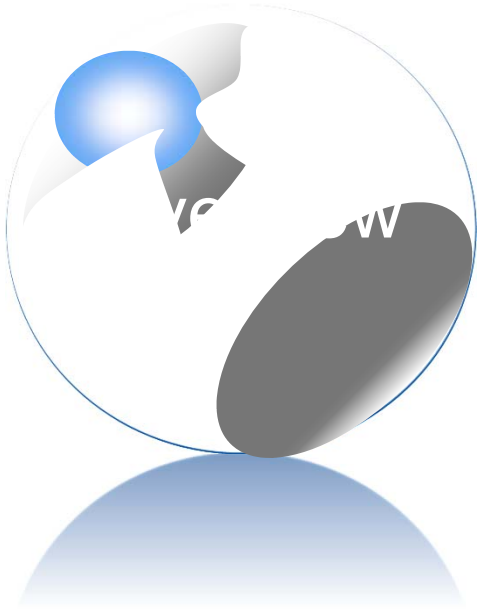
ICAO

NO COUNTRY LEFT BEHIND

Big Data analytics and tools to support aviation analysis

28-29 September 2021

Webinar on Air Transport Data and Analysis



- Reflections on Big Data
- Big Data and the UN
- Big Data and Aviation
- ICAO's engagement
- Way Forward

The term "Big Data" is often used synonymously with other related concepts such as business intelligence (BI) and data mining.

Big Data

- Large volume of data
- Day-to-day necessities of a corporation
- **Purpose** :
  - Analysis for accurate insights
- **Objective** :
  - Better decision-making
  - Strategic business moves

Volume  In 2020 – 50 times the amount of data in 2011.

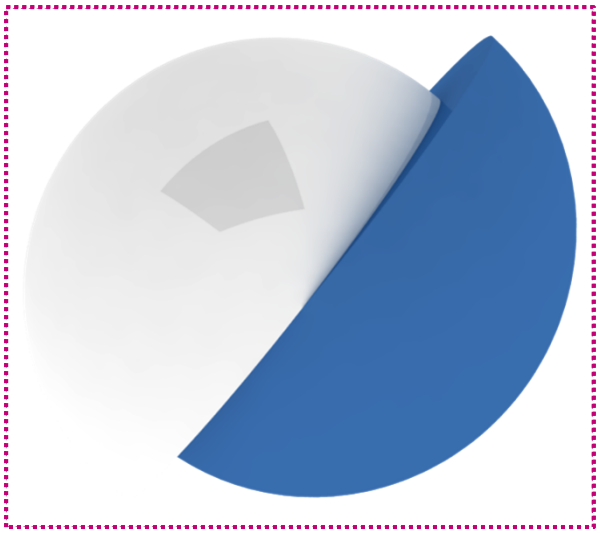
Velocity  Large amount of data must be dealt with in a timely manner.

Variety  Data comes in many various formats.

SOUTHWEST	- Analysis of sensor data to identify patterns indicating potential malfunction or safety issue. - Enables making reparations without interrupting flights or putting passengers at risk.
BOEING	- Perform ASBU analysis for operational efficiency. - Improve performance and customer experience.
KAYAK	- Creation of a predictive model for users of flight price fluctuation within the upcoming week. - Tracking of flights improve the algorithm.
UNION PACIFIC	- Prediction of potential derailment days. - Derailment reduced by 75%.
AIRBUS	- Optimize fleet management and operations. - Enhance operational efficiency.

Factors facilitating advancements in Big Data

Reduced costs of data collections, storage and processing	New sources of data & improved access to existing data	Broad spectrum of utility for collected data	Creative and powerful new methods to exploit Big Data



Advantages

- Significant increase in scope and coverage
- Significant decrease in costs
- Improving accuracy , transparencies and timeliness
- Leapfrog to more efficient technology for countries without proper statistical programs
- More cost effective and productive technology

Challenges

- Methodologies and definitions to match that of official statistics
- Perceptional differences
- Public Private Partnerships (PPPs)
- Capacity building

