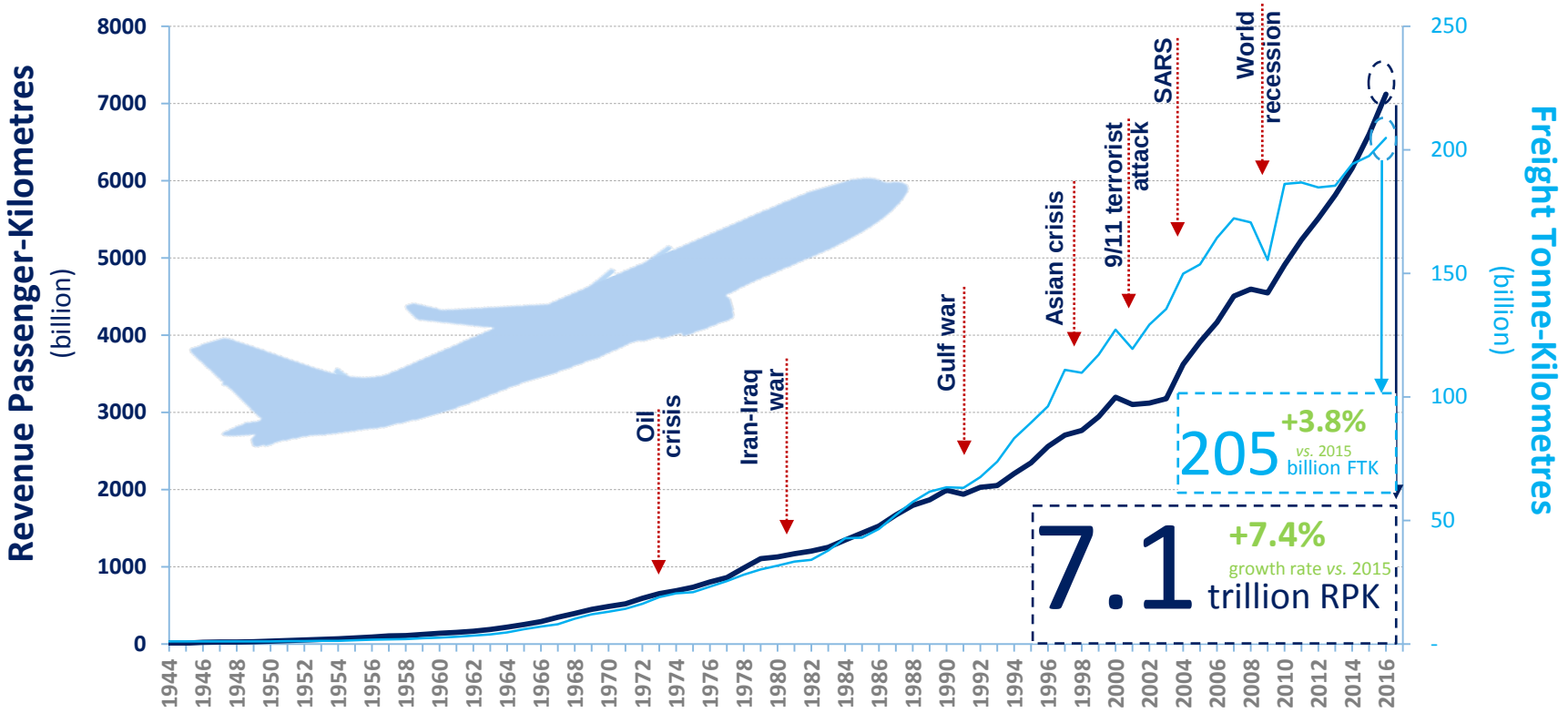
ICAO ECONOMIC DEVELOPMENT

State of Global Air Transport and ICAO Forecasts for Effective Planning

Economic Development
Air Transport Bureau
ICAO

State of Air Transport Industry in 2016

Growth of air transport



Source: ICAO Annual Report of the Council

Scheduled commercial traffic
Total (international and domestic) services

The size of the industry in 2016

3.8 BILLION
PASSENGERS
carried by airlines
(6.8% increase
from 2015)

53 MILLION
TONNES OF FREIGHT
carried by airlines
(4.0% increase
from 2015)

35 MILLION
SCHEDULED COMMERCIAL FLIGHTS
flown by airlines
(3.7% increase
from 2015)

54,000
ROUTES WORLDWIDE
(over 2,000 new
routes from 2015)

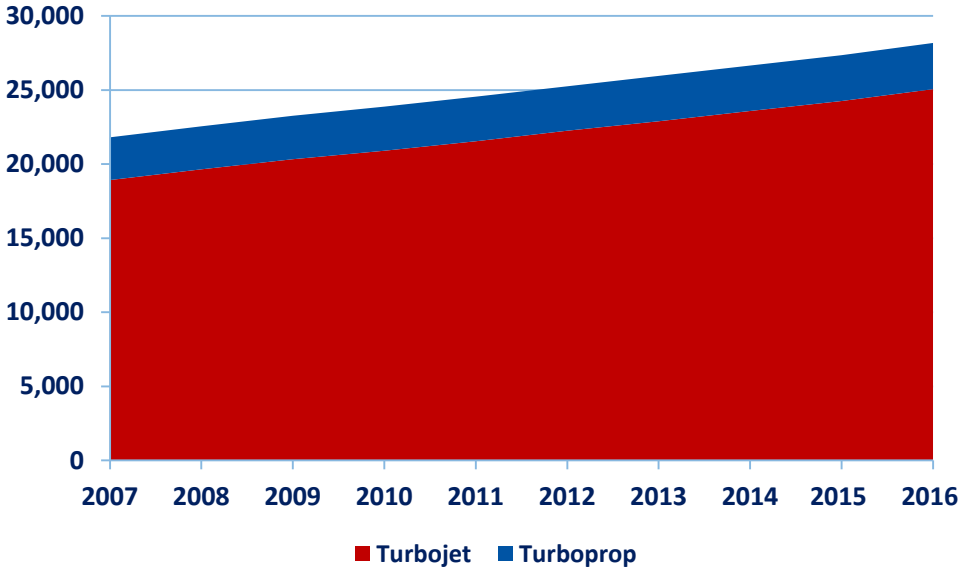
1,400 +
SCHEDULED AIRLINES

4,130 +
AIRPORTS

Source: ICAO Annual Report of the Council

Scheduled commercial traffic
Total (international and domestic) services

Commercial fleet evolution



For the 2 largest aircraft manufacturers (Airbus and Boeing) in 2016:

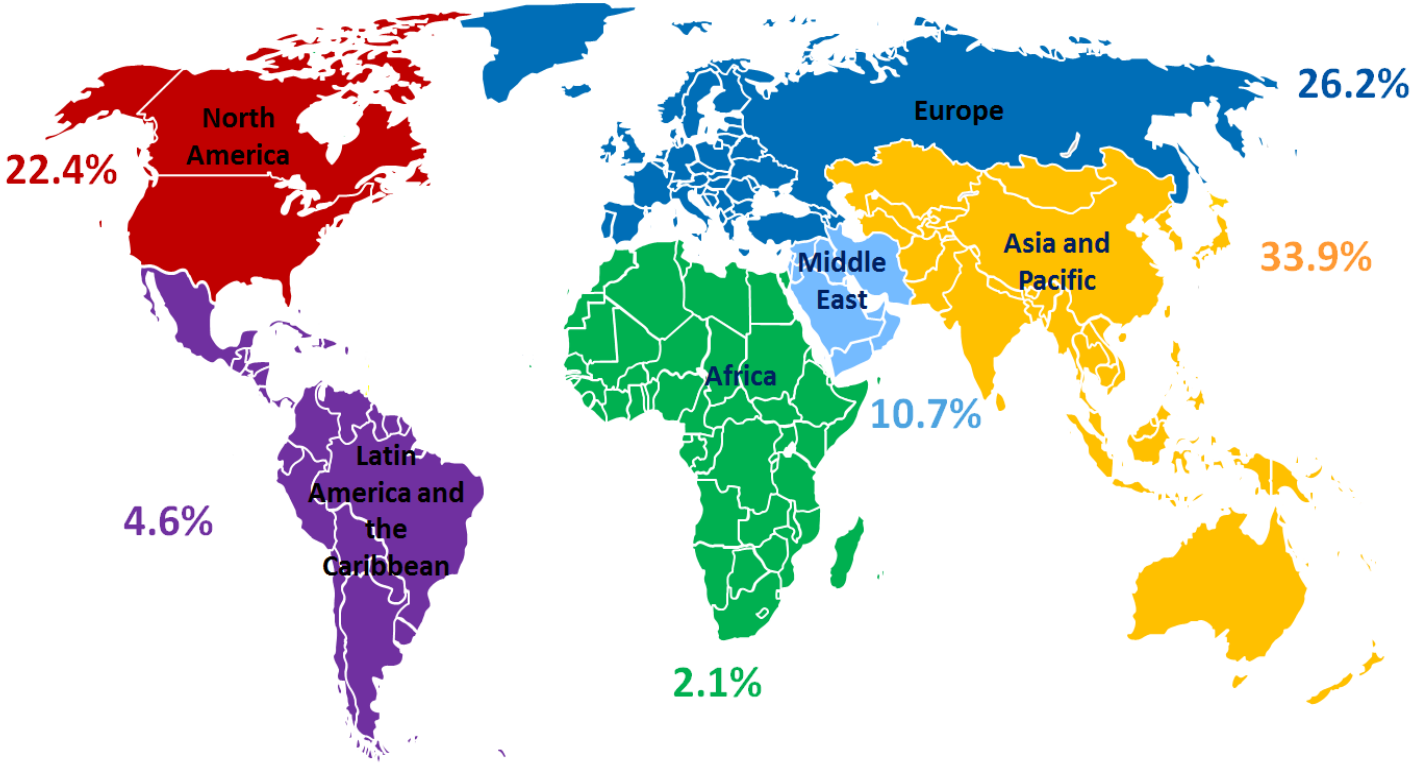
- **1520** new aircraft **delivered**
- **Net orders** for **1555** aircraft

