International Civil Aviation Organization

MIDANPIRG STEERING GROUP

Fourth Meeting (MSG/4)
(Cairo, Egypt, 24 - 26 November 2014)

Agenda Item 4: MID Region Air Navigation Planning

DEVELOPMENT OF AN ICAO SINGLE SET OF FORECASTS AND IMPACT ON THE CUSTOMIZED SETS

(Presented by the Secretariat)

EXECUTIVE SUMMARY

With a view to responding to the needs of the Organization and in order to meet the expressed needs of States, regional air navigation planning groups and environmental planning bodies, several sets of long-term traffic forecasts were developed under the auspices of ICAO over the course of the past several years. In considering this development and the resulting complexities, the 38th Session of the ICAO Assembly determined the need to develop one single set of long-term traffic forecasts from which customized or more detailed forecasts can be produced for various purposes.

This paper presents the Report of the First Meeting of the Aviation Data and Analysis Panel (ADAP/1), held in Montréal from 14 to 17 April 2014, regarding the development of an ICAO single-set of forecasts, and the impact on the customized sets to be produced for the Middle East Air Navigation Planning and Implementation Regional Group (MIDANDPIRG).

References:	• *Report of the First Meeting of the Aviation Data and Analysis Panel* (ADAP/1) • *Report of the Third Meeting of the Traffic Forecasting Sub-Group of the Middle East Air Navigation Planning and Implementation Regional Group (*MIDANDPIRG*)*

1. BACKGROUND OF THE ICAO FORECASTING ACTIVITIES

1.1 As requested by the Assembly, long-term forecasts are prepared for passenger/freight traffic, aircraft movements, and related parameters, supporting planning purposes of airlines, airports, air navigation systems and others. These global and regional forecasts have a twenty-year horizon and are issued triennially as a saleable publication. The latest set of these forecasts are contained the *Global Air Transport Outlook to 2030 (and trends until 2040)* (Circular 333) and the detailed methodology is at **Appendix A**.

1.2 The Secretariat is providing support to the Forecast and Economic Analysis Support Group (FESG) of the Committee on Aviation Environmental Protection (CAEP). This support includes provision of input in terms of aviation data toward the development of global long-term traffic and fleet

forecasts for environmental analyses and the review of a global constrained forecasting model for potential use in support of environmental assessment of the potential impact of constraints.

1.3 Assistance and support have been also provided since 1998 in the development of traffic forecasts and other planning parameters required by the Planning and Implementation Regional Groups (PIRGs) through Regional Traffic Forecasting Groups (TFG).

1.4 In considering this development and the resulting complexities, the 38th Session of the ICAO Assembly determined the need to develop one single set of long-term traffic forecasts from which customized or more detailed forecasts can be produced for various purposes.

1.5 The development of a single-set of forecasts, taking into account the needs expressed by States, internal users and the industry, was discussed under Agenda Item 5 of the First Meeting of the Aviation Data and Analysis Panel (ADAP/1). During this meeting, the establishment of a working group entitled Multi-disciplinary Working Group on Long-term Traffic Forecasts (MDWG-LTF) was agreed upon.

2. RECOMMENDATION FROM THE FIRST MEETING OF THE AVIATION DATA AND ANALYSIS PANEL (ADAP/1)

2.1 The panel adopted the following recommendation, (Recommendation ADAP/1-5 refers):

That,

a) an ADAP working group entitled Multi-disciplinary Working Group on Long-term Traffic Forecasts (MDWG-LTF) be established and work in collaboration with the Secretariat in the development of a single set of long-term traffic forecasts, from which their users can produce customized or more detailed forecasts for various purposes, such as air navigation systems planning and environmental analysis. This collaborative effort would be in the manner of the group providing a consensus view of the traffic forecasts for each traffic flow and models developed to generate such forecasts that would be incorporated in the single set of long-term forecasts to be submitted to 39th Session of the ICAO Assembly;

b) the development of the forecasting process should take into account the needs of States and the Organization and various ICAO entities such as the regional TFGs and the CAEP; and

c) the timeline for the development of a single set of traffic forecasts be communicated to the group in order to have the forecasts ready by the 39th Session of the ICAO Assembly.