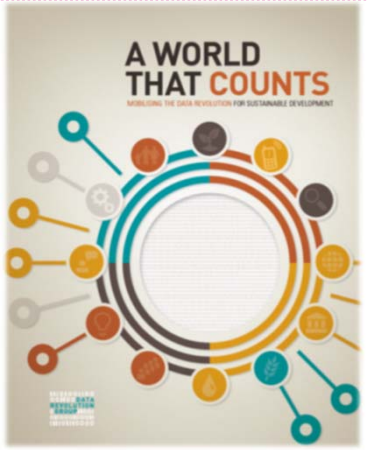
Big Data & the United Nations

- A transformative tool for official statistics
- Potential to improve accuracy and reduce costs for official statistics
- UN Global Working Group to:

*"provide strategic vision, direction, and coordination of a global programme on Big Data for **official statistics**, to promote practical use of sources of Big Data for official statistics, while finding solutions for their challenges, and to promote capacity building and sharing of experiences in this respect."*

Mobilizing Data Revolution for Sustainable Development

"Data are the lifeblood of decision-making and the raw material for accountability. Without high-quality data providing the right information on the right things at the right time; designing, monitoring and evaluating effective policies becomes almost impossible."



(Statement of Independent Expert Advisory Group on the Data Revolution appointed by UN Secretary General, August 2014)

PRINCIPLES GOVERNING INTERNATIONAL STATISTICAL ACTIVITIES

- Endorsed by the Committee for the Coordination of Statistical Activities – 2005
- Reaffirmed – 2014
- Endorsed by the Economic and Social Council -2013 (Resolution 2013/21) and by the United Nations General Assembly - 2014 (Resolution A/RES/68/261).

1. High quality international statistics for all
2. Impartiality & Professionality
3. Publicity
4. Transparency
5. Timeliness, Cost-efficiency, Reduced burden on data providers
6. Strict confidentiality, use mandated by legislation
7. Addressing misinterpretation and misuse of statistics
8. Effective statistical standards
9. Coordination of international statistical programs
10. Cooperation

UN Global Working Group (GWG) on Big Data for Official Statistics :

- 31 Member States
  - *States on the ICAO Council: Australia, Brazil, Canada, China, Colombia, Egypt, Germany, India Italy, Mexico, Netherlands, Republic of Korea, Saudi Arabia, South Africa, United Arab Emirates, United Kingdom, United States of America*
- 16 International agencies
- 8 Task teams to implement the mandates
- 2 International conferences

ICAO is a member of GWG

GWG Mandates

1. Advocacy and Communications
2. Linking Big Data and SDGs
3. Access and Partnerships
4. Training, Skills, and Capacity Building
5. Cross-Cutting Issues
6. Mobile Phone Data
7. Satellite Imagery
8. Social Media Data

The report was prepared in accordance with the United Nations' Economic and Social Council Decision 2015/216.

It will be presented to the UNSC in New York City (New York) in March 2016.

ITU International Telecommunication Union	Use of mobile data – population displaced by epidemics and natural disasters
UNIDO United Nations Industrial Development Organization	Industrial statistics; employment index
UPU Universal Postal Union	End to end predictability for international e-commerce
THE WORLD BANK	Developmental indicators
Food and Agriculture Organization of the United Nations	Remote sensing for agricultural statistics and forecasting

