total of 38% reduction compared to 1Q 2019 and 34% reduction from Baseline

Source: ICAO estimates
5.1 to 6.4 million passenger reduction in 1Q 2020 compared to Baseline

Scenario 1: a total of 5.1 million passenger reduction for 1Q 2020 from Baseline

Scenario 2: a total of 6.4 million passenger reduction for 1Q 2020 from Baseline

Source: ICAO estimates
Approx. USD 1.2 to 1.6 billion potential loss of airline revenues for 1Q 2020 compared to Baseline

Scenario 1: USD 1.2 billion reduction
- Hong Kong International: calculated with an average fare of USD 287.6 per passenger (i.e. almost the same as “International (Foreign carriers)”; - Macao International: calculated with an average fare of USD 172 per passenger; - Cross-Strait: calculated with an average fare of USD 135 per passenger (i.e. the same as “Regional”)

Scenario 2: USD 1.6 billion reduction

Source: ICAO estimates
The preliminary estimates indicate the impact in terms of scheduled international passenger traffic from/to Hong Kong SAR of China and Macao SAR of China, as well as scheduled passenger traffic among Hong Kong SAR of China, Macao SAR of China and Taiwan, Province of China, during 1Q 2020 compared to originally-planned:

- Overall reduction ranging from **33% to 34%** of seats offered by airlines
- Overall reduction of **5.1 to 6.4 million passengers**
- Approx. **USD 1.2 to 1.6 billion potential loss** of gross operating revenues of airlines

### Estimated Impact on

<table>
<thead>
<tr>
<th>Scope of analysis</th>
<th>Number of seats offered by airlines (000)</th>
<th>Number of passengers (000)</th>
<th>Gross operating revenues of airlines (USD, million)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scenario 1</td>
<td>Scenario 2</td>
<td>Scenario 1</td>
</tr>
<tr>
<td>Hong Kong International</td>
<td>-4,200</td>
<td>-29%</td>
<td>-4,400</td>
</tr>
<tr>
<td>Macao International</td>
<td>-600</td>
<td>-48%</td>
<td>-700</td>
</tr>
<tr>
<td>Cross-Strait</td>
<td>-1,500</td>
<td>-46%</td>
<td>-1,500</td>
</tr>
<tr>
<td>Total</td>
<td><strong>-6,300</strong></td>
<td><strong>-33%</strong></td>
<td><strong>-6,500</strong></td>
</tr>
</tbody>
</table>

**Source:** ICAO estimates
Summary of Scenario Analysis: China
+ Additional Estimates

This is a preliminary analysis. Figures and estimates herein will be updated with the situation evolving and more information available.
The direct impact of COVID-19 outbreak is expected to be greater than that caused by SARS in 2003 due to higher scale of flight cancellations and bigger economic size/air travel market of China.

The preliminary estimates indicate the impact in terms of scheduled international passenger traffic from/to China (including Hong Kong SAR of China, Macao SAR of China and cross-strait services from/to Taiwan, Province of China) during 1Q 2020 compared to originally-planned:

- Overall reduction ranging from 42% to 43% of seats offered by airlines
- Overall reduction of 24.8 to 28.1 million passengers
- Approx. USD 6.0 to 6.9 billion potential loss of gross operating revenues of airlines

The above estimates exclude, inter alia, the impact of traffic reduction related to air cargo, Chinese domestic, as well as other international services.

Source: ICAO estimates
55% and 87% of revenue reduction is estimated to be attributed to the loss from Chinese carriers and Asia/Pacific carriers (including Chinese carriers), respectively.

