



**WORKING PAPER**

**ASSEMBLY — 40TH SESSION**

**ECONOMIC COMMISSION**

**Agenda Item 34: Aviation Data — Monitoring and Analysis**

**REPORT ON THE UPDATED LONG-TERM TRAFFIC FORECASTS**

(Presented by the Council of ICAO)

**EXECUTIVE SUMMARY**

This working paper reports on activities in the area of forecasts and planning in accordance with Assembly Resolution A39-15, which requested the Council to update the single set of long-term traffic forecasts. The updated forecasts indicate that global passenger and freight traffic will grow at 4.3 per cent and 3.9 per cent respectively, on an annual basis to 2035. This paper also presents ICAO's plan for future work related to forecasting and planning (a part of the aviation data and analysis work programme). It will focus on the continued update of the existing forecasts with the further refinement of econometric methodologies and data set using big data, and the enhancement of the online analytical tool for the development of more detailed customized forecasts, to meet the varied needs of States and other stakeholders.

**Action:** The Assembly is invited to:

- a) review the work accomplished by ICAO in paragraphs 2 and 3;
- b) endorse the Organization's work programme as presented in paragraph 4; and
- c) consider the information contained in this paper for the update of Assembly Resolution A39-15, Consolidated statement of continuing ICAO policies in the air transport field.

<i>Strategic Objectives:</i>	This working paper relates to Strategic Objective — <i>Economic Development of Air Transport</i> .
<i>Financial implications:</i>	The activities referred to in this paper will be undertaken subject to the resources available in the 2020–2022 Regular Programme Budget and/or from extra budgetary contributions, including the Voluntary Air Transport Fund (TRAF).
<i>References:</i>	Doc 10075, <i>Assembly Resolutions in Force</i> (as of 6 October 2016) Doc 10078, <i>Report of the Economic Commission of the 39th Session of the Assembly</i> A39-WP/64-EC/8, Report on the Development of a Single Set of Harmonized Long-Term Forecasts A40-WP/19-EC/5, ICAO Statistics Programme and Big Data Analytics A40-WP/22-EC/7, Consolidated statement of continuing ICAO policies in the air transport field ICAO Business Plan 2020–2022

## 1. BACKGROUND

1.1 The first ICAO single set of long-term traffic forecasts was developed in 2016 in accordance with the requirement of Assembly Resolution A38-14, and the results were presented to the 39th Session of the Assembly. To continuously meet the needs of States and other stakeholders, Assembly Resolution A39-15 requested the Council to a) develop and update forecasts of future trends and developments in civil aviation, and to make these available to Member States, and b) keep forecasting methodologies and procedures reviewed and improved.

1.2 The Secretariat continued to work with the Multi-disciplinary Working Group on Long-term Traffic Forecasts (MDWG-LTF) under the Aviation Data and Analysis Panel (ADAP) to update and customize the single set of long-term traffic forecasts. The updated forecasts provided estimation of 10-, 20-, and 30-year annual passenger and freight growth from 2015 to 2025, 2035 and 2045.

## 2. DATA AND MODEL SPECIFICATION

2.1 **Passenger Forecasts.** Demand for passenger air travel is measured by revenue passenger-kilometres (RPKs). The historical time-series data set of RPKs at city-pair and carrier levels was extended from 1995–2012 to 1995–2015 for both international and domestic operations. The compilation of the data sets included following sources:

- a) *actual* traffic data reported by States to ICAO (through the Air Transport Reporting Forms A, B and C) and published directly by States, the coverage of which was over 90 per cent of air passenger traffic and 95 per cent of freight traffic;
- b) *actual* origin and destination passenger traffic data collected through the Market Intelligence Data Transfer (MIDT, A40-WP/19-EC/5 refers); and
- c) *estimated* traffic data based on the airline schedules published in the Official Airline Guide (OAG), which was used to fill the gaps.

