PHILIPPINES'

ACTION PLAN ON CO_2 EMISSION REDUCTION

EXECUTIVE SUMMARY

This action plan provide an overview of the primary initiatives of the Civil Aviation Authority of the Philippines (CAAP) in partnership with the Philippine aviation industry and the other Philippine Government Authorities, to reduce greenhouse gas (GHG) emission from Philippine aviation. The CAAP is committed to managing the carbon footprint of Philippine aviation industry while simultaneously enhancing its safe and efficiency. The commitment to reducing environmental impacts is reflected in an aspirational goal of achieving carbon-neutral growth for Philippine aviation by 2020 using the 2010-2015 emission as the baseline. CAAP used the ICAO methodology in preparation of the Action Plan for International emission.

Recognizing the effects of global warming, the Philippines has been sincerely exerting aggressive efforts to minimize aviation's carbon footprint through measures such as, including but not limited to, air traffic improvements, airport initiatives, as well as aircraft emission reduction measurements. These aim to continually address the GHG emission from the air sector by targeting an average of 2%year-on-year improvement in fuel efficiency by 2020, in both domestic and international operations.

Taking into account achievements to date, the Action Plan sets an ambitious goal to reduce GHG emissions from both domestic and international operations, which we expect to contribute to global efforts in line with the broad international consensus. To help reach this goal, the Action Plan identifies three key measures that are expected to have the greatest environmental impact:

- Aircraft and Engine Technology Improvement;
- Improvement of Airport Ground Operations and Infrastructure Use; and
- Air Traffic Management Operational Improvements.

Meanwhile, from GHG emission reduction beyond 2020, the Philippines will continue to make technical efforts and implement realizable measure aiming to improve fuel efficiency by 25% by 2030 compared to that of the 2016 baseline.

With best efforts, the Philippine Aviation industry expects these measures to have beneficial environmental results, but these results are not expressed in quantitative terms due to the nature or current stage of the activities. These include:

- Aviation Environmental Research and Development;
- Alternative Fuels;
- Regulatory Measures;
- International coordination;
- Eco-Friendly Infrastructures and
- Global Market-Based Measures for International Aviation

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I. BACKGROUND

The Philippine Government is committed to addressing the effects on climate change of domestic and international commercial aviation. In support of this effort, the Civil Aviation Authority of the Philippines (CAAP) works collaboratively with the International Civil Aviation Organization (ICAO) to address aviation's impact on the environment. The CAAP supports the policy of ICAO and the technical work conducted in Committee on Aviation Environment Protection (CAEP), in partnership with the Department of Transportation (DOTr), the Department of Environment and Natural Resources (DENR), and the Climate Change Commission (CCC), and other Philippines agencies.

The United Nations Framework Convention on Climate Change (UNFCCC), to which the Philippines is a signatory, has the ultimate objective to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system. This objective led to an International Treaty known as the Kyoto Protocol, which was adopted by the UNFCCC in 1997. As a signatory, the Philippines promulgated a law, to protect the climate system, Republic Act No. 9279, known as the Climate Change Act of 2009.

In October 2010, the ICAO adopted a resolution for its policies and practices related to environmental protection. The resolution became known as Resolution A37-19: "Consolidated statement of continuing ICAO policies and practices related to environmental protection – Climate Change". The objective of the resolution is to reduce the aviation activities' absolute emissions contribution to climate change. With this objective, ICAO resolves that States and relevant organizations will work through ICAO to achieve the agreed global fuel efficiency improvement targets.

According to ICAO data, the international aviation emissions is less than 2 percent (2%) of total global carbon dioxide emissions, but are projected to grow as a result of the continued development of the international aviation sector.

In aviation, the significant source of greenhouse gas (GHG) emissions is the utilization of aircraft fuel. By improving fuel efficiency, the GHGs emitted through aviation activities will be minimized proportionally.

According to the Philippine Climate Change Act of 2009, the GHGs are constituents of the atmosphere that contribute to the greenhouse effect including, but not limited to, carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride. The said Act defines the greenhouse effect as the process by which the absorption of infrared radiation by the atmosphere warms the Earth.