2.2 Regarding the methodology to be used to develop the forecasts, it was confirmed that econometric modelling would be preferable, as it was the method currently used by the Secretariat as well as other aviation stakeholders, and it is considered as one of the best methods to forecast air traffic over longer-time horizons. However, if the MDWG-LTF would agree that other methods would be more suitable or beneficial, such methods could be used. The forecasts would be developed for three scenarios: most likely, high and low. Due to big complexities involved and time constraints, at this stage, only unconstrained forecasts could be developed. In the work of the MDWG-LTF, full transparency should apply and the group would share the models and the underlying assumptions used in the development of the forecasts.

2.3 Once the single set of forecasts is developed, customized and/or more detailed forecasts would be developed by the different users in order to meet their specific needs. These forecasts should be consistent with the forecast growth rate of the relevant traffic flow in the single set of forecasts developed by the MDWG-LTF.

3. IMPACT ON THE CUSTOMIZED SETS TO BE PRODUCED FOR THE TFGS

3.1 With respect to the future of the TFGs, it was confirmed that the creation of the MDWG-LTF would not lead to the dissolution of these groups as their current specific tasks, which are to meet the needs of the respective PIRGs will be maintained.

3.2 The regions and route-groups previously used by the TFGs have been taken into consideration when establishing the regions and route-groups (RG) used by the MDWG-LTF to develop the single-set of forecasts. For passenger traffic, **Appendix B** describes the relationship between each route-group of the TFGs and the route-groups which are proposed to be used to develop the single set of traffic forecasts. The same table is under development by the MDWG-LTF for the cargo traffic. The route-groups are bidirectional for passenger traffic and directional for the cargo traffic.

3.3 The LTF will be published based on aggregated route-groups. The regions used for analysis and for publication for passenger traffic are shown in the maps in **Appendix C**. The route-groups for passenger traffic used for publication are detailed in **Appendix D**.

3.4 Taking into account the timelines imposed by this new methodology, as well as some budgetary constraints that have been raised by some States participating to more than one TFG, it is proposed to have only one meeting every three years gathering all the TFGs/all Regions during one week at the ICAO Head Quarters (HQ). In this respect, it is planned that this meeting be organised in ICAO HQ during the second quarter of 2015, for the development of the customized and/or more detailed forecasts (as detailed in **Appendix E**) consistent with the single set of forecasts to be developed by the MDWG-LTF.

4. FLEET ANALYSIS

4.1 The next iteration of the long-term passenger and cargo traffic forecasts produced by the MDWG-LTF is planned to be delivered for the 39th Assembly in 2016. It’s to be noted that it is not planned to have a fleet forecast developed by the MDWG-LTF.

4.2 However, the Secretariat has produced an analysis on the utilization of the fleet on traffic flows from the MID Region on commercial scheduled services for the period 2004-2013 and derived some trend projections up to 2024, based on OAG. This analysis is presented in **Appendix F**.

5. ACTION BY THE MEETING

The meeting is invited to note the information contained in this paper.

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APPENDIX A

1. Until recently, the ICAO Secretariat periodically developed a set of long-term traffic forecasts by means of a top-down approach utilizing econometric modelling to generate the global air traffic forecast. From this forecast, anticipated growth rates were developed for ICAO statistical regions; in addition, several major traffic flows were developed using the global forecast results, historical trends in flow traffic, and a judgemental approach. However, the datasets did not sufficiently meet the specific needs of internal and external users.

2. In 2012, a set of long-term traffic forecasts to the year 2030 was developed using a bottom-up approach (Circular 333, Global Air Transport Outlook to 2030 (GATO) refers); the forecasts are based on econometric modelling for each route group. The Secretariat developed passenger traffic forecasts for 30 route groups between and within nine forecast regions and for other scheduled traffic combined, as well as for aggregated non-scheduled traffic. In addition, freight traffic forecasts were developed for 50 route groups (including 38 directional route groups) between and within nine forecasting regions and for other scheduled traffic combined, as well as for aggregated non-scheduled traffic, which covers the world total freight traffic. The Secretariat produced traffic forecasts for commercial aircraft; the forecasts do not include business passenger aircraft related traffic.

3. This new approach, based on econometric techniques, was developed in order to accommodate the need to perform sensitivity analyses around a range of factors and assumptions on routes having different specificities.