2.2 The MIDT data was used for the first time in the complementation of passenger traffic data on city pairs with low reporting, which reduced the percentage of traffic estimation and hence improved the accuracy of historical data sets.

2.3 As is the case for the previous long-term forecasts, passenger traffic data was segmented into 50 defined route groups (40 international and 10 domestic). Following consultation with the MDWG-LTF, the definition of the route groups and regions remained unchanged in this instance in order to ensure the consistency for comparison. The 50 route groups were also assigned to six different “tiers” according to the income level and market maturity of each route group. The income thresholds to segregate the tiers were sourced from the World Bank definition of low, lower-middle, upper-middle and high-income economies (<https://datahelpdesk.worldbank.org/knowledgebase/articles/906519>).

2.4 After reviewing the original econometric model with a series of diagnostic tests, it was decided to use the same model which captures the main economic and demographic drivers of air traffic demand and best fits the input data. The model examines how passenger demand (passenger traffic in RPKs) is affected by real gross domestic product (GDP) per capita and cost of travel (airfares), and predicts annual change in RPKs for each route group using the following equation:

$$\Delta \log \widehat{RPK}_{pc_{rt}} = \sum_{i=1, j=1}^6 \beta_i (T_j * \Delta \log GDP_{pc_{rt}}) + \beta_{oil} \Delta \log \text{Cost of Travel}_{rt} + \text{dummies}$$

i: tier coefficient index, j: tier index, t: year, r: route group, pc: per capita, Δ: difference between t and t-1

2.5 Concerning the independent variables, country specific economic and demographic data were sourced from the International Transport Forum (ITF-OECD). This includes real GDP per capita in 2005 constant USD, which varies from the data in 2010 constant USD used for the previous forecasts. As there is no coherent methodology to obtain specific airfare costs, oil prices were used as a proxy for cost of travel, consistent with recent literature on this topic. In addition, dummy variables were added to the equation to take into account the effect of “special” events such as those of 11 September 2001 and the Severe Acute Respiratory Syndrome (SARS) outbreak.

2.6 A panel data analysis using a first difference estimator (i.e. based on difference between year t and year t-1) was used to estimate the passenger traffic equation. This approach best fits the dataset and information available for estimation while allowing for controlling of both time series and cross-sectional aspects of the data.

2.7 **Freight Forecasts.** Demand for freight is measured by freight tonne-kilometres (FTKs). The historical time-series data set of FTKs at the regional level were extended from 1995–2012 to 1995–2015 for both international and domestic operations. The data sets were compiled from the similar sources as for the passenger forecasts with the exception of MIDT data.

2.8 In line with the 2012 baseline freight forecasts, the model examines how freight demand (freight traffic in FTKs) is affected by real GDP as a sole independent variable, and predicts the level of FTKs for each region using the following equation:

$$\log \widehat{FTK}_t = \alpha + \beta \log GDP_t \quad t: \text{year}$$

2.9 Economic data was taken from the same source as the passenger traffic forecasts and aggregated by region to preserve the relatively large heterogeneity amongst the different regions in terms of the relationship between FTKs and real GDP. Ordinary least squares (OLS) regression was used for each of the six global regions by international and domestic.

### 3. RESULTS OF THE UPDATED FORECASTS

3.1 Econometric estimation of the models described above yields coefficient estimates for each of the independent variables. Compared with the previous results, the coefficients (all of which are statistically significant and have the expected sign) are generally higher mainly due to the shift in the base year of the economic data. For passenger forecasts specifically, the estimated coefficients are lower for low-income economies and highest for lower-middle income economies, with high-income economies somewhere in the middle. Overall, the models appear to be reliably estimated.

3.2 By using the estimated coefficients in the above models and economic outlook data provided by ITF-OECD et al., annual RPK value for each route group and annual FTK value for each region were calculated from 2016 to 2045. These predicted values were used to compute the Compound Annual Growth Rates (CAGR) of passenger and freight traffic for a 10 (2015-2025), 20 (2015-2035) and 30 (2015-2045) year period. The detailed results are presented in the Appendix.