Book to bill ratio = orders / deliveries

Book to bill ratio declined from **1.3:1** in 2015 to **1:1** in 2016, reflecting slowing orders to deliveries.

***Source**: ICAO, Reed Business Information (RBI)*

Share of Traffic in RTKs by region in 2016

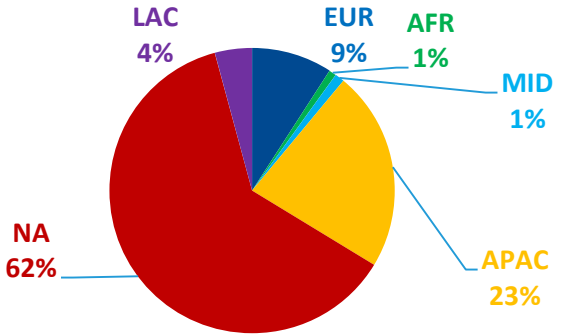


Source: ICAO

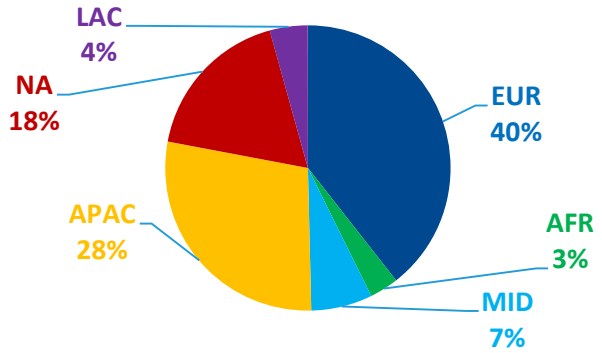
Scheduled commercial traffic measured in Revenue Tonne-Kilometres

Passenger traffic distribution

Domestic



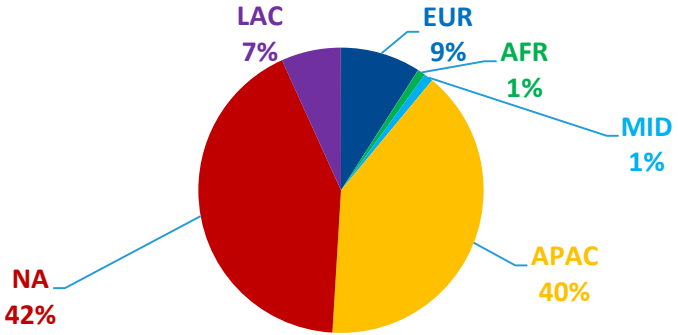
International



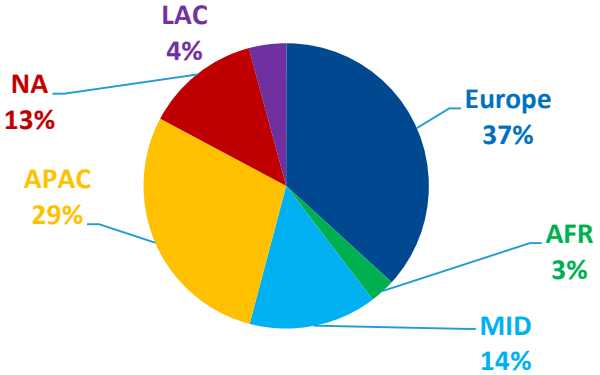
2005

Domestic 41%
International 59%

2016



Domestic 37%
International 63%

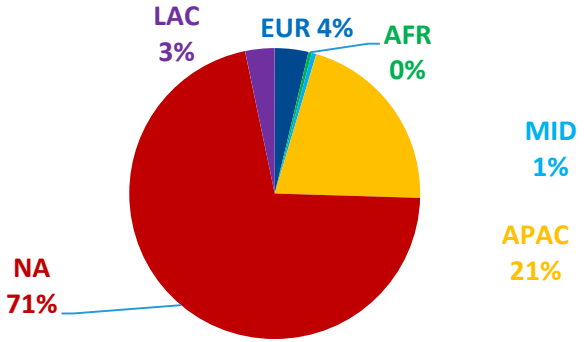


Source: ICAO Annual Report of the Council

Scheduled commercial traffic measured in Revenue Passenger-Kilometres

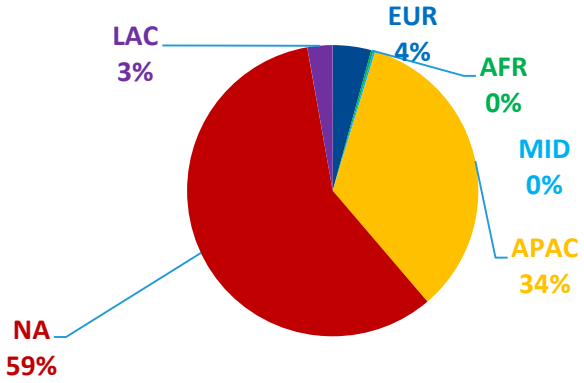
Freight traffic distribution

Domestic



2005

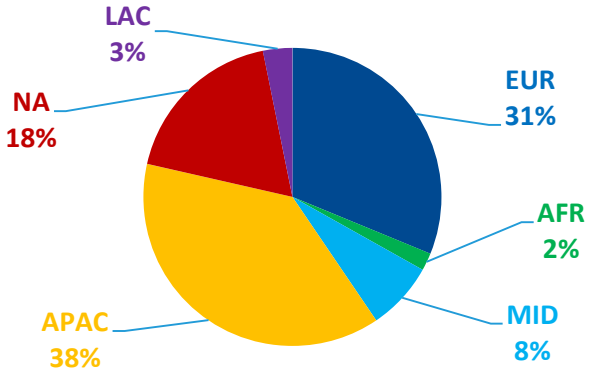
Domestic 17%
International 83%

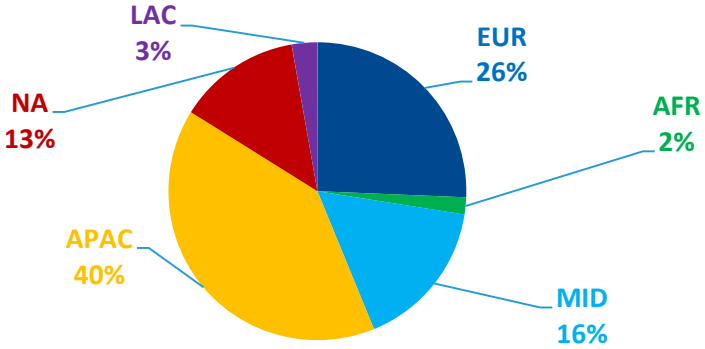


2016

Domestic 14%
International 86%

International





Source: ICAO Annual Report of the Council

Scheduled commercial traffic measured in Freight Tonnes-Kilometres

States traffic rankings in 2015-16

International Scheduled Revenue Tonne-Kilometres (RTK)

