



Original research article

Aeromasculinites and the fallacy of sustainable aviation

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ARTICLE INFO

Keywords:

Aeromobilities
Sustainable aviation
Justice
Carbon emissions
Masculinities

ABSTRACT

Despite growing recognition of the material impacts of fossil fuel extraction and use, many economic sectors remain highly dependent on these fuels. Amid growing pressure to - at a minimum - *appear* to be doing something, businesses increasingly communicate the actions they (seek to) take to reduce their environmental impacts. Oftentimes they aim to build a sense of compatible coexistence of the sector with particular modes of sustainability. For air transport, 'sustainable aviation' has emerged as a container term for a suite of actions proposed by sectoral actors in seeking to align the sector with social and environmental sustainability. This paper critically interrogates 'sustainable aviation' through an analysis of the websites and reports of 14 international and regional airlines. Our analysis reveals the multiple and diverse ways that dominant logics (1) underpin the status quo, (2) depend on 'the science', (3) support techno-organisational changes and (4) prioritise sectoral growth. By recognising the gendered nature of environmentalism, we suggest that 'sustainable aviation' can be viewed as an active enactment of *aeromasculinites* - a gendered system of thinking, being and doing which forecloses radical action and change required for a climate-safe and just energy future.

1. Introduction

There is much debate within and beyond academia on the compatibility of aviation with a climate safe future. This debate centres on whether *any* version of aviation is compatible with Paris Agreement limits to Greenhouse Gas (GHG) emissions. Aviation has contributed 4% to observed anthropogenic warming [1] and there is growing recognition of the sector's sizeable non-CO₂ effects [2]. At the same time, net zero ambitions have been articulated by the aviation sector as one 'technofix' to the climate impacts of air transport [3], but a wider concept - that of 'sustainable aviation' has been promoted by sectoral, governmental, and research actors to characterise a version of aviation that can operate within ecological limits [4] and support societal and economic ambitions.

Environmentally sustainable aviation is largely dependent on the development of technological solutions including alternative fuels, new airplane designs, and route optimisation to maintain business-as-usual flight operations including expansions of routes, airports, runways, routes and passenger numbers. Support for sustainable aviation is often

premised on the ideas that aviation is fundamental to the economy and supports economic development [5,6], and that science and technology offer the tools to overcome the environmental externalities associated with aviation [7]. In other words, proponents of sustainable aviation argue that compatible coexistence of aviation in a climate constrained world is possible.

For others - including (combinations of) environmentalists, critical scholars and activist groups - sustainable aviation discourse distracts from the need to radically reduce emissions which, they argue, will require structural and behavioural reconfigurations. These actors point to the uneven and often overstated contribution of aviation to economic development [8], the dependence on as yet unproven or small-scale technologies to maintain business-as-usual/sectoral growth [9,10], and large governance challenges [11].

The aviation system is made up of a variety of different actor groups across the public, private and third sectors. In this paper, we focus on airlines as an important and largely understudied part of the aviation system, with a critical role in determining discourses and narratives that inform dominant imaginaries of the future of aviation. As airlines seek to

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<https://doi.org/10.1016/j.erss.2023.103319>

Received 20 June 2023; Received in revised form 13 October 2023; Accepted 13 October 2023

Available online 8 November 2023

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align themselves with principles of ethical-ecological practice, it is now common for them to communicate their sustainability-focused actions, intentions and priorities to customers, the wider public, employees, and investors through publicly available webpages, reports and white papers. We use the language of discourse and narrative to describe the communicative strategies [12] employed by airlines and seek to empirically uncover the taken-for-granted assumptions and relations of power that are produced, sustained and challenged through sustainable aviation communication by airlines.

