# Data-driven Airspace Efficiency Study

## Case Study: EU-Asia Interface

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ATM/SG/14 of APANPIRG

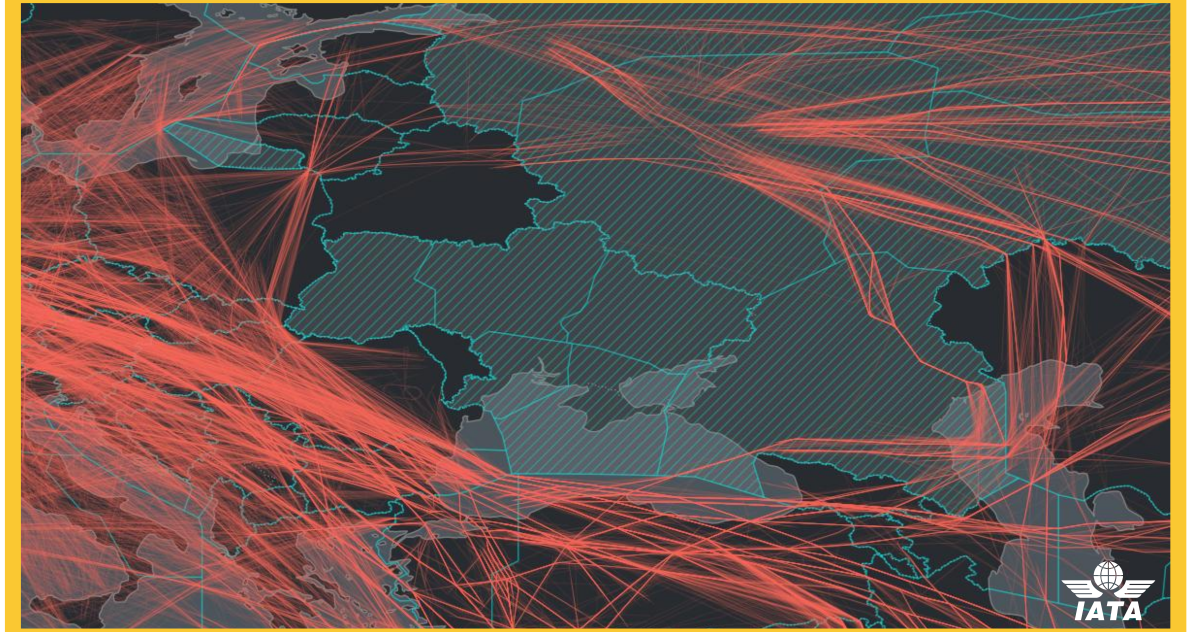
# Content



# Airspace Disruption

## Impact on airspace connectivity and efficiency

### Example : Russia & Ukraine Conflict

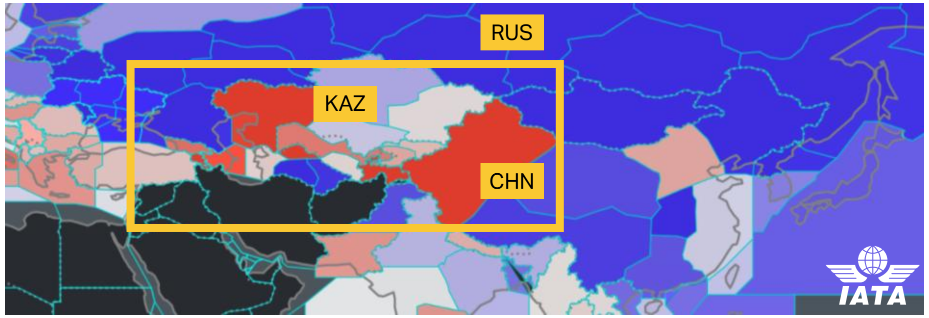

The enlarged view near Ukrainian airspace highlights increased flight activity below Ukraine, contrasted by reduced traffic in the Russian airspace directly above. (Same dates as previous slides: 8 November 2021 vs. 20 November 2022)

Visualizations of the traffic trajectories before and after airspace disruption

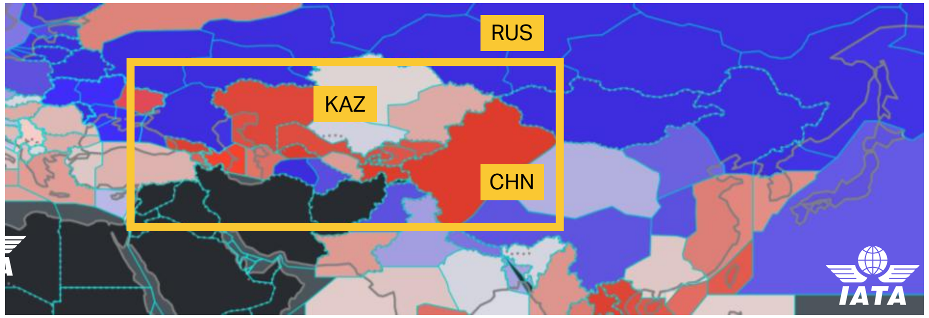
# Spillover Effect

## Airspaces in Asia experiencing traffic change

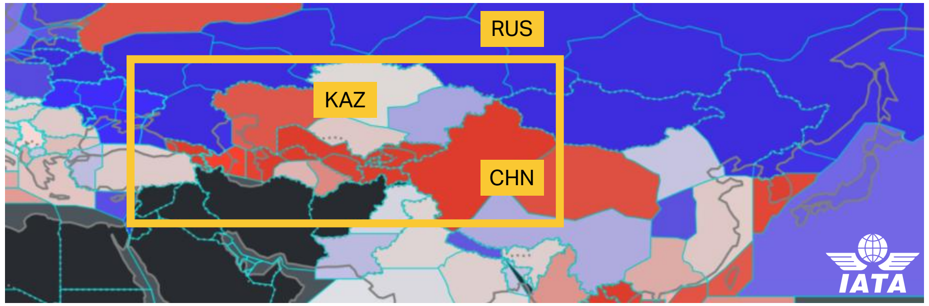
**2022**




**2023**




**2024**




### Traffic Shifts in Asia After Airspace Disruptions

This map shows how traffic volume changed across airspaces in Asia compared to 2021.

- Red areas: FIRs where traffic increased noticeably.
- Blue areas: FIRs where traffic dropped significantly.

***Technical note (for reference at the bottom of the slide)***

- Colors reflect changes in **total flight distance per FIR**, normalized to remove the effect of overall global traffic growth.
- A log transformation was applied for stability.
- Only changes that passed statistical significance tests (z-test + FDR) are highlighted.

# Data-driven Airspace Efficiency Study

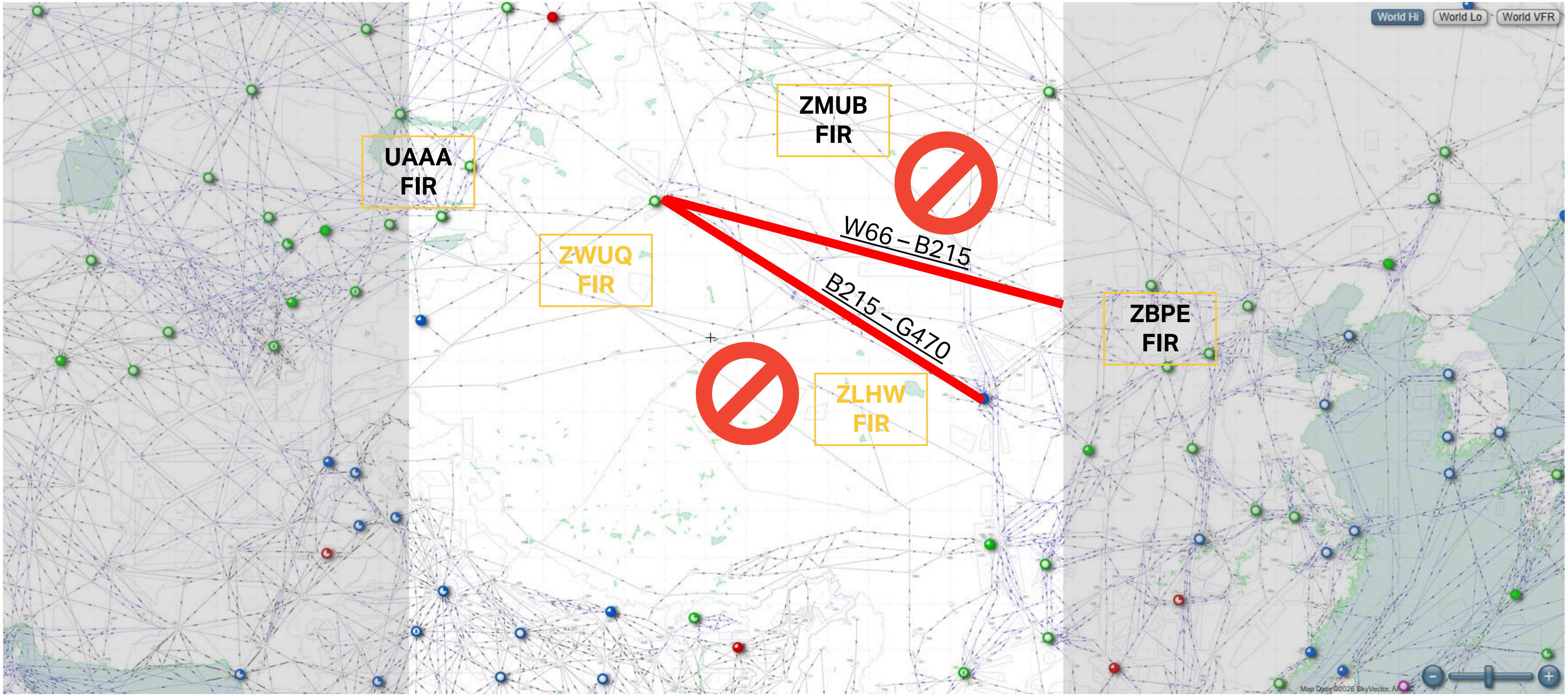
Project overview

- Collaborate with the airlines and industry stakeholders to develop and validate a performance-based and data-driven methodology for large airspace restructuring initiatives and route proposals from users.
- Utilize the EU-Asia Interface as the case study and validate the approach to support advocacy activities and decision making.
- Complete the statistical modelling and in-depth analysis, with delivery of an industry workshop and a white paper.
- The developed prototype could be further applied to other airspaces.

