

Carbon Emissions Task Force Report-out

Domain Lead: Ming Chang

Chair: Ellen Ebner

Presenters: Ellen Ebner, Matt Orr, Steven Barrett, Prashanth Prakash

AIAA Staff Liaison: Ashira Beutler-Greene

Meeting Purpose Today

- Share an overview of the task force, what was shared at the mid-term, and the proposal for the next steps
- Gauge your interest, get feedback and identify members interested in joining a working group

Agenda

- Intro to Task Force
- Sustainability Background / Context
- AIAA Position
- Future Vision
- Path Forward

Emissions & Sustainability Task Force


AIAA must improve its ability to meet member needs related to reducing the impact of aviation to climate change

Task Force Role:


- **Align efforts across AIAA to drive progress on reduction of impact of climate change**
- **Identify gaps in AIAA activities**
- **Establish a roadmap and strategic plan**

Sustainability

- In 1987, the United Nations Brundtland Commission defined sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs."⁴
- Climate Change
 - Global mean temperature in 2021: 1.1deg C above pre-industrial. The years from 2015 to 2021 were the seven warmest on record.
 - To limit warming to 1.5° Celsius above pre-industrial levels, as set out in the Paris Agreement, global greenhouse gas emissions will need to peak before 2025.



SUSTAINABLE DEVELOPMENT GOALS



⁴ Ref: <https://www.un.org/en/academic-impact/sustainability>

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SUSTAINABLE DEVELOPMENT GOALS



SHAPING THE FUTURE OF AEROSPACE

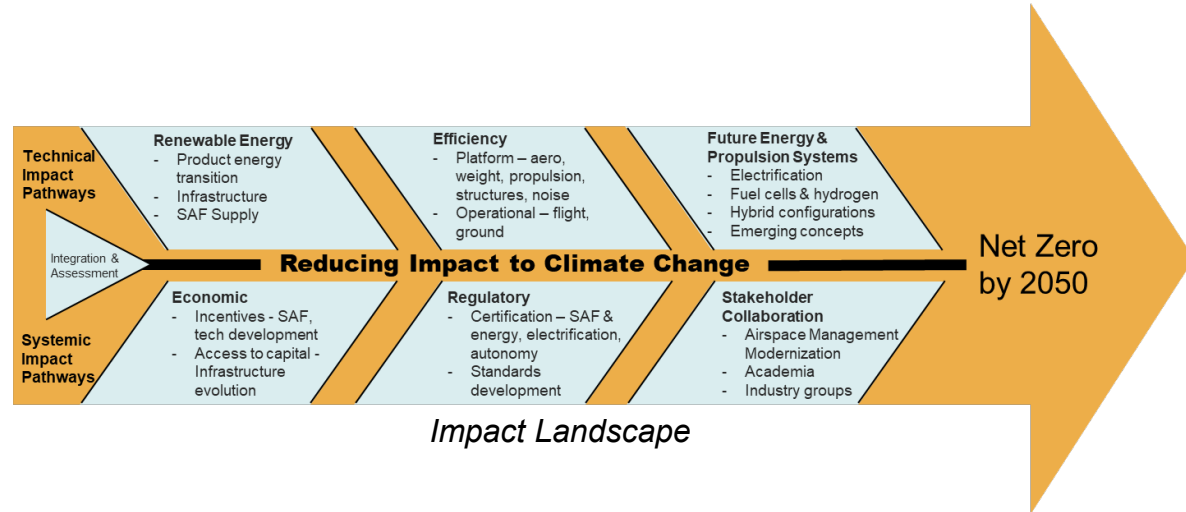
Methodology & Scope

Methodology:

- 12 month period – July 2022-2023
- Three sprints
- Stakeholders across industry, academia, and government

Scope:

- Commercial Aviation
- Impact to climate change includes beyond carbon emissions
- Inclusive of all AIAA domains & work statements