This paper presents an analysis of these communications for 14 regional and international airlines, not as a representative sample of the sector but rather to include a range of geographical regions, airline types and operational routes. From this empirical material we answer two research questions: *How are airlines positioning their business operation vis-a-vis sustainability and climate breakdown?* And, *what types of actions and responses are being prioritised by airlines?* Since “any attempt to tackle climate change that excludes a gender analysis will be insufficient, unjust and therefore unsustainable” [12] (p. 124), we situate our analysis in relation to particular forms of masculinities, those which are co-produced with, and co-produce, systems of aeromobilities. We argue that this could extend understanding of the “largely underexplored and untapped” [13] (p. 243) entanglements of masculinities and environmentalism, and suggest that aeromaskinities, as a gendered system of thinking, being and doing, prohibits substantive climate action in the sector and perpetuates the fallacy of sustainable aviation.

That extractive sectors are largely run by men [14,15] is not surprising in the context of ongoing dominance of board and leadership roles across sectors by men [16]. It is not the category of ‘men’, however, but *masculinities* which play out and are reproduced through business practice and structures that enable men to succeed and progress. Climate breakdown, and particularly climate denialism, has also been connected to dominant forms of masculinities [17]. As gender intersects with other social categories, we recognise the importance of accounting for the plurality of masculinities [18]. We conceptualise masculinities not as a binary opposite from femininities, nor as only relating to men, but as ‘relational achievements’. Following Gorman-Murray and Hopkins ([19] p. 6; original emphasis): “masculinity/masculinities is/are constructed in relation to other entities, including bodies, identities, institutions, ideas, social norms and categories, and historical and social contexts”, with masculinities “continuously reconstructed in and through these social and material relations”.

2. Conceptual framing

2.1. Corporate- and petro-masculinities

Recognising the relational and pluralised nature of masculinities [19], McDowell ([20] p. 183) stresses how “masculinity, like femininity, is multiple, variable, context-dependent and unstable in contemporary workplace[s]”. Many economic sectors are dominated by men and (multiple) masculinities, including; extractive sectors such as mining, forestry and fishing [21,22], investment banking [20], infrastructure development and construction [23,24], which have all been recognised as replicating – and often relying on – forms of (hegemonic) corporate masculinities (see [25] for further elaboration), with specific social practices learnt by new entrants [26]. For Siemiatycki et al. [23], masculinity is part of the fabric of the global infrastructure sector; they reveal the “ramifications of an infrastructure sector where the positions of power are overwhelmingly held by men, in an industry that has a legacy of racial discrimination that remains deeply entrenched through to the present” (p. 298). Ramifications include project outcomes which maintain the status quo. This means that both the dominance of men in positions of power, and masculine symbols, narratives, norms and practices have lasting implications for – and potentially represent barriers to – change, particularly as these relate to neoliberal ideals [27]. This is particularly important for aviation where transformations are

required to stay within planetary ecological limits and there is not yet a consensus on the roles and prioritisation of different actions in future pathways.

This scholarship on gendered workplaces and corporate masculinities can be brought into conversation with thinking on global ecological crises by questioning how “different forms of masculinities influence environmental problems” [13] (p. 239). A gendered lens on climate breakdown exposes the various ways that perceptions of, and responses to, the climate crisis are constructed, shared and stabilised through the performance of forms of masculinities and femininities. MacGregor [12] uncovers a *masculinised environmentalism* which emerges from dominant frames that are used to make sense of climate breakdown, through presentation as a scientific problem (‘scientized’) and/or as a threat to inter/national security (‘securitized’). MacGregor notes a shift from a feminised environmentalism, often related to ‘Mother Earth’ ideas of care, protection and support, to a version that is dominated by masculine ideals. For us, this matters because such frames have consequences; they contribute to preferences for particular solutions and actions, and mean that “the kinds of solutions that are the traditional domain of men and hegemonic masculinity” ([12] p. 128), such as technological fixes [28], are rationalised, prioritised and mainstreamed.