4. The data sources include ICAO Air Transport Reporting Form A - *Traffic — Commercial Air Carriers*, Form B - *On-flight Origin and Destination*, and Form C - *Traffic by Flight Stage*[1] as well as the schedule published by the Official Airline Guide (OAG) and government data sources, such as Form 41 from the U.S. Department of Transportation and the database developed by Ecole Nationale de l´Aviation Civile (ENAC) of the French Civil Aviation Authority.

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[1] Copies of the Air Transport Reporting Forms, with their corresponding reporting instructions are available at: http://www.icao.int/sustainability/Pages/Forms.aspx

APPENDIX B
TFGS AND MDWG-LTF FOR PASSENGER TRAFFIC

Notes:

RG means Route Group

"&" is the symbol for the aggregation of two LTF regions

Grey Italic font is used to identify aggregated LTF region-pairs

China is considered in this table as the region including China, Hong Kong SAR China, Macao SAR China and Mongolia

Africa: North Africa and Sub Saharan Africa

Asia/Pacific: China, North Asia, Pacific South East Asia and North Asia

Latin America/Caribbean: Central America/Caribbean and South America

TFG	TFG RG	RG based on LTF regions for analysis	LTF RG for analysis (LTF region-pairs or aggregation of them)
Africa/Indian Ocean TFG	Africa - Asia/Pacific	China - North Africa North Africa - South West Asia North Africa - Pacific South East Asia North Africa - North Asia China - Sub Saharan Africa South West Asia - Sub Saharan Africa Pacific South East Asia - Sub Saharan Africa North Asia - Sub Saharan Africa	*Africa - Asia/Pacific*
Africa/Indian Ocean TFG	Africa - Europe	Europe - North Africa Europe - Sub Saharan Africa	Europe - North Africa Europe - Sub Saharan Africa
Africa/Indian Ocean TFG	Intra Africa	Intra North Africa Intra Sub Saharan Africa North Africa - Sub Saharan Africa	*Intra Africa*
Africa/Indian Ocean TFG	Africa - North America	North Africa - North America North America - Sub Saharan Africa	*Africa - North America*
Africa/Indian Ocean TFG	Africa - Middle East	Middle East - Sub Saharan Africa North Africa - Middle East	*Africa - Middle East*
Asia/Pacific Area TFG	Intra Asia/Pacific	North Asia - Pacific South East Asia Intra Pacific South East Asia Intra North Asia	North Asia - Pacific South East Asia Intra Pacific South East Asia Intra North Asia
		China - North Asia North Asia - South West Asia	*China & South West Asia - North Asia*
		China - Pacific South East Asia Pacific South East Asia - South West Asia	*China & South West Asia - Pacific South East Asia*

		Intra South West Asia China - South West Asia Intra China	*Intra China & South West Asia*
Asia/Pacific Area TFG	Transpacific (US&Canada)	China - North America North America - North Asia North America - South West Asia North America - Pacific South East Asia	China - North America North America - North Asia North America - South West Asia North America - Pacific South East Asia
Caribbean/South America TFG	Intra Central America/Caribbean	Intra Central America/Caribbean	Intra Central America/Caribbean
Caribbean/South America TFG	Intra South America	Intra South America	Intra South America
Caribbean/South America TFG	South America - Central America/Caribbean	Central America/Caribbean - South America	Central America/Caribbean - South America
Caribbean/South America TFG	South America and Central America/Caribbean - North America	North America - South America Central America/Caribbean - North America	North America - South America Central America/Caribbean - North America
Caribbean/South America TFG	Mid Atlantic	Central America/Caribbean - Europe	Central America/Caribbean - Europe
		Central America/Caribbean - Middle East Central America/Caribbean - North Africa Central America/Caribbean - Sub Saharan Africa	*Africa & Middle East - Central America/Caribbean*
Caribbean/South America TFG	South Atlantic	Europe - South America	Europe - South America
		Middle East - South America North Africa - South America South America - Sub Saharan Africa	*Africa & Middle East - South America*
Middle East TFG	Intra Middle East	Intra Middle East	Intra Middle East
Middle East TFG	Africa - Middle East	Middle East - Sub Saharan Africa North Africa - Middle East	*Africa - Middle East*
Middle East TFG	Middle East - Asia/Pacific	China - Middle East Middle East - South West Asia Middle East - Pacific South East Asia Middle East - North Asia	China - Middle East Middle East - South West Asia *Middle East - North Asia & Pacific South East Asia*
Middle East TFG	Europe - Middle East	Europe - Middle East	Europe - Middle East
Middle East TFG	Middle East - North America	Middle East - North America	Middle East - North America
North Atlantic TFG	Europe - Caribbean/ Central America	Central America/Caribbean - Europe	Central America/Caribbean - Europe
North Atlantic TFG	Europe - North America	Europe - North America	Europe - North America