The greenhouse effect is internationally recognized as the cause of climate change. According to the aforesaid Act, climate change is defined as a change in climate that can be identified by changes in the mean and/or variability of its properties and that persists for an extended period typically decades or longer, whether due to natural variability or as a result of human activity. The Act recognizes that the climate change and global warming have potential dangerous consequences such as increasing temperatures, rising seas, changing landscapes, increasing frequency and/or severity of

droughts, fire, floods and storms, climate-related illnesses and diseases, damage to ecosystems, and biodiversity loss.
Cognizant of the recent effects of climate change on the Philippine archipelago, and consistent with the Philippine Climate Change Act of 2009, and theICAO Assembly Resolution No. A37-19, the C AAP is committed to achieve an annual average fuel efficiency improvement of 2 percent until 2020, and an aspirational global fuel efficiency improvement rate of 2 percent per annum from 2021 to 2050, calculated on the basis of volume of fuel used per revenue ton kilometer performed.

With improved fuel efficiency, the cost of airfares and services will be reduced, and the dangerous consequences of climate change and global warming will be minimized. This in turn is forecasted to improve the Philippine economy.

II. PURPOSE AND SCOPE

The intent of this document is to establish a means for the Philippines, as a Contracting State, to communicate to ICAO information on its activities to address CO_2 emission from international aviation. The level of information contained in this document demonstrates the actions that the Philippines have already undertaken and future mitigation strategies that the State vows to implement, for the ICAO to measure, to meet the global goals set by ICAO Assembly Resolution A37-19.

III. DEFINITION OF TERMS

Air taxi revenue flights – On-demand, non-scheduled flights on short notice for the carriage by air of passengers, freight or mail, or any combination thereof for remuneration usually performed with smaller aircraft including helicopters (Typically no more than 30 seats). This definition includes any positioning flights required for the provision of the service.

Biofuels - Products refer to non-fossil energy sources which are made from living organism or from biogenic feedstock (plant oils or animal fats). In order to be considered as biofuel, the fuel must contain over 80 percent renewable materials.

Flight Stage - A flight stage is the operation of an aircraft from take-off to its next landing. A flight stage is classified as either international or domestic based on the following definitions:

a) ***International.*** A flight stage with one or both terminals in the territory of a State, other than the State in which the air carrier has its principal place of business.
b) ***Domestic.*** A flight stage not classified as international. Domestic flight stages include all flight stages flown between points within the domestic boundaries of a State by an air carrier whose principal place of business is in that State. Flight stages between a State and territories belonging to it, as well as any flight stages between two such territories, should be classified as domestic. This applies even though a stage may cross international waters or over the territory of another State.

Fuel consumed – The mass of fuel uplifted in metric tonnes for all aircraft in each aircraft type in air carrier's fleet should be reported. There should not be distinction given between fuel types. Fuel uplift can be determined based on the measurement by

the fuel supplier, as documented in the fuel delivery notes or invoices. Alternatively, fuel uplift can also be established using aircraft onboard measurement systems.

Tonne-kilometres performed – For all aircraft in each aircraft type the sum of the product obtained by multiplying the number of tonnes of revenue load (i.e one for which remuneration is received) carried on each flight stage by the corresponding stage distance shall be entered.

To convert aircraft passenger load into weight loads, the number of revenue passenger plus both normal baggage allowance and excess baggage. This conversion factor is left to the discretion of the carrier. However, if no conversion factor is available, it is recommended that 100 kilograms is used. Freight shall include express and diplomatic bags.

Mail shall include all correspondence and other objects tendered by and intended for delivery to postal administration shall be included under this heading.

The factor to convert freight and mail loads from volume into mass is left to the discussion of the carrier. However, if no conversion is available, it is recommended that 161 kilograms per cubic meter be used.

IV. acronymS

CAAP	-	Civil Aviation Authority of the Philippines
CAEP	-	Committee on Aviation Environment Protection
CNS/ATM	-	Communication Navigation Surveillance / Air Traffic Management
DENR	-	Department of Environment and Natural Resources
DOTr	-	Department of Transportation
CCC	-	Climate Change Commission
ICAO	-	International Civil Aviation Organization