There is a longstanding recognition of the connections between climate denialism and some forms of masculinities [29]. Hultman ([13], p. 244) argues that “climate scepticism is not a social movement; it is a project of a few influential men”; men who mistrust government regulation and believe in a market society, “men who occupy the most privileged positions in society in the Global North and the masculine socialisations that define them” [29] (p. 1). Some have referred to gendered climate denialism as the ‘white male effect’ (e.g., [30]), while others suggest political ideology and party identification has a greater effect than gender [31]. Cara Daggett’s conceptualisation of petro-masculinity [32] may go some way to reconcile these perspectives, dismantling a homogenising ‘male’ character, to interrogate the complex intersections of climate denialism, racism and misogyny. Daggett uncovers the toxic interactions between forms of masculinity and fossil fuel extraction, tracing the role of petrocultures globally, noting – provocatively – how “privileged subjectivities are oil-soaked and coal-dusted” (pp. 27–28). This resonates with the privileges embedded in, and also made possible by, contemporary aeromobilities (see [33] for alternative scenarios). This is played out through the capacities to be (aero)mobile as well as experiences of mobility.

Sectoral responses to environmental challenges can also be interpreted through corporate masculinities/masculine environmentalism. There are important intersections between sustainability, class, gender and race (e.g., [34]). Research on the relationship between environmental sustainability actions and gender in organisations has suggested that both demographic (percentage of women in leadership roles) and structural (cultures, norms, policies and practices) elements contribute to the likelihood and type of actions an organisation might initiate [35]. This is important as it goes beyond a ‘women-on-the-board’ approach to gender, which has suggested female directors to be more likely (than men) to support carbon emission reduction efforts (e.g., [36]), but in the process essentialises gender categories. Such findings have been explained by way of modes of decision-making, experiences, skills and leadership styles (including risk aversion); arguably relating to particular forms of masculinity and femininity. Thus, within our characterisation of aeromaskinities that follows (Section 5), variegated but related performances of masculinity can emerge. We are not, therefore, suggesting a fully knowable, stable form of masculinity [27], but rather intersecting enactments of aeromaskinities, ‘sustainable aviation’ being one of these.

2.2. (Gendered) aeromobilities

Aeromobilities [37] offers us an initial entry point to consider the specific contexts of airlines’ sustainability responses. This literature has

grown in a number of directions over the last two decades (see, [38]), conceptualising aeromobilities as simultaneously a mobility system [39], a norm [40], an embodied practice [41] and a lifestyle [42]. These categories expose the complex entanglements of aeromobilities in late capitalism. Yet to date this scholarship remains largely focused on *users*, showing the affordances of aeromobile lives and how “Western societies are made and constituted by air-travel, allowing social relationships, networks and associations to be held and maintained” ([37], p. 1319, also see [33,42]). When the *mobility-system* is foregrounded, airports often take precedence over airlines, perhaps due to the fixity and nodal nature of airports, as well as being important sites of environmental contestations due to expansion projects. Yet airlines, and their constituent parts, logics, coordination and practices, seek to leverage from and reinforce deeply unequal hypermobile lives [43], as we will go on to show. Thus this paper seeks to extend scholarship on the *production* of aeromobilities in the climate crisis.

Theorising the gendered nature of aviation can begin with pervasive cultures of aviation. For instance, notions of freedom, independence and exploration are dependent upon a gendered mobile subject who is able to fulfil these ideals [44]. Gendered aeromobile subjectivities are also constructed for and by those working in aviation, including pilots, cabin crew, baggage handlers, airport service providers, air traffic controllers, engineers, as well as those working in ticketing offices and customer relations roles. Durante ([45], p. 89) uncovers the “clichés in which air hostesses metaphorically represent the triad of beauty, elegance, and comfort, while pilots, endowed with a vibrant masculinity, equally fuel the dream of luxury and aerial style”. Similarly, Smith et al. ([46], also see [47]) discuss the ‘hyper-feminised’ cabin spaces in airlines’ Instagram representations of aviation, with images “resembling and reproducing hegemonic gender norms, stereotypes and performances that reflect popular media” (p. 20). Thus to date, the intersections of masculinities and aviation have largely been discussed in relation to mobile subjects, without recognising the many ways that gendering operates across the aviation sector more widely.

