ICAO LTAG GLADs
DAY 1 - WRAP-UP AND PREPARATION FOR DAY 2

ICAO Secretariat

APAC/MID/EURNAT/NACC/SAM/ESAF/WACAF Regions,

27 March - 8 April 2022

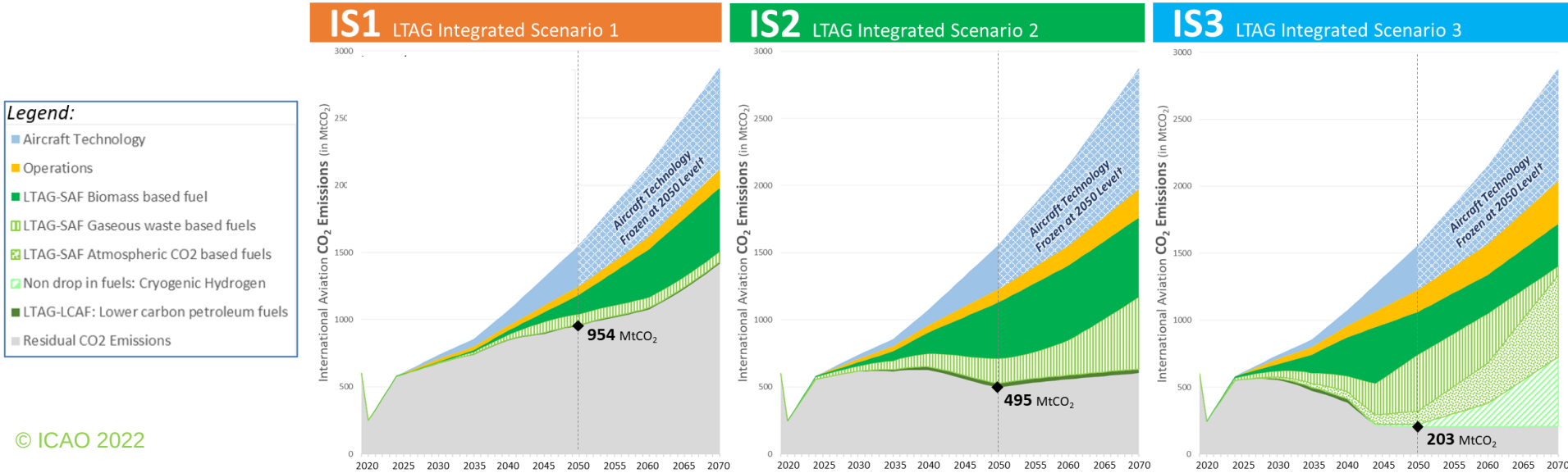
ICAO LTAG-GLADs Programme

Day 1
Understanding the latest ICAO technical work on LTAG
1. Opening ceremony – Welcome address and 2022 LTAG-GLADs objectives and expectations
2. LTAG report presentation – ICAO's technical work on the feasibility of LTAG
3. Q & A Session, Part I – Understanding the ICAO LTAG report (overview, scenarios, cost)
Coffee Break
4. Q & A Session, Part II – Understanding the ICAO LTAG report (technology,operations,fuels)
5. Plenary – Wrap-up and preparation for Day 2

What we have seen today

- Understanding of ICAO technical work in LTAG Report, covering:
  - Three integrated scenarios (IS1/IS2/IS3) from technology, operations and fuels
  - Level of ambition and costs/investments
  - Scientific context
  - Additional considerations on LTAG options (e.g. metrics)
  - LTAG report is limited to in-sector CO2 reduction; out-of-sector measures?
  - Implementation – capacity building, monitoring of progress, review
- You had the opportunity for Q&A session
- How do we build upon this technical work to facilitate LTAG considerations?
- Let's see possible building blocks

Technical Feasibility of LTAG Scenarios



Metrics	IS1	IS2	IS3
CO_2 Emissions in 2050 after Reductions	**≈950 $MtCO_2$** in 2050 *(**160%** of 2019 CO_2 emissions)*	**≈500 $MtCO_2$** in 2050 *(**80%** of 2019 CO_2 emissions)*	**≈200 $MtCO_2$** in 2050 *(**35%** of 2019 CO_2 emissions)*
Reduction in 2050 from the Baseline	**39% total** through: Technologies - 20%, Operations - 4%, Fuels - 15%	**68% total** through: Technologies - 21%, Operations - 6%, Fuels - 41%)	**87% total** through: Technologies - 21%, Operations - 11%, Fuels - 55%
Cumulative residual Emissions from 2020 to 2070	23 $GtCO_2$ (2020 to 2050) 23 $GtCO_2$ (2051 to 2070)	17 $GtCO_2$ (2020 to 2050) 11 $GtCO_2$ (2051 to 2070)	12 $GtCO_2$ (2020 to 2050) 4 $GtCO_2$ (2051 to 2070)

LTAG Scenarios and Costs/Investments

Investments from States:

- R&D to support aircraft technology developments.
- IS1: $15 to $180 billion through 2050.
- IS2 and IS3: $75 to $870 billion (to support advanced aircraft configuration and/or energy systems (i.e., hydrogen powered aircraft).