# Case Study: EU-Asia Interface

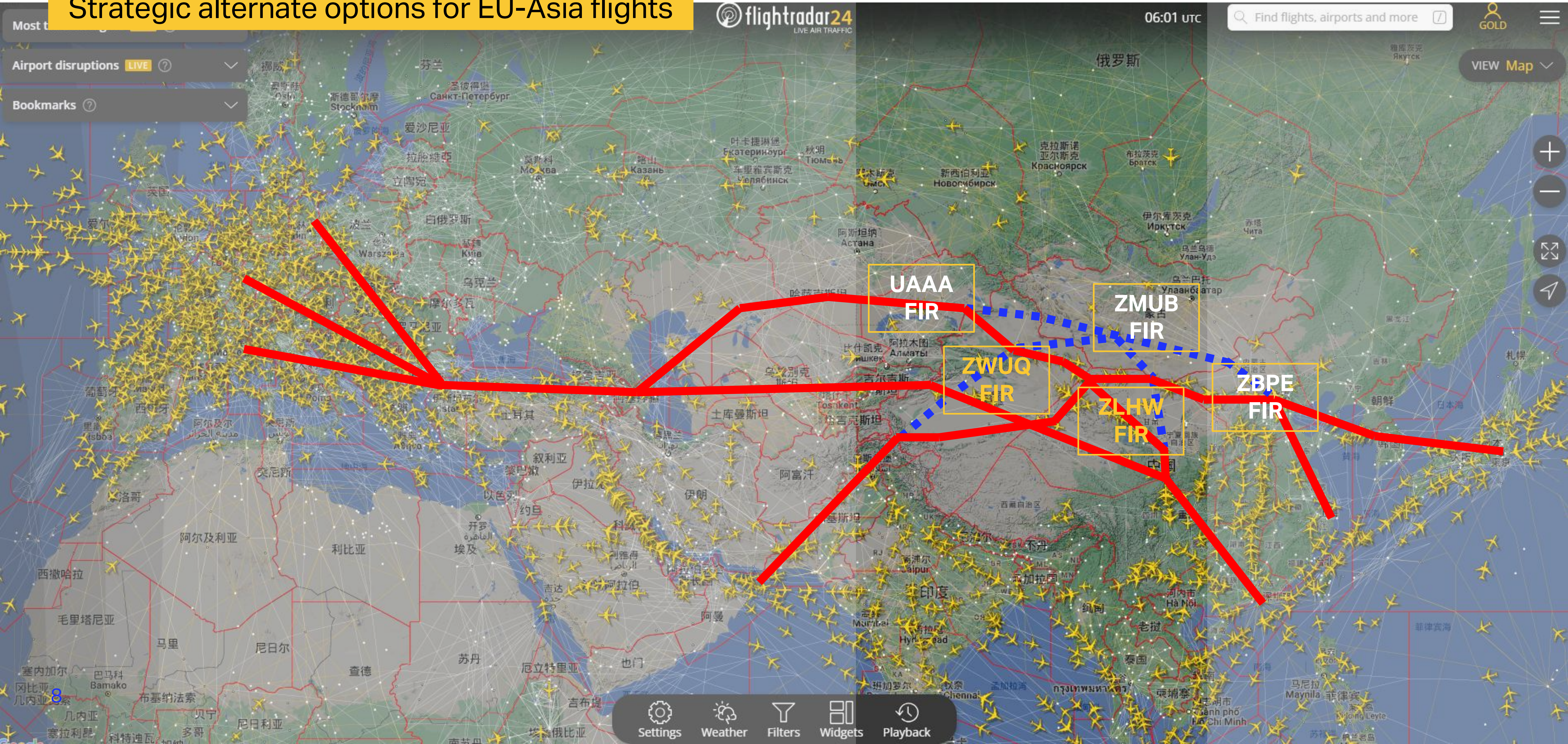
The “new normal” of EU-Asia air corridor

# Airspace Supply in Lanzhou & Urumqi FIRs

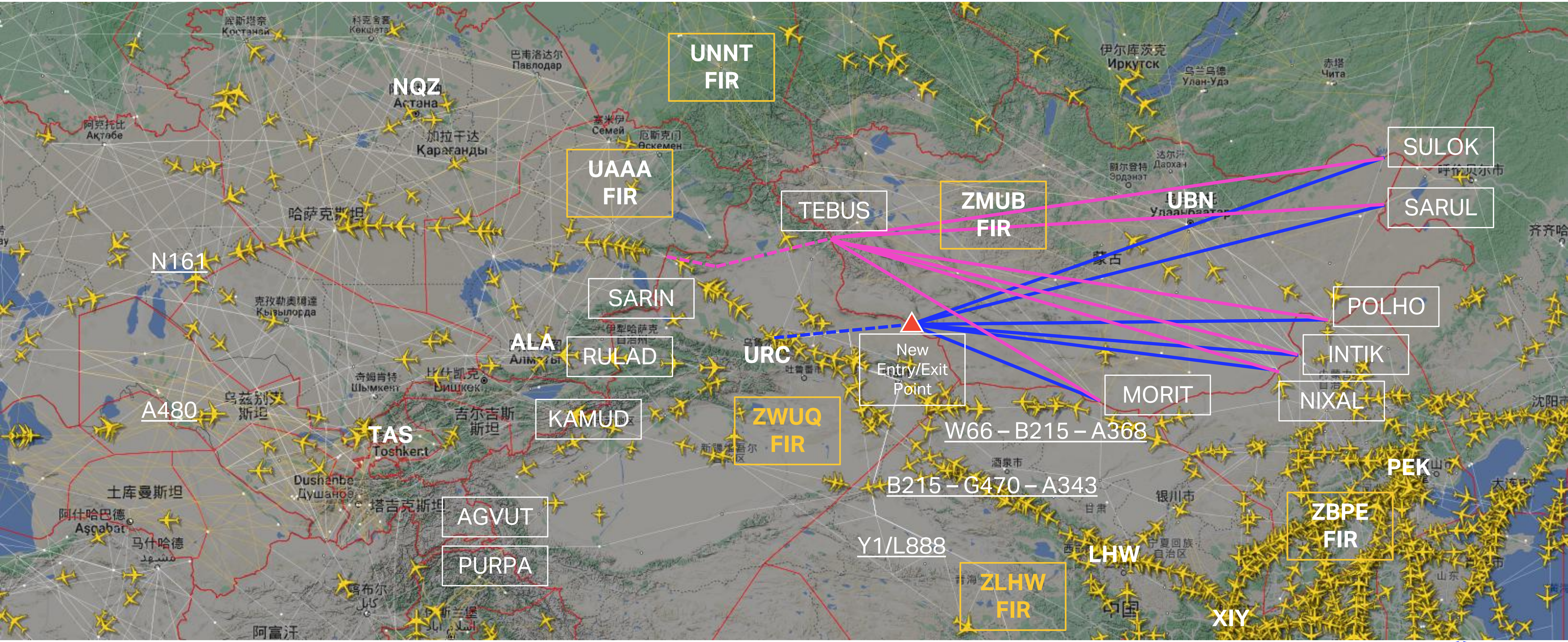


# New ATS Routes Proposed by Operators

Strategic alternate options for EU-Asia flights



# New ATS Routes Proposed by Operators



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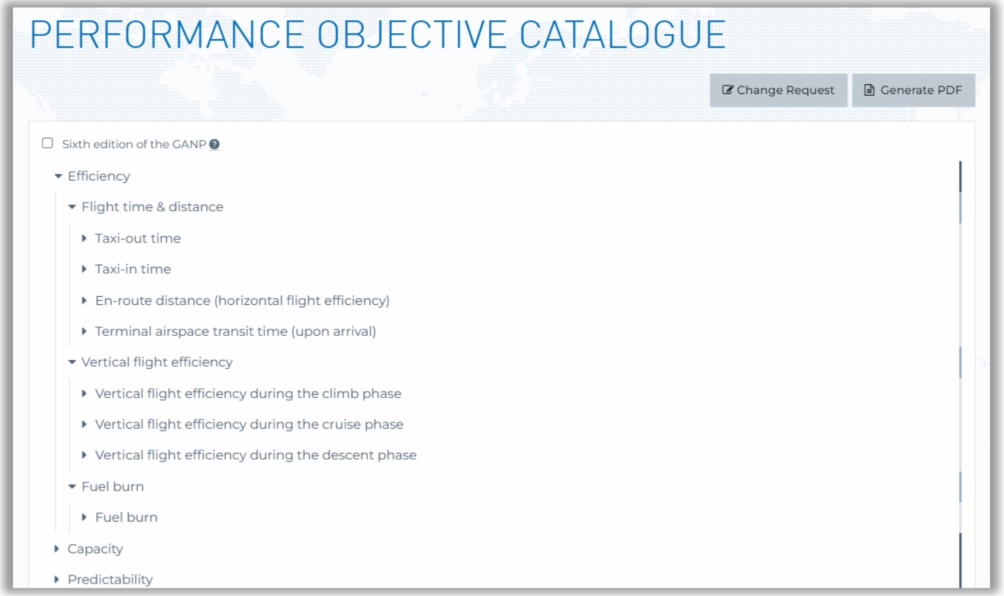
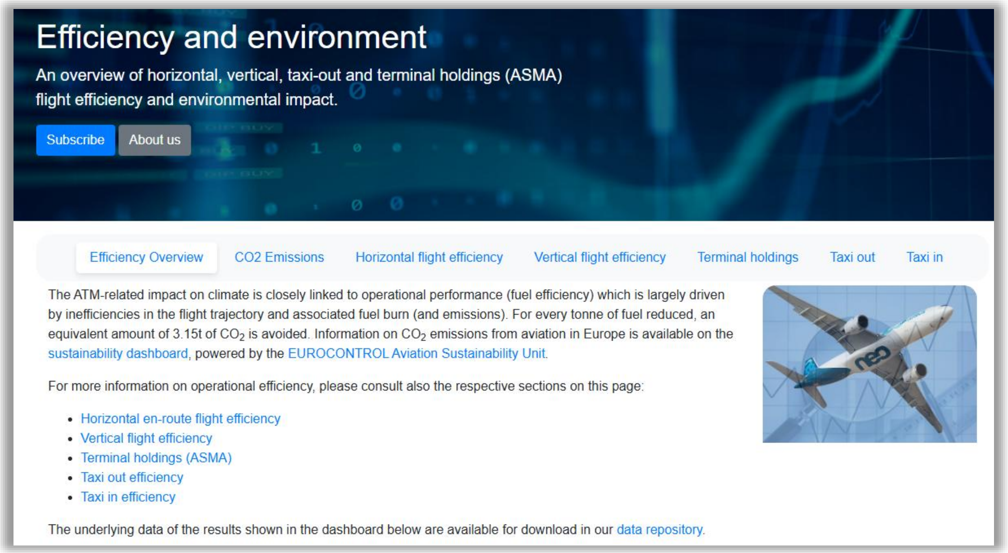
# Scope & KPI Reference

- Scope – enroute flight efficiency within focused FIRs:
  - China: ZWUQ FIR, ZLHW FIR, ZBPE FIR
  - Mongolia: ZMUB FIR
  - Kazakhstan: UAAA FIR
- Timeframe for the study: 2 flight seasons (12 months)
- KPI reference:
  - ICAO: GANP KPIs on ATM efficiency
  - Eurocontrol: Efficiency and environment
  - IATA: ATM WG prioritized metrics from the ICAO GANP (Flight efficiency & environmental impact)