V. CONTACT INFORMATION

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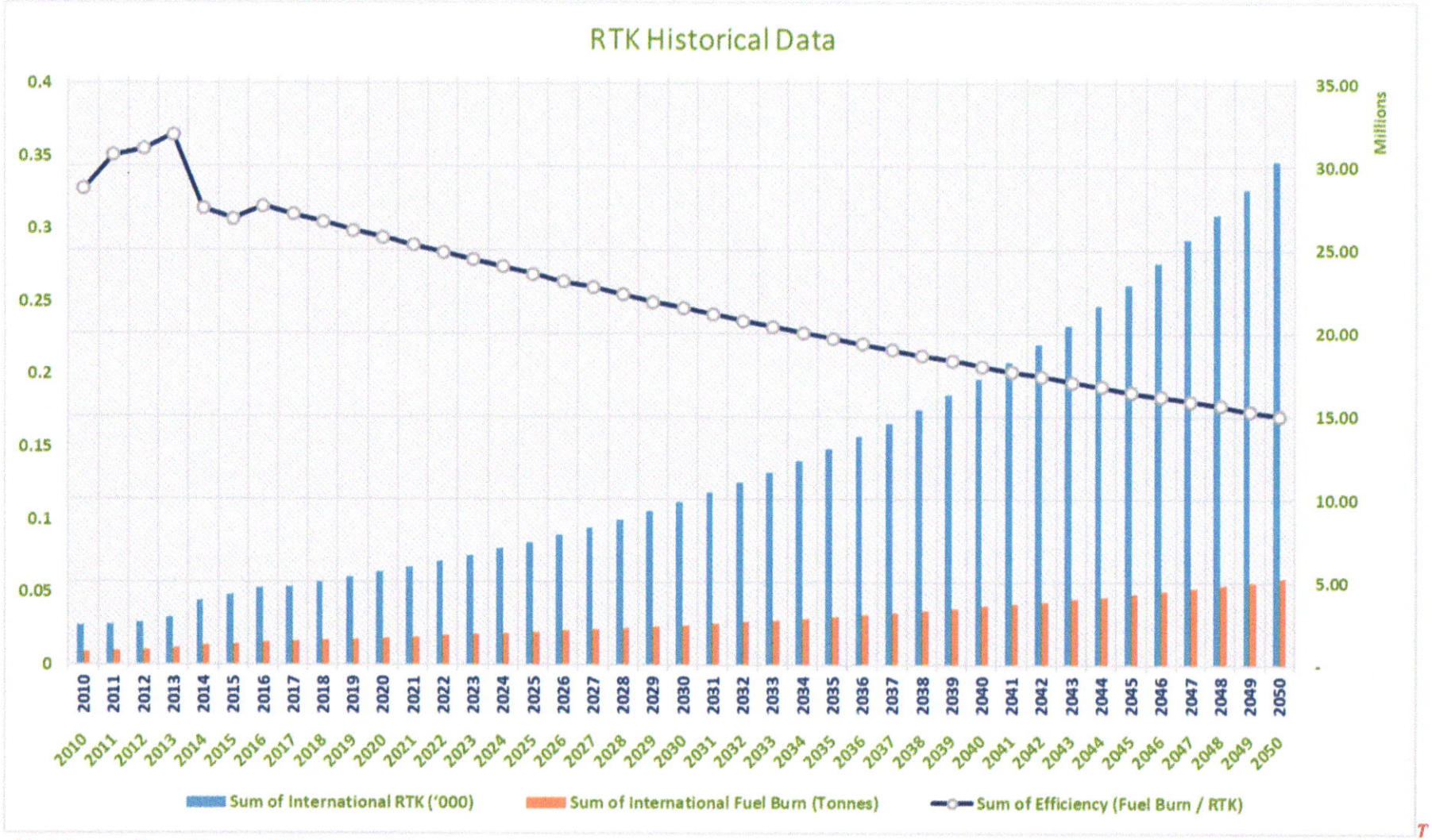
VI. BASELINE WITHOUT ACTION



able 1: Revenue Tonne-Kilometre (RTK) Historical Data. Source (ICAO Environment Bureau)

VII. MITIGATION MEASURES

1. Aircraft and Engine Technology Improvement

a) *Purchase of New Aircraft*

The airline companies plan to purchase new aircraft.

b) Avionics

With the implementation of PCAR 7, 8 and 9, it is part of CAAP's oversight function to ensure that avionics equipment meet current navigational requirement on aircraft to be operated in Performance Based Navigation. Guidelines for this type of operation are also made available in the published CAAP Advisory Circular (AC) for aircraft operators.

2. Alternative Fuel

a) Development of Bio-Fuel or other fuel with lower carbon lifecycle content and associated standards for alternative fuels.

Studies on the production of Bio-Fuels (Used Cooking Oil) are being conducted by the Scientists of University of the Philippines-Los Banos in coordination with the Department of Science and Technology.

