ICAO ENVIRONMENT

ICAO Environmental Symposium 2019

DESTINATION GREEN: THE NEXT CHAPTER

ICAO basket of measures – Operational measures

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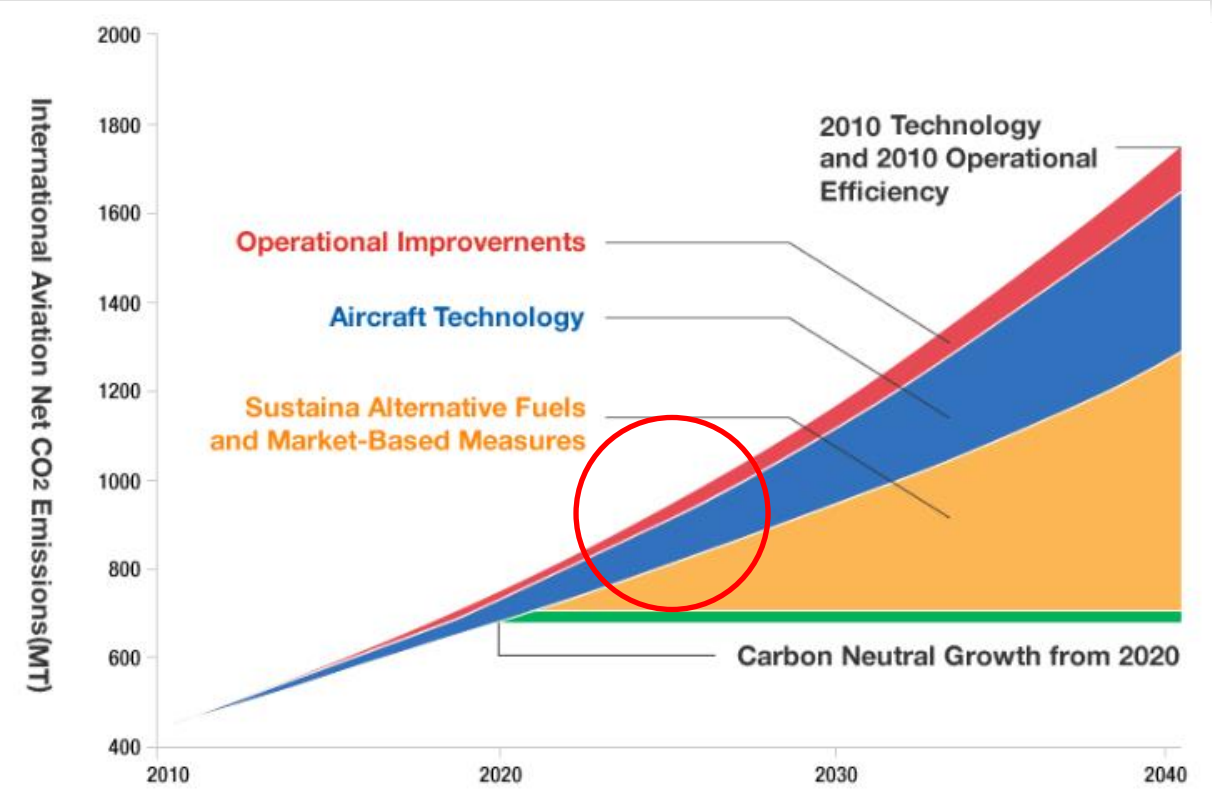
EUROCONTROL


International Aviation Net CO2 Emissions(MT)
2000
1800
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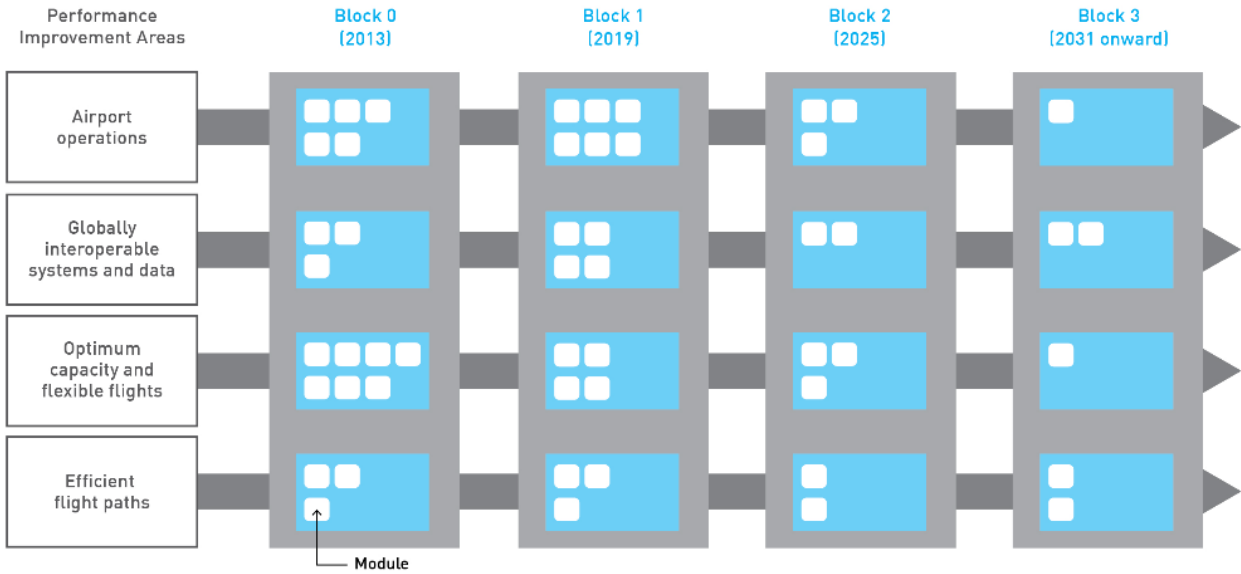
Operational Improvernents
Aircraft Technology
Sustaina Alternative Fuels and Market-Based Measures
Carbon Neutral Growth from 2020