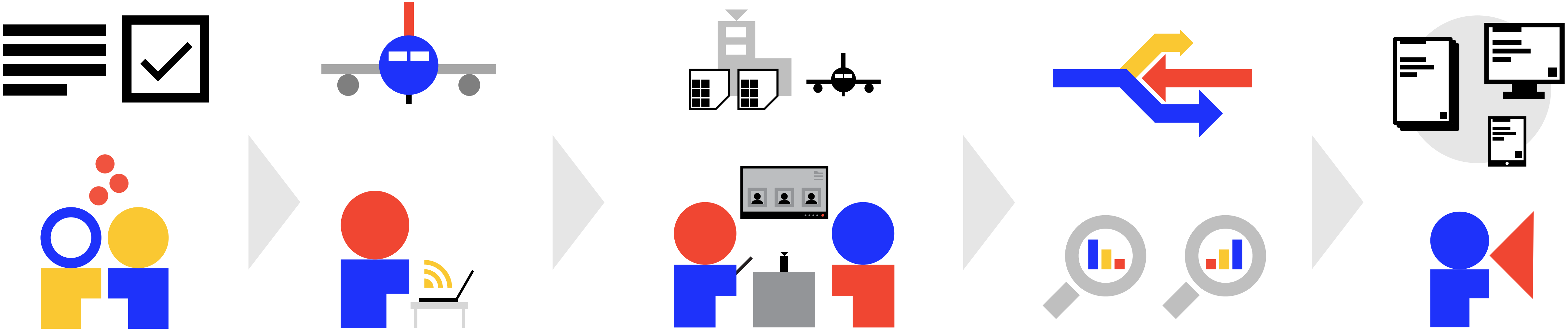



# Methodologies

## The approach suggested by project team:

- Real data collection and analysis
- Statistical modelling
- Interviews with key stakeholders
- Technical visits to key facilities
- Performance assessment and desk research
- Industry review and validation

# Project Timeline

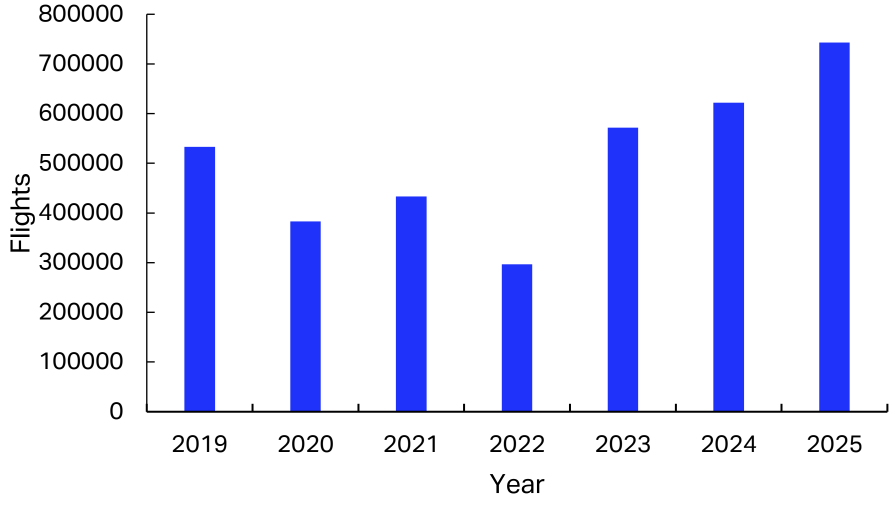


| Q2 – Q3 2025 | | Q4 2025 | | Q1 2026 |
|---|---|---|---|---|
| Stakeholder survey & interviews | Data analysis & measure potential costs/benefits | Industry workshop with stakeholders 25-27 Nov 2025 in Xi'an, China | Collect feedback & summarize findings | White paper & follow-up |

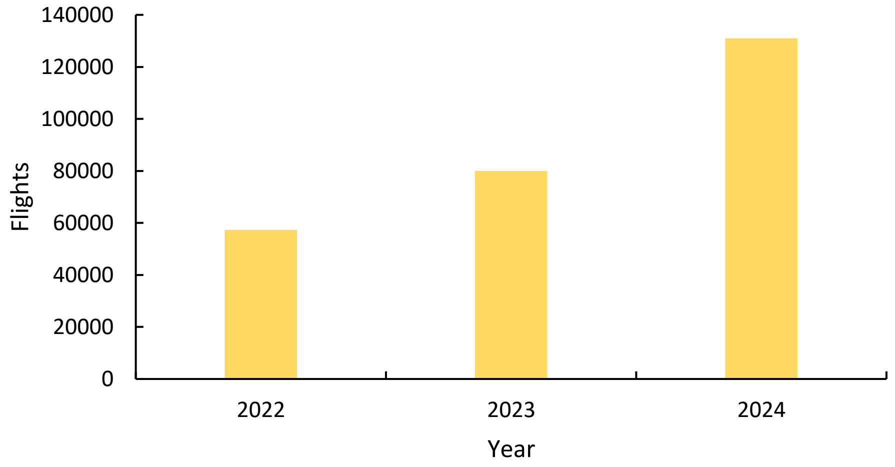
# Annual Traffic Data

| FIR | 2022 | 2023 (YoY) | 2024 (YoY) |
|---|---|---|---|
| ZWUQ | 26,008 | 157,178 (+504.34%) | 429,905 (+173.51%) |
| ZLHW | 431,380 | 912,827 (+111.61%) | 1,313,810 (+43.93) |
| ZMUB | 35,339 | 48,554 (+37.39%) | 73,755 (+51.90%) |
| UAAA | 112,721 | 160,231 (+42.15%) | 191,599 (+19.58%) |
| UACN | 104,802 | 139,104 (+32.73%) | 152,113 (9.35%) |
| UAII | 141,243 | 188,397 (+33.39%) | 223,576 (+18.67) |

Annual flights by FIRs (Source: GADM)

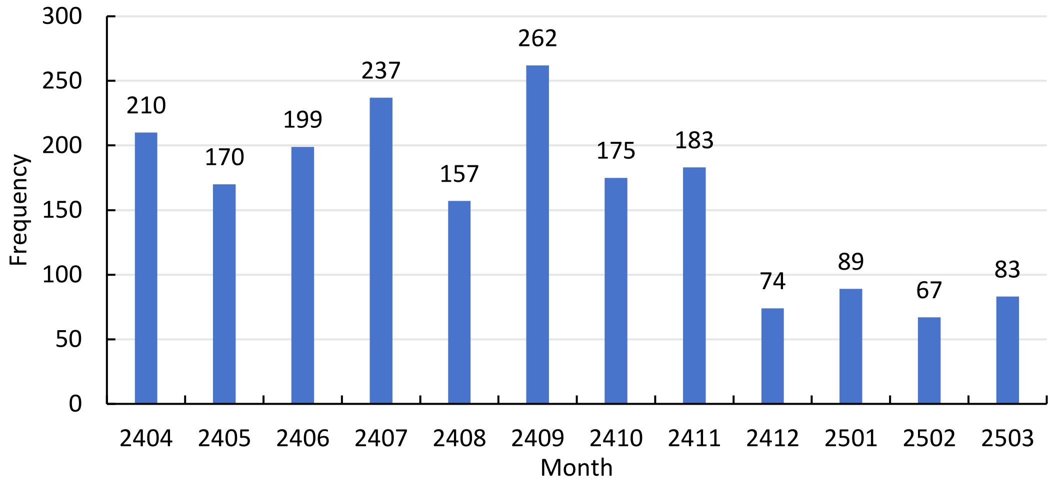



Annual flights in Lanzhou FIR (Source: ATMB)

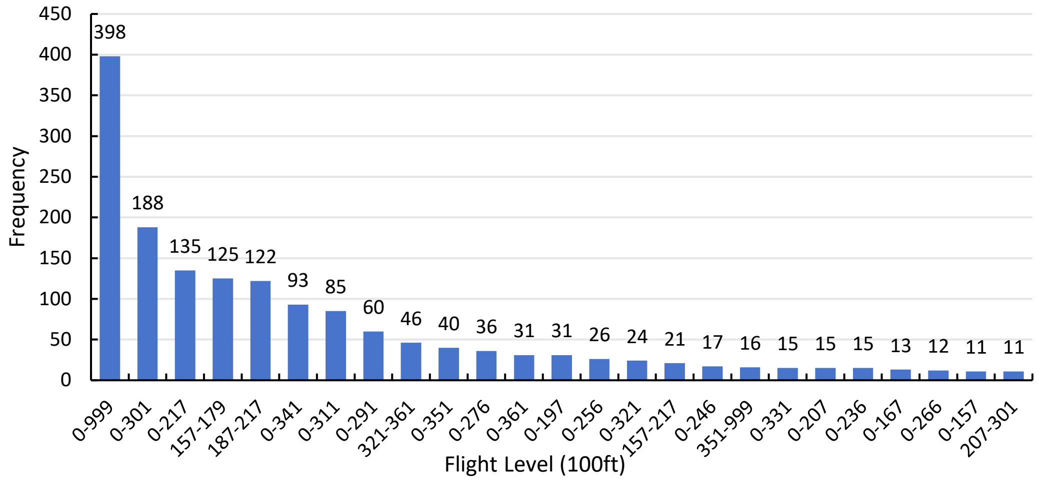



Annual flights crossed the border between Urumqi FIR and Central Asia (Source: ATMB)