Investments from OEMs:

- IS1: ≈ $ 180 billion (2020-2050).
- IS2-3: ≈ $ 350 billion (2020 and 2050) to develop aircraft with unconventional configurations and hydrogen powered aircraft.

Costs for ANSPs:

$ 11 to 20 billion

Costs and investments for Airlines:

- ≈ $ 710 to 740 billion reduced operating fuel costs from aircraft technology improvements.
- ≈ $ 210 to 490 billion reduced operating fuel costs from operational measures associated with $ 40 to 155 billion of implementation costs.
- Incremental fuel related costs:
  - IS1: ≈ $ 1100 billion
  - IS2: ≈ $ 2700 billion
  - IS3: ≈ $ 4000 billion

Investments from fuel suppliers:

- IS1: ≈ $ 1,300 billion
- IS2: ≈ $ 2,300 billion
- IS3: ≈ $ 3,200 billion

Costs for airports:

- $ 2 to 6 billion for operational measures.
- IS3: ≈ $ 100-150 billion by 2050 for hydrogen.

Metrics	IS1	IS2	IS3
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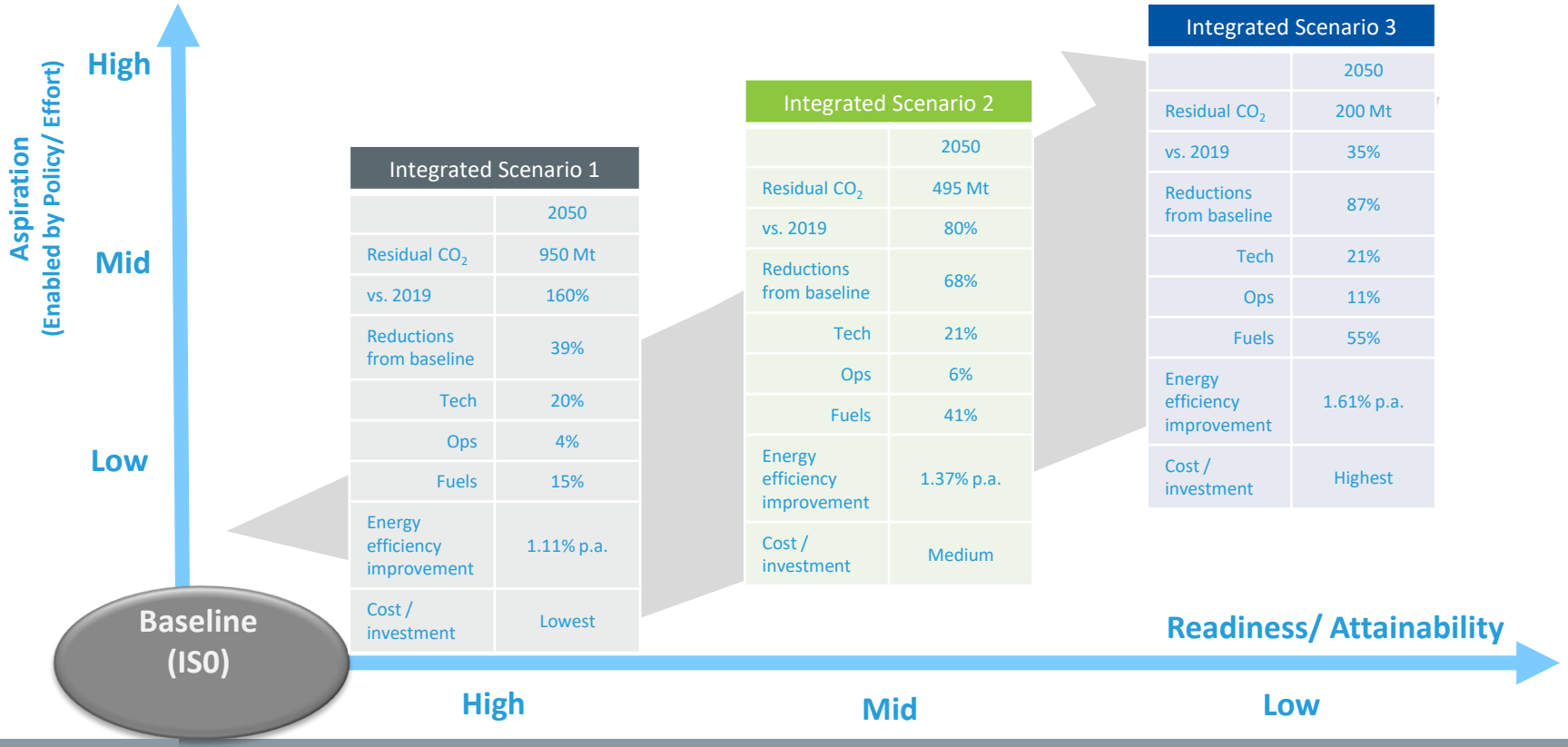
Level of LTAG ambition