Source: ICAO estimates
## Break-down of estimated impact in 1Q 2020

<table>
<thead>
<tr>
<th>Scope of analysis</th>
<th>Number of seats offered by airlines (000)</th>
<th>Number of passengers (000)</th>
<th>Gross operating revenues of airlines (USD, million)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scenario 1</td>
<td>Scenario 2</td>
<td>Scenario 1</td>
</tr>
<tr>
<td>International from/to mainland China (Chinese carriers)</td>
<td>-11,400</td>
<td>-11,600</td>
<td>-8,900</td>
</tr>
<tr>
<td></td>
<td>-44%</td>
<td>-45%</td>
<td>-44%</td>
</tr>
<tr>
<td>International from/to mainland China (Foreign carriers)</td>
<td>-9,200</td>
<td>-9,300</td>
<td>-7,400</td>
</tr>
<tr>
<td></td>
<td>-47%</td>
<td>-48%</td>
<td>-47%</td>
</tr>
<tr>
<td>Regional between mainland China and Hong Kong SAR of China</td>
<td>-1,900</td>
<td>-1,900</td>
<td>-1,700</td>
</tr>
<tr>
<td></td>
<td>-49%</td>
<td>-50%</td>
<td>-56%</td>
</tr>
<tr>
<td>Regional between mainland China and Macao SAR of China</td>
<td>-700</td>
<td>-700</td>
<td>-600</td>
</tr>
<tr>
<td></td>
<td>-46%</td>
<td>-47%</td>
<td>-46%</td>
</tr>
<tr>
<td>Regional between mainland China and Taiwan, Province of China</td>
<td>-1,500</td>
<td>-1,500</td>
<td>-1,200</td>
</tr>
<tr>
<td></td>
<td>-45%</td>
<td>-46%</td>
<td>-45%</td>
</tr>
<tr>
<td>Sub-total</td>
<td>-24,700</td>
<td>-25,100</td>
<td>-19,700</td>
</tr>
<tr>
<td></td>
<td>-46%</td>
<td>-46%</td>
<td>-46%</td>
</tr>
<tr>
<td>Hong Kong International</td>
<td>-4,200</td>
<td>-4,400</td>
<td>-3,400</td>
</tr>
<tr>
<td></td>
<td>-29%</td>
<td>-31%</td>
<td>-29%</td>
</tr>
<tr>
<td>Macao International</td>
<td>-600</td>
<td>-700</td>
<td>-500</td>
</tr>
<tr>
<td></td>
<td>-48%</td>
<td>-48%</td>
<td>-48%</td>
</tr>
<tr>
<td>Cross-Strait</td>
<td>-1,500</td>
<td>-1,500</td>
<td>-1,200</td>
</tr>
<tr>
<td></td>
<td>-46%</td>
<td>-46%</td>
<td>-46%</td>
</tr>
<tr>
<td>Sub-total</td>
<td>-6,300</td>
<td>-6,500</td>
<td>-5,100</td>
</tr>
<tr>
<td></td>
<td>-33%</td>
<td>-34%</td>
<td>-33%</td>
</tr>
<tr>
<td>Grand total</td>
<td>-31,100</td>
<td>-31,600</td>
<td>-24,800</td>
</tr>
<tr>
<td></td>
<td>-42%</td>
<td>-43%</td>
<td>-43%</td>
</tr>
</tbody>
</table>

Source: ICAO estimates
The preliminary estimates indicate the impact in terms of scheduled domestic passenger traffic within mainland China during 1Q 2020 compared to originally-planned:

- Overall reduction of **40% of seats offered by airlines**
- Overall reduction of **66.6 to 75.8 million passengers**
- Approx. **USD 6.7 to 7.6 billion potential loss** of gross operating revenues of airlines

### Scope of analysis

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Number of seats offered by airlines (000)</th>
<th>Number of passengers (000)</th>
<th>Gross operating revenues of airlines (USD, million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic within mainland China</td>
<td>-76,100</td>
<td>-66,600</td>
<td>-$6,460</td>
</tr>
<tr>
<td>Assumption</td>
<td>Seat capacity is reduced by 3% in January 2020 and 60% in February and March 2020 from the originally-planned schedules (baseline)</td>
<td>Load factor is down from 83% (baseline) to 80% for 1Q 2020</td>
<td>Calculated with an average fare of USD 97 per passenger based on CANNews.com.cn estimates</td>
</tr>
<tr>
<td>Scenario 1</td>
<td>-76,100</td>
<td>-66,600</td>
<td>-75,800</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>-40%</td>
<td>-42%</td>
<td>-48%</td>
</tr>
</tbody>
</table>