Overall Timeline



Form & Level-set

Reflect & Record

Working Group 1 —————
6 wks - Landscape Assessment

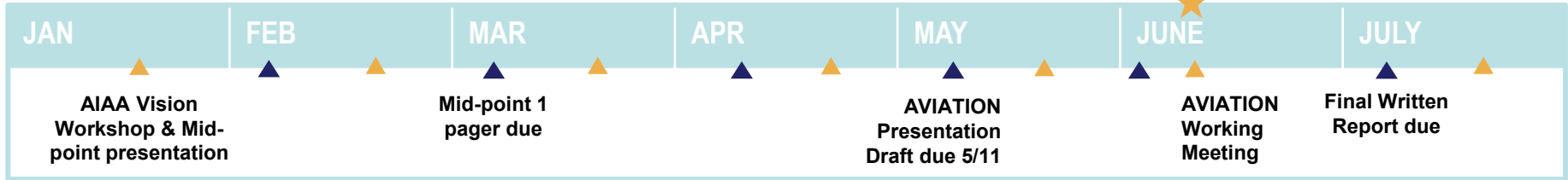
Working Group 2 —————
8 wks – Opportunities Assessment

Working Group 3 ————— ————— ————— ————— —————
 AIAA Vision & Capabilities AIAA Vision & Capabilities Alignment to Opportunities Assessment Roadmap Creation Strategic Plan Report Prep



Current Timeline

6/12-16 AVIATION: Report on Roadmap & Strategic Plan Sustainability Day - Tuesday



TF deliverables

5, 10, 15 yr Vision Roadmap

Strategic Planning & Actions

Report Prep

Reflect & Record

Leadership Framework

Dev AIAA Sustainability Leadership Framework

Operationalize leadership framework

Operationalize

Engage TCs and ICs – identify focals and pilot opportunities

TC and IC thoughts on their roles moving forward

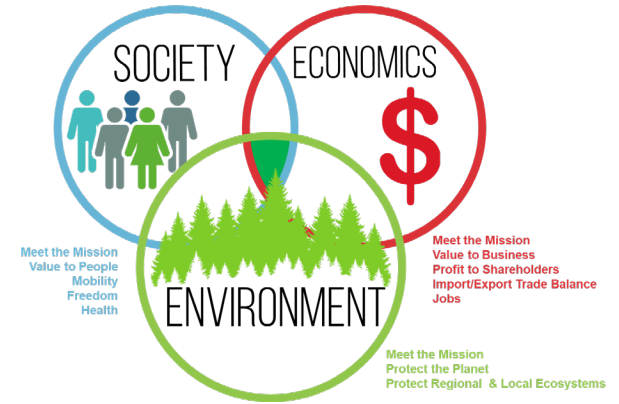
Working group to startup and take this forward – transition from task force

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Sustainability

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SUSTAINABLE DEVELOPMENT GOALS