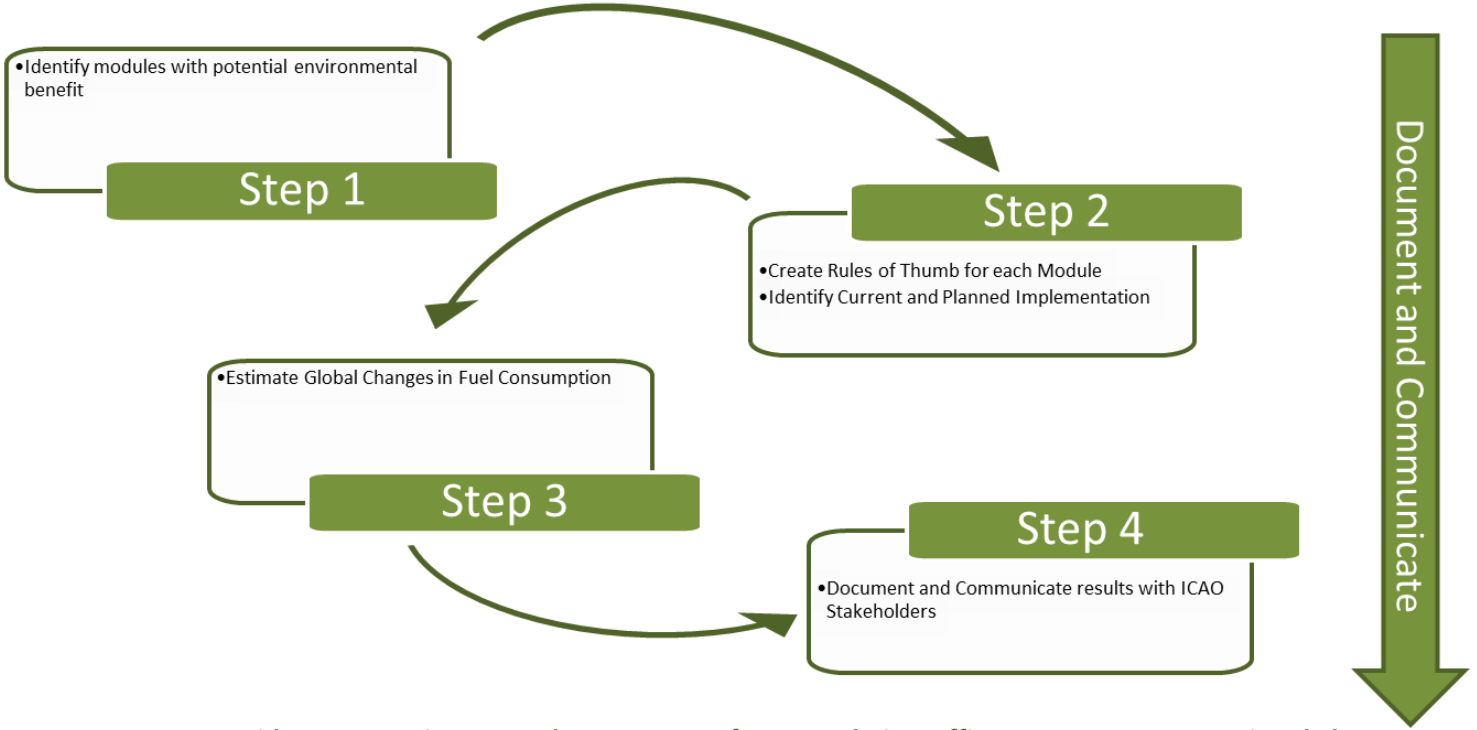
- **In 2019, ICAO-CAEP undertook a global environmental benefits assessment to identify the fuel / CO_2 emissions savings from the implementation of ASBU Blocks 0/1 out to 2025**