**Source:** ICAO estimates
Potential loss of revenues from Chinese tourists to top 5 States in 1Q 2020

<table>
<thead>
<tr>
<th>Top 5 States that Chinese traveller had the largest share</th>
<th>Baseline</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger number</td>
<td>Tourism revenue (in million USD)*</td>
<td>Passenger number</td>
<td>Tourism revenue (in million USD)*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>460,161</td>
<td>446.36</td>
<td>340,318</td>
</tr>
<tr>
<td></td>
<td>Loss -</td>
<td>-</td>
<td>-119,843</td>
</tr>
<tr>
<td>France</td>
<td>240,523</td>
<td>233.31</td>
<td>137,867</td>
</tr>
<tr>
<td></td>
<td>Loss -</td>
<td>-</td>
<td>-102,656</td>
</tr>
<tr>
<td>Japan</td>
<td>3,181,840</td>
<td>3,086.38</td>
<td>2,167,273</td>
</tr>
<tr>
<td></td>
<td>Loss -</td>
<td>-</td>
<td>-1,014,567</td>
</tr>
<tr>
<td>Thailand</td>
<td>2,772,352</td>
<td>2,689.18</td>
<td>1,826,629</td>
</tr>
<tr>
<td></td>
<td>Loss -</td>
<td>-</td>
<td>-945,723</td>
</tr>
<tr>
<td>United States</td>
<td>888,102</td>
<td>861.46</td>
<td>505,096</td>
</tr>
<tr>
<td></td>
<td>Loss -</td>
<td>-</td>
<td>-383,006</td>
</tr>
</tbody>
</table>

- Data excludes Special Administrative Regions (SAR) of China (Hong Kong SAR and Macao SAR) and Taiwan, Province of China
- Calculated with average international tourism spending of China (USD 970) per tourist reported by UNWTO

Source: ICAO estimates
Scenario Analysis: 
Republic of Korea

This is a preliminary analysis. Figures and estimates herein will be updated with the situation evolving and more information available.
Scenario analysis of COVID-19 outbreak impact for 1Q 2020

• Scope: scheduled international passenger services from/to Republic of Korea

• Baseline (hypothetical situation without COVID-19 outbreak)*
  – Seat capacity: used "originally-planned" winter schedule
  – Load factor: 80%

• Scenario 1 (mild)*
  – Seat capacity: estimated by airlines' schedule changes
  – Load factor: used the same percentage as Baseline

• Scenario 2 (severe)*
  – Seat capacity: estimated by airlines' schedule changes
  – Load factor: 10 percentage points lower in March (i.e. 70%)

* Between Republic of Korea and China, Hong Kong SAR and Macao SAR of China: extracted the impacts involving Korea from the respective scenarios of China and Hong Kong/Macao SARs
27% seat capacity reduction in 1Q 2020 from Baseline

COVID-19 has started to impact airline operations from late February 2020 (except China routes)

Source: ICAO estimates
ICAO estimates

6.1 to 6.6 million passenger reduction in 1Q 2020 compared to Baseline

Scenario 1: a total of 6.1 million passenger reduction for 1Q 2020 from Baseline

Scenario 2: a total of 6.6 million passenger reduction for 1Q 2020 from Baseline

Source: ICAO estimates
Approx. USD 1.3 to 1.4 billion potential loss of airline revenues for 1Q 2020 compared to Baseline

**Scenario 1: USD 1.3 billion reduction**
- January 2020: 0
- February 2020: -15
- March 2020: -254

**Scenario 2: USD 1.4 billion reduction**
- January 2020: 0
- February 2020: -15
- March 2020: -279

**Source:** ICAO estimates

- Between Korea and China including Hong Kong/Macao SARs
- Between Korea and other international destinations (Korean carriers)
- Between Korea and other international destinations (Foreign carriers)

- Between Korea and China including Hong Kong SAR: extracted the impact involving Korea from scenarios 1 and 2 of China;
- Other internal destinations: Other internal destinations: calculated with an average fare of USD 287.6 per passenger (ranging from USD 155 to 485 by destination)
Scenario Analysis: Italy

This is a preliminary analysis. Figures and estimates herein will be updated with the situation evolving and more information available.
• Scope: scheduled international passenger services from/to Italy

• Baseline (hypothetical situation without COVID-19 outbreak)*
  – Seat capacity: used "originally-planned" winter schedule
  – Load factor: 80%

• Scenario 1 (mild)*
  – Seat capacity: estimated by airlines' schedule changes
  – Load factor: used the same percentage as Baseline

• Scenario 2 (severe)*
  – Seat capacity: estimated by airlines' schedule changes
  – Load factor: 10 percentage points lower in March (i.e. 70%)