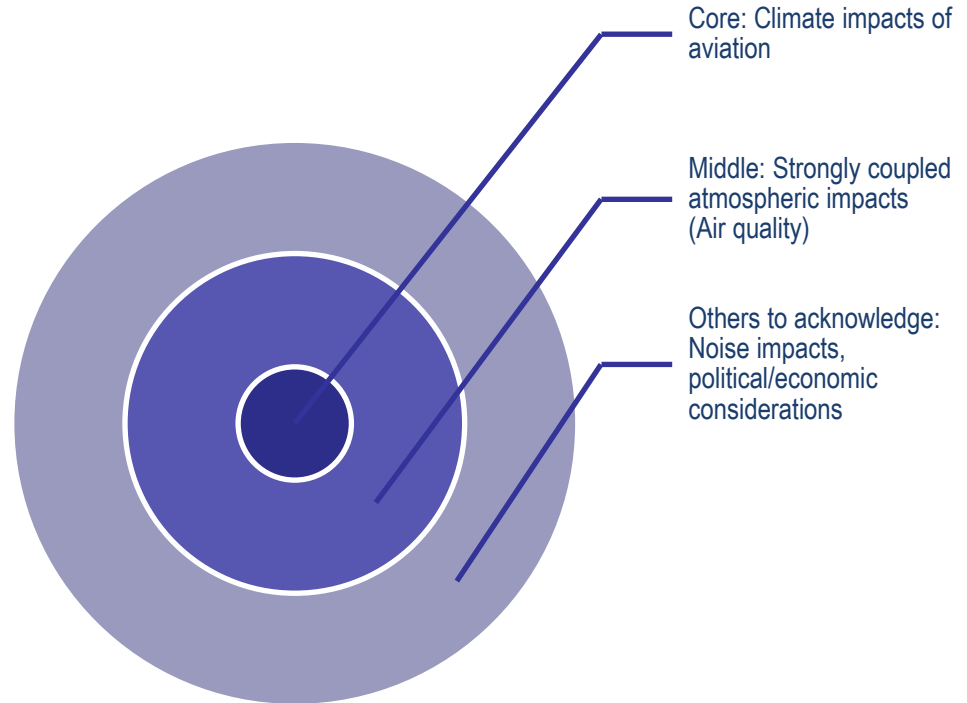


9 Ref: <https://www.un.org/en/academic-impact/sustainability>

Scope: Important Climate Change Interactions

Important Scope Clarification

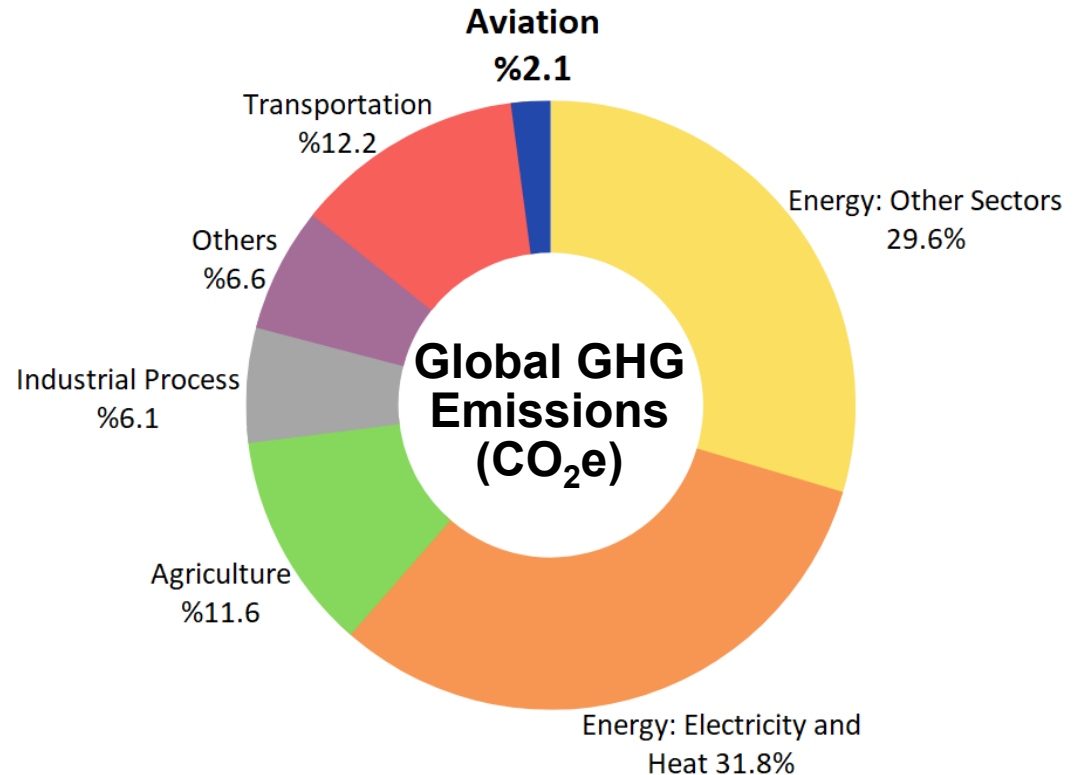
- We **focus on climate**
- Air pollution is a strongly coupled challenge (atmospheric emissions)
- Noise is a moderately coupled challenge (through design/operational tradeoffs)



Scale of Impact

Why it matters

- Aviation growth is connected to important social and economic benefits
- We are a tough to decarbonize sector
- Do our part! Responsibility for impacts is a growing cultural trend



Source: "World Greenhouse Gas Emissions in 2019", World Resources Institute, 2022

Commercial Aviation Impact Space

Important Context

- ~2/3rd of fuel consumption occurs in flights over 1500 km
- Product design and introduction is long-cycle
- Current aircraft have 20+ year economic lives