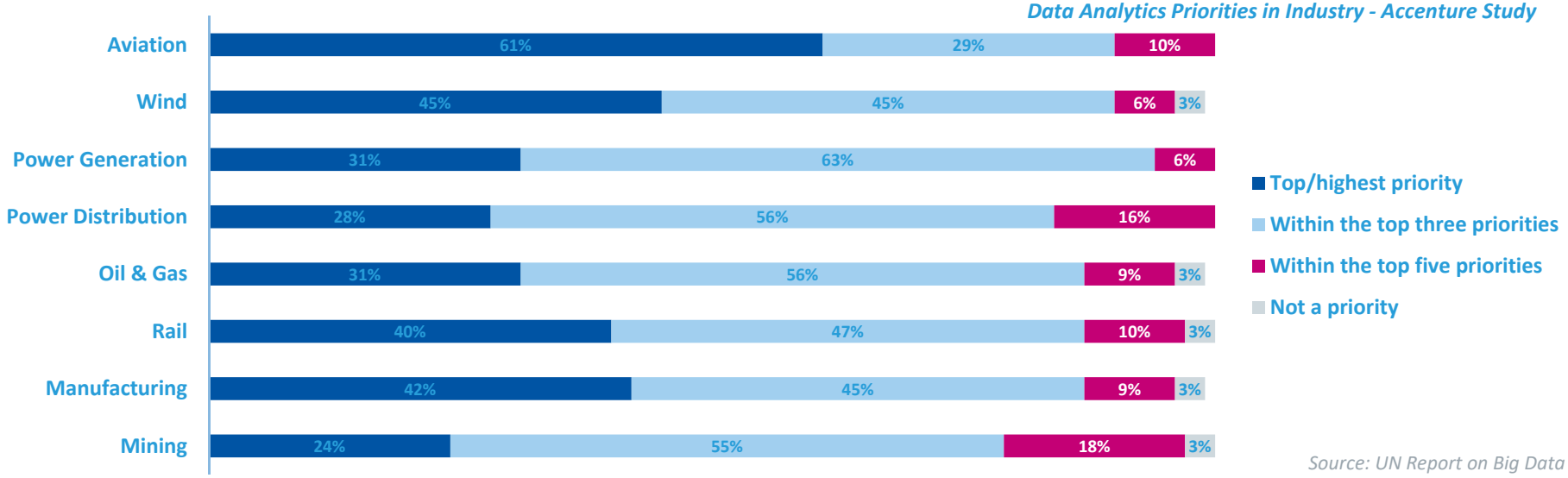
Other international agencies

OECD BETTER POLICIES FOR BETTER LIVES	Geospatial and web data for OECD statistics – transport studies , environmental indicators, economic studies, and governance indicators
EUROPEAN CENTRAL BANK EUROSYSTEM	Macroeconomic nowcasting
eurostat	Integration of big data into EU official statistics

Big Data & Aviation

Big Data analytics has become the highest priority for the aviation industry

Data Analytics Priorities in Industry - Accenture Study



Source: UN Report on Big Data

Big Data & Aviation

- **193 Member States**
- **38 million flights in 2019**
- **4.5 billion passengers in 2019**
- **About 4000 airports worldwide with scheduled services**
- **1 400 scheduled commercial airlines**
- **About 55 000 city pairs**
- **173 ANSPs**
- **31 000 aircraft in service**

Source: 2014 State of air transport

Benefits of Big Data

- Clear Comparability between Different Data Sources
- Internationalization of Data
- True Passenger Origin and Destination
- Data reflecting Real Aircraft Movements
- Granular Information from all airlines/airports

Big Data for improved connectivity

Connectivity components

Market Access

- Optimal use of ANS (ASBUs)
- Airline activities
- Optimal use of airport systems
- Inter-modality
- Optimal use of aircraft
- Facilitation

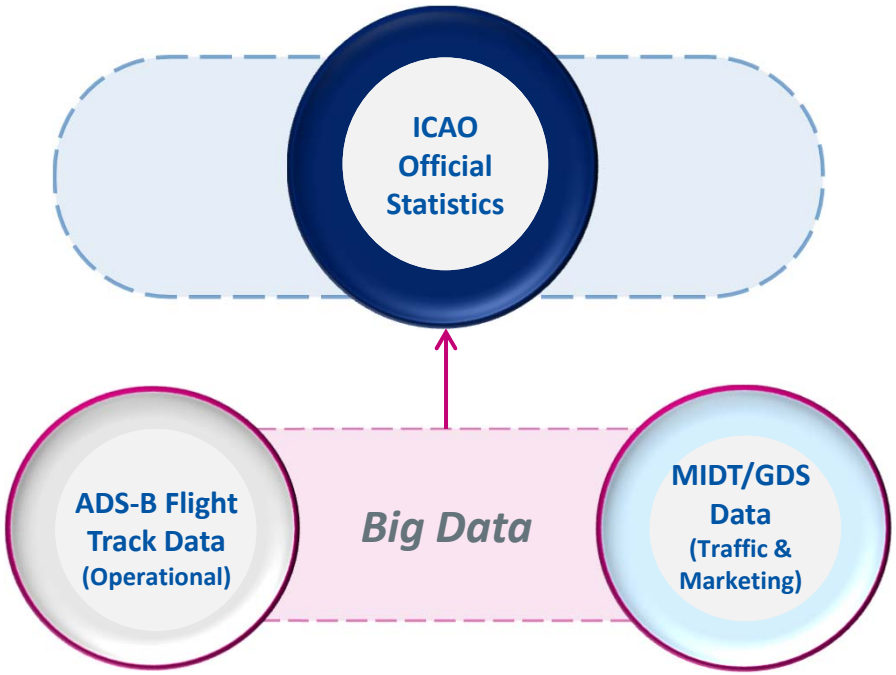
Supporting regulatory framework

Market Access

- Multilateral Agreements
- Bilateral Agreements
- Regional frameworks
- Traffic liberalization (pax and cargo)