ICAO initiated the Aviation System Block Upgrade (ASBU) initiative as a programmatic framework that:

- **Develops a set of Air Traffic Management (ATM) solutions or upgrades**
- **Takes advantage of current equipage**
- **Establishes a transition plan, and**
- **Enables global interoperability**

Outlined in *ICAO Global Air Navigation Plan (Doc. 9750)*

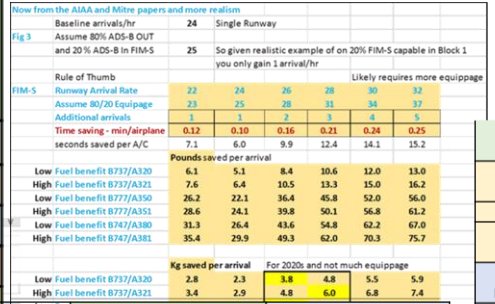




Aligns with approach outline in ICAO Doc 10031, *Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes*

- 53 rules of thumb (RoT) were developed for ASBU B0 / B1 generic implementations

AC Class	High Ave Kg Saved per taxi min Taxi-out	Low Ave Kg Saved per taxi min Taxi-in**	Fleet %
RJ	7	4.9	6,0
SA	14,4	10.1	71,0
Small TA	20,5	14,4	12,9
Med TA	34	23,8	8,8
Large TA	70	49	1,3
Composite	17,2	12,0	
	High	Low	



AC Class	kg/arr	Low kg/arr	High kg/arr	Low kg/dep	High kg/dep
RJ	0,51	2,2	4,8	7,1	16,4
SA	0,68	2,9	6,4	9,4	21,9
Small TA	1,11	4,8	10,5	15,4	35,7
Med TA	1,57	6,8	14,9	21,7	50,5
Large TA	2,47	10,7	23,4	34,2	79,4
Composite	0,829	3,6	7,8	11,5	26,7

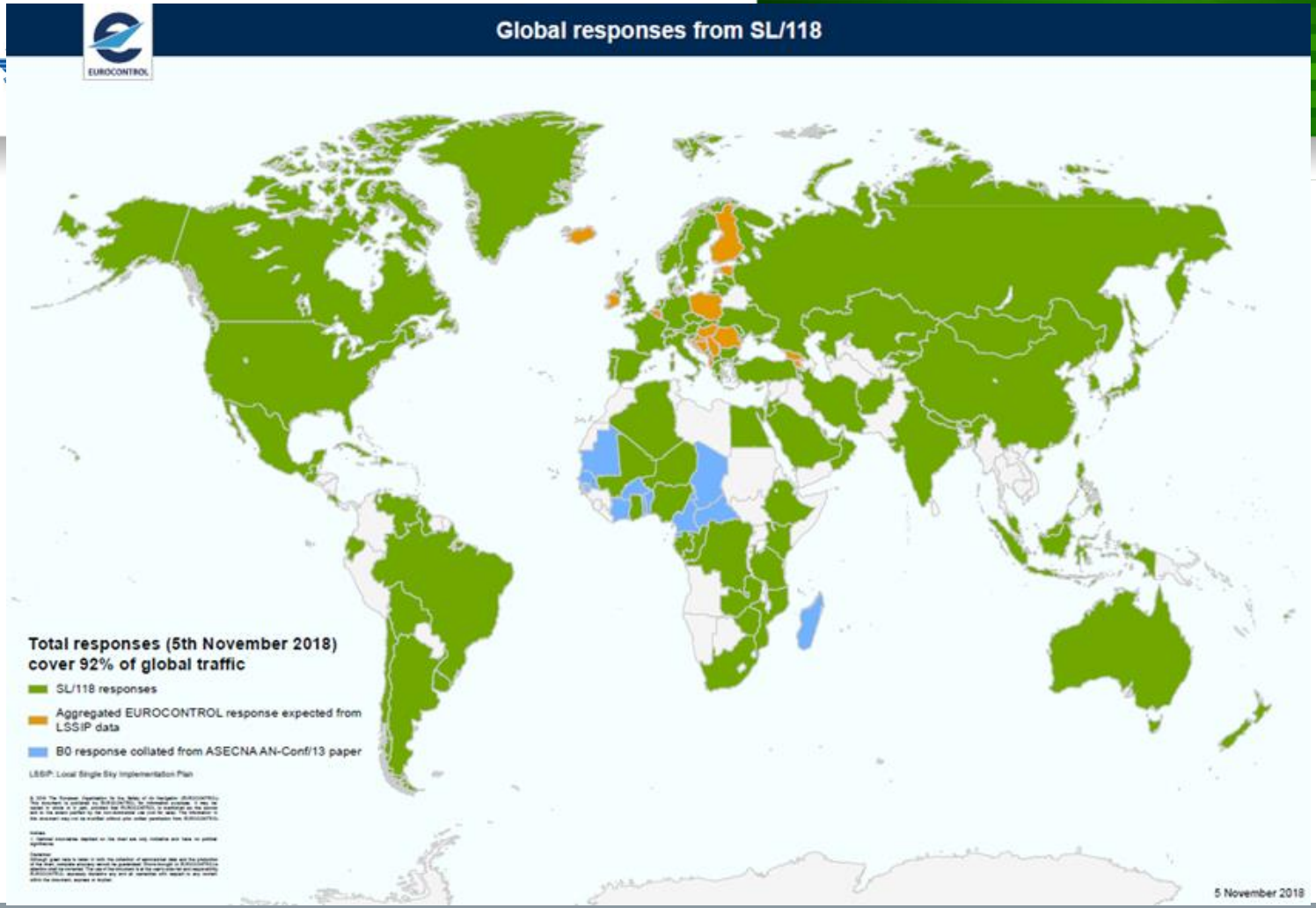
AC Class	Ave Kg Saved per flight	Modified Fleet %
SA	21,0	74,0
Small TA	89,3	13,4