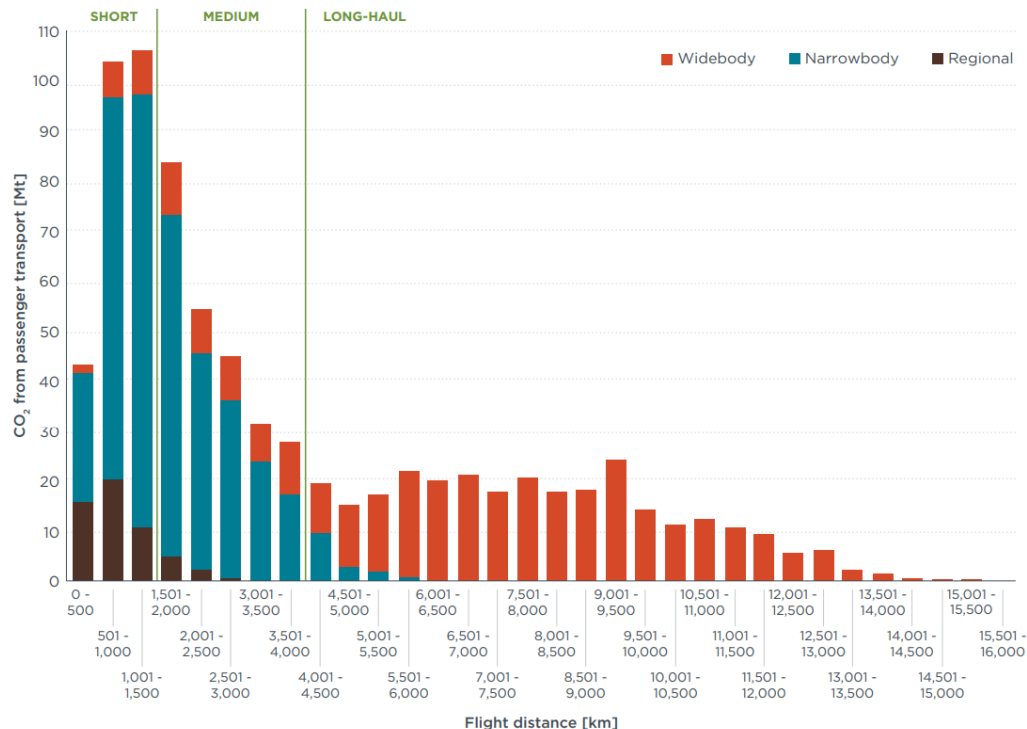


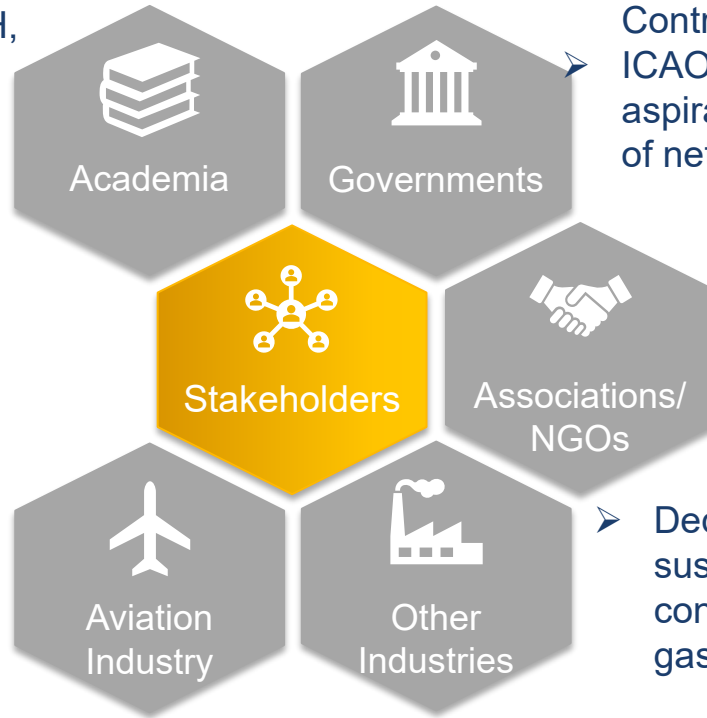
Figure 9. Share of passenger CO₂ emissions in 2019, by stage length and aircraft class

Brandon Graver, Dan Rutherford, And Sola Zheng, *CO₂ emissions from commercial aviation 2013, 2018, and 2019*, ICCT 2020

Stakeholder Positions, Goals & Measures

- Studies done by GT, MIT, ETH, and DLR
- Mostly assesses goals rather than setting goals
- Consensus on the need to study non-CO₂ impacts

- Announcements made by OEMs, concept builders, airlines, and airports
- **Most players announced commitments to the industry's net-zero carbon emission goals by 2050**