Integrated Scenario 1	
	2050
Residual CO_2	950 Mt
vs. 2019	160%
Reductions from baseline	39%
Tech	20%
Ops	4%
Fuels	15%
Energy efficiency improvement	1.11% p.a.
Cost / investment	Lowest

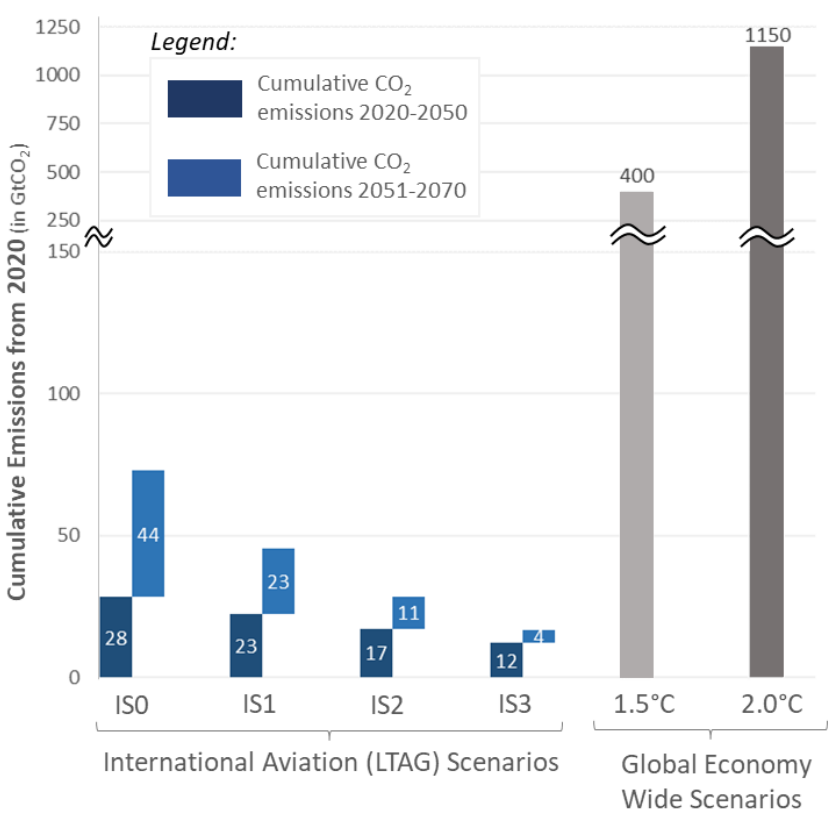
Integrated Scenario 2	
	2050
Residual CO_2	495 Mt
vs. 2019	80%
Reductions from baseline	68%
Tech	21%
Ops	6%
Fuels	41%
Energy efficiency improvement	1.37% p.a.
Cost / investment	Medium

Integrated Scenario 3	
	2050
Residual CO_2	200 Mt
vs. 2019	35%
Reductions from baseline	87%
Tech	21%
Ops	11%
Fuels	55%
Energy efficiency improvement	1.61% p.a.
Cost / investment	Highest

Scientific context

- **Estimated cumulative residual global anthropogenic CO_2 emissions from the start of 2020 to limit global warming to 1.5°C is 400 $GtCO_2$ at 67% probability.**
  - International aviation share ~4.1-11.3%

- **For a warming limit of 2°C, the remaining allowed carbon emissions are estimated to be 1150 $GtCO_2$ at 67% probability.**
  - International aviation share ~1.4-3.9%



Considerations regarding LTAG Options

Based on the results of the LTAG feasibility study, technical **options for LTAG metrics** were identified below. This is not an exhaustive list and other formulations may of course be considered.