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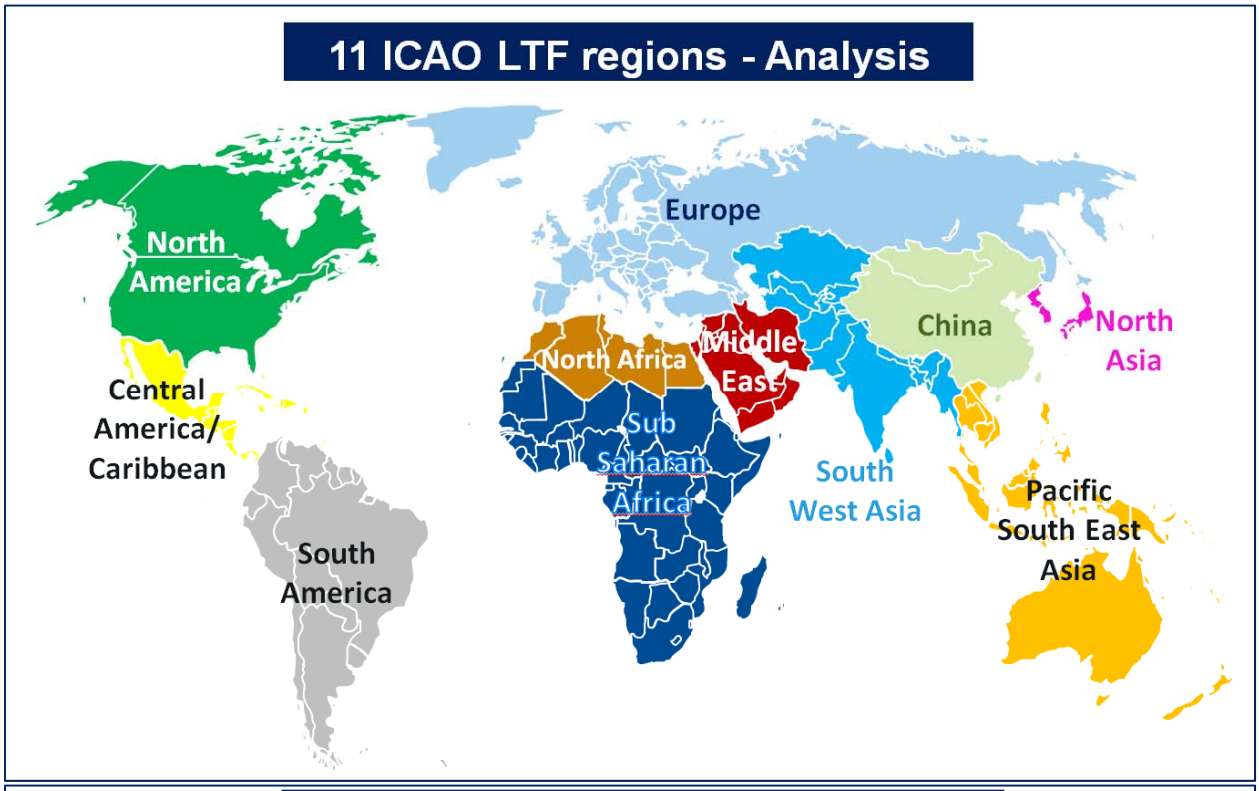