Rank	State of AOC	RTK 2016 (million)	RTK Share (%)	Cumulative (%)
1	China[1]	76,649	12.69%	12.69%
2	United States	62,335	10.32%	23.00%
3	United Arab Emirates	55,157	9.13%	32.13%
4	United Kingdom	33,583	5.56%	37.69%
5	Germany	31,834	5.27%	42.96%
6	Republic of Korea	22,756	3.77%	46.72%
7	Qatar	21,672	3.59%	50.31%
8	Singapore	19,218	3.18%	53.49%
9	France	18,128	3.00%	56.49%
10	Turkey	17,181	2.84%	59.33%
11	Japan	16,990	2.81%	62.15%
12	Netherlands	15,794	2.61%	64.76%
13	Canada	14,757	2.44%	67.20%
14	Ireland	14,428	2.39%	69.59%
15	Russian Federation	12,202	2.02%	71.61%
16	Spain	9,864	1.63%	73.24%
17	Thailand	9,697	1.60%	74.85%
18	Australia	9,684	1.60%	76.45%
19	Malaysia	8,280	1.37%	77.82%
20	India	7,566	1.25%	79.07%

Rank	State of AOC	RTK 2015 (million)	RTK Share (%)	Cumulative (%)
1	China[1]	70,319	12.38%	12.38%
2	United States	61,945	10.90%	23.28%
3	United Arab Emirates	52,019	9.16%	20.06%
4	United Kingdom	31,066	5.47%	14.62%
5	Germany	30,924	5.44%	10.91%
6	Republic of Korea	21,803	3.84%	9.28%
7	Singapore	18,647	3.28%	7.12%
8	France	18,295	3.22%	6.50%
9	Qatar	17,360	3.06%	6.28%
10	Netherlands	15,733	2.77%	5.83%
11	Turkey	15,619	2.75%	5.52%
12	Japan	15,495	2.73%	5.48%
13	Ireland	13,238	2.33%	5.06%
14	Canada	13,040	2.30%	4.63%
15	Russian Federation	11,635	2.05%	4.34%
16	Australia	9,376	1.65%	3.70%
17	Thailand	9,264	1.63%	3.28%
18	Spain	9,146	1.61%	3.24%
19	Malaysia	8,984	1.58%	3.19%
20	India	6,994	1.23%	2.81%

***Source**: ACI*

(1): Including Hong Kong SAR, Macao SAR and Taiwan Province of China

Capacity growth stimulating traffic

International capacity growth – Top States in terms of ASK Growth

Rank	State	Percentage Increase in ASK
1	China	13%
2	USA	7%
3	United Kingdom	7%
4	Spain	14%
5	United Arab Emirates	8%
6	Qatar	22%
7	Australia	11%
8	Canada	11%
9	Thailand	9%
10	Germany	4%
11	Republic of Korea	9%
12	Saudi Arabia	14%
13	Italy	9%
14	India	9%
15	Japan	4%
16	New Zealand	22%
17	Netherlands	7%
18	Philippines	14%
19	Mexico	9%

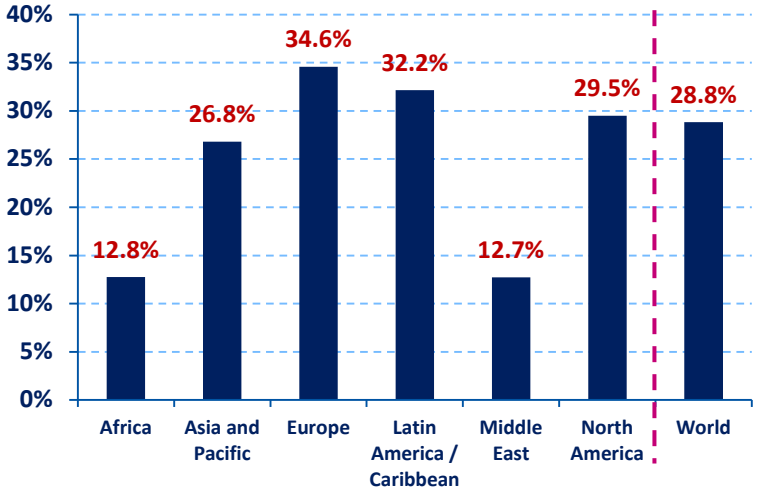
Source: ICAO

Top 20 new routes in ASK in 2016

City Pair	Country Pair
Doha - Sydney (AU)	Qatar - Australia
Doha - Los Angeles	Qatar - USA
Doha - Boston	Qatar - USA
Atlanta - Doha	USA - Qatar
Adelaide - Doha	Australia - Qatar
Dubai - Cebu	United Arab Emirates - Philippines
Atlanta - Istanbul	USA - Turkey
Angeles/Mabalacat - Dubai	Philippines - United Arab Emirates
Rome (IT) - Santiago (CL)	Italy - Chile
Vancouver - Brisbane	Canada - Australia
Vienna - Shanghai	Austria - China
Shanghai - Madrid	China - Spain
Cebu - Los Angeles	Philippines - USA
Munich - Denver	Germany - USA
Warsaw - Tokyo	Poland - Japan
Reykjavik - San Francisco	Iceland - USA
Panama City (PA) - Istanbul	Panama - Turkey
Istanbul - Bogota	Turkey - Colombia
Los Angeles - Reykjavik	USA - Iceland
Shenzhen - Sydney (AU)	China - Australia

Low-cost carriers (LCCs) stimulating traffic

Share of passengers carried by LCCs in 2016



Passenger number growth for LCCs and other carriers

	2015	2016
LCCs	11.4%	10.5%
Others	5.1%	4.2%
Total	7.2%	6.8%

LCCs growth has been consistently twice as much as other carriers' growth

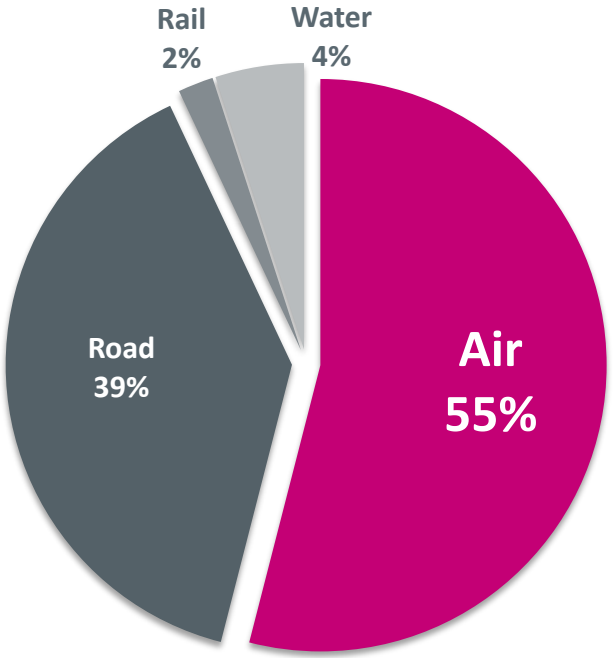
Source: ICAO

Top 20 airports in 2016 passenger traffic

Rank No.	City and airport code	Passenger (thousand) 2016	2015	2016/2015 (%)	Movements (thousand) 2016	2015	2016/2015 (%)
1	Atlanta (ATL)	104,172	101,491	2.6%	898	882	1.8%
2	Beijing (PEK)	94,393	89,939	5.0%	606	590	2.7%
3	Dubai (DXB)	83,654	78,015	7.2%	420	407	3.2%
4	Los Angeles (LAX)	80,922	74,956	8.0%	697	656	6.3%
5	Tokyo (HND)	79,700	75,573	5.5%	446	439	1.7%
6	Chicago, IL (ORD)	77,961	76,950	1.3%	868	875	-0.9%
7	London (LHR)	75,715	74,990	1.0%	475	474	0.2%
8	Hong Kong (HKG)	70,306	68,283	3.0%	422	417	1.2%
9	Shanghai (PVG)	66,002	60,098	9.8%	480	449	6.8%
10	Paris (CDG)	65,933	65,767	0.3%	479	476	0.7%
11	Dallas/Fort Worth (DFW)	65,671	65,512	0.2%	673	681	-1.2%
12	Amsterdam (AMS)	63,626	58,285	9.2%	496	466	6.6%
13	Frankfurt (FRA)	60,787	61,032	-0.4%	463	468	-1.1%
14	Istanbul (IST)	60,120	61,287	-1.9%	465	465	0.1%
15	Guangzhou (CAN)	59,732	55,202	8.2%	435	410	6.2%
16	New York (JFK)	58,873	56,859	3.5%	448	439	2.1%
17	Singapore (SIN)	58,698	55,449	5.9%	365	351	4.0%
18	Denver (DEN)	58,267	54,015	7.9%	566	541	4.5%
19	Incheon (ICN)	57,850	49,413	17.1%	343	308	11.3%
20	Bangkok (BKK)	55,892	52,902	5.7%	333	320	4.1%