Market Access

- Air Carrier Ownership & Control
- Taxes
- ASBUs
- Charges
- Facilitation / Security
- Consumer Protection
- Fair Competition

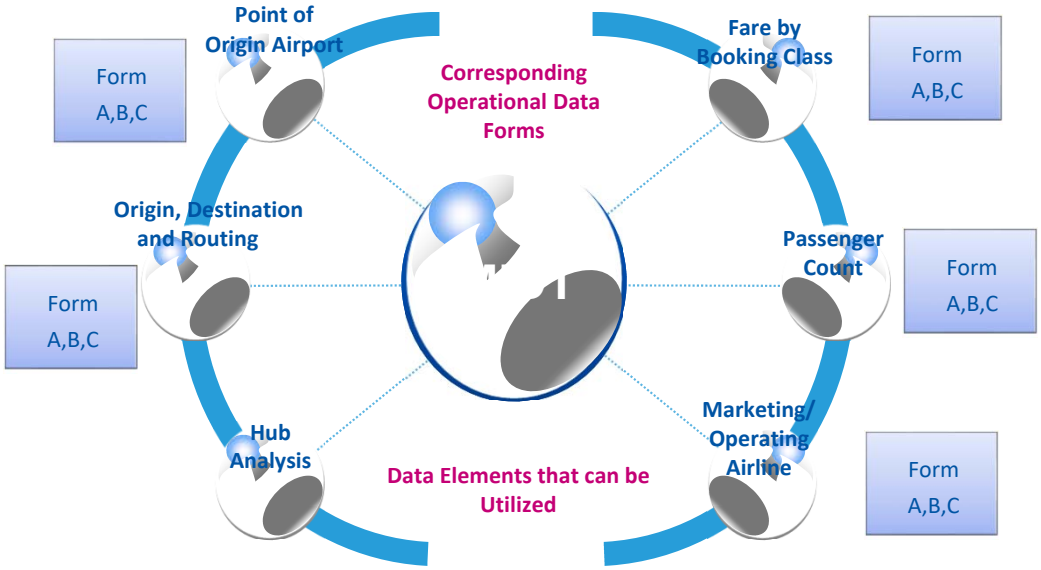


For the first time, a low cost and high efficiency opportunity exists toward gaining insights from the big data that cannot be done using localized data sets:

- Informed policy making
- Implementation
- Meet Strategic objectives
- Give States what is needed
- Improve coverage to nearly 100%
- Reduce costs

Pilot Project
MIDT Data

Marketing Information Data Transfer (MIDT) are the bookings made in the global distribution systems (GDS) covering 3.3 billion passengers on more than 3 million departures with the ability to see their true origin/destination.



The current Big Data activities are focused on global optimization and it could be a potential area of interest for a wide spectrum of entities :

- Central and Regional Governmental Institutions
- Airlines, Airports, ANSPs
- Environmental Agencies
- Aircraft Manufactures
- Other aviation services and equipment providers

Next Steps

Deliverables	Purpose
Monitoring of airspace and airports on crisis zones	Improve safety
Monitoring of airspace complexity and density	Improve safety
Monitoring of en-route aircraft separations	improve safety and operational efficiency
Measuring and monitoring of airspace congestion	improve safety and operational efficiency
Trending of in-flight declared emergencies	Improve safety
Identify airspace hotspots to correlate with loss of separation events	Improve safety
Identify terrain hotspots to correlate with loss of terrain clearance	Improve safety

