



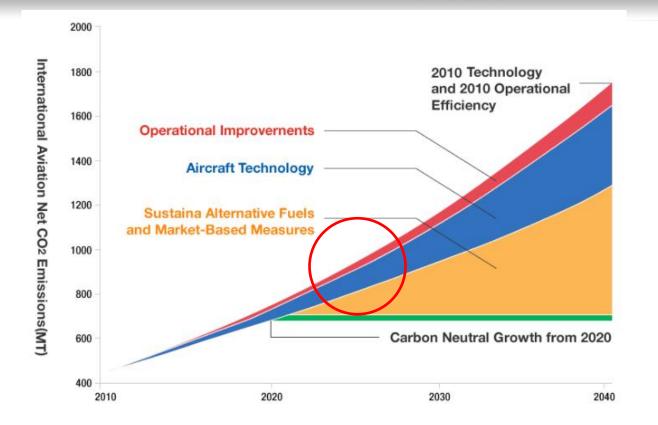
DESTINATION GREEN: THE NEXT CHAPTER

ICAO basket of measures – Operational measures

David Brain EUROCONTROL











 In 2019, ICAO-CAEP undertook a global environmental benefits assessment to identify the fuel / CO₂ emissions savings from the implementation of ASBU Blocks 0/1 out to 2025

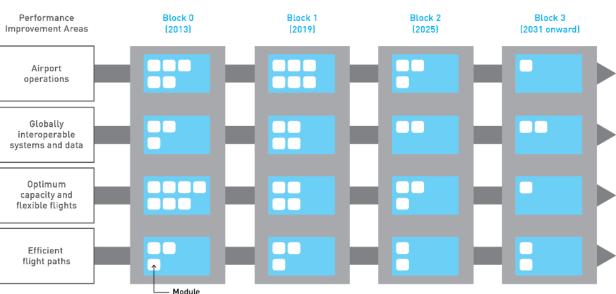


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ICAO initiated the Aviation System Block Upgrade (ASBU) initiative as a programmatic framework that:

- 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)