***Source**: ICAO Annual Report of the Council, ACI*

More than half of international tourists arrive by air



Inbound tourism by mode of transport 2016

- Tourism expansion relies heavily on air transport, providing substantial economic benefits for anyone involved in the value chain of tourism

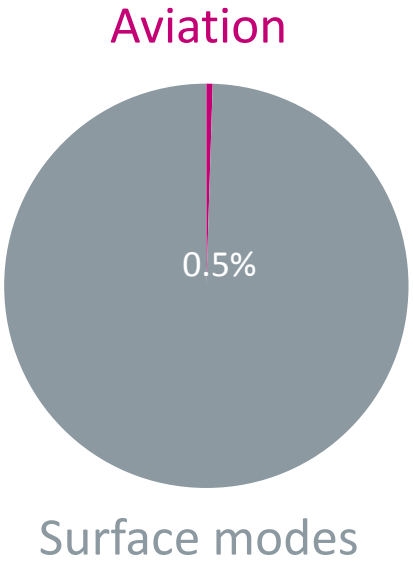
Source: World Tourism Organization (UNWTO)

Top 15 airports in 2016 cargo traffic

	City and airport code	Freight tonnes 2016	2016/2015 (%)
1	Hong Kong (HKG)	4,521,028	+3.2%
2	Memphis (MEM)	4,312,884	+0.5%
3	Shanghai (PVG)	3,343,502	+5.1%
4	Incheon (ICN)	2,602,679	+4.5%
5	Dubai (DXB)	2,592,454	+3.4%
6	Anchorage (ANC)	2,542,526	-3.4%
7	Louisville (SDF)	2,340,553	+3.4%
8	Tokyo (NRT)	2,130,847	+2.2%
9	Taipei (TPE)	2,081,043	+3.8%
10	Frankfurt (FRA)	2,029,058	+1.8%
11	Miami (MIA)	1,977,881	+0.4%
12	Singapore (SIN)	1,969,400	+6.3%
13	Paris (CDG)	1,952,935	+2.7%
14	Beijing (PEK)	1,943,159	+2.8%
15	Los Angeles (LAX)	1,903,155	+2.8%

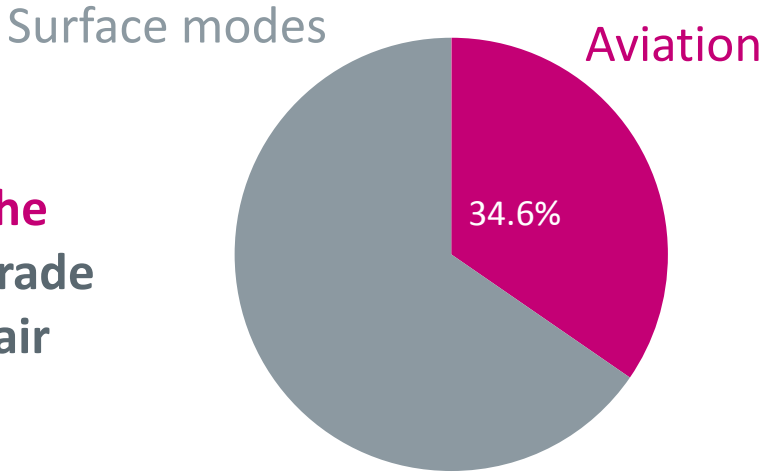
***Source**: ICAO Annual Report of the Council, ACI*

Volume of world international cargo shipment



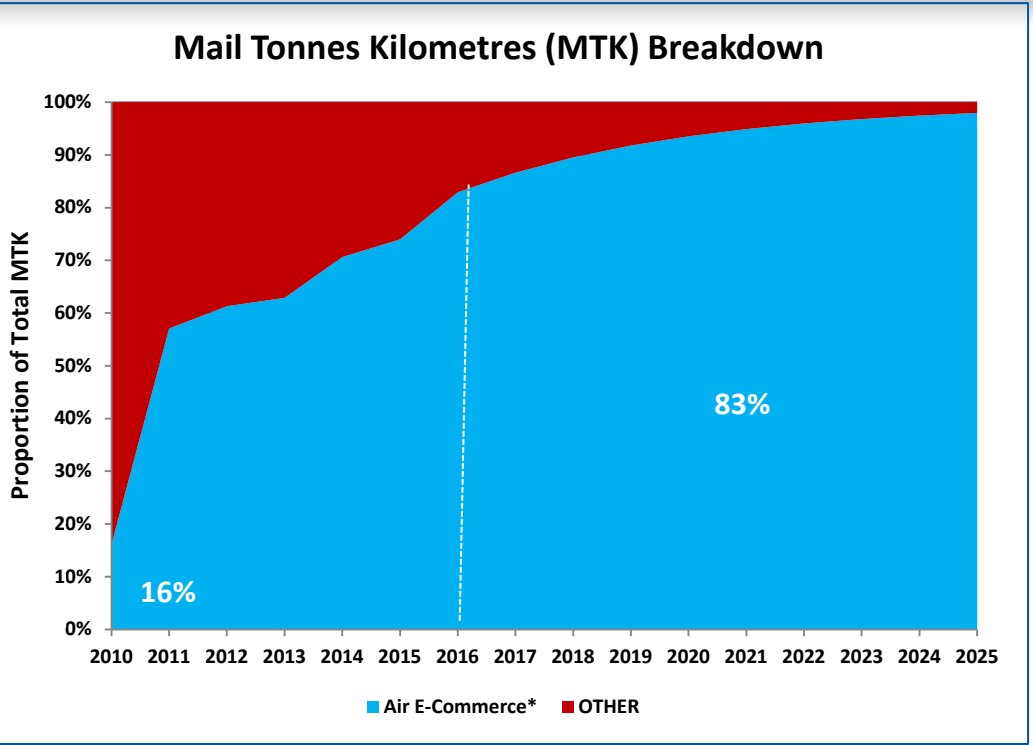
One third of the value of world trade is shipped by air

Value of world international cargo shipment

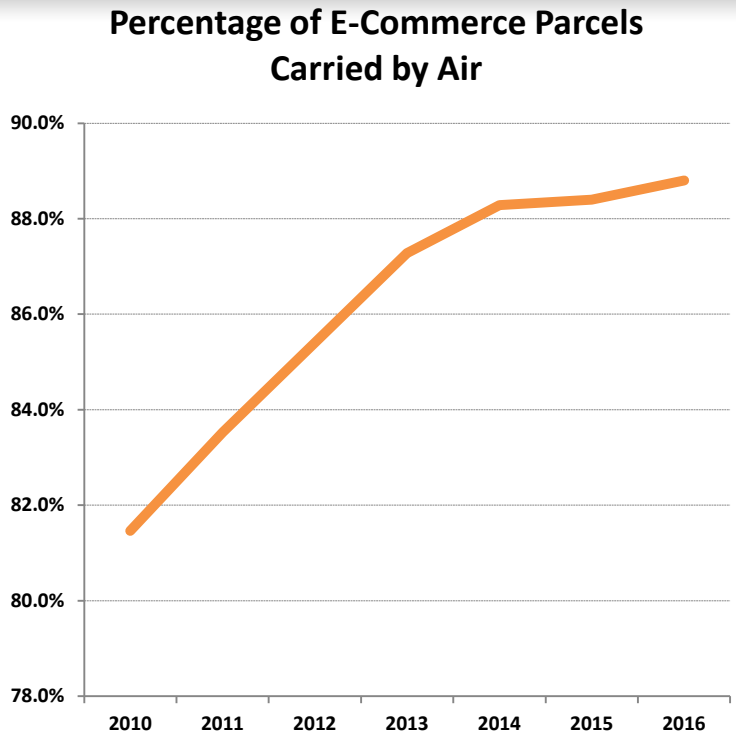


***Source**: Air Transport Action Group (ATAG), 2016*

E-commerce development

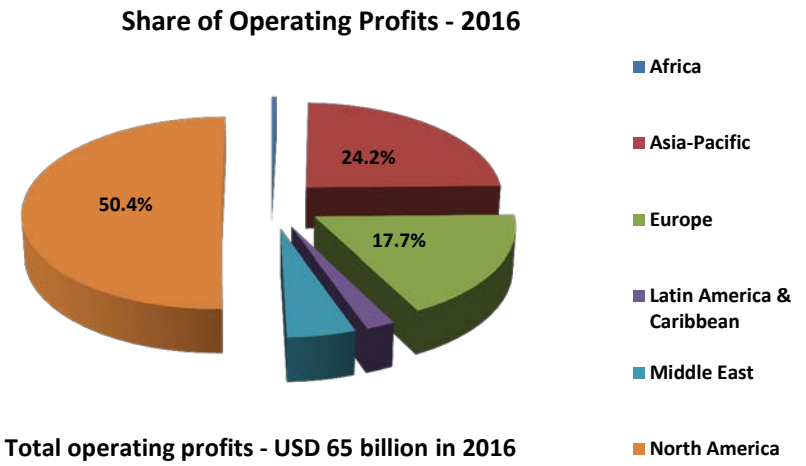


- E-commerce share of MTKs grew from 16% to 83% between 2010 and 2016 and is estimated to grow to 91% by 2025