Next Steps

Deliverables	Purpose
Complete data set of operational and traffic data	Near 100% coverage of data encompassing scheduled, non scheduled , charters and business jet operations. Complete COD for CAEP and environmental work.
True Origin Destination traffic	Better traffic and fleet forecasts for CAEP, improved planning and implementation (navigation and safety)
All freighter traffic route flow traffic	Cargo forecasts for CAEP, Improved cargo utilization
Social and economic impacts of disruptions	Developmental assistance, implementation and IWAF tool
Fuel Burn based on actual trajectory data and operations	Environmental tasks, cost benefits of more efficient routes, pre and post implementation monitoring
ICAO ICM Air Transport Diagnostics Project	Global connectivity optimization, ICAN agreements , more liberalization of air space
Price elasticity analysis	Policy impacts on demand
Business Analysis projects	DOC 7100, ASBU analysis

Future Developments

Work With UN GWG Task Forces

Modernize Data Collection & Analysis Program

Work on Big Data Projects in line with other UN agencies

Collaboration with National Accounting Offices of States

Capacity Building & Assistance to States

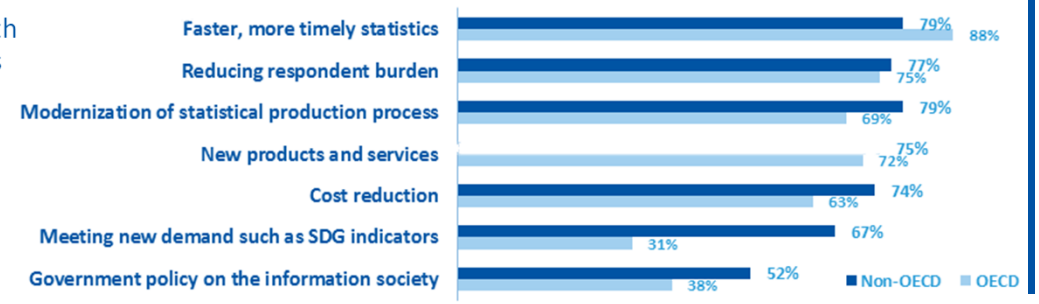
Incorporation of Big Data in an official statistics program (EDM)

Collaboration with RASGs, PIRGS, ROs and other IO.

Bringing substantive benefits to the global aviation system and to States

These main reasons lead ICAO to engage in …

Main Reasons & Benefits of Using Big Data



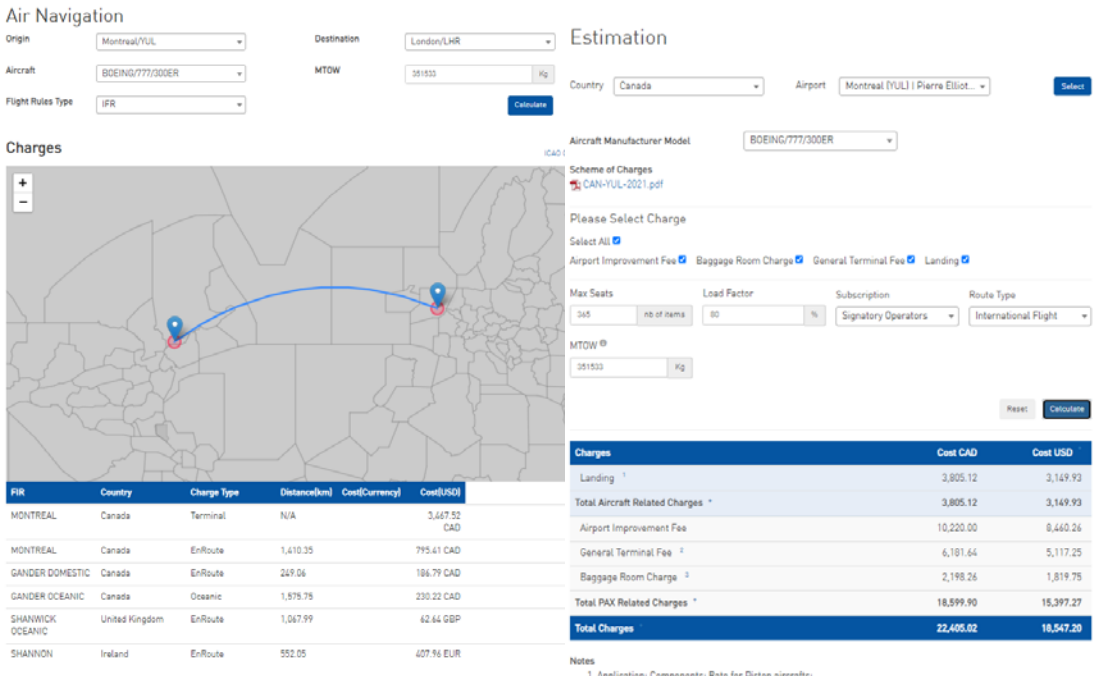
Source: United Nations Statistics Division