RJ	900-1220	4030	1832	30,53	0,509	1832	31	0,51	6,0%
SA	900-1220	5815	2643	44,05	0,734	2460	41,0	0,68	71,0%
SA	1900	5357	2435	40,58	0,676				
SA	4000-5500	5060	2300	38,33	0,639				
Small WB-1 B57/67-A33/34	900-1220	8580	3900	65,00	1,083	4009	66,8	1,11	12,9%
Small WB-1 B57/67-A33/34	1900	7883	3583	59,72	0,995				
Small WB-2 B57/67/87-A33/34	4000-5500	9995	4543	75,72	1,262				
Medium WB B777-A340/350	4000-5500	11865	5393	89,88	1,498	5642	94,0	1,57	8,8%
Medium WB B777-A340/350	9000-14000	12960	5891	98,18	1,636				
Large WB 747/A380	4000-5500	17279	7854	130,90	2,182	8887	148,1	2,47	1,3%
Large WB 747/A380	9000-14000	21824	9920	165,33	2,756				
						2986	49,8	0,829	100%

Fuel Savings (kgs) per Flight from R
Setting Enabled by Performance E

Aircraft Class >>>	Savings (kgs)	Distance Savings (NM)
Range:		
RoT low	11-95	1-5
RoT high	40-187	17-27

Global responses from SL/118



- Average fuel burn savings due to ASBU Block 0/1 implementation:106-204kg per flight.
- 5.2-10.1Mt / 16.6-32Mt in global annual fuel burn / CO_2 savings

ICAO region	Fuel (Mt)	CO_2 (Mt)	Saving (Fuel / CO_2) (%)
Africa	0.2-0.3	0.5-0.9	1.5-2.7%
Asia/Pacific	2.1-3.9	6.7-12.5	1.6-3.0%
Europe	1.4-2.5	4.3-8.0	1.7-3.2%
Latin America/Caribbean	0.5-0.8	1.5-2.5	2.1-3.6%
Middle East	0.2-0.4	0.6-1.3	0.8-1.7%
North America	1.0-2.2	3.2-6.9	1.2-2.6%
Global	**5.2-10.1**	**16.6-32.0**	**1.5-2.9%**

- IATA recognise that,

“as a general rule, carrying additional fuel can result in a total increase in fuel burn of 2.5-4.5% of the additional mass of fuel carried per hour of flight”.

➔ You have to burn fuel to carry fuel!

- In the B0 / B1 analysis as a result of the implementation of the modules from ASBU Blocks 0/1 between 2015 and 2025, the reduction in additional fuel due to the reduction of trip fuel was estimated to provide up to an additional 4-10kg of fuel burn savings per flight