- UNFCCC has 194 Nationally Determined Contributions (NDCs) registered
- ICAO adopted a long-term global aspirational goal for international aviation of net-zero carbon emissions by 2050”
- ATAG, IATA, ICCAIA, IBAC, and ACI announced their commitments to industry's carbon emission goals
- Dedication to shift towards a more sustainable future in agriculture, construction, health, automotive, oil and gas industries

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Proposed AIAA Position

- **AIAA Mission:** AIAA is dedicated to being the forum for innovation, technical excellence, and global leadership for aerospace professionals. Its mission is to advance the state of aerospace science, engineering, technology, operations, and policy to benefit global society.
- **Proposed AIAA position on climate change:** AIAA recognizes it must play a key role in the development of the science, technologies, and systems essential to achieving net zero climate impact for aerospace.

What is the purpose of a position for the AIAA?

- Clarity that AIAA is aligned with commercial aviation sustainability commitments
- Foundation to support building initiatives & making decisions
- Guidance for prioritization sustainability within AIAA and the broad cross section of the community it represents
- External visibility & context for announcements

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Vision – 5 years

- Three groups ~aligned on need for some nearer term goals – e.g., 1 yr/ 2 yr (need to act now)

In 5 years:

- Institutionalize/ embed sustainability within AIAA organization + culture
- Common theme for near term was catch-up and demonstrate AIAA leadership in the area
 - Impressing on membership sustainability goals – including sustainability over lifecycle
 - Defining clearly success metrics
 - Providing relevant platform to bring stakeholders together – forums/ journals etc.



BIG CITY TIMES Feb 2028

AIAA – the unifying voice for aviation sustainability

AIAA
SHAPING THE FUTURE OF AEROSPACE


AIAA's leadership and focus on sustainability has led to increased collaboration between industry, academia, government, and international partners to foster foundational research and innovation to shape the future of the Air Transportation system....

>> See full story on page 2

AIAA student sustainability competition can revolutionize aviation

The winners of the AIAA student aviation sustainability competition put forth ideas that can revolutionize aviation as we know it – delivering greater global connectivity minus the environmental impacts...

>> See full story on page 4



An image of a futuristic aircraft with four engines, flying over a body of water and mountains.

Vision – 10 years

SUSTAINABILITY TIMES Feb 2033

New study shows AIAA common denominator for major sustainability innovations in the past decade

AIAA's role in leading (through its members) sustainability for the aviation sector changed the level of industry collaboration on sustainability. Key innovations resulting from technical sessions and research dating back to 2024 are now being implemented
>> See full story overleaf

AIAA and education

AIAA has played a major role in integrating aviation sustainability into the curriculum for US aerospace engineering programs.

How one professional organization helped put an entire industry on a path to net zero-impacts



AIAA's ability to convene cross-sector technical leaders around aviation's challenges has resulted in the standards & certification processes commercial aviation needed to

>> See full story on page 4

In 10-yr:

- AIAA leadership in developing collaborations and platforms to share and cross-pollinate ideas for technology and policy relating to sustainability
- AIAA's role in shaping higher education in the US
- AIAA providing venue/ platform to facilitate innovations relating to sustainability – e.g., ideas from TTBW and ZEROe
- Role in operationalizing sustainable aviation
 - Driving standards
 - Certification processes
 - Education – Ex. workshop for engineers to support/maintain in-service H₂/ advanced concept aircraft

AIAA's prospective roles in achieving net zero climate impact



Vision at a glance



Climate change → defining challenge for aviation today
Sustainably **grow societal benefits** of aviation

2023



NOW:
***Establish AIAA's
relevance to
sustainability amongst
members***

2028



***Structural changes to
integrate
sustainability
throughout AIAA
complete***

2033+ (longer term)



***AIAA – recognized global
platform to share and
collaborate on
sustainability technology,
science and policy***

Specific actions to achieve vision



Climate change → defining challenge for aviation today
Sustainably **grow societal benefits** of aviation

NOW:
Establish AIAA's
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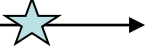
2023



2028



2033+ (longer term)



Transition from task force to working group

Sustainability focused conference days (e.g. already Aviation 2022)

Setup TC

AIAA liaison/nominee to CAEP WGs

Establish long-term collaborations with adjacent professional societies

AIAA sustainability journal

Structural changes to integrate sustainability throughout AIAA complete

All AIAA forums have a sustainability day/ track

Publish expert reviews/ state of the science/tech/policy (IEIR model?)