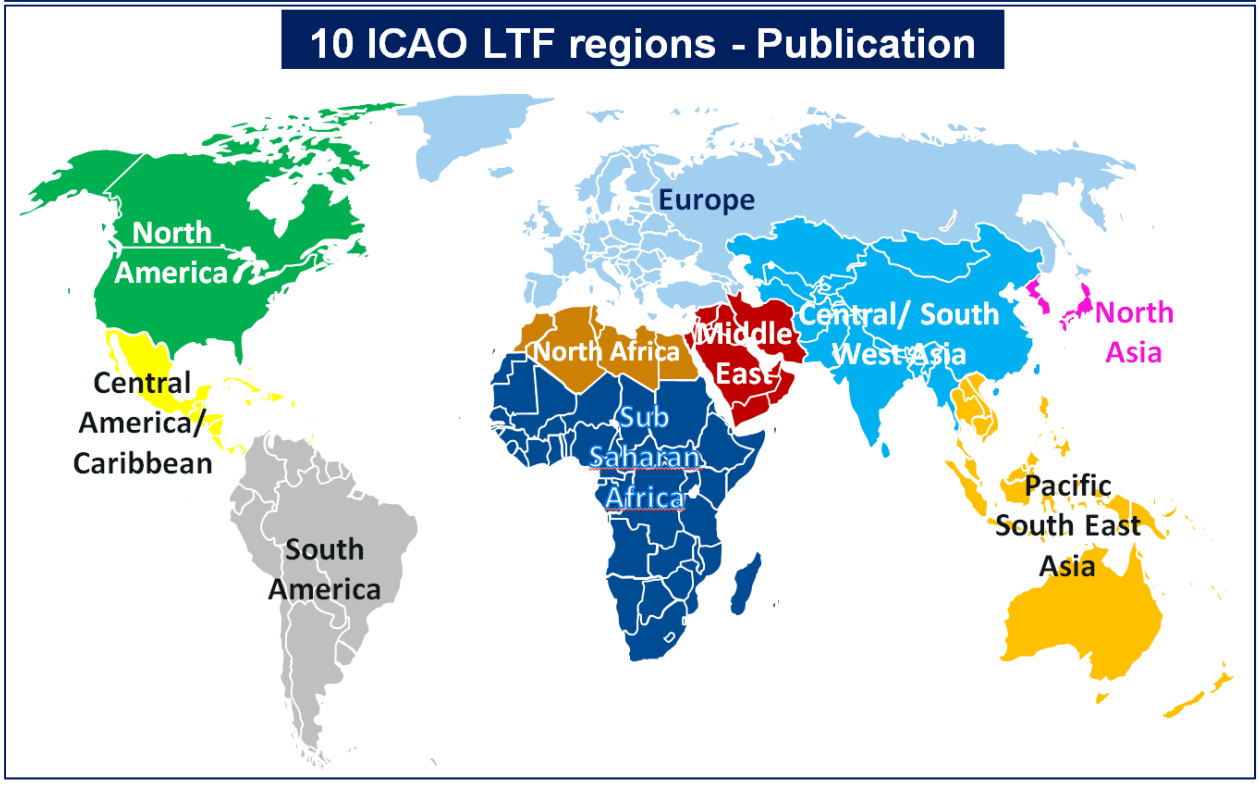
APPENDIX C
ICAO LTF REGIONS USED FOR ANALYSIS AND FOR PUBLICATION
PASSENGER TRAFFIC