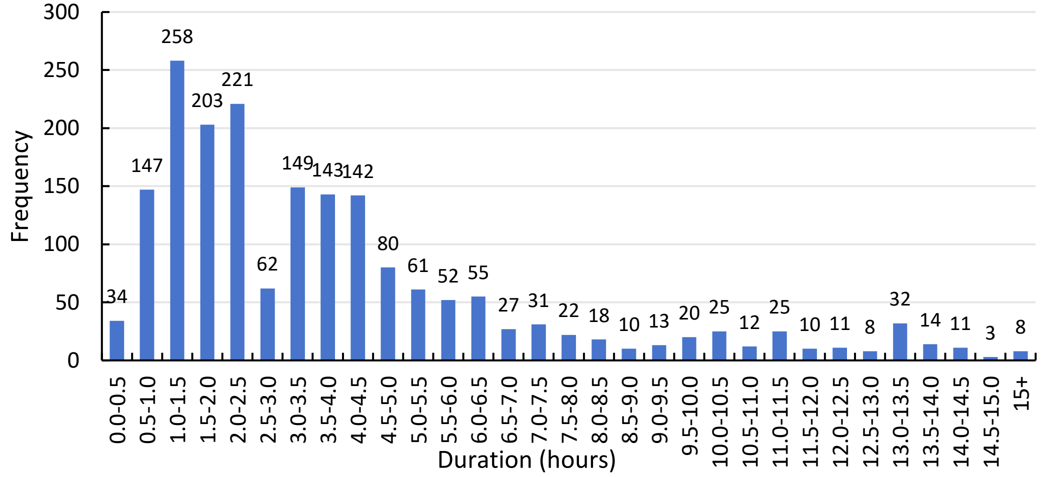
# Analysis on NOTAM Data of Lanzhou FIR



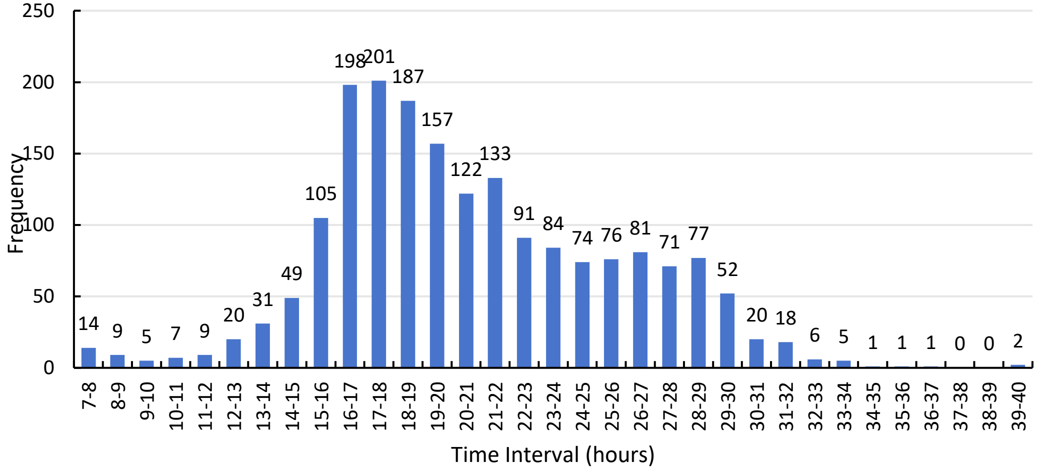

Monthly airspace closure NOTAM frequency of Lanzhou FIR




Distribution of the restricted flight levels in Lanzhou FIR



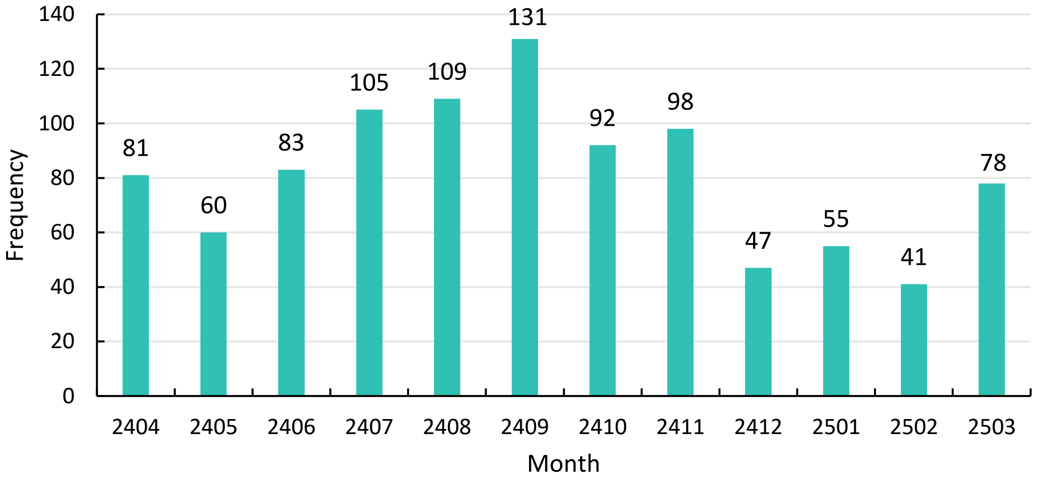

Restriction duration distribution of Lanzhou FIR



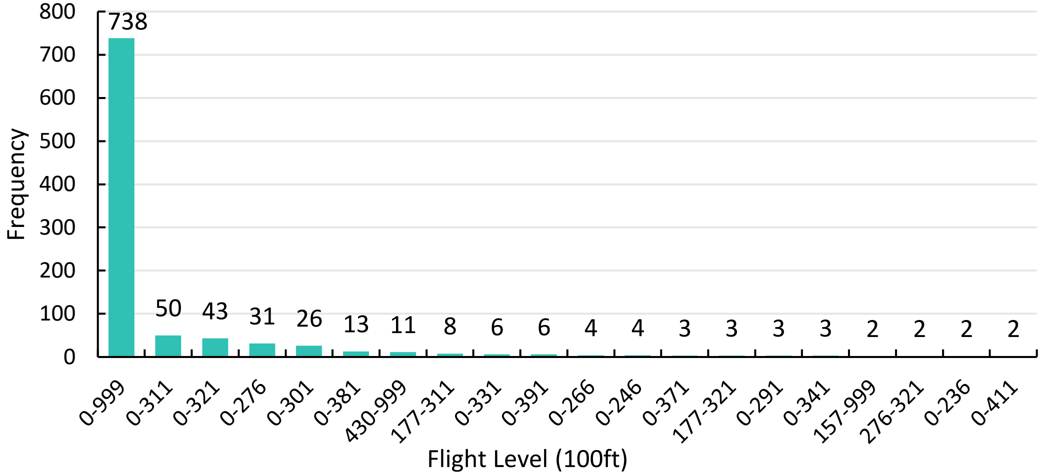

Distribution of airspace closure NOTAM lead time in Lanzhou FIR

**Based on historical data of 1,965 NOTAMs for ZLHW FIR collected between 30 Mar 2024 and 29 Mar 2025.*

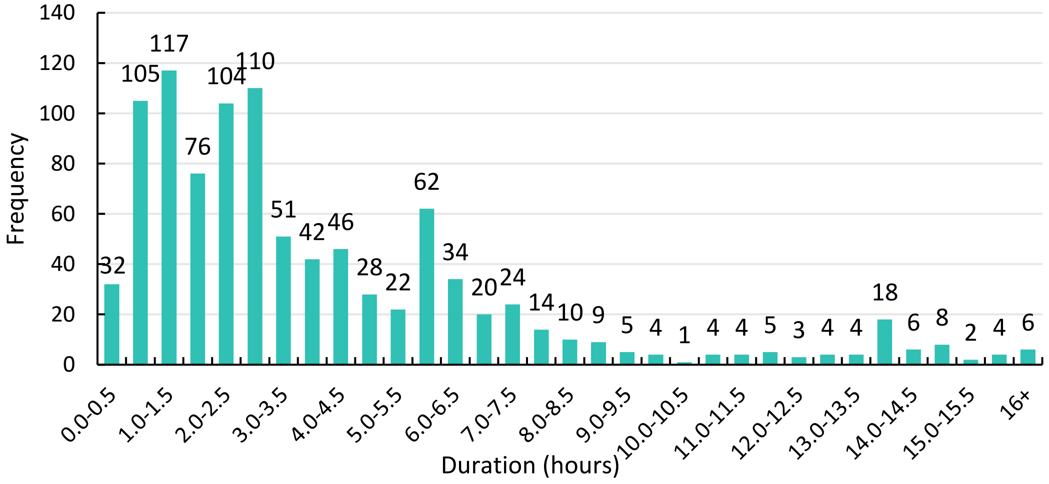
# Analysis on NOTAM Data of Urumqi FIR



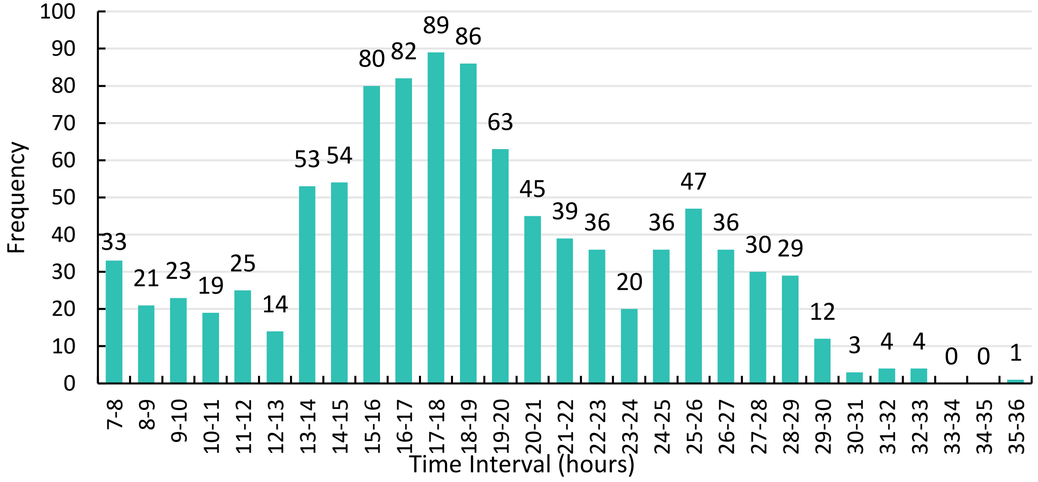

Monthly airspace closure NOTAM frequency of Urumqi FIR




Distribution of the restricted flight levels in Urumqi FIR



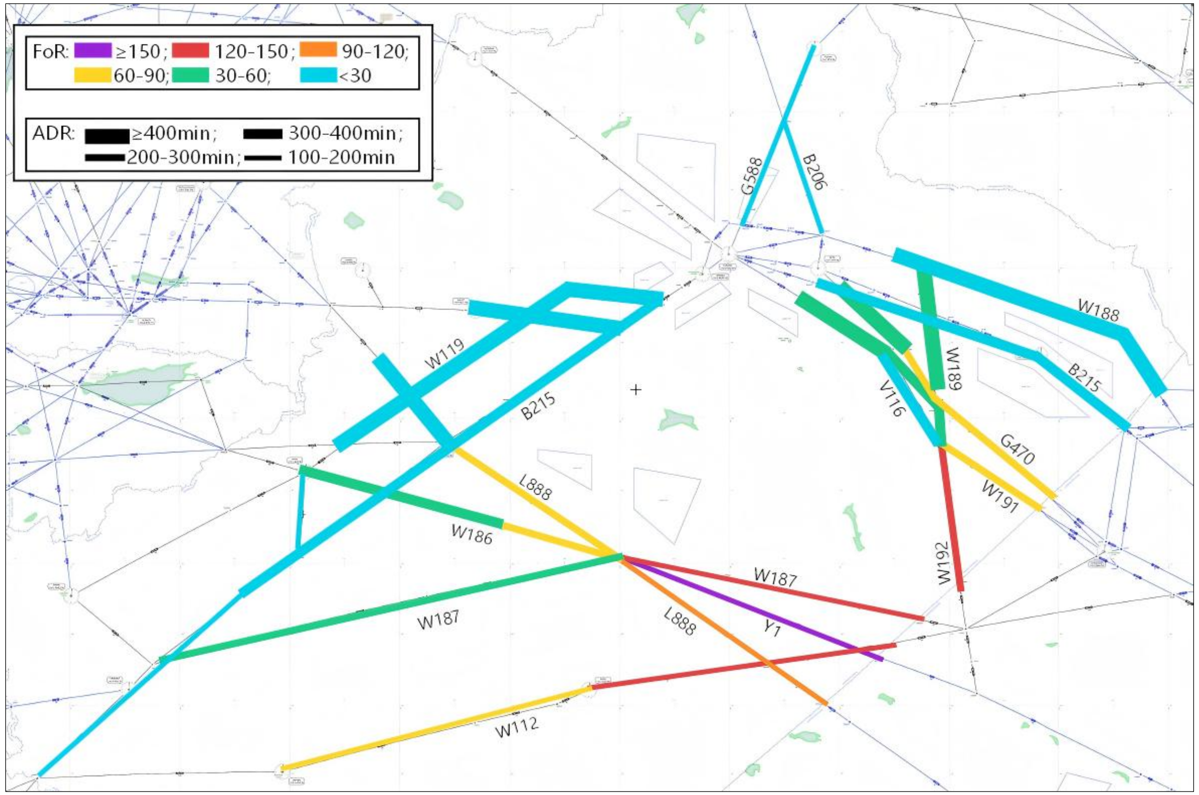

Restriction duration distribution of Urumqi FIR



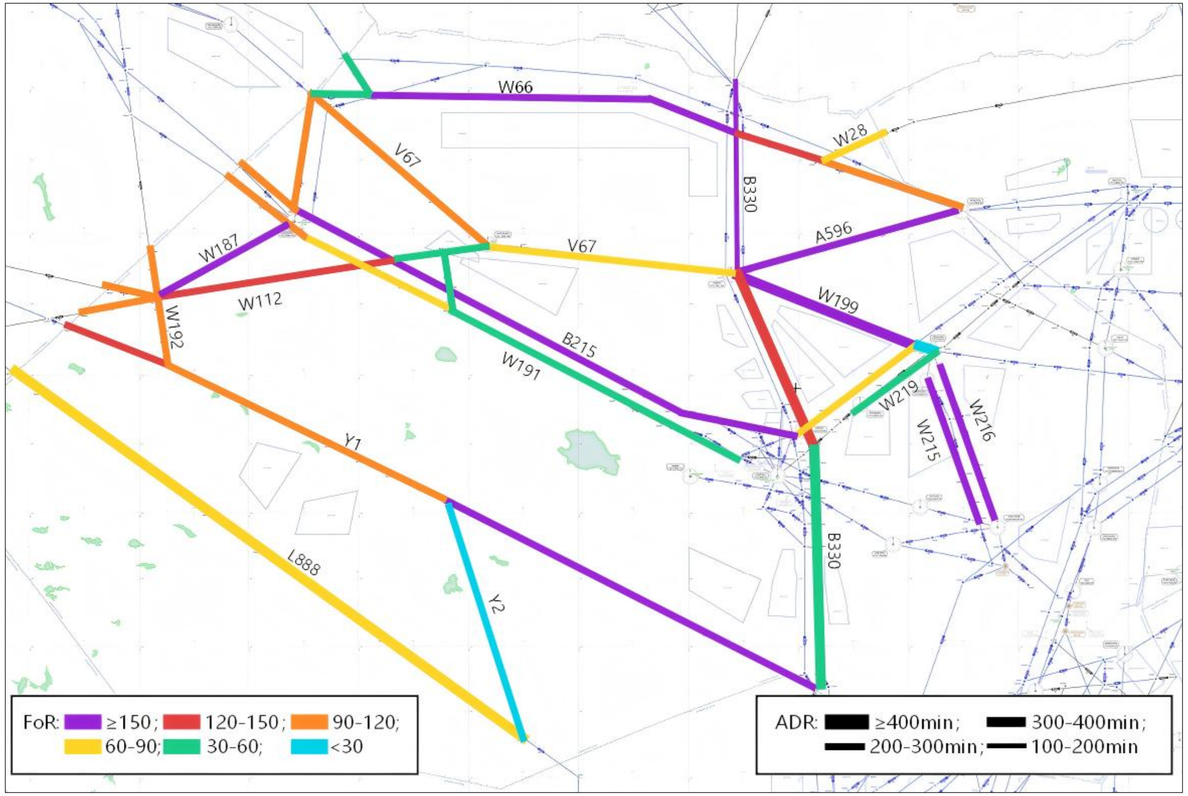

Distribution of airspace closure NOTAM lead time in Urumqi FIR

**Based on historical data of 1,582 NOTAMs for ZWUQ FIR collected between 30 Mar 2024 and 29 Mar 2025.*

# Distribution of Airspace Restrictions




Route closures in Urumqi FIR




Route closures in Lanzhou FIR

**Based on historical data of 3,547 NOTAMs collected for ZLHW FIR and ZWUQ FIR between 30 Mar 2024 and 29 Mar 2025.*
*FoR = Frequency of Restrictions, ARD = Average Restriction Durations*



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# Assessment of Potential Solutions

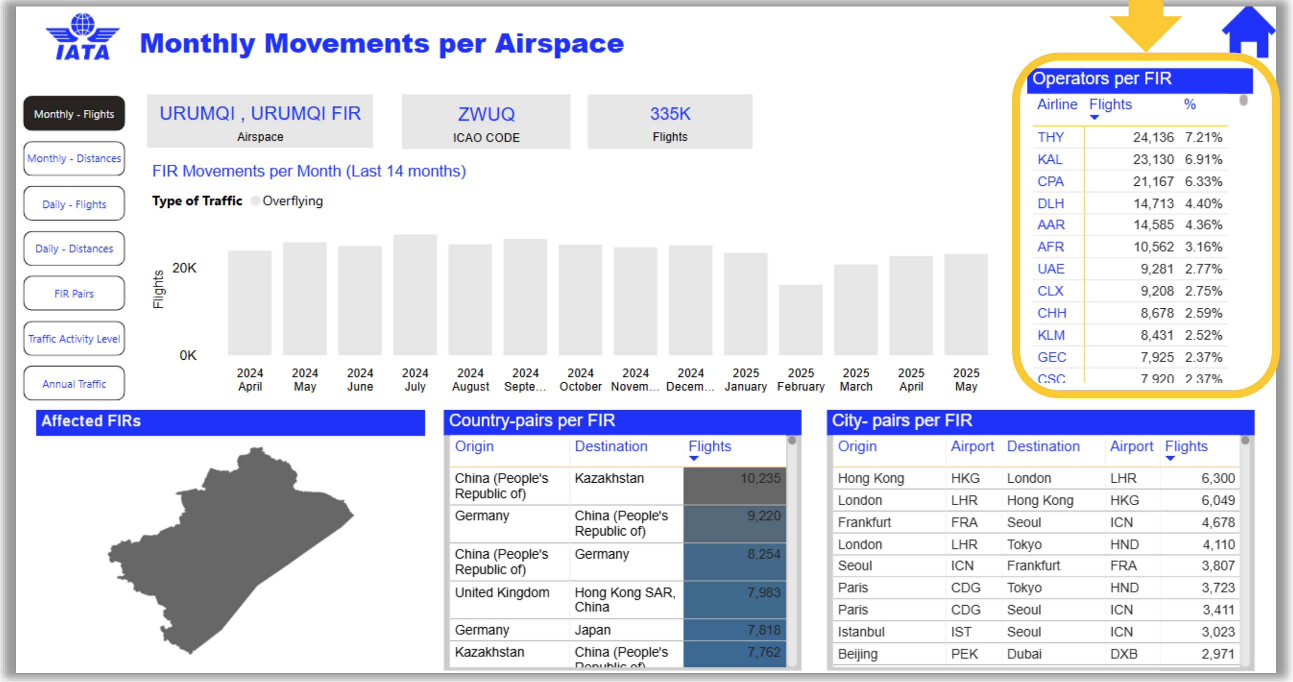
| Dimension | Solution 1: Development of New Routes Within Lan-U FIRs | Solution 2: Optimization of Airspace Closure Notification & Alternative Route Information | Solution 3: Strengthening Civil-Military Coordination to Enhance Airspace Flexibility | Solution 4: Development of Strategic Alternative Routes in Mongolian Airspace |
|---|---|---|---|---|
| **Solution Type** | Route structure modification (domestic) | Process optimization | Dynamic resource management | Route structure modification (cross-border) |
| **Key Content** | Planning new routes within Lan-U airspace | Earlier NOTAM issuance; provision of diversion recommendations | Enhanced real-time airspace sharing and release mechanisms | Planning new routes within Mongolian airspace |
| **Feasibility** | Extremely low: constrained by geography and airspace structure | Moderate to high: achievable through administrative measures | Moderate: existing coordination mechanisms can be further optimized | Moderate to high: resources available, but requires international coordination and infrastructure upgrades |
| **Expected Benefits** | Directly increases local route supply, though difficult to realize | Addresses information gaps; improves decision-making efficiency and predictability | Unlocks latent capacity; enhances instantaneous capacity; mitigates short-term congestion | Fundamentally strengthens network resilience; provides systemic backup corridor; delivers direct economic benefits |