Sustainability scholarships

AIAA – recognized global platform to share and collaborate on sustainability technology, science and policy

Launch a sustainability student competition

Sustainability awards – best paper/ fellowship etc.

Recurring special issues

Sustainability courses and workshops

Education and contribution in CAEP/ legislation

Establish formal means to exchange ideas with adjacent professional societies (panels in existing forums/ workshops/ meetings)

Yearly cross-cutting workshops on sustainability topics

Sustainability embedded in higher ed curriculum

On-going collaborations with adjacent professional societies (add outcomes)

Establish a AIAA – sustainability tracker – are we on track to goals

Brokering Zero-emissions focused collaborations between key stakeholders

Sustainability beyond Emissions

- The task force encountered questions about sustainability beyond Commercial Aviation's Impact to Climate change continually...
- So we also developed a bigger vision to help seed future initiatives

Embracing a Broader Sustainability Vision (Part 1)



Holistic Approach

- Address **life cycle** of aerospace systems: manufacturing, materials sourcing, end-of-life
- Facilitate discussions and research on the **social and economic impacts** of aviation



Collaborative Efforts

- Foster **interdisciplinary** work: partner with organizations in energy, transportation, and environmental sciences
- Support **joint initiatives**, workshops, conferences for innovative solutions



Promoting Environmental Stewardship

- Share **best practices and emerging trends** in sustainable aviation with members
- Provide platforms for knowledge exchange on **environmental responsibility**

Embracing a Broader Sustainability Vision (Part 2)



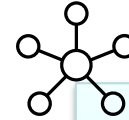
Social Responsibility and Equity

- Address **social implications**, community engagement, workforce development
- Advocate for **diversity, equity, inclusion**, and **access** to sustainable aviation



Sustainable Aerospace

- Include **sustainability of space** operations and exploration
- Encourage **research and collaboration** on environmentally responsible space practices



Expanding AIAA's Footprint

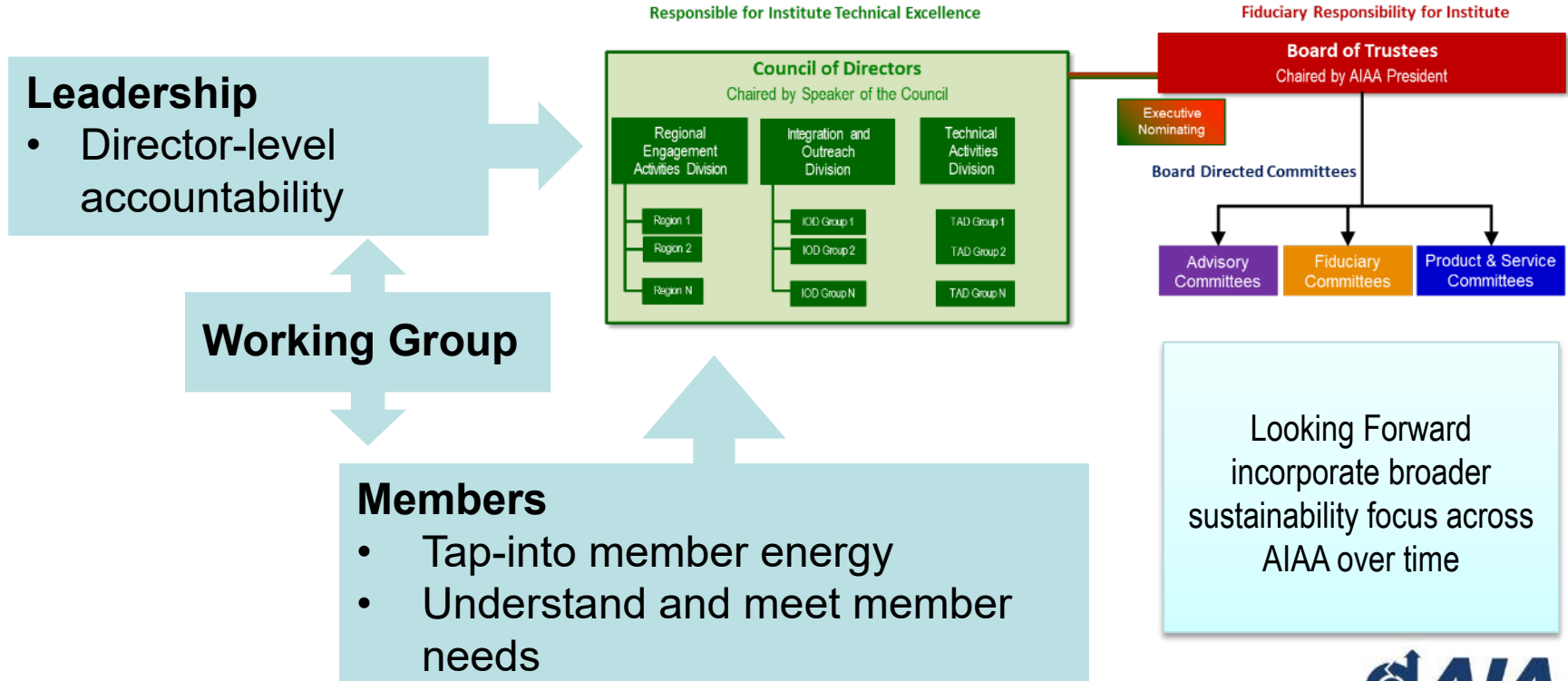
- Continuously **refine** and **expand** AIAA's role in the global sustainability agenda
- Develop new initiatives, programs, and resources that respond to **emerging sustainability challenges**