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APPENDIX D

LTF ROUTE GROUPS FOR PUBLICATION
PASSENGER TRAFFIC

Notes:

RG means Route Group

"*&*" is the symbol for the aggregation of two LTF regions

Central/South West Asia: China and South West Asia

China is considered in this table as the region including China, Hong Kong SAR China, Macao SAR China and Mongolia

Africa: North Africa and Sub Saharan Africa

Asia/Pacific: China, North Asia, Pacific South East Asia and North Asia

Latin America/Caribbean: Central America/Caribbean and South America

Analysis:

The differences between the *LTF RG for analysis* and the *LTF RG for publication* are the RG including China:

- For 5 *LTF RG for Publication*, each is an aggregation of 2 *LTF RG for analysis*
- 3 particular *LTF RG for Publication* are the same as the *LTF RG for analysis* but renamed for publication

LTF RG for publication	LTF RG for analysis (LTF region-pairs or aggregation of them)
Africa - Asia/Pacific	Africa - Asia/Pacific
Africa - Middle East	Africa - Middle East
Africa & Middle East - Central America/Caribbean	Africa & Middle East - Central America/Caribbean
Middle East - North America	Middle East - North America
Africa - North America	Africa - North America
Africa & Middle East - South America	Africa & Middle East - South America
Central America/Caribbean - Europe	Central America/Caribbean - Europe
Central America/Caribbean - North America	Central America/Caribbean - North America
Central America/Caribbean - South America	Central America/Caribbean - South America
Central/South West Asia - Europe	China - Europe Europe - South West Asia
Central/South West Asia - Latin America/Caribbean	Latin America/Caribbean - China Latin America/Caribbean - South West Asia
Central/South West Asia - Middle East	China - Middle East Middle East - South West Asia
Central/South West Asia - North America	China - North America North America - South West Asia
Central/South West Asia - Pacific South East Asia	China & South West Asia - Pacific South East Asia
Central/South West Asia - North Asia	China & South West Asia - North Asia
Domestic Africa	Domestic Africa
Domestic Central/South West Asia	Domestic China Domestic South West Asia
Domestic Europe	Domestic Europe

Domestic Central America/Caribbean	Domestic Central America/Caribbean
Domestic South America	Domestic South America
Domestic Middle East	Domestic Middle East
Domestic North America	Domestic North America
Domestic North Asia	Domestic North Asia
Domestic Pacific South East Asia	Domestic Pacific South East Asia
Europe - Middle East	Europe - Middle East
Europe - North America	Europe - North America
Europe - North Africa	Europe - North Africa
Europe - North Asia	Europe - North Asia
Europe - Pacific South East Asia	Europe - Pacific South East Asia
Europe - South America	Europe - South America
Europe - Sub Saharan Africa	Europe - Sub Saharan Africa
Intra Africa	Intra Africa
Intra Central America/Caribbean	Intra Central America/Caribbean
Intra Central/South West Asia	Intra China & South West Asia
Intra Europe	Intra Europe
Intra Middle East	Intra Middle East
Intra North America	Intra North America
Intra North Asia	Intra North Asia
Intra Pacific South East Asia	Intra Pacific South East Asia
Intra South America	Intra South America
Latin America/Caribbean - North Asia & Pacific South East Asia	Latin America/Caribbean - North Asia & Pacific South East Asia
Middle East - North Asia & Pacific South East Asia	Middle East - North Asia & Pacific South East Asia
North America - North Asia	North America - North Asia
North America - Pacific South East Asia	North America - Pacific South East Asia
North America - South America	North America - South America
North Asia - Pacific South East Asia	North Asia - Pacific South East Asia

APPENDIX E

Civil Aviation Forecasts - ICAO vs. CAEP vs. TFGs - Commercial Aircraft

Methodologies of Passenger Traffic Forecasts

methodological items	GATO, cir 333	FESG - CAEP 9	TFG				
			Carib./South A.	Asia/Pacific	Africa	Middle-East	North-Atlantic
Passenger demand	yes	yes	yes				
methodology	*econometric modelling*	*consensus process on 10 years intervals RPK growth rates*	*econometric modelling*				
forecast variable	*RPK*	*RPK*	*number of passengers carried*				
extrapolated variable	*movements*	*Passenger tonne-km (100 kg by pax) , movements, ASKs, kilometers flown, seats in fleet*	*aircraft movements*				
number of route groups and services	*31 scheduled RGs 1 total non-scheduled RG*	*32 scheduled and non-scheduled RGs*	*6 (scheduled)*	*2 (scheduled)*	*5 (scheduled)*	*5 (scheduled)*	*2 (scheduled) 1 (sched+non sched)*
coverage	*World sched and non-sched*	*World sched and non-sched*	*regional traffic flows. The sum of them does not have a global coverage*				
domestic/international breakdown	*yes*	*yes*	*only international*				
Region definition	*ICAO forecasting regions*	*FESG / ICAO (aligned)*	*ICAO statistical regions*				
base year	*2010*	*2010*	*2011*	*2011*	*2012*	*2010*	*2011*
data source for the development of traffic forecasts	*ICAO Air Transport Reporting Forms (A, B and C), OAG, airframe manufacturers and government data agencies*	*Airbus, Boeing, Eurocontrol, General Electrics, ICAO, Rolls-Royce, U.S. FAA, others*	*multiple sources: - ICAO - OAG - other*	*multiple sources: - ICAO - Transport Canada - FAA - other*	*multiple sources: - ICAO - IATA - OAG - other*	*multiple sources: - ICAO - IATA - OAG - other*	*multiple sources: - IATA - US Form I-92 - US Form T-100 - Transport Canada*
horizon	*2030*	*2030*	*2031*	*2032*	*2032*	*2030*	*2030*
extended horizon/methodology	*2040 (extended econometric models by RG)*	*2040 (polynomial approach by route group) and 2050 (polynomial approach on DOM/INT)*	*no*				
sensitivity analysis	*yes (GDP assumptions in econometric models)*	*yes (substract or add to consensus growth the standard deviation by RG across all forecasts inputs)*	*no (but possible)*	*yes (GDP and yield assumption)*	*no (but possible)*	*no (but possible)*	*yes (GDP assumption)*