- Approximately 90% of e-commerce parcels were carried by air in 2016

* Air E-Commerce is estimated assuming parcels traveling a distance of above 1000 kilometres are delivered by air



Airline **operating results** in 2016:

➡ US$ 68 billion operating profit

With 22.4% of global traffic, airlines of North America generated more than half of global operating profits

ICAO Long-term Traffic Forecasts

Needs and Development of Long-Term Traffic Forecasts (LTF)

- The forecasts are critical to:
  - infrastructure planning and capacity building for improved safety of operations
  - assess the operational and cost-effectiveness of air navigation systems including the Aviation System Block Upgrades (ASBU)
  - assess licensed personnel and training requirement
  - estimate future trends of noise, emissions and particulate matter
  - effectively implement ICAO's No Country Left Behind (NCLB) initiative
- A38-14: Develop and maintain Long Term Traffic Forecasts, from which customized or more detailed forecasts can be produced for various purposes, such as air navigation systems planning and environmental analysis
- The development of the forecasts has taken into account the needs of States and the Organization and various ICAO entities.

Data sources

Main source: ICAO Air Transport Reporting Forms A, B and C submitted by States

Completed with data from national offices of statistics:

Transportation.gov U.S. Department of Transportation	US Department of Transportation (Bureau of Transportation Statistics)
Civil Aviation Authority	AvStats (UK CAA)
Australian Government Department of Infrastructure and Regional Development	Bureau of Infrastructure, Transport and Regional Economics (Australia)

90% of scheduled international passenger and **95% of Freight traffic** covered by reported traffic

OAG connecting the world of travel	Official Airline Guide (OAG)

Cleaned OAG used to complement the data to arrive at **100%** coverage

Factors influencing air traffic demand

Air Traffic Demand = Function (Economic Growth, Cost, non-economic events …..)

❑ **Macro-economic factors**
- **GDP per capita** (More disposable income per capita, higher demand for leisure travel)
- **Employment** (Increasing economic activity and employment generating higher demand for business travel)
- **Population growth** (Increasing population can drive travel demand)
- **International Trade** (Cargo)

❑ **Micro-economic factors (cost of travel)**
- **Regulations** (market access/ticket prices)
- **Infrastructure** (transportation network, connections to airport, air traffic control, etc.)
- **Market structure** (extent of airline competition)
- **Input costs** (fuel, capital costs, labor costs etc.)

❑ **Random non-economic factors**
- 2001 9/11 (North America and connected routes)
- 2003 SARS (Asia and connected routes)
- 2010 Iceland Volcano (Europe and connected routes)
- 2011 Tsunami (Japan and connected routes)

Passenger traffic demand model

Econometrics Modeling

50 Route Groups 900 Observations

Utilized panel model approach

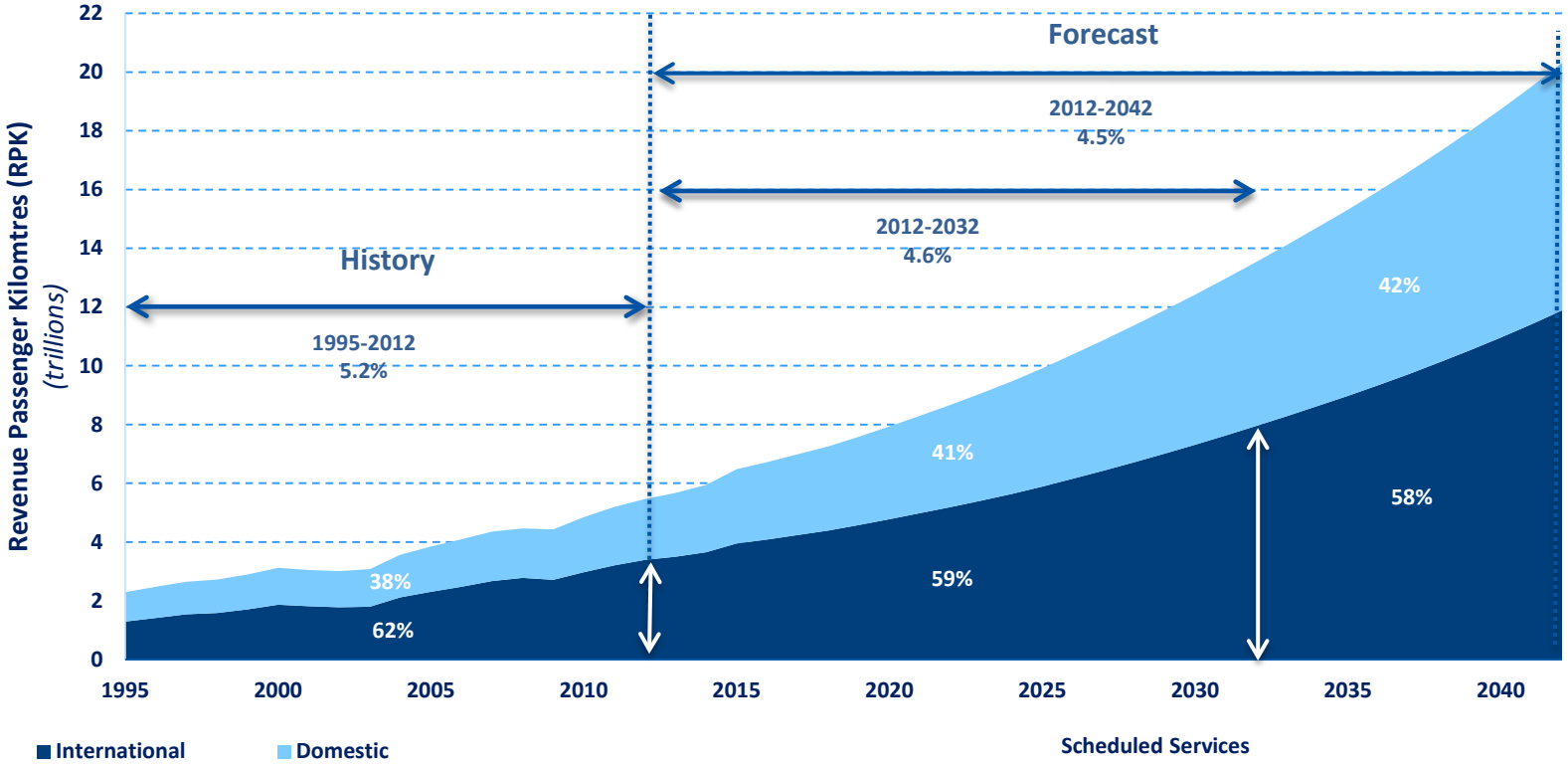
Overcomes time series limitations and allows for using the entire dataset