| **Key Limitations** | Geographical and airspace constraints insurmountable | Does not increase physical route capacity | Outcomes unpredictable; cannot be incorporated into advance planning | Dependent on international coordination; requires investment and involves longer timelines |

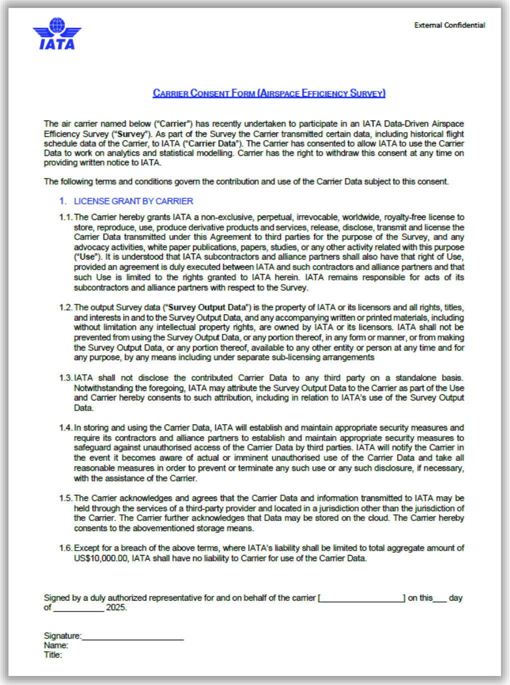
# Structured Operator Survey

- Historical schedule data was collected for S24 and W24/25 flight seasons (from 30 Mar 2024 to 29 Mar 2025) – covering all the real flights operated (in/out/overfly).

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flight Number | Aircraft Type | Start Date | End Date | Day of Ops | Departure | STD (UTC) | Arrival | STA (UTC) | Flight Route in China | Planned Flight Level in ZWUQ FIR (Meter) | Planned Flight Level in ZLHW FIR (Meter) | PBN (Enroute) | CPDLC | RCP | ADS-C |
| CA1211 | 333 | 31-Mar-24 | 26-Oct-24 | ....5.7 | ZBAA | 6:10 | ZWWW | 11:15 | IDKEX B339 ASILA A575 UPREK W28 ATBUG W66 NUKTI B215 HAM W99 FKG B215 WUR | 11000 | 11000 | | | | |

- Totally **6,830** flight schedules from 22 top users of the airspace were collected.



External Confidential

**Carrier Consent Form (Airspace Efficiency Survey)**

The air carrier named below ("Carrier") has recently undertaken to participate in an IATA Data-Driven Airspace Efficiency Survey ("**Survey**"). As part of the Survey the Carrier transmitted certain data, including historical flight schedule data of the Carrier, to IATA ("**Carrier Data**"). The Carrier has consented to allow IATA to use the Carrier Data to work on analytics and statistical modelling. Carrier has the right to withdraw this consent at any time on providing written notice to IATA.

The following terms and conditions govern the contribution and use of the Carrier Data subject to this consent.

1. LICENSE GRANT BY CARRIER

1.1. The Carrier hereby grants IATA a non-exclusive, perpetual, irrevocable, worldwide, royalty-free license to store, reproduce, use, produce derivative products and services, release, disclose, transmit and license the Carrier Data transmitted under this Agreement to third parties for the purpose of the Survey, and any advocacy activities, white paper publications, papers, studies, or any other activity related with this purpose ("**Use**"). It is understood that IATA subcontractors and alliance partners shall also have that right of Use, provided an agreement is duly executed between IATA and such contractors and alliance partners and that such Use is limited to the rights granted to IATA herein. IATA remains responsible for acts of its subcontractors and alliance partners with respect to the Survey.