Strengthen AIAA's position as a thought leader in the sustainable aviation and aerospace movement

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Creating change in the organization



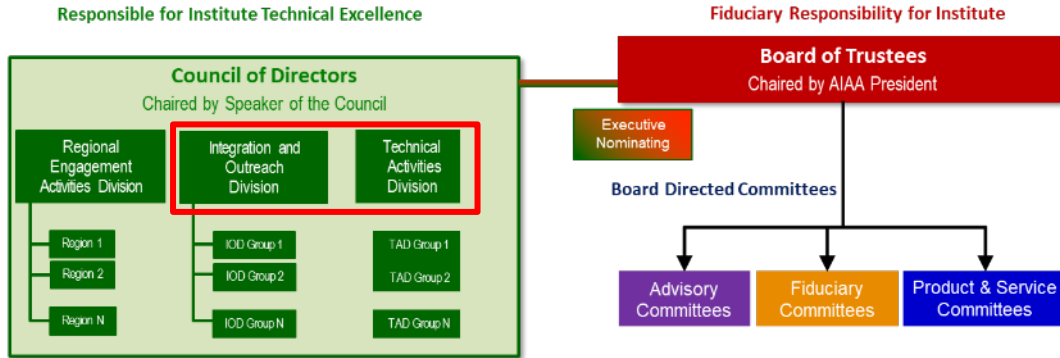
Leadership – Director-level Accountability

➤ Target

- Enduring initiative on Emissions & Sustainability
- Need uniquely broad reach & engagement
- Ability to grow – incorporate increased sustainability focus over time

➤ Proposal

- Adopt sponsorship of Sustainable Aviation Working Group into a Council of Directors role
- Leverage IOD or TAD director



Sustainable Aviation Working Group

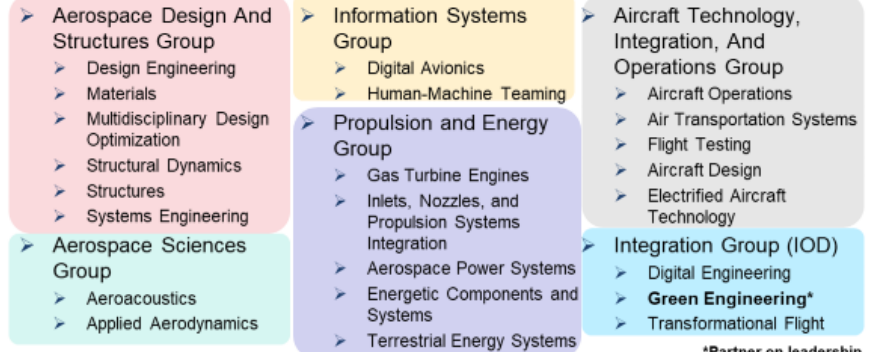
➤ Target

- Focal point for Sustainability-focused research and science
- Contribute to building a 2050 Net-Zero emissions commercial aviation sector

➤ Proposal

- Transition task force into AIAA Commercial Aviation Sustainability Working Group
- Collaborate with Green Engineering IC (GEIC) & other existing committees
- Initially prioritize AIAA members; then open to adjacent stakeholders