Third meeting of the Aviation Data and Analysis Panel (ADAP/3) [28-30 June 2021]

- The Panel provided Recommendations regarding the development of methodologies to collect, process and analyze Big Data
- Establish a multi-disciplinary working group tasked with determining the feasibility, benefits, and risks of using Big Data to assist in contact tracing of passengers travel history during public health emergencies (ADAP/3.5 b)
- Develop a Guidance Document on the use of Big Data in aviation, seeking advice from Member States and organizations, when needed (ADAP/3.5 c)

ICAO Civil Aviation Data Solutions

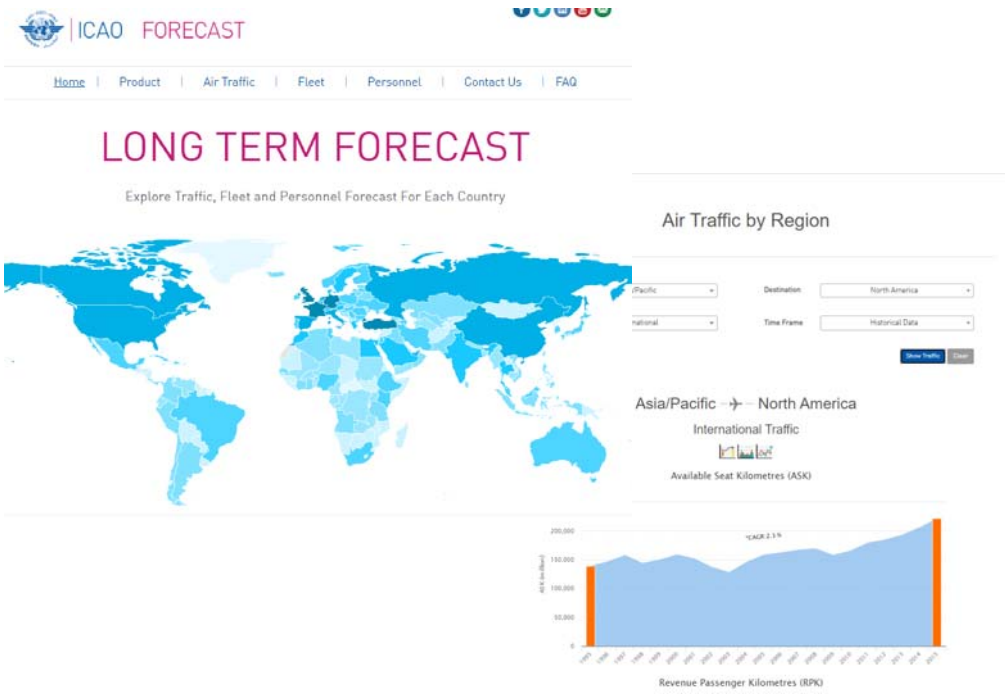
https://data.icao.int/icads/



ICAO Aero Tariffs

https://data.icao.int/aerotariffs

- Scheme of charges
- Air Navigation charges route
- Airport charges benchmarking



ICAO Traffic forecasts

https://data.icao.int/trafficforecast

- Developed by the Multi-Disciplinary Working Groups on Long-term Traffic Forecasts
- Passenger and Freight long-term traffic forecasts by region, State and 40 international route groups
- Fleet and licensed aviation personnel forecasts

ICAO Data+

https://data.icao.int/newDataPlus/Tools

- tool that presents in a dynamic and graphical environment the air transport statistic data collected from its 193 Member States
- enable users to quickly visualize trends, differences and similarities between air transport data selection and make competitive analyses (benchmarking) more accessible
- Data across different modules: Air Carrier Traffic, Traffic by Flight Stage, Air Carrier Finances, Airport Traffic, On-Flight Origin Destination, Air Carrier Personnel, Air Carrier Fleet

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