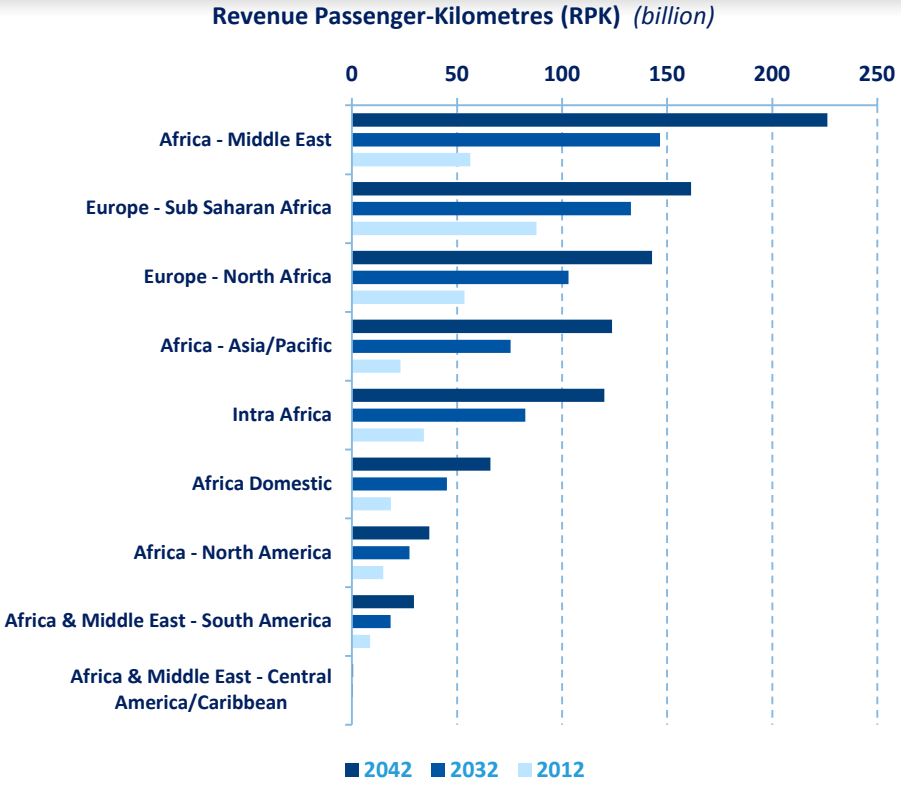
Cargo traffic demand model

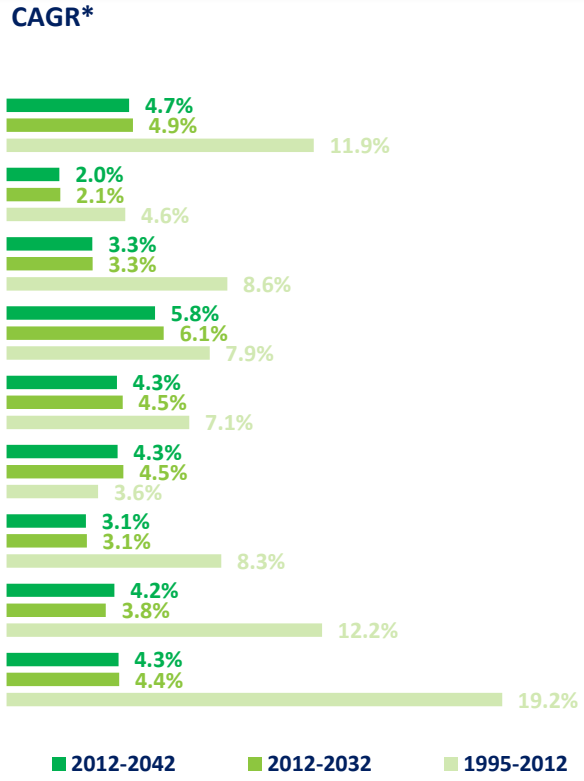
- **Forecast at regional level**
  - Africa
  - Asia and Pacific
  - Europe
  - Latin America and the Caribbean
  - Middle East
  - North America

- **Model Specification**
  - Individual ordinary least squares (OLS) regression was used for each region as it performed better than other approaches
  - GDP and oil prices main explanatory variables