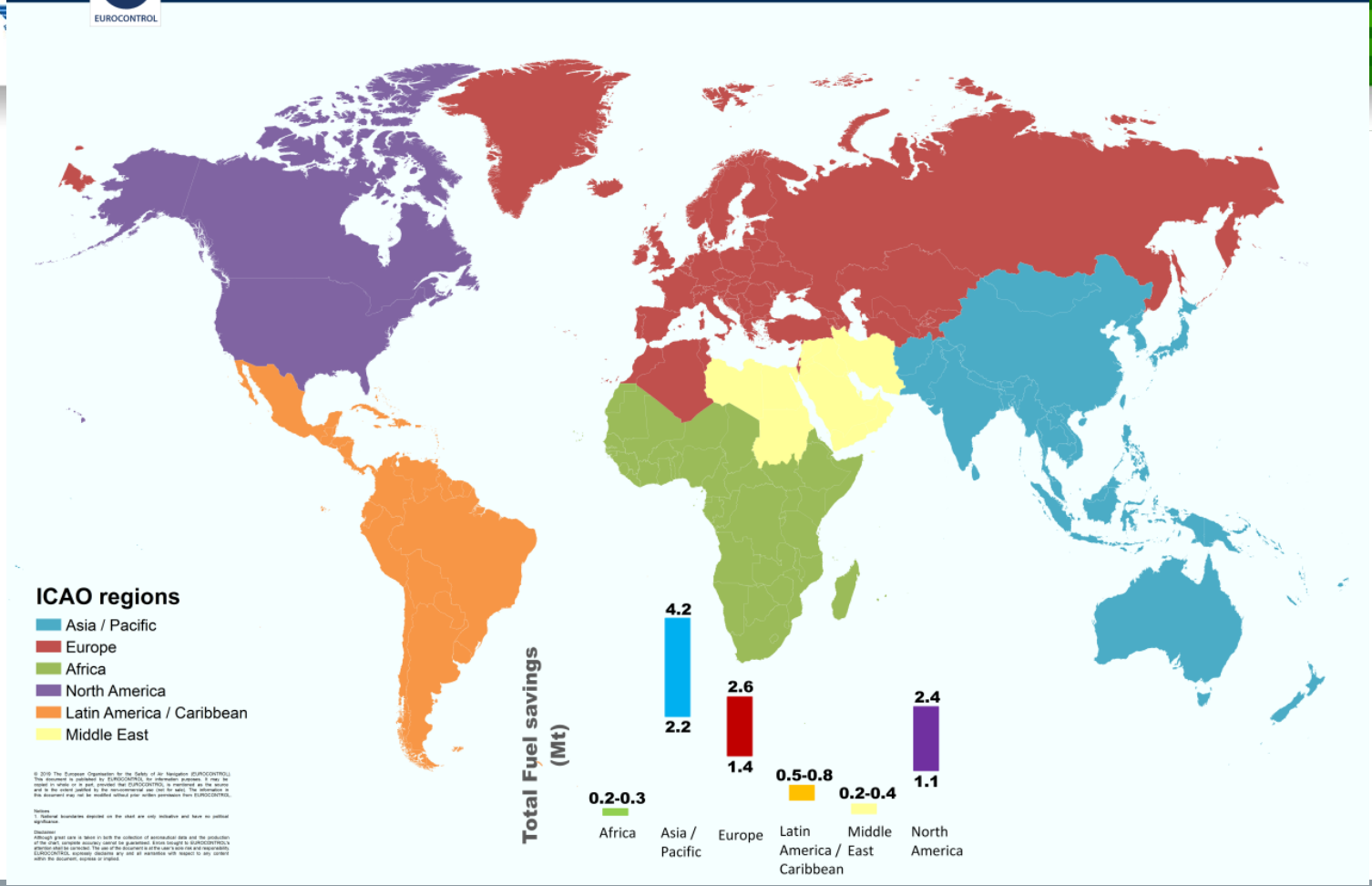
- Global annual fuel burn savings from ASBU Block 0/1 elements + IATA fuel burn savings