There are historical and contemporary examples of the relationships between forms of masculinities and aeromobilities. For instance, in the context of military aeromobilities, Lee ([48] p. 1128) notes how, even in World War I, the UK’s Royal Flying Corps’ (RFC) airmen “invigorated nationalist discourse through exciting representations of military masculinities and daring acts of heroism”. Flight promised to “expand masculine hegemony” while also recruiting almost exclusively from elite public schools and universities. More recently, it has been suggested that the 2009 film *Up in the Air* provides representations of social and moral norms, escapism, (hyper)mobile life, and social relations in civilian aviation [49]. Business travel has traditionally been viewed as masculinised mobilities performed by men due to work cultures and occupational hierarchies [50]. Yet the romanticisation of this travel has been disrupted by evidence of its emotional and bodily effects/affects [51,52], itself a trend away from dominant managerial masculinities [25]. Across aeromobile movements more generally, women are increasingly – but differentially – mobile, and at the same time aviation is only available to a small minority of the global population [53]. To date, the intersections of masculinities and aeromobilities have centred on passengers, we suggest that aeromobilities scholarship offers important entry points to make visible how masculinities and aeromobilities are simultaneously co/re-produced through *supply-side* aeromobilities.

3. Methodology and methods

3.1. Approach

To answer our research questions, we analysed 60 reports, documents and webpages across 14 airlines between May and August 2022 (Table 1 & Supplementary Material). We recognise that these reports are often produced by or in consultation with consultancies and others,

rather than the airlines themselves, nevertheless they represent the formal organisational communication for public consumption. We sought a diversity of airlines to cover categories including operational routes, organisational size and geographies. To do this we used two airline ranking profiles; the World Air Transport Statistics (WATS) 2021 (domestic and international) and Leafscore Sustainable Airline Ranking 2022. These rankings are not intended to be representative of the whole sector, but rather used as a sampling tool. For WATS we included the top 5 domestic and international airlines as the airlines with the highest scheduled revenue passenger kilometres of the sector and coupled this with the top 5 airlines by Leafscore ranking (2022) to produce our database. Delta Airlines appeared on two of the three lists, and therefore this resulted in a total sample of 14, rather than 15, airlines.

The documents included from these 14 airlines were identified through a structured process of: 1. Reading the homepage of the airline,

Table 1

Airlines included in the sample, reason for inclusion and number of documents for each airline.

	Airline	Reason for inclusion	Number of documents included
1	Emirates	Ranked #1 in World Air Transport (WAT) Statistics 2021 ^a International Airline Scheduled Revenue Passenger-KM (78,746 mil)	7
2	Ryanair	Ranked #2 in World Air Transport (WAT) Statistics 2021 International Airline Scheduled Revenue Passenger-KM (64,928 mil)	2
3	Qatar Airways	Ranked #3 in World Air Transport (WAT) Statistics 2021 International Airline Scheduled Revenue Passenger-KM (57,171 mil)	4
4	Air France	Ranked #4 in World Air Transport (WAT) Statistics 2021 International Airline Scheduled Revenue Passenger-KM (45,619 mil)	9
5	Turkish Airlines	Ranked #5 in World Air Transport (WAT) Statistics 2021 International Airline Scheduled Revenue Passenger-KM (42,973 mil)	5
6	China Southern Airlines	Ranked #1 in World Air Transport (WAT) Statistics 2021 Domestic Airline Scheduled Revenue Passenger-KM (100,474 mil)	2
7	American Airlines	Ranked #2 in World Air Transport (WAT) Statistics 2021 Domestic Airline Scheduled Revenue Passenger-KM (94,730 mil)	5
8	Southwest Airlines	Ranked #3 in World Air Transport (WAT) Statistics 2021 Domestic Airline Scheduled Revenue Passenger-KM (85,272 mil)	2
9	China Eastern Airlines	Ranked #4 in World Air Transport (WAT) Statistics 2021 Domestic Airline Scheduled Revenue Passenger-KM (78,811 mil)	2
10	Delta Airlines	Ranked #5 in World Air Transport (WAT) Statistics 2021 Domestic Airline Scheduled Revenue Passenger-KM (74,401 mil) Ranked #5 in Leafscore sustainable airlines ranking 2022	3
11	KLM Royal Dutch Airlines	#1 in Leafscore sustainable airlines ranking 2022	7
12	Alaska Airlines	#2 in Leafscore sustainable airlines ranking 2022	4
13	Xiamen Airlines	#3 in Leafscore sustainable airlines ranking 2022	2
14	Cathay Pacific	#4 in Leafscore sustainable airlines ranking 2022	11

^a WATS World Air Transport Statistics 2021: <https://www.iata.org/content/assets/a686ff624550453e8bf0c9b3f7f0ab26/wats-2021-mediakit.pdf>.