1.2. The output Survey data ("**Survey Output Data**") is the property of IATA or its licensors and all rights, titles, and interests in and to the Survey Output Data, and any accompanying written or printed materials, including without limitation any intellectual property rights, are owned by IATA or its licensors. IATA shall not be prevented from using the Survey Output Data, or any portion thereof, in any form or manner, or from making the Survey Output Data, or any portion thereof, available to any other entity or person at any time and for any purpose, by any means including under separate sub-licensing arrangements

1.3. IATA shall not disclose the contributed Carrier Data to any third party on a standalone basis. Notwithstanding the foregoing, IATA may attribute the Survey Output Data to the Carrier as part of the Use and Carrier hereby consents to such attribution, including in relation to IATA's use of the Survey Output Data.

1.4. In storing and using the Carrier Data, IATA will establish and maintain appropriate security measures and require its contractors and alliance partners to establish and maintain appropriate security measures to safeguard against unauthorised access of the Carrier Data by third parties. IATA will notify the Carrier in the event it becomes aware of actual or imminent unauthorised use of the Carrier Data and take all reasonable measures in order to prevent or terminate any such use or any such disclosure, if necessary, with the assistance of the Carrier.

1.5. The Carrier acknowledges and agrees that the Carrier Data and information transmitted to IATA may be held through the services of a third-party provider and located in a jurisdiction other than the jurisdiction of the Carrier. The Carrier further acknowledges that Data may be stored on the cloud. The Carrier hereby consents to the abovementioned storage means.

1.6. Except for a breach of the above terms, where IATA's liability shall be limited to total aggregate amount of US$10,000.00, IATA shall have no liability to Carrier for use of the Carrier Data.

Signed by a duly authorized representative for and on behalf of the carrier [_________________] on this___ day of ___________ 2025.

Signature:_____________________
Name:
Title:

# Selected KPIs

1. Airspace efficiency
2. Predictability
3. Economic impact
4. Environmental impact
5. Traffic flow
6. Workload

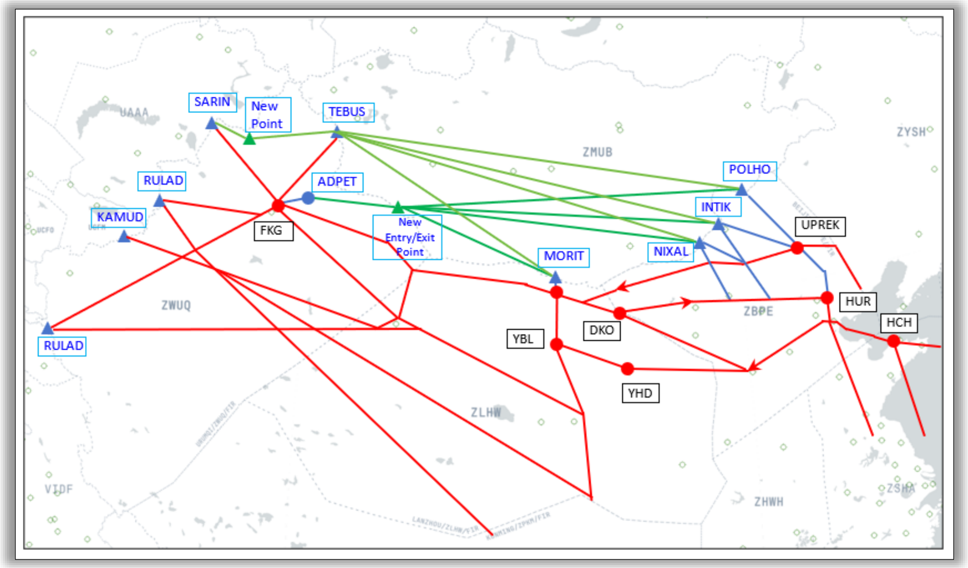
| No. | Dimension | Indicator | Definition | Unit | Primary Assessment Objective |
|---|---|---|---|---|---|
| KPI1 | Traffic Flow | Traffic Volume | Number of flights operating on a given route segment | Flights | To assess the level of traffic demand on a route segment |
| KPI2 | Efficiency | Route Distance | Planned distance of the route flown | km, nm | To evaluate route efficiency in terms of distance |
| KPI3 | Efficiency | En-route Extension Ratio | Ratio of planned route distance to the ideal great circle distance | % | To assess the efficiency of flight planning and route design |
| KPI4 | Efficiency | Flight Time | Flight time within a given route segment | min | To evaluate time efficiency and distribution of flight times on a given route |
| KPI5 | Predictability | Flight Time Variability | Distribution of flight times around the mean value | min/flight | To assess the stability of flight operations; greater variability indicates lower predictability |
| KPI6 | Predictability | NOTAM-induced Delay Rate | Proportion of flights delayed due to NOTAM restrictions | % | To evaluate the likelihood of NOTAM-related disruptions on a given route |
| KPI7 | Efficiency | Average NOTAM-induced Delay | Average delay per flight caused by NOTAM restrictions | min/flight | To assess the severity of NOTAM-related disruptions |
| KPI8 | Economic/ Environmental | Fuel Consumption | Fuel consumed during flight | kg | To quantify fuel usage as an input for economic and environmental assessment |
| KPI9 | Environmental | CO2 Emissions | CO2 emissions resulting from fuel consumption | kg | To evaluate environmental impact |
| KPI10 | Economic | ANS Charges | Charges for air navigation services on a given route | USD | To assess the cost of air navigation services |
| KPI11 | Traffic Flow | Diversion Rate | Proportion of flights diverted from original routes to new routes | % | To indicate the level of traffic redistribution achieved by new routes |
| KPI12 | Workload | Controller Workload | Change in controller workload resulting from flight diversions, expressed as total flight hours within a sector | Sector-hours | To evaluate the impact of new routes on controller workload (both China and Mongolia) |
| KPI13 | Workload | Pilot Workload | Change in pilot workload resulting from flight diversions, expressed primarily as total flight time | Flight hours | To assess the impact of new routes on pilot workload |

# Multi-faceted Assessment Approach

| Assessment Perspective | | Content | Reference KPIs |
|---|---|---|---|
| **Overall Performance** | | NOTAM-induced delay rate and delay time, flight time, fuel consumption, CO2 emissions, ANS charges, controller workload, pilot workload | KPI6, KPI7, KPI4, KPI8, KPI9, KPI10, KPI12, KPI13 |
| **Representative Route Performance** | | For each representative route: information on original and alternative routes, distance distribution within China and Mongolia airspace, route distance and enroute Extension Ratio for both original and alternative routes, NOTAM-induced delay rate on original route, delay time for affected flights, and changes in flight time, fuel consumption, and ANS charges | KPI2, KPI3, KPI6, KPI7, KPI4, KPI8, KPI10 |
| **Stakeholder-specific Performance** | Chinese airlines | Operational efficiency, fuel consumption, ANS charges, and overall economic impact | KPI4, KPI8, KPI9, KPI10, KPI11, KPI13 |
| | Non-Chinese airlines | Operational efficiency, fuel consumption, ANS charges, and overall economic impact | KPI4, KPI8, KPI9, KPI10, KPI11, KPI13 |
| | Chinese ANSP | Changes in ANS charges, traffic volumes, controller workload, and CO2 emissions | KPI1, KPI8, KPI9, KPI10, KPI12 |
| | Mongolian ANSP | Changes in ANS charges, traffic volumes, controller workload, and CO2 emissions | KPI1, KPI8, KPI9, KPI10, KPI12 |
| | Industry | Improvements in operational efficiency, delay reduction, and CO2 emissions | KPI4, KPI7, KPI8, KPI9, KPI10 |
| **Traffic Flow Characteristics** | | Overall traffic flow changes, diversion rates, and traffic variations at different waypoints and key routes in Mongolia | KPI1, KPI11 |

# Data Modeling and Simulation

- Data pairing and cleaning:
  - Match the original and alternative route operations
- Data simulation:
  - Original route: **68,256** movements
  - Alternative route: **797,666** movements (generated by the model)
- Data selection:
  - Select the alternative with shortest flight distance
  - Pair simulated data with original route data and establish the baseline dataset
  - Comparative data analysis and assessment




| FL NO. | AC | DATE | DEPART AD | DEPART TIME | ARRIVAL AD | ARRIVAL TIME | ROUTE | ROUTE ID | TIME | FUEL | DIST. | FEE | CO2 EMISSION | IMPACT | NOTAM | IMPACT ROUTE | DELAY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CZ5893 | 32H | 2024/10/14 | ZYCC | 2024/10/14 10:55 | ZWWW | 2024/10/14 16:10 | ZYCC BUTET G341 TGO B334 KAKAT W28 ATBUG W66 NUKTI B215 HAM W99 FKG B215 WUR ZWWW | 1 | 04:30 | 12140.0 | 1785.0 | 185.6 | 38241.0 | 否 | | | |
| CZ5893 | 32H | 2024/10/14 | ZYCC | 2024/10/14 10:55 | ZWWW | 2024/10/14 16:10 | ZYCC BUTET G341 TGO B334 KAKAT W86 TMR G343 NIXAL DCT TEBUS G588 FKG B215 WUR ZWWW | 2 | 04:36 | 12459.0 | 1854.0 | 1062.52 | 39245.85 | 否 | | | |
| CZ5893 | 32H | 2024/10/14 | ZYCC | 2024/10/14 10:55 | ZWWW | 2024/10/14 16:10 | ZYCC BUTET G341 TGO B334 KAKAT W86 TMR G343 NIXAL DCT 4433N09419E DCT ADPET W188 FKG ZWWW | 3 | 04:20 | 11721.0 | 1727.0 | 879.15 | 36921.15 | 否 | | | |
| CZ5893 | 32H | 2024/10/14 | ZYCC | 2024/10/14 10:55 | ZWWW | 2024/10/14 16:10 | ZYCC BUTET G341 TGO B334 KAKAT W28 UPREK A575 INTIK DCT TEBUS G588 FKG B215 WUR ZWWW | 4 | 04:33 | 12317.0 | 1834.0 | 1090.0 | 38798.55 | 否 | | | |
| CZ5893 | 32H | 2024/10/14 | ZYCC | 2024/10/14 10:55 | ZWWW | 2024/10/14 16:10 | ZYCC BUTET G341 TGO B334 KAKAT W28 UPREK A575 INTIK DCT 4433N09419E DCT ADPET W188 FKG ZWWW | 5 | 04:18 | 11623.0 | 1714.0 | 915.13 | 36612.45 | 否 | | | |
| CZ5893 | 32H | 2024/10/14 | ZYCC | 2024/10/14 10:55 | ZWWW | 2024/10/14 16:10 | ZYCC BUTET G341 TGO B334 KAKAT W28 UNTEN B339 POLHO DCT TEBUS G588 FKG B215 WUR ZWWW | 6 | 04:36 | 12433.0 | 1859.0 | 1070.1 | 39163.95 | 否 | | | |
| CZ5893 | 32H | 2024/10/14 | ZYCC | 2024/10/14 10:55 | ZWWW | 2024/10/14 16:10 | ZYCC BUTET G341 TGO B334 KAKAT W28 UNTEN B339 POLHO DCT 4433N09419E DCT ADPET W188 FKG ZWWW | 7 | 04:24 | 11863.0 | 1756.0 | 898.6 | 37368.45 | 否 | | | |
| CA1281 | B738 | 2024/05/17 | ZBAA | 2024/05/17 09:15 | ZLIC | 2024/05/17 11:00 | ZBAA BOTPU W47 IDSOT W48 MAKIP H53 MULOB W220 NIRUV B215 YHD ZLIC | 1 | 01:28 | 3995.0 | 546.0 | 56.66 | 12584.25 | 是 | ZLHW C1411/24 | ZLHW C1411/24 B项【2405170930】,C项【2405172030】 禁用高度【[0M-7799M]】 影响航段【MULOB W220 NIRUV B215 YHD】【MULOB W220 TUTGO】,高度【[FL230-FL361]】【TUTGO W220 NIRUV】,高度【[FL0-FL361]】【NIRUV B215 YHD】,高度【[FL0-FL361]】 进入时间【MULOB:05-17 10:22(UTC)】,退出时间【YHD:05-17 10:38(UTC)】 | 128 |
| HU7850 | 738 | 2024/05/30 | ZHCC | 2024/05/30 00:00 | ZWWW | 2024/05/30 00:00 | ZHCC NOPIN B208 NIXAL DCT TEBUS G588 FKG B215 WUR ZWWW | 2 | 04:08 | 11180.0 | 1691.0 | 1045.33 | 35217.0 | 否 | | | |
| HU7850 | 738 | 2024/05/30 | ZHCC | 2024/05/30 00:00 | ZWWW | 2024/05/30 00:00 | ZHCC NOPIN B208 NIXAL DCT 4433N09419E DCT ADPET W188 FKG ZWWW | 3 | 03:53 | 10456.0 | 1564.0 | 861.96 | 32936.4 | 否 | | | |
| HU7850 | 738 | 2024/05/30 | ZHCC | 2024/05/30 00:00 | ZWWW | 2024/05/30 00:00 | ZHCC PADNO B208 HET W32 INTIK DCT TEBUS G588 FKG B215 WUR ZWWW | 4 | 04:15 | 11490.0 | 1742.0 | 1080.09 | 36193.5 | 否 | | | |