- 5.4-10.7Mt fuel burn or 17.2-33.7Mt CO_2

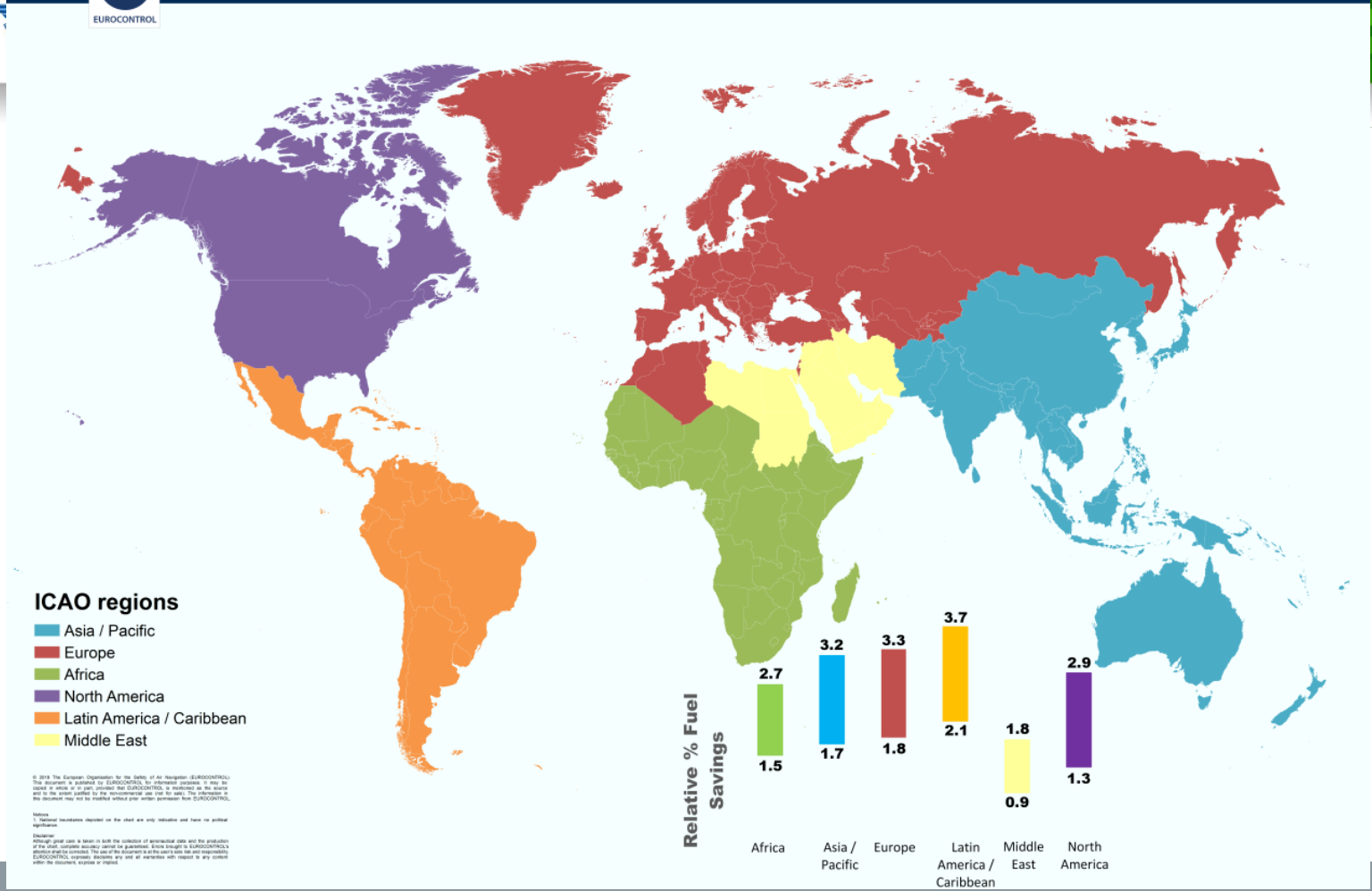
ICAO Region	Fuel savings (Mt)	Fuel / CO_2 savings (%)	CO_2 savings (Mt)	Cost savings ($billion)*	Cost savings (€billion)
Africa	0.2-0.3	1.5-2.7	0.5-1.0	0.1 – 0.2	0.1 – 0.2
Asia/Pacific	2.2-4.2	1.7-3.2	6.9-13.3	1.3 – 2.5	1.2 – 2.2
Europe	1.4-2.6	1.8-3.3	4.4-8.2	0.8 – 1.5	0.7 – 1.4
Latin America/Caribbean	0.5-0.8	2.1-3.7	1.5-2.6	0.3 – 0.5	0.2 – 0.4
Middle East	0.2-0.4	0.9-1.8	0.7-1.4	0.1 – 0.3	0.1 – 0.2
North America	1.1-2.4	1.3-2.9	3.5-7.6	0.7 – 1.5	0.6 – 1.3
Global	**5.4-10.7**	**1.6-3.0**	**17.2-33.7**	**3.3 – 6.4**	**2.9 – 5.6**

*IATA fuel price and exchange rate 24/01/19

Range of estimated block 0/1 fuel savings (from 2015-2025 implementation) per ICAO region (Mt)

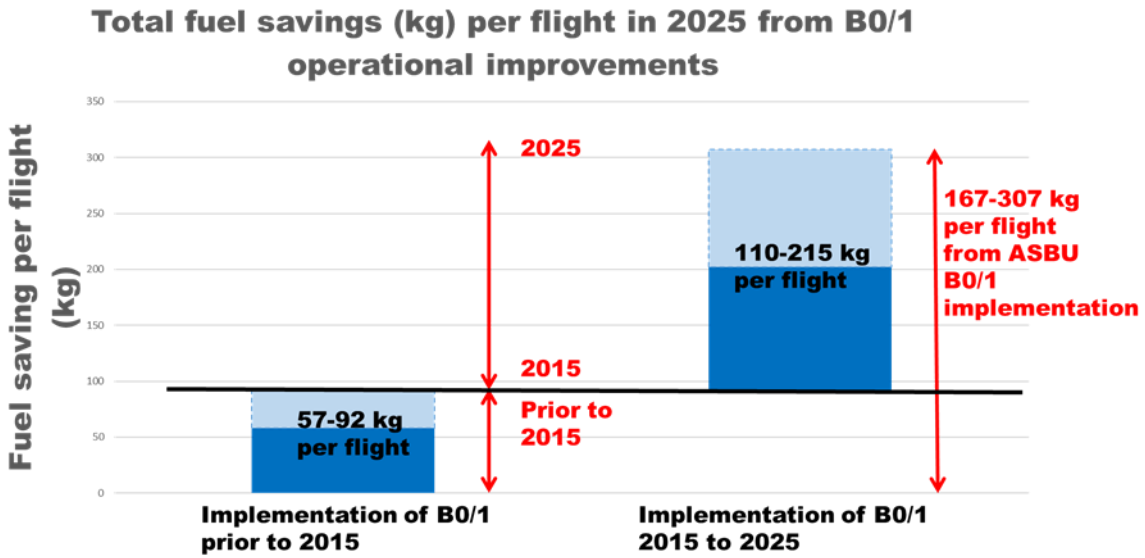


Range of estimated block 0/1 fuel savings (2015-2025 implementation) per ICAO region relative to total 2025 regional fuelburn (%)