Forecast of aircraft with less than 20 seats

GATO *Global Air Transport Outlook*
FESG *Forecasting and Economic analysis Support Group*
CAEP *Committee on Aviation Environmental Protection*
TFG *Traffic Forecasting Group*

Civil Aviation Forecasts - ICAO vs. CAEP vs. TFGs - Commercial Aircraft

Methodologies of Freight Traffic Forecasts

methodological items	GATO, cir 333	FESG - CAEP 9	TFG				
			Carib./South A.	Asia/Pacific	Africa	Middle-East	North-Atlantic
Cargo demand	**yes**	**yes**	**no**	**yes**	**no**		**yes**
methodology	*econometric modelling*	*reallocation of 13 Boeing forecasted Regions to 32 RGs*		*deduced from pax aircraft movements with assumptions*			*econometric modelling*
forecast variable	*FTK*	*FTK*		*aircraft movements*			*aircraft movements*
number of route groups and services	*51 scheduled RGs and 1 non-scheduled RG*	*32 scheduled and non-scheduled RGs*		*1*			*1*
directional route group	*yes*	*no*		*no*			*no*
coverage	*World sched and non-sched*	*World sched and non-sched*		*scheduled international*			*scheduled international*
domestic/international breakdown	*yes*	*yes*		*n/a*			*n/a*
Region definition	*ICAO forecasting regions*	*FESG / ICAO (aligned)*		*ICAO*			*ICAO*
base year	*2010*	*2010*		*2011*			*2011*
data source for the development of traffic forecasts	*ICAO Air Transport Reporting Forms (A, B and C), OAG, airframe manufacturers and government data agencies*	*Boeing*		*OAG*			*multiple sources: - IATA - Transport Canada - FAA*
horizon	*2030*	*2030*		*2032*			*2030*
extended horizon/methodology	*2040 (extended econometric models by RG)*	*2040 (estimated growth by RG) and 2050 (polynomial approach on DOM/INT)*		*no*			*no*
sensitivity analysis	*yes (GDP assumptions in econometric models)*	*yes (consensus)*		*no*			*yes (as for passenger forecast)*

GATO *Global Air Transport Outlook*
FESG *Forecasting and Economic analysis Support Group*
CAEP *Committee on Aviation Environmental Protection*
TFG *Traffic Forecasting Group*

APPENDIX F

REGIONAL FLEET ANALYSIS
MID REGION

1. SCOPE OF THE ANALYSIS

1.1 The analysis is based on OAG, for the 15 Member States to which MID, Cairo Office is accredited: 1) Bahrain, 2) Egypt, 3) Iran, Islamic Republic of, 4) Iraq, 5) Jordan, 6) Kuwait, 7) Lebanon, 8) Libya, 9) Oman, 10) Qatar, 11) Saudi Arabia, 12) Sudan, 13) Syrian Arab Republic, 14) United Arab Emirates and 15) Yemen.