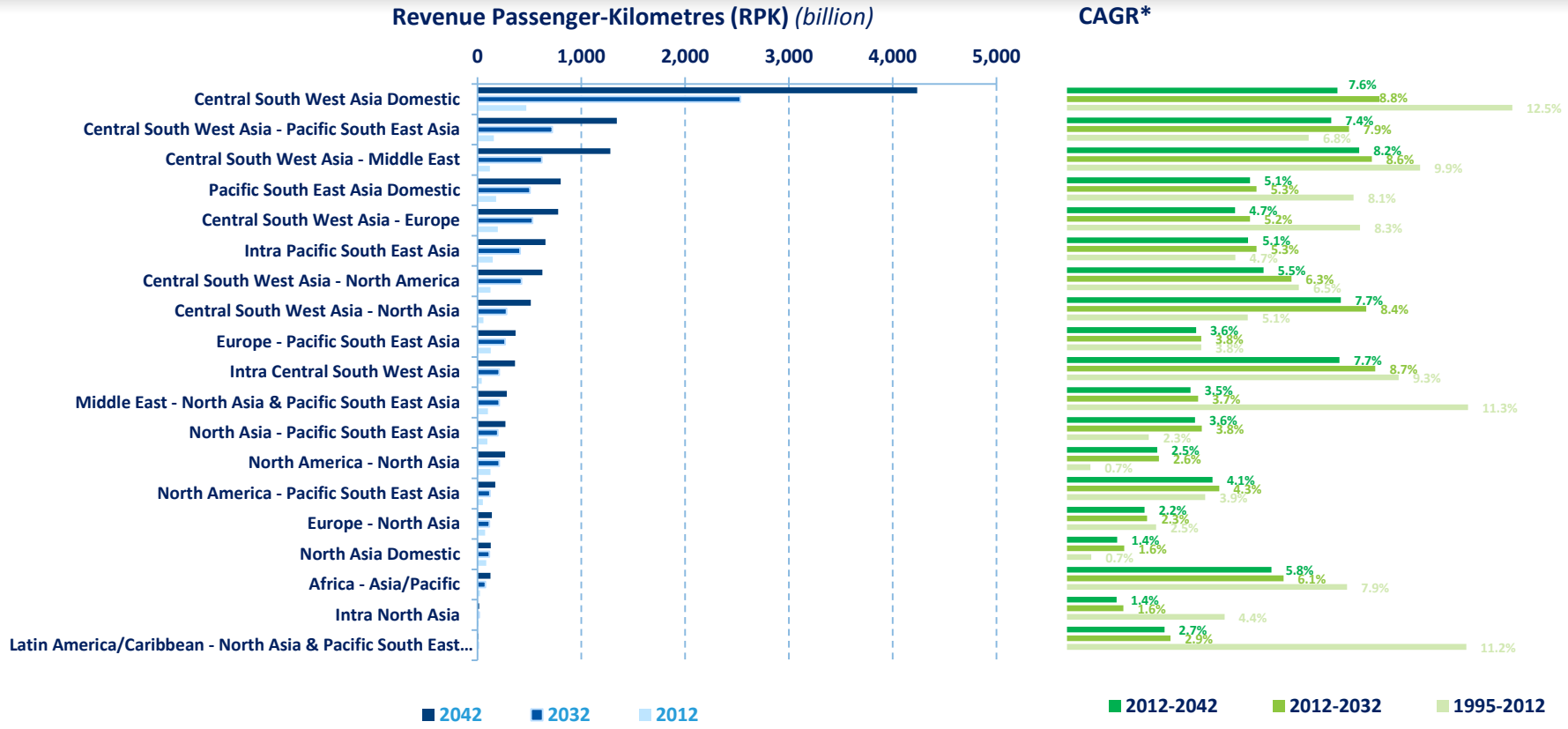
Global Passenger Traffic Forecasts







CAGR: Compound Annual Growth Rate



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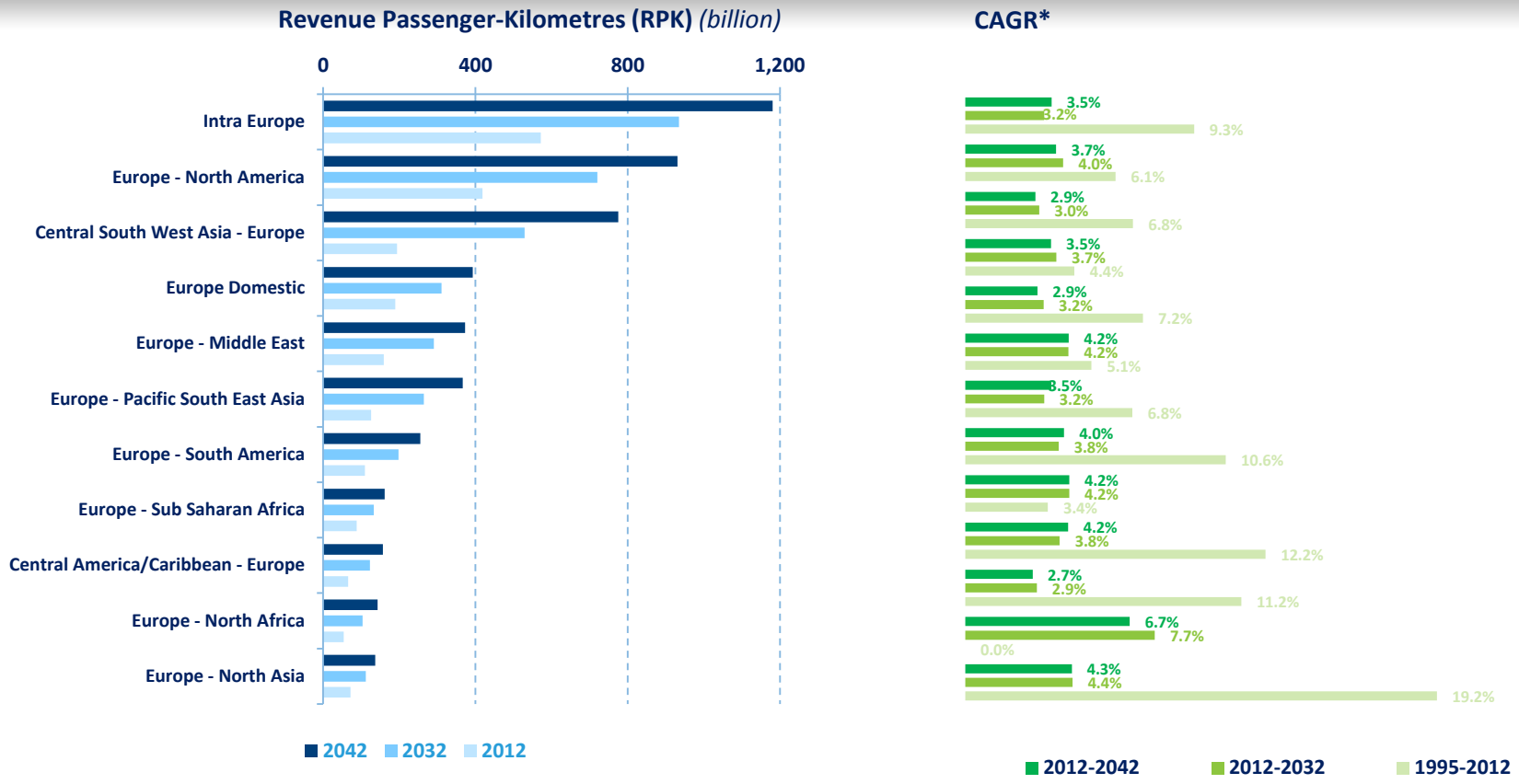
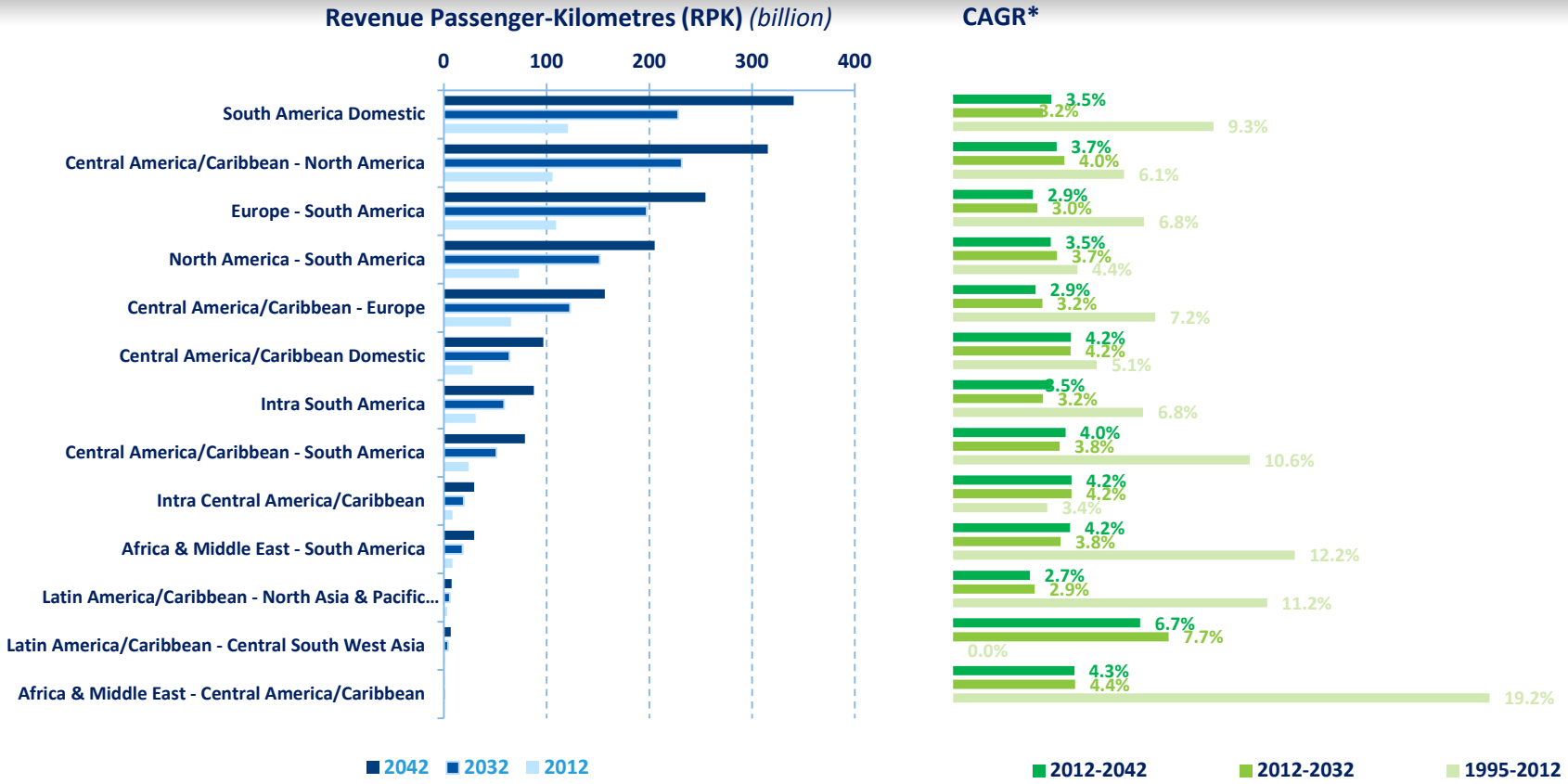
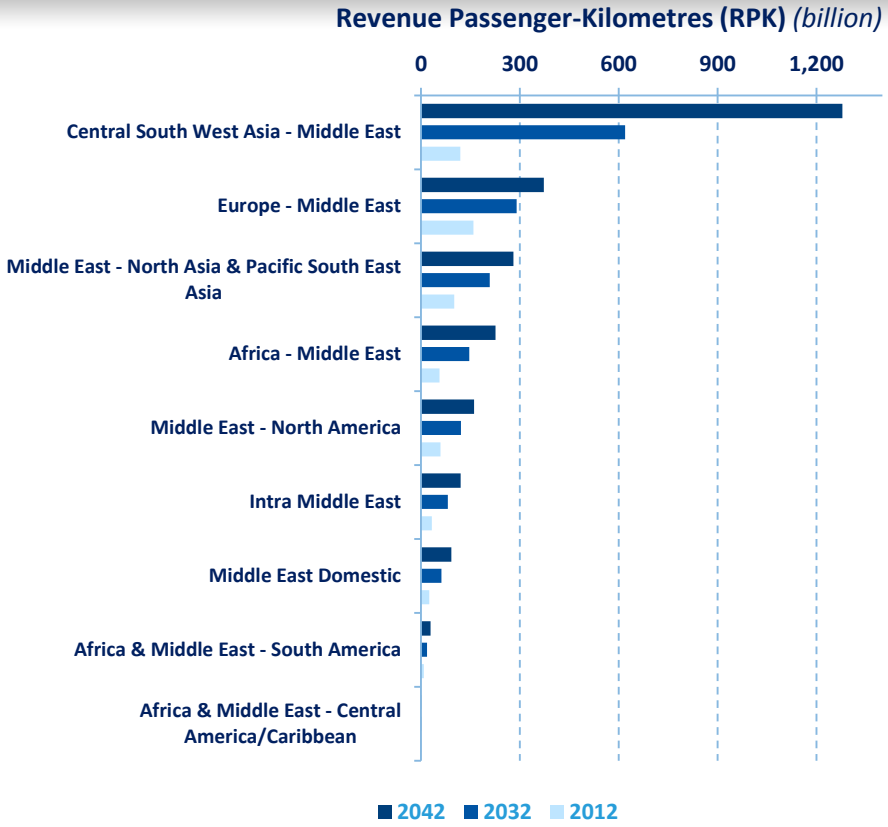