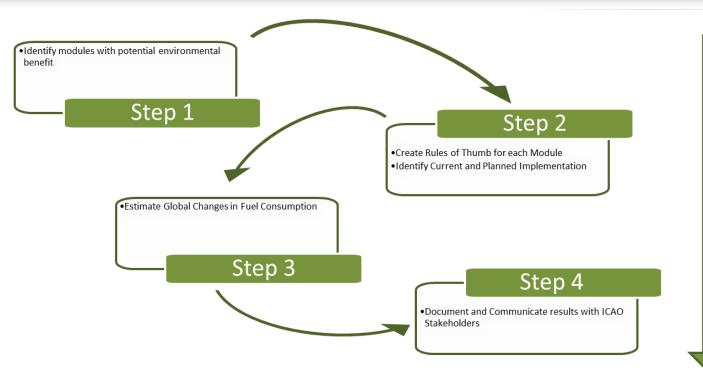




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Document

and Communicate



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



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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 %	Now from the AIAA and Baseline arri Fig 3 Assume 80% and 20 % AD Rule of Thum FIM-5 Runway Arrh Assume 80/2 Additional a	6 ADS-B OUT SS-B In FIM-S 25 So given re you only ga mb ival Rate 22 24 (20 Equipage 23 25	alistic example of on iin 1 arrival/hr	20% FIM-S capable in Block 1 Likely requires more equips 30 32 34 37 4 5	nge		SA	AC Class	17	ve Kg S er fligh 21,0 89,3	t	Modi Flee 74	et % ,0	
RJ	7	4.9	6,0		- min/airplane 0.12 0.10	0.16 0.21 9.9 12.4	0.24 0.25 14.1 15.2	RJ	900- 1220	4030	1832	30,53	0,509	1832	31	0,51	6,0%
SA	14,4	10.1	71,0	Low Fuel benefit High Fuel benefit Low Fuel benefit	t 8737/A320 6.1 5.1 t 8737/A321 7.6 6.4	8.4 10.6 10.5 13.3 36.4 45.8	12.0 13.0 15.0 16.2 52.0 56.0	SA	900- 1220	5815	2643	44,05	0,734				
Small TA	20,5	14,4	12,9	High Fuel benefit Low Fuel benefit High Fuel benefit	t 8747/A380 31.3 26.4	39.8 50.1 43.6 54.8 49.3 62.0	56.8 61.2 62.2 67.0 70.3 75.7	SA	1900 4000-	5357		40,58	0,676	2460	41,0	0,68	71,0%
Med TA	34	23,8	8,8	High Fuel benefit	Kg saved per arrival	49.3 62.0		SA	5500	5060	2300	38,33	0,639				
				Low Fuel benefit High Fuel benefit		3.8 4.8 4.8 6.0	5.5 5.9 6.8 7.4	Small WB-1 B57/67-A33/34	900- 1220	8580	3900	65,00	1,083				
Large TA	70	49	1,A Class	Low Fue	v kg/arr High kg/arr	Low kg/dep	High kg/dep	Small WB-1 B57/67-A33/34	1900	7883	3583	59,72	0,995	4009	66,8	1,11	12,9%
Apercan India Southwest Asia 4 40% 10 12% 10 12% 10 12% 10 12% 10 22% Europe India Southwest Asia 108 22% Europe Oter Asia Pacific 91 1.5%	17,2	12,0 288 2 1038 64,348 73,122	RJ SA		2,2 4,8 2,9 6,4	7,1 9,4	16,4 21,9	Small WB-2 B57/67/87-A33/34	4000- 5500	9995	4543	75,72	1,262				
Europe Africa 418 1.5% Europe Middle East 275 1.8% North America South America 89 2.0% North America Central America and Carlt 534 1.4%	103 00% 01 02 00% 01 02 00% 013 317 00% 104 02 00% 013 105 00% 03 02 00% 03 595 00% 357 1.089 10% 109		Small TA Med TA		4,8 10,5 6,8 14,9	15,4 21,7	35,7 50,5	Medium WB B777-A340/350	4000-	11865	5393	89,88	1,498				
Middle East China/Mongola 25 2.3% Middle East India/Suchwest Asia 208 2.2% Middle East Ocha/Suchwest Asia Intra Africa 270 1.9% Intra Africa 270 1.9% Intra Asia/Pacific 1132 2.1%	30 60% 16 3.351 50% 1.876 245 60% 147 1.366 20% 279 63 60% 38 3.716 70% 2.601 313 20% 63 733 80% 586 1338 0 1.120 0 0	193 2 996 12,399 14,397 7 0 0 8 0 317 2 1140 43,251 48,149 48 0 0 6 0 0 0 0 8 6	Large TA	2,47 1	10,7 23,4	34,2	79,4	Medium WB B777-A340/350	9000- 14000	12960	5891	98,18	1,636	5642	94,0	1,57	8,8%
Intra Europe 4370 1,4% Intra Latin America 407 1,9% Intra Modele East 284 1,7% Intra Modele Cast 403 0,7%	326 0 500 0 426 0 673 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Composite	Fuel	<u>3,6 7,8</u> Savings (kgs) per Fl	iaht from	Large WB 747/A380	4000- 5500	17279	7854	130,90	2,182	0007	140.1	2.47	1.20/
	456 0 1.275 0 11054 1988 555 0 300 0 2759 0 568 0 3255 60% 1.953 319 5% 16	0 0 0 0 0 0 810.432 920.946 0 0 0 0 0 0 0 0 2 1 4 7.470 8.488			tting Enabled			Large M/B	9000- 14000	21824	9920	165,33	2,756	8887	148,1	2,47	1,3%
Europe / Russia 3022 0.9% Latit America 1861 1.7% Middle East 263 1.3% North America / Polar 9125 0.6% Jacon 055 0.5%	3255 60% 1.953 319 5% 16 2122 0 385 0 293 0 354 0 293 0 354 0 354 0 9609 96% 9.225 579 0.25% 1 663 0 372 0 0 372 0 0	2 1 7.470 8.468 0 0 0 0 0 0 0 0 0 2 1 6.496 7.280		_	Aircraft C	lass >>>		Savings	(kas)					2986	49,8	0,829	100%
Other Asia/Pacific 2056 1,6% India/Southwest Asia 669 3,2% Total Domestic 20492 1,2%	2343 0 354 0	0 0 0 0 0 0 0 0 0 0 13,876 15,748		Range:				-						ngs (NM))		
Global [International + Domestic] 30145 1,3%	33532 13166 704	824.308 936.714			RoT low RoT high			11-9 40-18						1-5 7-27	_		
Assumption Base Fuel efficiency gain 1,5% Base Fuel burn kgimin 120 494.000	Low High 1.0% 2.0% 80 150 211.000 \$38.000	min climbs 0 0 60 1 150 2 375 3			itor ingi		1	40-10	,,				,	1-21			

Global responses from SL/118



Total responses (5th November 2018) cover 92% of global traffic

SL/118 responses

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EUROCONTROL

 Aggregated EUROCONTROL response expected from LSSIP data

B0 response collated from ASECNA AN-Conf/13 paper

L&SP: Local Single Sky Implementation Plan

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5 November 2018



- 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 / CO₂ 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".