* Between Italy and China, Hong Kong SAR of China, as well as Republic of Korea: extracted the impacts involving Italy from the respective scenarios of China, Hong Kong SAR and Korea
14% seat capacity reduction in 1Q 2020 from Baseline

COVID-19 has started to impact airline operations from late February 2020 (except China routes)

Source: ICAO estimates
Between Italy and China including Hong Kong SAR, Republic of Korea, and Iran (Islamic Republic of)

between Italy and other international destinations

Source: ICAO estimates

3.5 to 4.3 million passenger reduction in 1Q 2020 compared to Baseline
Between Italy and China, Hong Kong SAR and Macao SAR of China, as well as Republic of Korea: extracted the impacts involving Italy from the respective scenarios of China, Hong Kong/Macao SARs and Korea;

Other internal destinations: calculated with an average fare of USD 287.6 per passenger (ranging from USD 60 to 485 by destination)

Approx. USD 0.5 to 0.6 billion potential loss of airline revenues for 1Q 2020 compared to Baseline

Source: ICAO estimates
Scenario Analysis:
Iran (Islamic Republic of)

This is a preliminary analysis. Figures and estimates herein will be updated with the situation evolving and more information available.
• **Scope:** scheduled international passenger services from/to Iran

• **Baseline (hypothetical situation without COVID-19 outbreak)**
  – Seat capacity: used "originally-planned" winter schedule
  – Load factor: 80%

• **Scenario 1 (mild)**
  – Seat capacity: estimated by airlines' schedule changes
  – Load factor: used the same percentage as Baseline

• **Scenario 2 (severe)**
  – Seat capacity: estimated by airlines' schedule changes
  – Load factor: 10 percentage points lower in March (i.e. 70%)

---

*Between Iran (Islamic Republic of) and China, as well as Italy: extracted the impacts involving Iran from the respective scenarios of China and Italy*
ICAO estimates

25% seat capacity reduction in 1Q 2020 from Baseline

COVID-19 has started to impact airline operations from late February 2020 (except China routes)

Note: Some capacity change was announced and implemented before COVID-19 outbreak

Source: ICAO estimates
IATA estimates

580,000 to 630,000 passenger reduction in 1Q 2020 compared to Baseline

Between Iran and China, Italy

Between Iran and other international destinations

Source: ICAO estimates
Approx. USD 92 to 100 million potential loss of airline revenues for 1Q 2020 compared to Baseline

**Scenario 1: USD 92 million reduction**

- Between Italy and China, Italy: extracted the impacts involving Iran from the respective scenarios of China and Italy;
- Other internal destinations: calculated with an average fare of USD 140 per passenger (ranging from USD 105 to 370 by destination).

**Scenario 2: USD 100 million reduction**

- Between Italy and China, Italy: extracted the impacts involving Iran from the respective scenarios of China and Italy;
- Other internal destinations: calculated with an average fare of USD 140 per passenger (ranging from USD 105 to 370 by destination).

**Source:** ICAO estimates
This section contains a very preliminary analysis. Figures and estimates herein will be updated with the situation evolving and more information available.
International passenger services from/to Mongolia in Feb 2020

42% seat capacity reduction from originally-planned level in February 2020

-53%: Mongolian carriers
-59%: Chinese carriers
-19%: Korean carriers
-2%: Other foreign carriers

Source: OAG Scheduled data and ICAO estimates
International passenger services from/to Mongolia in Feb 2020

34,000 passenger reduction in February 2020 compared to originally-planned

- From/to mainland China: extracted the impact involving Mongolia from scenarios 1 and 2;
- From/to Republic of Korea and other internal destinations: assumed 80% load factor

Source: ICAO estimates
USD 6.1 million potential loss of airline revenues in February 2020 compared to originally-planned

- From/to mainland China and Hong Kong SAR: extracted the impact involving Mongolia from scenarios 1 and 2;
- From/to Republic of Korea and other internal destinations: calculated with an average fare of USD 135 to 155 per passenger
Arrangement for the prevention and Management of Public Health Events in Civil Aviation (CAPSCA)
• https://www.capsca.org/CoronaVirusRefs.html

Aviation and COVID-19
• https://www.icao.int/Security/COVID-19/Pages/default.aspx

Updated analysis of the effects of the Novel Coronavirus (COVID-19) on air transport