3.3 According to this updated estimation, global passenger traffic will grow at 4.3 per cent annually from 2015 to 2035, which is 0.3 percentage points lower than the previous forecasts (4.6 per cent annually from 2012 to 2032). The difference of the traffic growth prediction can be explained mainly by the overall downward adjustment to the long-term economic outlook, specifically, slower economic growth predicted for China and the Middle East (overriding higher growth in Europe), compared to the previous outlook used three years ago. All route groups involving Central Southwest Asia are among the Top 10 fastest growing ones, and Central South West Asia – North Asia is estimated to have the highest growth rate at 7.2 per cent annually up to 2035. Route groups in and between Africa, Central America/Caribbean and the Middle East are expected to grow around the global pace. Lower growth rates are estimated for route groups in and between mature markets, including Europe, North America, and North Asia.

3.4 Global freight traffic is expected to grow at 3.9 per cent annually from 2015 to 2035, i.e. 0.5 percentage points lower than the previous forecasts (4.4 per cent annually from 2012 to 2032) due to the same reason as passenger forecasts. Two regions, the Middle East and Asia/Pacific, will exceed the global growth, with the former having the highest annual growth outpacing global estimate by about 1.9 percentage points. This is followed by Africa which is estimated to grow at an almost similar pace to the global estimate. North America and Europe will grow at a slightly slower pace than the global estimate while Latin America/Caribbean has the lowest annual growth rate of less than 2 per cent.

3.5 The updated traffic forecasts have been integrated into a newly-developed online analytical tool, allowing States and other users to generate customized forecasts at different levels of granularity (for example, by route, country-pair, city-pair, and country of departure). The Committee of Aviation Environmental Protection (CAEP) also uses customized forecasts for the development of fleet forecasts, and activities on trends assessment.

#### 4. FUTURE WORK

4.1 The availability of accurate, credible air traffic forecasts is the basis for all the planning activities in States, ICAO, as well as other stakeholders. They are critical to effectively implement ICAO's *No Country left Behind* (NCLB) initiative; estimate future trends of noise, emissions and particulate matter; estimate aviation's economic contribution in the future; and conduct a gap analysis between forecasted demand and current capacity of infrastructure and human resources. The traffic forecasts are also required to conduct business case, cost-benefit analysis, economic impact analysis and cost-effectiveness analysis in developing aviation infrastructure programmes and plans, including the Aviation System Block Upgrades (ASBUs), and establishing evaluation and monitoring frameworks, in alignment with the Global Aviation Safety Plan (GASP) and the Global Air Navigation Plan (GANP), and adequate oversight system. The accurate forecasts build business confidence and contribute to encouraging investments in the aviation sector by financial institutions.

4.2 As described in the ICAO Business Plan 2020–2022, the focus and priority of future work in the area of forecasts and planning (a part of the aviation data and analysis work programme) will, therefore, be placed on the continued update of the existing single set of long-term traffic forecasts with the further refinement of econometric methodologies and data set using big data (A40-WP/19-EC/4 refers), and the enhancement of the online analytical tool to generate more detailed customized forecasts. In conducting this work, the Organization will, inter alia, update global and regional 20-year forecasts for pilots, maintenance personnel and air traffic controllers (Doc 9956) to meet the needs of the ICAO Next Generation Aviation Professional (NGAP) programme; develop a methodology of the capacity-constrained traffic forecasts, taking into account airport congestion; and forecast e-commerce activities jointly with the Universal Postal Union (UPU) and the United Nations Conference on Trade and Development (UNCTAD).