3. Regulatory Measures

a) ANNEX 16 Part 1 and Part 2

Compliance by adopting Annex 16 Part 1 Noise into national regulation under PCAR 5 Noise.

b) Transparent Carbon Reporting

In response to the urgency for action on climate change, the Philippines passed Republic Act 9729, also known as the Climate Change Act of 2009, Establishment of a Climate Change Commission (CCC), an independent and autonomous body that has the same status as that of a national government agency. The CCC is under the Office of the President and is the "sole" policy making body of the government which shall be tasked to coordinate, monitor and evaluate the programs and action plans of the government relating to climate change. One of the action plan is a centralized data management system that would aid the general public in gathering relevant

information on climate change. As an initiative by the CAAP and in parallel with the CCC action plan, carbon reporting will be recommended to be part of the amendment of the PCAR.

c) *Conferences and Seminar*

The CAAP actively participates in conferences and seminars for the aviation industry to educate and increase the awareness of the public in the aviation sector. As of the moment, a drive for the "Green Airport" is on-going.

d) *Deploying tablet computer*

A simple solution of using consumer electronic devices such as IPadS and other tablet computer to replace the heavy paper flight manual, maps and charts that pilots are required to carry.

Aside from allowing pilots to update their manuals faster and more easily, file flight plan and manage schedule changes and weather disruptions, there is a significant environment benefit. Many pilots and flight deck routinely have to carry up to 20kgs worth of maps, manuals and charts. A typical paper flight plan for a Manila to United States trip could be almost ten meters long. By putting it in a tablet computer, airlines can save paper, and spare pilots from carrying it all around, and most importantly, save fuel and reduce CO_2 emissions.

4. Air Traffic Management Operational Improvements

The Philippines developed its Performance-based Navigation (PBN) implementation Plan in 2009, updated in 2011, as a response to the 36th ICAO General Assembly Resolution urging States to develop PBN Implementation Plan with a firm belief that implementing PBN will improve existing conditions in many of its airport, such as congestion, diversion, unstabilized approaches, flight delays and CO_2 emission.

Considering the many aspects related to its implementation, such as aerodrome development, CNS infrastructure, obstacle survey, airspace and procedure design, flight validation, ATC training and formulating applicable regulations in accordance with ICAO regulations, the State organized the CAAP PBN Task Force Committee to ensure a collaborative approach of its implementation. The CAAP PBN Task Force includes operator representatives, air traffic controllers, surveyors, engineer, flight validation inspectors, flight operation inspector, airspace planners, procedure designers and safety oversight inspectors. A PBN stakeholder workshop conducted by the ICAO Asia Pacific Flight Procedure Program in November 2011 was held to assess stakeholders' readiness to implement PBN. The workshop identified tasks for the different

stakeholders that need to be accomplished in order to meet the short term goal of implementing PBN in Philippines.

The Philippines PBN Implementation Plan considered a phased-approached consistent with the Asia Pacific Regional PBN Implementation Plan.

The table below shows the status of operational implementation of different PBN procedures for airports included in the PBN plan:

INTERNATIONAL AIRPORT APAC AIR NAVIGATION			International Instrument Runway Ends	Planned for 2016 Implementation	Completed as of December 31, 2016	Remarks
Airport	RWY					
1. Ninoy Aquino International Airport (RPLL) For Departure	06	24	3	2	2	AIP 8-23-12
	13					RWY 13 - DEP
2. Clark International Airport (RPLC)	02	20	2	2	2	SUP AO12-16 01-02-17
3. Mactan - Cebu International Airport (RPVM)	04	22	2	2	2	SUP AO03-16 03-03-16
4. Davao International Airport (RPMD)	05	23	2	2	2	AIP 5-26-16
5. Laoag International Airport (RPLI)	01	19	2	2	2	SUP AO12-16 01-02-17
6. Zamboanga International Airport (RPMZ)	09	27	2	2	2	AIP 5-29-14
7. Tambler International Airport (RPMR)	17	35	2	2	2	SUP AO12-16 01-02-17
8. Iloilo Airport (RPVI)	02	20	2	2	2	AIP 8-23-12

9. Subic Bay International Airport (RPLB)	07	25	2	0	0	To be designed if there will be operational advantages

Table 2: Operational Implementation of PBN for International Airports.

DOMESTIC AIRPORT			International Instrument Runway Ends	Planned for 2016 Implementation	Completed as of December 31, 2016	Remarks
Airport	RWY					
1. Bacolod-Silay Airport	03	21	2	2	2	SUP A006-15 10-15-15
2. Kalibo Airport (RPVK)	05	23	2	2	1	SUP A009-15 2-4-16 -Completed IFPs for 2nd RWY on-going verification
3. Puerto Princesa Airport (RPVP)	09*	27	1	1	1	AIP 8-23-12
4. Laguindingan Airport (RPMY)	09	27	2	2	2	SUP A0017-14 2-5-15
5. Tacloban Airport (RPVA)	18	36	2	2	1	AIP 5-26-16 2nd RWY design on-going
6. Dumaguete Airport (RPVD)	09*	27	1	1	1	SUP A007-14 5-29-14
7. Butuan Airport (RPME)	12	30	2	2	2	SUP A006-14 5-29-14
8. Legazpi Airport (RPLP)	06	24	2	2	2	SUP A005-14 5-29-14
***Non-instrument runway: to be designed if the operators will declare RNP AR capability**						
9. Caticlan Airport (RPVE)	06	24	2	-	2	SUP A0011-16 12-08-16

Table 3: Operational Implementation of PBN for Domestic Airports.