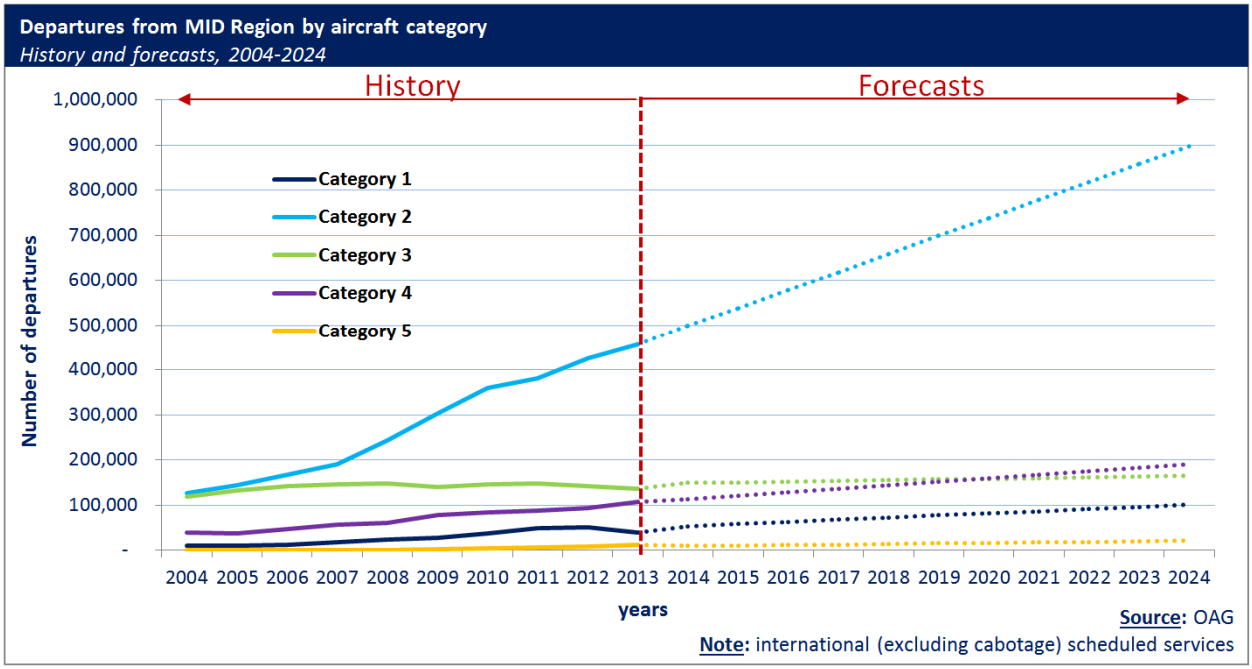
1.2 Only the international direct scheduled flights from the Region between 2004 and 2013 have been taken into consideration, excluding cabotage.

1.3 For the purpose of the analysis, the aircraft have been aggregated in 5 categories, covering 99 per cent of the flights in 2013. The following table describes the 5 categories and the corresponding traffic in 2013:

Category	Aircraft types in the category	Departures	% share in terms of departures
Category 1	ATR42, ATR72, Bombardier CRJ, Embraer 120 Brasilia, Embraer 170/195, Embraer RJ 135/140/145, Fokker F27/28, Fokker 70/50/100	38,087	5%
Category 2	Airbus Industrie A318/319/320/321, Boeing B727/737	455,633	60%
Category 3	Airbus Industrie A300/310/330/340, Boeing B757/767/787	136,436	18%
Category 4	Boeing B747/777	107,434	14%
Category 5	Airbus Industrie A380	11,270	1%
Other	other	5,915	1%
Total		**754,775**	**100%**

2. ANALYSIS

2.1 Based on OAG, the following graph shows the fleet distribution between 2004 and 2013 and the trend projection up to 2024 that has been derived for each category. To be noted that the trend projections are based on the historical OAG data. These forecasts are not to be considered as part of the work of the MDWG-LTF.



2.2 While in 2004, categories 2 and 3 aircraft represented in OAG respectively 41 per cent and 39 per cent of the total number of departures, in 2013 categories 2 and 3 represented 60 per cent and 18 per cent respectively: category 2 aircraft departures have skyrocketed while category 2 aircraft departures rose moderately.

2.3 According to OAG, category 5 aircraft (A380) has started operation in 2008 in the MID Region, and represented 1 per cent of the departures in 2013, with more than 11 000 scheduled international departures.

2.4 Category 1 aircraft accounted for 3 per cent of departures in 2004 and rose to 5 per cent in 2013.

2.5 Category 4 aircraft departures remained relatively stable between 2004 and 2013 in term of share of departures (13 per cent in 2004 and 14 per cent in 2013).

- END -