Sample of simulated output data

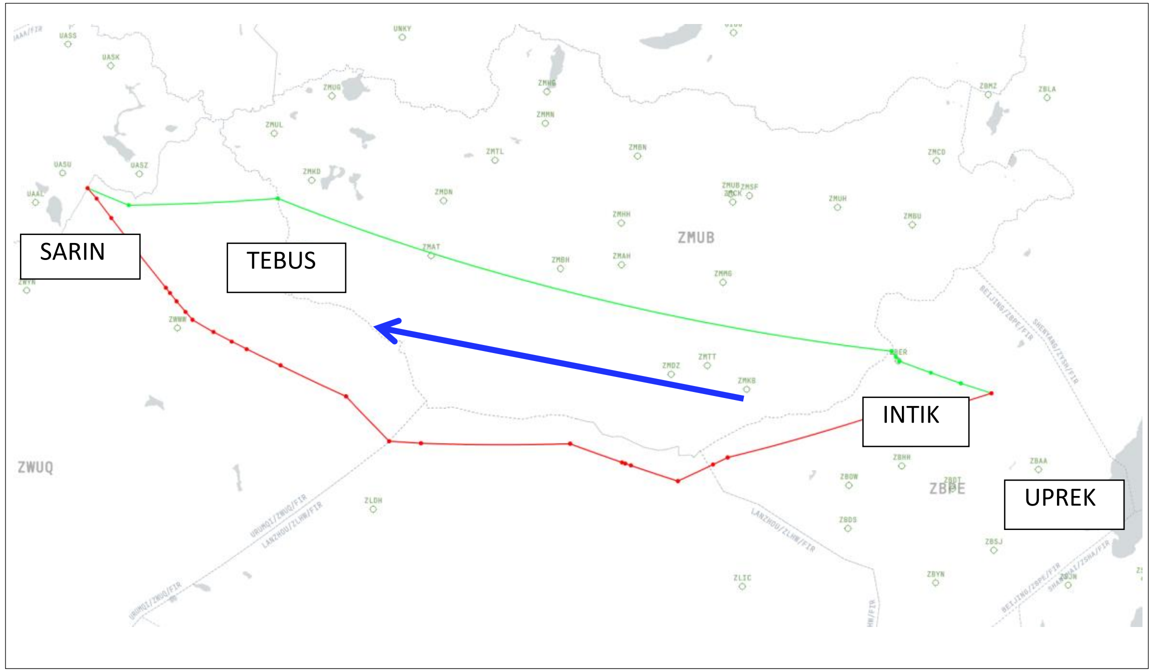
# Deliverables and Key Results

## Overall performance

| Item | Change in Numbers |
|---|---|
| Total number of flights (30 Mar 2024 – 29 Mar 2025) | 46,161 of 68,256 flights were selected |
| Flight delays affected by NOTAMs | 6,664 flights (14.4%) with an average delay of 140.3 minutes per flight |
| **39,456 flights with shorter alternative route distances:** | |
| Total flight time | - 4,968 hours |
| Total fuel consumption | - 33,530.6 tons (approximately - 91,865 kg per day) |
| Total CO2 emission | - 105,622.8 tons (approximately - 289 tons per day) |
| Total ANS charges | - 2,040,908 USD ( - 44,650,445 for China & + 42,609,537 for Mongolia) |
| Total potential delay time affected by NOTAMs | - 13,084 hours |
| Total controller service time | - 4,968 sector-hours ( - 72,346 for China & + 67,378 for Mongolia) |
| Total crew workload | - 4,968 hours of flight time & -13,084 hours of delays |
| **1,044 (affected by NOTAMs) out of 6,705 flights with longer alternative route distances:** | |
| Total delay time | - 2,320 hours |
| Total fuel consumption | + 1,630 tons |
| Total CO2 emission | + 5,134 tons |
| Total ANS charges | - 32,760 USD |

# Representative Route Performance

## Example: UPREK – SARIN Route Pair

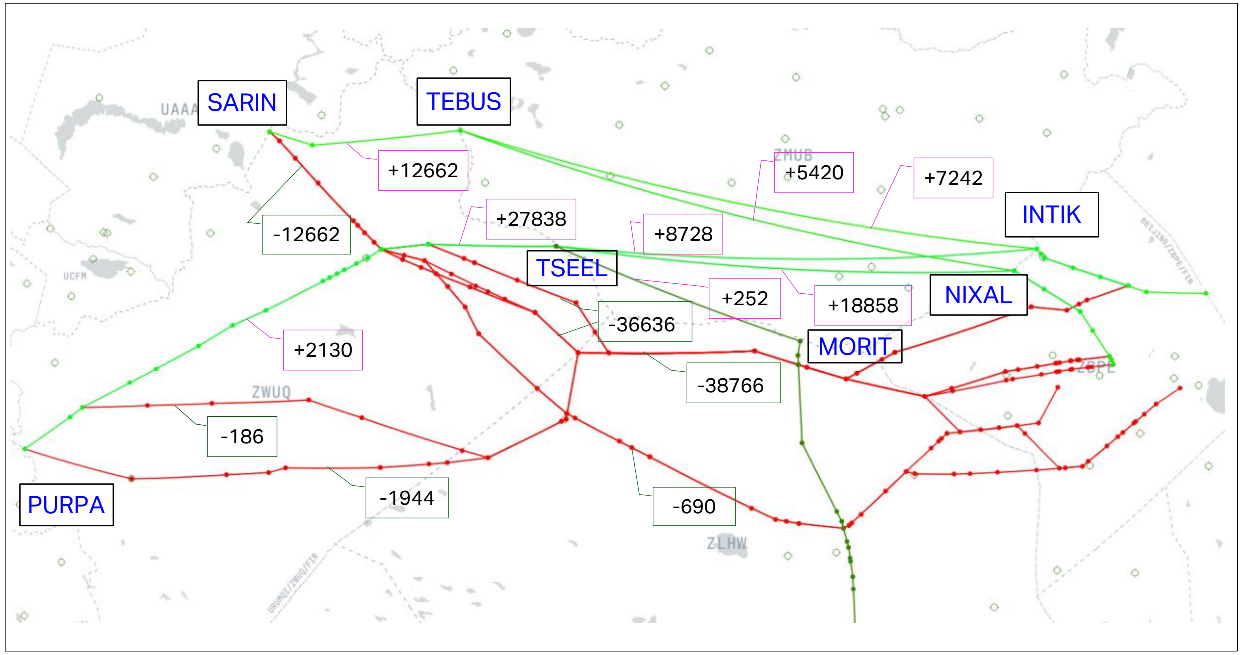



| Route Information | | Simulated Performance | |
|---|---|---|---|
| **Origin-Destination** | UPREK-SARIN | Flights Simulated | 2,432 |
| **Great Circle Distance (NM)** | 1,406 | NOTAM-Induced Delay Rate on Original Route | 17.9% |
| **Original Route** | UPREK W28 KEVOB W28 ATBUG W66 NUKTI B215 FKG A368 SARIN | Average / Median Delay per Affected Flight on Original Route (min/flight) | 266/282 |
| **Original Route Distance (NM)** | 1,543.2 | Average Change in Flight Time per Flight (min/flight) | -17.1 |
| **Original Route En-route Extension Ratio** | 9.74% | Total Change in Flight Time (min) | -41,446 |
| **Alternative Route** | UPREK A575 LHT A575 INTIK DCT TEBUS DCT 4640N08444E DCT SARIN | Average Change in Fuel Consumption per Flight (kg/flight) | -2,604 |
| **Alternative Route Distance (NM)** | 1,418 | Total Change in Fuel Consumption (t) | -6,333 |
| **Alternative Route En-route Extension Ratio** | 0.85% | Total Change in CO2 Emissions (t) | -19,947 |
| **Change in Alternative Route Distance (NM)** | -125.2 | Total Change in Route Charges (USD) | -1,579,604 |
| **Distance within Chinese Airspace (NM)** | 489.8 | Change in Route Charges - China (USD) | -5,078,649 |
| **Distance within Mongolian Airspace (NM)** | 928.2 | Change in Route Charges - Mongolia (USD) | +3,499,044 |

# Traffic Flow Shift and Diversion Rates

| Route / Border Point | Annual Traffic | Max Daily Change | Avg Daily Change | Avg Flight Time (min) | Flight Time Variability (min) |
|---|---|---|---|---|---|
| INTIK-TEBUS | +7242 | +23 | +20 | 126 | 3.7 |
| NIXAL-TEBUS | +5420 | +19 | +15 | 104 | 1.9 |
| INTIK-TSEEL | +8728 | +38 | +24 | 113 | 6.1 |
| NIXAL-TSEEL | +18858 | +66 | +49 | 88 | 7.5 |
| TEBUS | +12662 | +42 | +35 | | |
| INTIK | +16334 | +61 | +45 | | |
| NIXAL | +23486 | +85 | +64 | | |
| TSEEL | +27838 | +100 | +73 | | |

Traffic Flow Changes on Mongolian Route Segments and at China-Mongolia Border Points