Working Group Related Committees



*Partner on leadership



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Working Group Role Clarity

Green Engineering Integration Committee

- Sustainability (Broader Scope)
- Integrative across AIAA members, sectors & content

- Helps AIAA increase sustainability scope over time

Working Group

- Impacts of Commercial Aviation on Climate Change
- Sponsorship & engagement from GEIC
- Integrative across TCs

- Evolves over time into a Tech Committee or Integration Committee as scope & participation sharpen

Sustainability Working Group Startup

➤ Initial Membership:

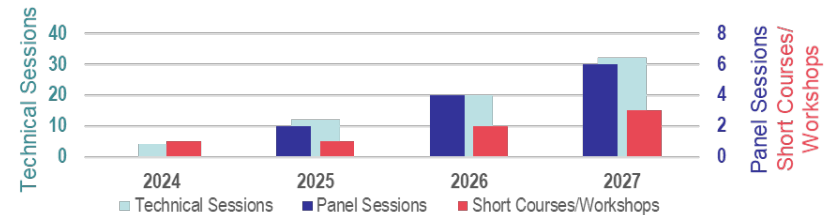
- Academia, Commercial Industry, Government, NGOs
- Focus on AIAA Member Engagement

➤ Draft Working Group Structure

- Group Leadership – chair, vice-chair, secretary, etc.
- Sub-Committees

➤ Key Outcomes:

- Develop initial working group structure, operating rhythm
- Develop proposal for sustained efforts (TC, IC...?)
- Sponsor calls for papers and AIAA Forum sessions/tracks
- Workshop / Engagement event at Forums
- Establish community of practice, methods, and standards
- Rolling recaps of sustainability focused work
- Establish awards, design competitions, member path to join working group etc.
- Establish topics for membership engagement



Task Force History & Working Group Next Steps

➤ **Task Force History**

- July 2022: Task Force is established
- January 2023: Midpoint presentation
- June 2023: Roadmap and Strategic Plan
- July 2023: Report Complete

➤ **Working Group 2023-2024 Proposed Next Steps**

- June/July 2023: Kickoff and Sustainable Aviation Workshop Planning
- January 2024: AIAA SciTech – Sustainable Aviation Workshop Intro
- Spring 2024: Propose pathway to TC or IC
- July 2024: AIAA Aviation – Sustainable Aviation Workshop + sustainability sessions/tracks

Get Involved

- Read the report upcoming in July
- Watch for us at SciTech – “Sustainable Aviation Workshop”
- Show us that you are interested in this topic and get information on the working group start-up!
- Aeronautics Domain Task Force Priority Topic Interest Form
- https://share.hsforms.com/1vKskyTNVRrmeO0Pv2A41c1v?_hstc=72680524.ac706ba72e2351452d638601ef465ffe.1684791686787.1684792703364.1684847215894.3&_hssc=72680524.3.1684847215894&_hsfp=2484105774



Aeronautics Domain Task Force Priority Topic Interest Form

The aeronautics community is continuing to chase the horizon. In the next 5–10 years, many new capabilities will be introduced, and the next generation will experience flight in ways we are just imagining. If you are interested in helping AIAA advance these opportunities, please complete the below form.

First Name *

Last Name *

Email *

Organization *

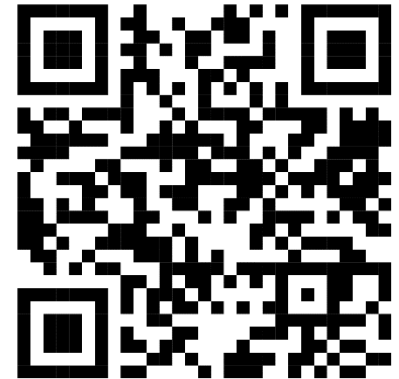
Job Title

Region/Section Involvement

Which domain priorities are of interest to you? *

- Advanced Air Mobility
- Carbon Emissions & Sustainability
- Certification
- Hypersonics & Supersonics

AIAA is seeking a range of experience levels and stakeholder perspectives, including enthusiastic students and young professionals. If your current professional or academic responsibilities involve one or more of the



Group Engagement

- Post-its & Markers are on the table
- Give your thoughts on three things:
 - Direct feedback on this work and report-out
 - Thoughts on what the working group should do moving forward
 - Thoughts on what AIAA should do more broadly on sustainability
- We will hang around to chat!



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