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→ 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



• <u>Global</u> annual fuel burn savings from ASBU Block 0/1 elements + IATA fuel burn savings

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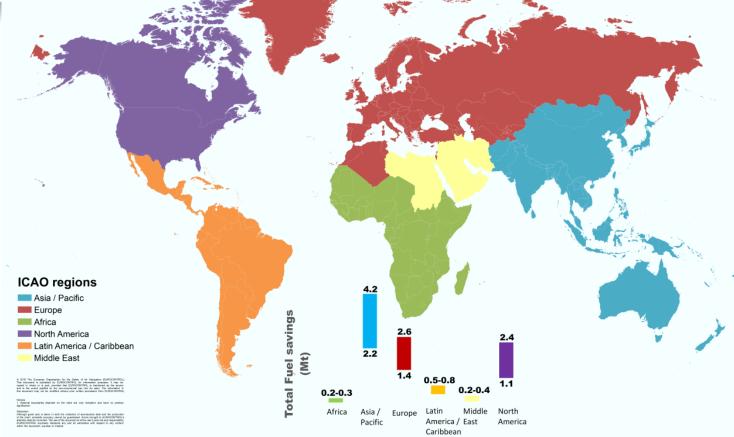
• 5.4-10.7Mt fuel burn or 17.2-33.7Mt CO₂

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











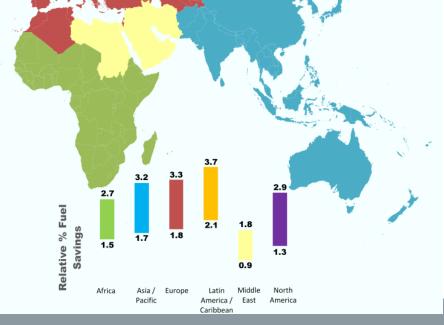
ICAO regions

Asia / Pacific Europe Africa North America Latin America / Caribbean Middle East

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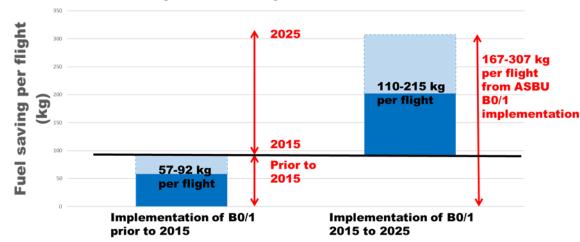


• ASBU B0 / B1 modules implemented prior to 2015: 57-92kg fuel per flight (180-289 kg CO₂)

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• The implementation of ASBU is estimated to provide a total annual global fuel savings in 2025 of between 167-307kg per flight (528-970kg CO₂)



Total fuel savings (kg) per flight in 2025 from B0/1 operational improvements



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

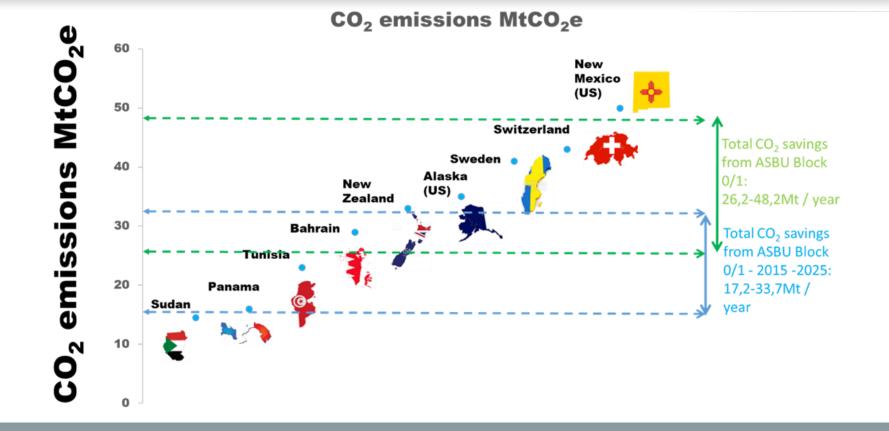
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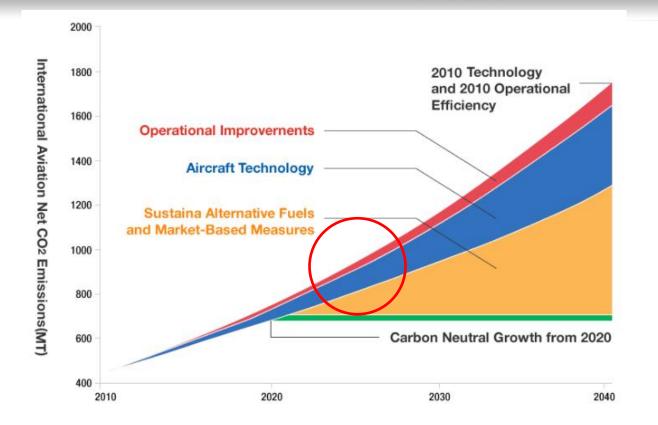
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Africa	0.2-0.4	2.1-3.5	0.8-1.2	0.1 - 0.2	0.1 - 0.2
Asia/Pacific	3.0-5.9	2.3-4.5	9.5-18.5	1.8 - 3.5	1.6 - 3.1
Europe	1.9-3.4	2.5-4.2	6.2-10.6	1.2 – 2.0	1.0 - 1.8
Latin					
America/Caribbean	0.6-1.1	2.9-4.9	2.0-3.4	0.4 - 0.7	0.3 – 0.6
Middle East	0.3-0.5	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











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The ATM / Operations wedge: 26-48M tonnes CO₂ in 2025 (2.4 - 4.3%)

Is this enough?



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Thank you

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