- ASBU B0 / B1 modules implemented prior to 2015: 57-92kg fuel per flight (180-289 kg CO_2)

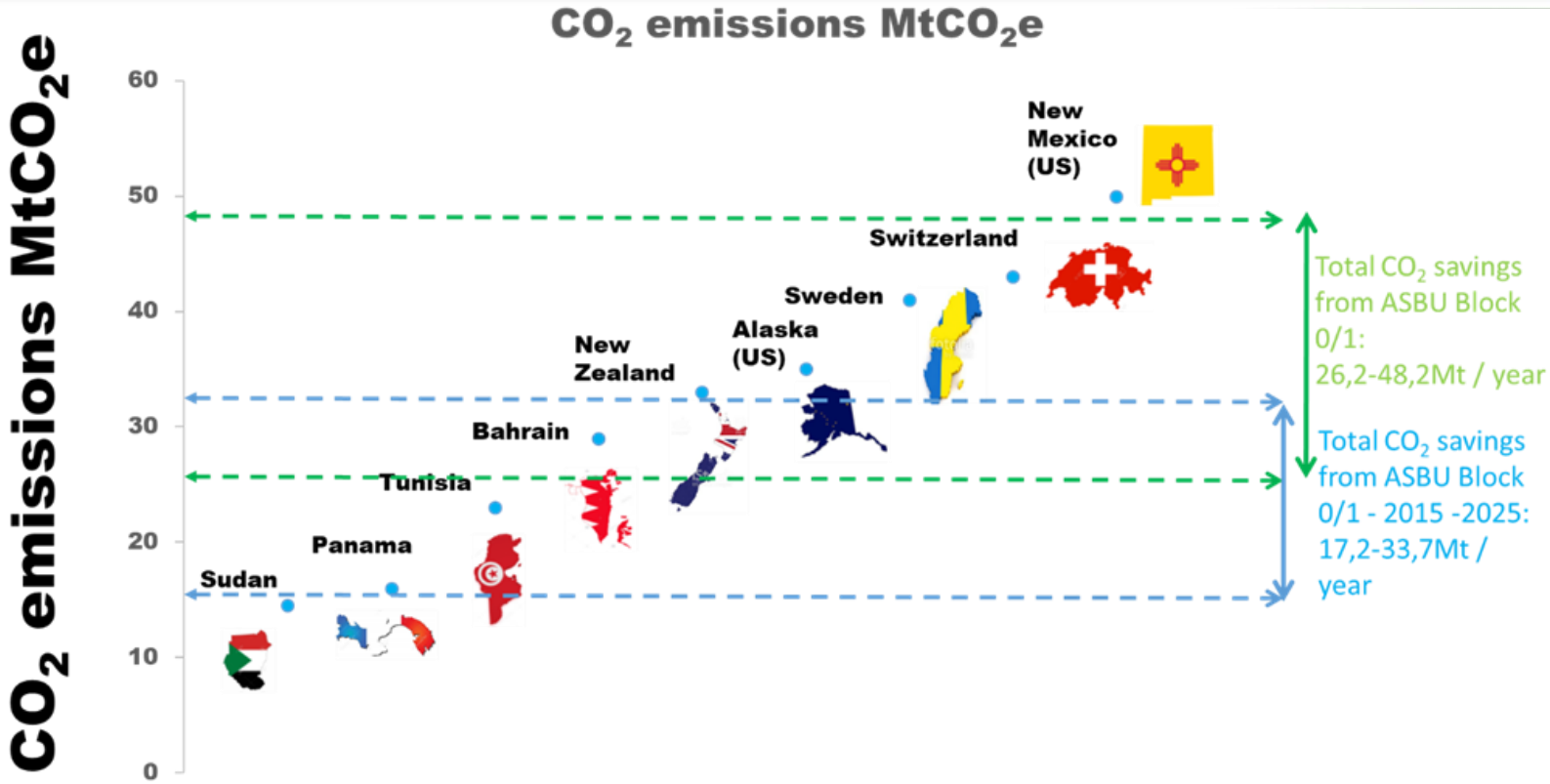
- The implementation of ASBU is estimated to provide a total annual global fuel savings in 2025 of between 167-307kg per flight (528-970kg CO_2)