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**APPENDIX**

**PASSENGER TRAFFIC FORECASTS (RPKS)**

<b>Route Group</b>	<b>10 Year (2015-2025)</b>	<b>20 Year (2015-2035)</b>	<b>30 Year (2015-2045)</b>
Africa - Asia/Pacific	5.0%	5.0%	4.7%
Africa - Middle East	4.0%	4.5%	4.6%
Africa - North America	2.5%	2.9%	2.9%
Africa & Middle East - Central America/Caribbean	3.7%	4.3%	4.8%
Africa & Middle East - South America	3.1%	3.8%	3.9%
Africa Domestic	5.1%	5.8%	5.9%
Central America/Caribbean - Europe	3.9%	4.4%	3.8%
Central America/Caribbean - North America	3.6%	4.0%	3.6%
Central America/Caribbean - South America	2.6%	3.6%	4.4%
Central America/Caribbean Domestic	3.5%	4.3%	4.5%
Central South West Asia - Europe	5.3%	5.5%	5.1%
Central South West Asia - Middle East	7.0%	6.8%	6.5%
Central South West Asia - North America	5.9%	5.9%	5.3%
Central South West Asia - North Asia	7.4%	7.2%	6.8%
Central South West Asia - Pacific South East Asia	7.2%	6.6%	6.1%
Central South West Asia Domestic	7.5%	6.7%	6.0%
Europe - Middle East	3.8%	4.2%	4.0%
Europe - North Africa	3.9%	4.3%	4.1%
Europe - North America	2.5%	2.8%	2.6%
Europe - North Asia	2.1%	2.5%	2.4%
Europe - Pacific South East Asia	4.1%	4.5%	4.4%
Europe - South America	3.6%	4.2%	4.1%
Europe - Sub Saharan Africa	2.5%	2.9%	2.8%
Europe Domestic	2.4%	2.7%	2.6%
Intra Africa	5.1%	5.8%	5.9%
Intra Central America/Caribbean	3.5%	4.3%	4.5%
Intra Central South West Asia	7.7%	6.9%	6.3%
Intra Europe	2.4%	2.7%	2.6%
Intra Middle East	3.4%	3.6%	3.4%
Intra North America	2.4%	2.6%	2.5%
Intra North Asia	1.1%	1.7%	1.7%
Intra Pacific South East Asia	5.3%	5.4%	5.2%
Intra South America	2.0%	3.1%	3.3%
Latin America/Caribbean - Central South West Asia	5.6%	5.4%	5.3%

<b>Route Group</b>	<b>10 Year (2015-2025)</b>	<b>20 Year (2015-2035)</b>	<b>30 Year (2015-2045)</b>
Latin America/Caribbean - North Asia & Pacific South East Asia	3.3%	4.2%	4.4%
Middle East - North America	3.5%	3.8%	3.6%
Middle East - North Asia & Pacific South East Asia	3.4%	4.0%	4.0%
Middle East Domestic	3.4%	3.6%	3.4%
North America - North Asia	2.0%	2.4%	2.3%
North America - Pacific South East Asia	4.1%	4.4%	4.3%
North America - South America	3.5%	4.0%	3.9%
North America Domestic	2.4%	2.6%	2.5%
North Asia - Pacific South East Asia	3.3%	4.0%	4.1%
North Asia Domestic	1.1%	1.7%	1.7%
Pacific South East Asia Domestic	5.3%	5.3%	5.2%
South America Domestic	2.0%	3.1%	3.3%
<b>World Total</b>	<b>4.1%</b>	<b>4.3%</b>	<b>4.1%</b>

### Freight Traffic Forecasts (FTKs)

<b>Region</b>	<b>10 Year (2015-2025)</b>	<b>20 Year (2015-2035)</b>	<b>30 Year (2015-2045)</b>
Middle East	5.6%	5.7%	5.4%
Asia and Pacific	4.9%	4.3%	3.9%
Africa	3.4%	3.8%	3.9%
North America	3.2%	2.8%	2.6%
Europe	2.9%	2.7%	2.5%
Latin America/Caribbean	1.4%	1.6%	1.6%
<b>World Total</b>	<b>4.1%</b>	<b>3.9%</b>	<b>3.6%</b>

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