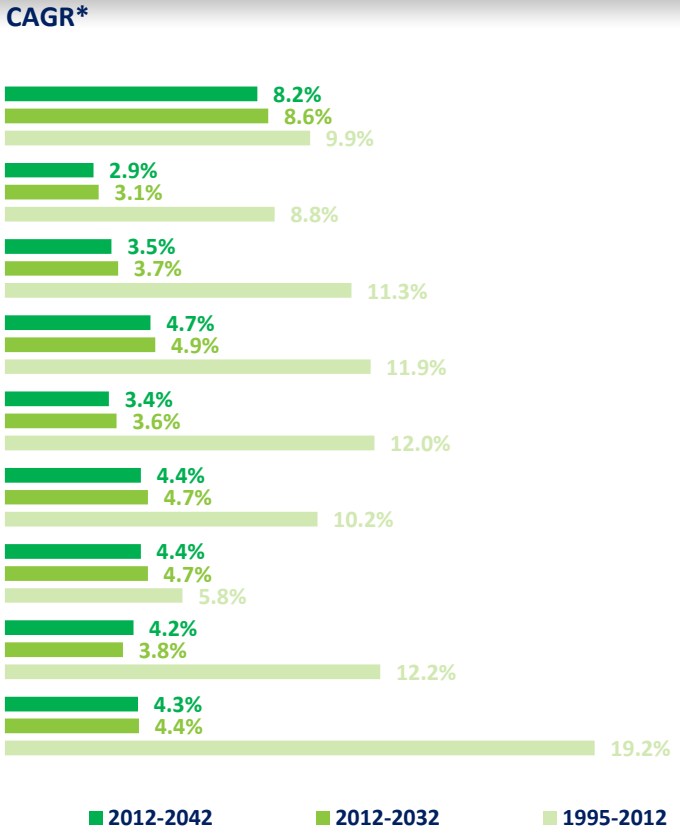
CAGR: Compound Annual Growth Rate

Latin America and the Caribbean

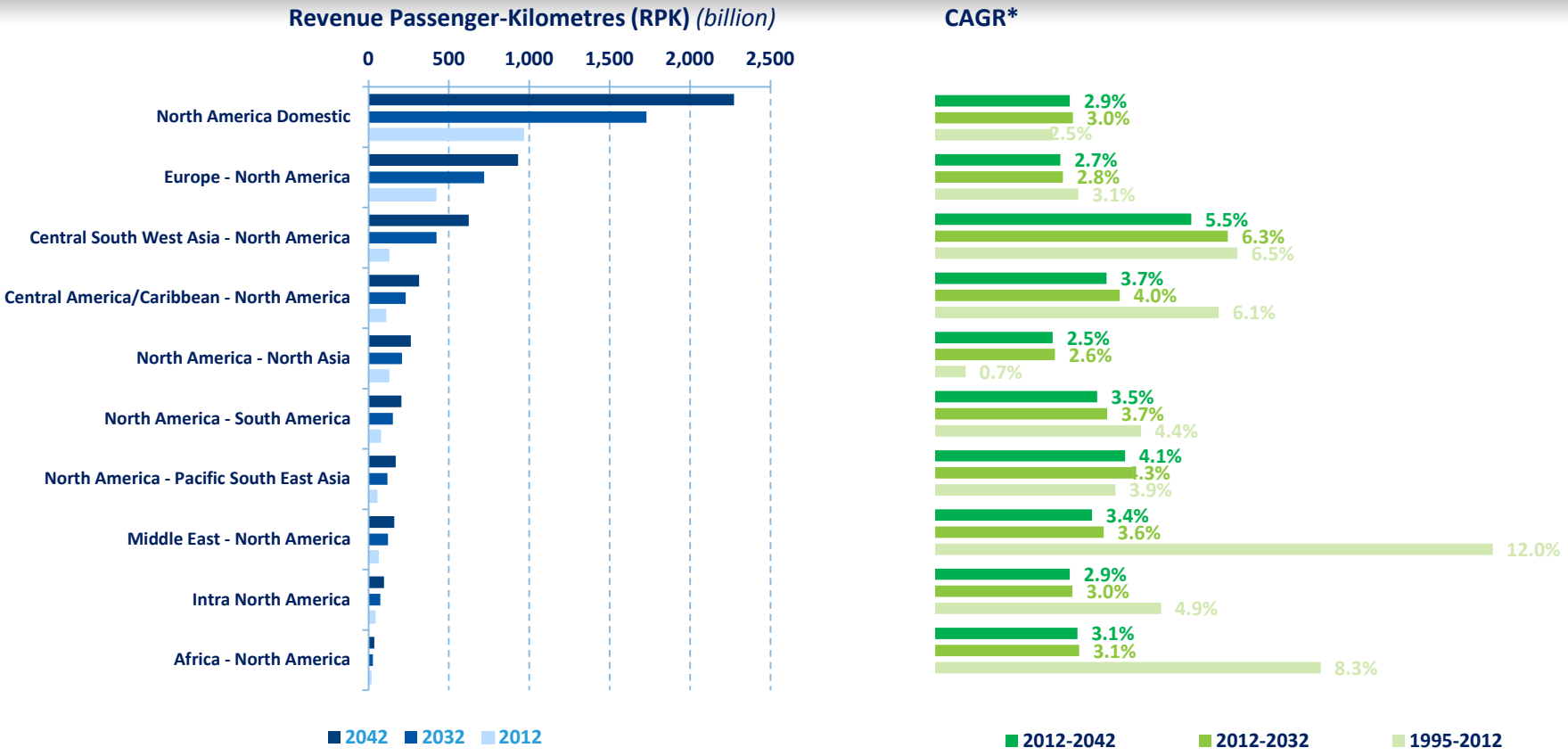


CAGR: Compound Annual Growth Rate





CAGR: Compound Annual Growth Rate



*CAGR: Compound Annual Growth Rate

Cargo Traffic Forecasts

Summary of Total Cargo Traffic Forecasts by Region of Airline Registration

(Scheduled Services)

Cargo traffic results in terms of FTKs

Region	Flight Stage	CAGR* 2012-2022	2012-2032	2012-2042
Europe	**Total**	**2.9%**	**2.6%**	**2.4%**
	International	2.9%	2.6%	2.4%
	Domestic	0.2%	0.8%	1.0%
Africa	**Total**	**1.6%**	**2.1%**	**2.2%**
	International	1.6%	2.1%	2.2%
	Domestic	0.3%	0.1%	0.1%
Middle East	**Total**	**6.6%**	**7.1%**	**6.9%**
	International	6.6%	7.1%	6.9%
	Domestic	1.4%	0.7%	0.5%
Asia and Pacific	**Total**	**5.7%**	**5.1%**	**4.7%**
	International	5.2%	4.7%	4.3%
	Domestic	8.7%	7.8%	7.0%
North America	**Total**	**2.7%**	**2.5%**	**2.6%**
	International	3.7%	3.5%	3.4%
	Domestic	0.8%	0.7%	0.6%
Latin America and the Caribbean	**Total**	**3.1%**	**2.9%**	**2.8%**
	International	3.4%	3.1%	3.0%
	Domestic	2.0%	1.7%	1.6%
WORLD	**Total scheduled**	**4.4%**	**4.3%**	**4.2%**
	International	**4.5%**	**4.4%**	**4.2%**
	Domestic	**3.9%**	**4.0%**	**4.0%**

Use of traffic forecasts

Air navigation systems planning	Airport planning	Airline planning
Aircraft movements	Aircraft movements	Planning of routes and services
	Airport passengers	Fleet planning
	Licensed personnel	Estimation of airline's market share

- Forecasts can be used as the base to produce customized or more detailed forecasts for various purposes, such as air navigation systems planning, airport planning as well as airline planning.
- Forecasts can also serve as an input to environment for critical tasks such as trend analysis, assessment and development of fleet forecasts.

Future work in aviation forecasts

- Develop an electronic interface allowing States and other users to generate customized forecasts at different levels of granularity (for example, by route, by country-pair, by State of departure, by airport);
- Customize forecast results/data required for the Environment to develop its fleet forecasts, trends and assessment activities;
- Customize forecast results/data required for air navigation service planning and assessment activities at a global and regional level; and
- Updated global and regional twenty year forecasts for pilots, maintenance personnel and air traffic controllers (DOC 9956) in April 2018 to meet the needs of the ICAO Next Generation Aviation Professional (NGAP) programme.

Aviation data partnership

Publications

Aviation Benefits

State of Air Transport

ICAO


North American Central American and Caribbean (NACC) Office Mexico City
South American (SAM) Office Lima
ICAO Headquarters Montréal
Western and Central African (WACAF) Office Dakar
European and North Atlantic (EUR/NAT) Office Paris
Middle East (MID) Office Cairo
Eastern and Southern African (ESAF) Office Nairobi
Asia and Pacific (APAC) Sub-office Beijing
Asia and Pacific (APAC) Office Bangkok
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