Options using annual levels of emissions:

- **The annual level of emissions in 2050 e.g., 950, 500 or 200 $MtCO_2$**
- **Using a reference year earlier than 2050 may not give the long-term certainty expected to be a key benefit of adopting an LTAG**
- **Using a reference year after 2070 would be subject to increased uncertainty**
- **Intermediate waypoints in milestone years could add a trajectory to the emissions profile in times.**

Options using cumulative total emissions :

- **The cumulative total emissions from the international aviation sector by 2050, for example 23, 17 or 12 $GtCO_2$ (based on the Scenario).**
- **The cumulative total emissions from the sector would most closely translate into an atmospheric temperature response and allow for monitoring of progress without the need for intermediate waypoints.**

- **Additional consideration: With the scope of the LTAG study limited to consider in-sector measures only, 'out-of-sector' measures were not considered in the LTAG analysis.**

Roadmaps for LTAG Implementation

Implementation Roadmap

- ICAO CAEP considered technical aspects of implementation without prejudging future decisions

Monitoring of progress

- State Action Plans may be used for States to report progress towards a goal, without duplicating existing processes
- If a goal were adopted, ICAO could conduct future work on possible metrics, reporting mechanisms, etc.

Review

- ICAO may need to review any goal to ensure it remains appropriate
- A triennial review process could be considered similar to the CORSIA Periodic Review

Capacity building

- Possible needs for capacity building and assistance e.g.:
  - **workshops** on measures, including understanding costs
  - **assistance** on monitoring and measuring CO_2 emissions
  - an **overarching training programme** similar to ACT-CORSIA

Roles of various stakeholders

- Goals are achieved by joint efforts… how can each Stakeholder contribute?

States	Implement policies for technology research and SAF deployment?
Manufacturers	Speed up development and certification of new technologies?
Airports	Facilitate SAF distribution?
Airlines	Support SAF deployment? Use more efficient aircraft?
ANSPs	Implement ASBUs?
Fuel Suppliers	Prioritize fuels with lower CO2 impact?

LTAG Building Blocks

Possible building blocks to facilitate LTAG considerations as the preparation for the GLADs Day 2 discussions:

1) Recognition of scientific understanding
2) Technical feasibility of LTAG scenarios
3) Level of LTAG ambition
4) Means of implementation (e.g. capacity building)
5) Support to States with action plans and roadmaps
6) Monitoring of progress to achieve LTAG

ICAO LTAG-GLADs Programme – Day 2

Day 2
Building blocks to facilitate LTAG decision **(What will the ICAO High-level Meeting and the 41st Session of the ICAO Assembly be asked to decide on LTAG?)**
1. Recap of discussions on Day 1
2. Presentation on the road to the ICAO Assembly
3. Dialogue, Part I – What are building blocks for LTAG decision?
Coffee Break
4. Dialogue, Part II – What are building blocks for LTAG decision?
5. Wrap-up

Dialogue session Part I – Day 2

Topic 1: What might an LTAG look like?

The latest IPCC findings are unequivocal on the need for all sectors to contribute to the global temperature goals for 2050. In this regard, the LTAG scenarios are based on projected potential contributions of in-sector measures at the global level. What does this mean for your State and/or region and what level of international aviation's global CO2 reduction and by which date should it be reached using in-sector measures?

Items to consider in the discussion:

- The latest scientific understanding and the need for all sectors to contribute to the global temperature goals for 2050.
- The potential contribution of technology, operations and fuels.
- The level of ambition for an LTAG.
- Potential CO_2 emissions Gap fillers.

Dialogue session Part II – Day 2

Topic 2: What does it take to implement an LTAG?

As detailed in the LTAG report, there are many measures and innovations that can contribute to a future LTAG. What would be the possible means of implementation (e.g. capacity building) needed to support a long term aspirational goal of international aviation CO2 emissions reduction? In which form should this support be provided?

Items to consider in the discussion:

- Means of implementation and the roles of various stakeholders.
- The need for additional guidance and support (e.g. for State Action Plans, feasibility studies, roadmaps) relating to LTAG development and implementation.
- The possible means to take stock of LTAG achievement and best practices.
- Future monitoring and review of LTAG.

Preparation for Day 2 Dialogues

- States and Organizations are invited to inform Secretariat (officeenv@icao.int) if they wish to take the floor to provide views on Topic 1 and/or Topic 2 at Day 2 dialogue sessions
- Deadline: COB on the day before the start of Day 2 of each regional ICAO LTAG GLADs.
- States and organizations will be able to deliver maximum 2 minute views on each topic during the dialogue sessions.
- Only the 2 nominated representatives may take the floor.
- During the dialogue sessions, nominated representatives who have not given prior notice may also provide views verbally after those that requested the floor before the meeting or via the Q&A function.
- All views will be compiled and published on the GLADs website.

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