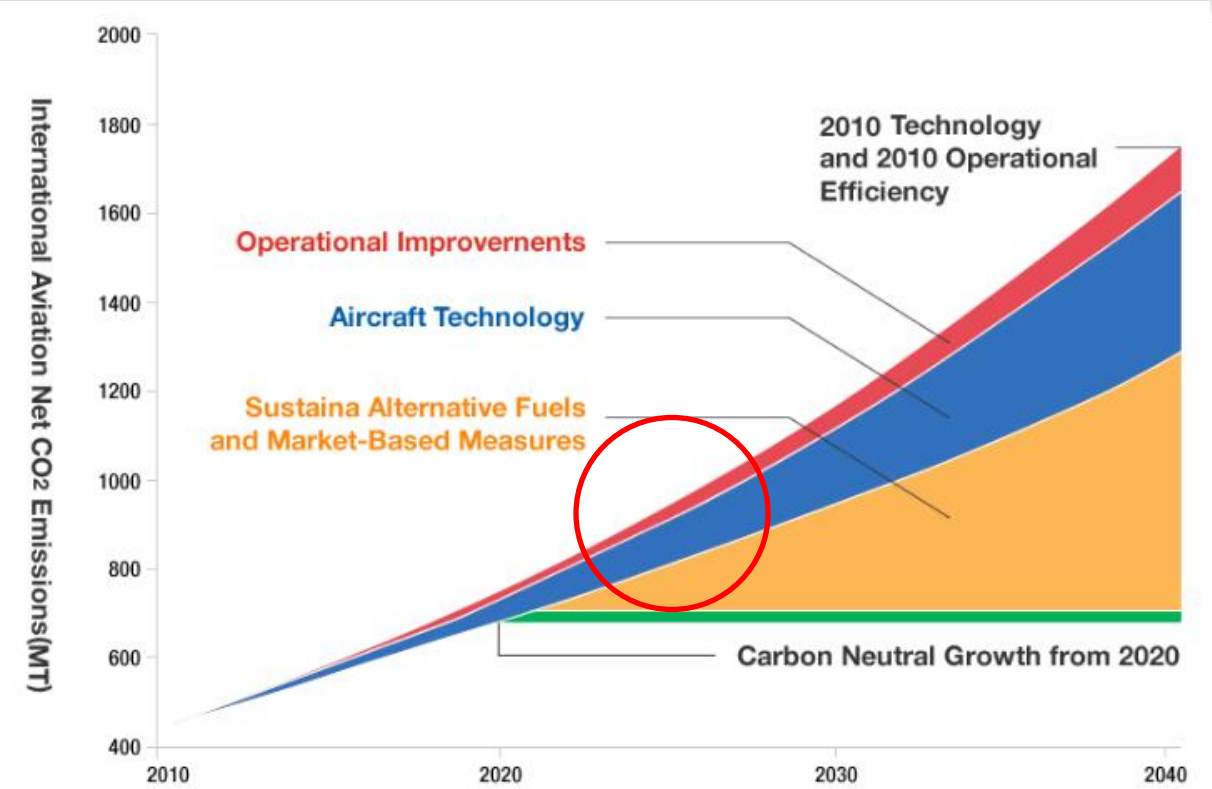


- The total global annual savings by 2025, from the current and planned implementation of B0 / B1 operational improvements:

ICAO Region	Fuel savings (Mt)	Fuel / CO_2 savings (%)	CO_2 savings (Mt)	Cost savings ($billion)*	Cost savings (€billion)*
Africa	0.2-0.4	2.1-3.5	0.8-1.2	0.1 – 0.2	0.1 – 0.2
Asia/Pacific	3.0-5.9	2.3-4.5	9.5-18.5	1.8 – 3.5	1.6 – 3.1
Europe	1.9-3.4	2.5-4.2	6.2-10.6	1.2 – 2.0	1.0 – 1.8
Latin America/Caribbean	0.6-1.1	2.9-4.9	2.0-3.4	0.4 – 0.7	0.3 – 0.6
Middle East	0.3-0.5	1.1-2.2	0.8-1.7	0.2 – 0.3	0.1 – 0.3
North America	2.2-4.1	2.6-4.9	7.0-13.1	1.3 – 2.5	1.2 – 2.2
Global	**8.3-15.2**	**2.4-4.3**	**26.2-48.2**	**5.0 – 9.2**	**4.4 – 8.1**

*IATA fuel price and exchange rate 24/01/19


CO_2 emissions $MtCO_2e$
CO_2 emissions $MtCO_2e$
60
50
40
30
20
10
0
New Mexico (US)
Switzerland
Sweden
Alaska (US)
New Zealand
Bahrain
Tunisia
Panama
Sudan
Total CO_2 savings from ASBU Block 0/1: 26,2-48,2Mt / year
Total CO_2 savings from ASBU Block 0/1 - 2015 -2025: 17,2-33,7Mt / year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Aircraft Technology
Sustaina Alternative Fuels and Market-Based Measures
Carbon Neutral Growth from 2020

The ATM / Operations wedge:

26-48M tonnes CO_2 in 2025 (2.4 - 4.3%)

Is this enough?

Thank you

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THANK YOU