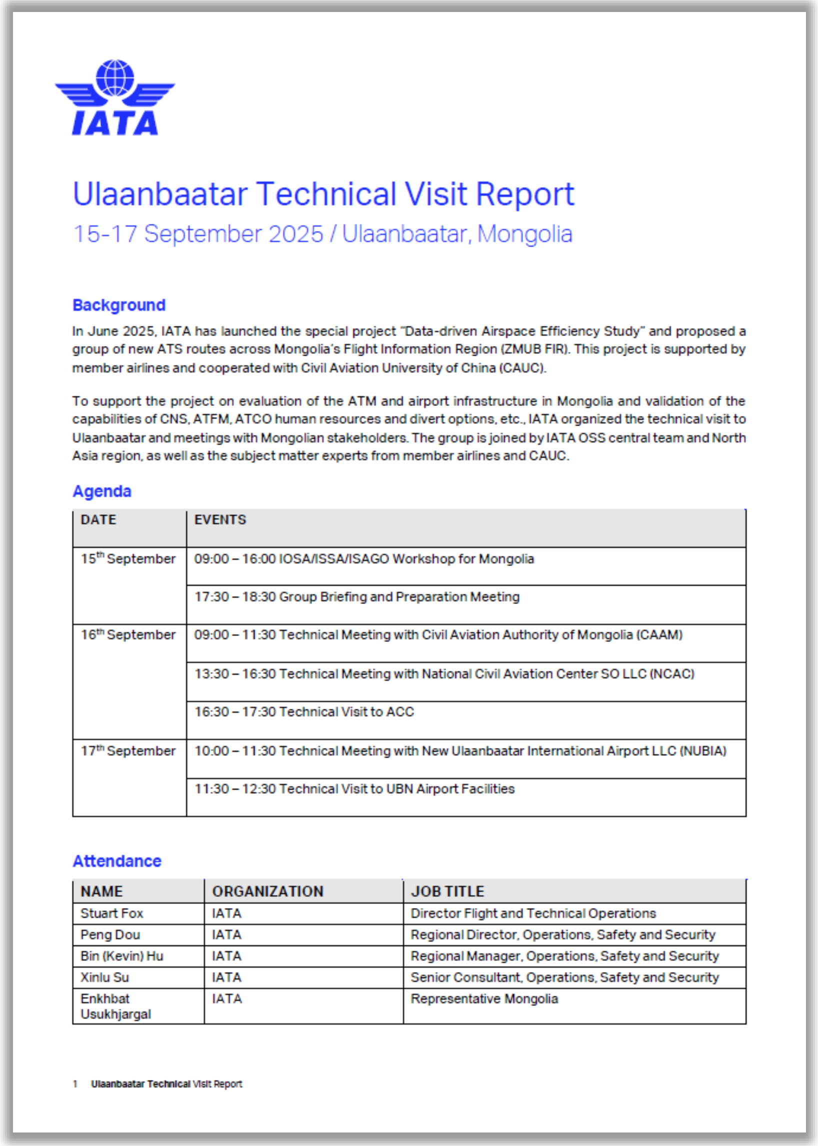



Traffic Flow Changes on Major Routes

| Representative Route | Simulated Flights | Restriction Rate | Chinese Airlines (Flights) | Net Cost Reduction for Chinese Airlines? | Net Cost Reduction for Non-Chinese Airlines? | Estimated Diversion Rate |
|---|---|---|---|---|---|---|
| UPREK-SARIN | 2432 | 17.90% | \ | \ | Y | 100% |
| AGAVO-SARIN | 4810 | 17.40% | \ | \ | Y | 100% |
| SARIN-PUKOL | 212 | 15.60% | \ | \ | Y | 100% |
| SARIN-SASAN | 1315 | 15.20% | \ | \ | Y | 100% |
| SARIN-BIKUT | 3893 | 16.70% | 585 | N | Y | 86.5% |
| UPREK-PURPA | 1944 | 15.40% | \ | \ | Y | 100% |
| UPREK-FKG | 6784 | 12.20% | 5984 | N | Y | 20.6% |
| ZBHH-FKG | 364 | 12.10% | 364 | Y | \ | 80.0% |
| LAXAG-FKG | 700 | 11.70% | 700 | N | \ | 10.0% |
| ZBTJ-FKG | 326 | 10.20% | 326 | Y | \ | 80.0% |
| MAGIV-BIKUT | 186 | 14.10% | 186 | N | \ | 10.0% |
| ADPET-PUKOL | 1693 | 10.40% | 1693 | N | \ | 10.0% |
| ADPET-BIKUT | 14640 | 13.40% | 4360 | N | Y | 73.2% |
| ADPET-TMR | 157 | 9.60% | 157 | N | \ | 10.0% |

Estimated Diversion Rates for Routes with Shorter Alternative Distances

# Technical Meetings, Visits and Interviews



IATA

## Ulaanbaatar Technical Visit Report

15-17 September 2025 / Ulaanbaatar, Mongolia

### Background

In June 2025, IATA has launched the special project "Data-driven Airspace Efficiency Study" and proposed a group of new ATS routes across Mongolia's Flight Information Region (ZMUB FIR). This project is supported by member airlines and cooperated with Civil Aviation University of China (CAUC).

To support the project on evaluation of the ATM and airport infrastructure in Mongolia and validation of the capabilities of CNS, ATFM, ATCO human resources and divert options, etc., IATA organized the technical visit to Ulaanbaatar and meetings with Mongolian stakeholders. The group is joined by IATA OSS central team and North Asia region, as well as the subject matter experts from member airlines and CAUC.

### Agenda

| DATE | EVENTS |
|---|---|
| 15th September | 09:00 – 16:00 IOSA/ISSA/ISAGO Workshop for Mongolia |
| | 17:30 – 18:30 Group Briefing and Preparation Meeting |
| 16th September | 09:00 – 11:30 Technical Meeting with Civil Aviation Authority of Mongolia (CAAM) |
| | 13:30 – 16:30 Technical Meeting with National Civil Aviation Center SO LLC (NCAC) |
| | 16:30 – 17:30 Technical Visit to ACC |
| 17th September | 10:00 – 11:30 Technical Meeting with New Ulaanbaatar International Airport LLC (NUBIA) |
| | 11:30 – 12:30 Technical Visit to UBN Airport Facilities |

### Attendance

| NAME | ORGANIZATION | JOB TITLE |
|---|---|---|
| Stuart Fox | IATA | Director Flight and Technical Operations |
| Peng Dou | IATA | Regional Director, Operations, Safety and Security |
| Bin (Kevin) Hu | IATA | Regional Manager, Operations, Safety and Security |
| Xinlu Su | IATA | Senior Consultant, Operations, Safety and Security |
| Enkhbat Usukhjargal | IATA | Representative Mongolia |

# Industry Review Workshop

- The industry workshop was delivered on 25-27 Nov 2025 in Xi'an, China in collaboration with CAAC/ATMB, attended by 103 participants from 9 States/ANSPs, 20 airlines and 7 international organizations and institutes.

Unrestricted

# IATA White Paper

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  - Drones
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- Baggage Operations
- Fuel
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- Aircraft Performance
- Pilot & Maintenance Training & Licensing

## ATM Operational Concepts

IATA plays a leading role in coordinating efforts among aviation stakeholders to ensure that Air Traffic Management (ATM) standards are globally harmonized. Several regional ATM programs have been initiated or launched across the world, without alignment. They cannot be sustainable solutions.

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In addition, future ATM systems must be managed as an integrated network that is harmonized and interoperable to achieve on-time operations, predictability, and low carbon footprint. Currently the incompatibilities in technologies, aircraft equipage, and performance requirements create unsustainable business cases for airlines considering investment decisions. Technological solutions must be derived in collaboration amongst all stakeholders to ensure functional compatibility with airborne systems and timeliness of implementation.

**Navigational Avoidance of Contrail Regions**
Airlines have been partnering with universities, research centers, and private entities to identify the requirements and limitations for navigational avoidance of high-probability, high-warming contrail regions. This insights paper (pdf) highlights the unknowns and limitations, and their impacts on operational decisions at tactical and pre-tactical levels.

**User Requirements for Air Traffic Services (URATS) - ATM**
The User Requirements for Air Traffic Services (URATS) – Air Traffic Management (ATM), Volume I (pdf), presents IATA's positions on ATM concepts to be applied as a reference for air navigation services provider's (ANSP) investment plans and in the adoption of new cockpit technologies.

OPERATIONAL IMPROVEMENTS | TBO & FF-ICE | SWIM | IATA WEBINARS | A-CDM TOOLKIT | AIRSPACE EFFICIENCY

In response to the airspace disruption and operational challenges, IATA has launched a special project in 2025 named "Data-driven Airspace Efficiency Study" in collaboration with airlines, ANSPs and industry stakeholders, and a data-driven and performance-based methodology has been developed to improve airspace efficiency, sustainability and resilience. This approach was validated by the case study on EU-Asia Interface and its FIRs, further details along with the findings and recommendations can be found in the IATA White Paper - Data Driven Airspace Efficiency (pdf)

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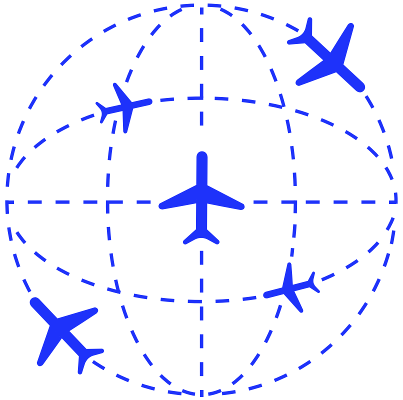
## Data-driven Airspace Efficiency Study
### Case Study: EU-Asia Interface

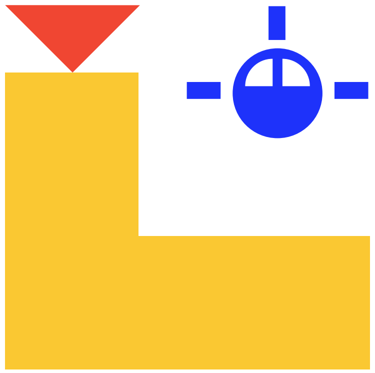
1 Data-driven Airspace Efficiency Study

# Key Takeaways and Recommendations



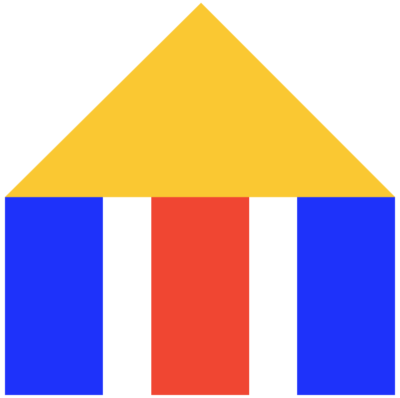
## Outcome of Study

Strategic value to EU-Asia routes offered by the proposed solutions



## Short Term

Coordinated measures to alleviate cross-border operational challenges



## Medium-to-long Term

Recommended industry framework for airspace efficiency management

# Airspace Efficiency Management System

Recommended industry framework

Airspace Efficiency Policy and Objectives

Airspace Efficiency Planning and Program Management (e.g., FRA)

**Airspace Efficiency Management**

Airspace Efficiency Assurance

Airspace Efficiency Promotion

Recommended Industry Framework for Airspace Efficiency, Sustainability and Resilience

# Thank you

**Bin (Kevin) Hu**

hub@iata.org