The CAAP first implemented the Performance Based Navigation (PBN) routes in selected airports in 2012. To date, new instrument procedures consisting of Standard Arrival Route (STAR), Instrument Approach Procedures (IAP) and Standard Instrument Departure (SID) have been established in nine (9) airports and three (3) enroute to terminal procedure with RNAV-5 navigation specification:

a) PBN instrument flight procedures in airports with Conventional Procedure

The establishment of STAR/SID flight procedure at Ninoy Aquino International Airport (NAIA), Puerto Princesa International Airport, Iloilo International Airport, and Zamboanga International Airport made possible the significant reduction in flight time when electing to use the PBN instrument flight procedures in lieu of conventional procedures. PBN arrival procedures allow aircraft to fly directly to the initial approach fix CIAF leading to the instrument approach path thereby significantly reducing track meter to intercept the final approach path.

As estimated by the JICA Evaluation Team in their Terminal Evaluation Report 2013 of the Capacity Development Project for Improvement of Safety and Efficiency for Air Navigation System, ten (10) minutes of A320 flight time reduction can save USD336 of fuel costs and reduce CO2 emission by 1.1 tons per arrival.

b) New IFR rated airports with PBN instrument flight procedures

In 2014, three (3) VFR domestic airports, namely Legazpi, Butuan, Dumaguete and Laguindingan airports were upgraded to instrument rated airport following establishment of instrument flight procedures in the said airports.

The establishment of instrument flight procedures in these airports significantly increased the accessibility and safety of aircraft operations thereby reducing the possibility of costly diversion to alternate airport when ceiling and visibility requirement dictate suspension of take-off and landing operations.

c) Enroute to Terminal Routes

The use of W-25 instead of B462 W-8 route reduces the track mile by 11.6NM with the corresponding reduction of 104 seconds of flight time, USD 58 of fuel consumption and 271 kilograms of CO2 emission per A320 flight (JICA Joint Terminal Report 2013). During the JICA Project evaluation sample period September 2013, 128 flights use W-25 which correspond to an average reduction of USD0.4 million in fuel costs and 1,300 tons of CO2 emission per year.

Expectedly, the increased utilization of PBN procedure in more airports enable a significant contribution to the efficiency of flight, improvement of safety and reduction in fuel cost and CO2 emission.

d) *Continuous Descent Operation (CDO) / Continuous Climb Operation (CCO)*

Continuous Descent Operations (CDO) allow an aircraft to approach and land on the runway on smooth motion, rather than the traditional steeped approach to airport where engine power was needed to level off at multiple altitude before landing. Meanwhile, Continuous Climb Operations (CCO) allow an aircraft to take-off and reach its cruising altitude on smooth maneuver. The flight can attain the most fuel-efficient flying condition quickly and also reduce the fuel used by leveling-off at different altitude.

The CAAP already implemented the CDO and CCO at Ninoy Aquino International Airport (NAIA).

By using the CDO / CCO techniques through collaboration with stakeholders, it is possible to increase efficiency, flight predictability and airspace capacity, while reducing fuel burn, emissions and aircraft noise and whilst maintaining safety. By using the CDO technique, fuel burn, emissions and aircraft noise can be reduced.

e) *New Communication Navigation Surveillance / Air Traffic Management (CNS/ATM) Systems Development Project*

The objective of the CNS-ATM is to develop a dynamic and integrated CNS/ATM System using satellite technology to enhance safety, reliability, efficiency of air traffic service in the Philippine airspace and to reduce CO_2 emission.

The project covers, (1) the establishment of priority elements of the new satellite-based CNS/ATM systems in accordance with the ICAO Global Air Navigation Plan for CNS/ATM Systems (ICAO Doc 9750); (2) the deployment of vital communications, navigation, surveillance and information equipment/facilities; (3) the replacement of aging vital communications, surveillance and air traffic control equipment/facilities at selected airports/sites nationwide.

Figure 1: CAAP New CNS-ATM Building