2. Navigating links to sustainability visible from this front page, 3. Using the websites' search function to look for (additional) pages relating to sustainability, 4. Use of a web search engine (Google) using the key words "[airline name] AND sustainability". To be included in the corpus, the documents needed to be generated by the airline themselves, not about the airline written by other commentators or media. All suitable webpages and documents were saved as PDFs and logged into a spreadsheet. These were then analysed using the approach described below.

3.2. Analysis

Once the corpus of documents was collected and stored, we began a process of reflexive thematic analysis as proposed by Braun and Clarke [54,55]. The research team selected this analytical approach as it offers the flexibility to uncover a variety of narratives and discourses [56] put to work through the documents. We spent time with the 'themes' slowly and iteratively developing interpretations through to higher levels of abstraction. Staying at the level of 'themes' also allows us to reflect across the construction and use of discourse and narratives for airlines individually and across our corpus.

Our particular form of thematic analysis also recognises the researchers' central role in knowledge production through thematic analytical processes, so themes do not passively emerge, but rather are actively created through the 'creative labour' of coding. Following this approach, the aim was not to seek consensus between coders but as a team to "develop a richer more nuanced reading of the data" ([54] p. 594) through the analysis and the writing process, which is generated with the theoretical and practical experience/s of the research team. Guided by the research questions, we re/read the documents listed in Table 1, producing two documents concurrently; (1) a discussion document of ideas and reflections, and (2) a table of key themes.

We followed advice of Terry and Hayfield [57] who warn against creating themes too early in the process (which can result in simplistic thematic categories), allowing the discussion document to be re/worked and discussed by the research team, as well as building theoretical links to the literatures. Our analytical process also required "continual bending back on oneself – questioning and querying the assumptions we [were] making in interpreting and coding the data" ([54], p. 594) which we believe has led to meaningful themes: Doing Our Bit, Follow(ing) the Science, Carbon Neutral Growth, Aviation for All, and Techno-Organisational Sustainable, all of which are anchored in the key concepts of sustainability, mobilities, aviation and masculinities, which aid interpretation and critical engagement.

In what follows, we present our findings and interpretations in two stages. In Section 4, we work to answer our two research questions (1) *How are airlines positioning their business operation vis-a-vis sustainability and climate breakdown?* [Sections 4.1–4.4]; (2) *What types of actions and responses are being prioritised by airlines?* [Section 4.5]. We do this through presenting the discourses, logics and practices which we found through our analysis. In Section 5, we interpret these findings through the lens of masculinities and aeromasculinities.

3.3. Limitations

As with all research, there are a number of limitations to the approach we adopted, and decisions made in the research process. For instance, by analysing 14 airlines' current (at the time of data collection – summer 2022) publications we are not in this paper able to reflect on change across time. We also focused only on those publications written in the English language, which is likely to have limited the resources available by airlines from non-Anglophone countries. Finally, our corpus focused on airlines alone, and this limits our capacity to talk more widely about the systems of aeromobilities and aeromasculinities.

4. Findings: 'doing' sustainability in aviation

The emergence of 'sustainable aviation' coincided with international climate agreements (e.g., Kyoto Protocol) and regional Emissions Trading Schemes (EST) in the early 2000s. Since this time, the discourses, practices and policies of 'sustainable' versions of aviation have received criticism [58]. Our analysis shows a variety of modes of sustainability adopted by airlines in their documents and on webpages, initially coalescing around awareness of (being part of) the problem (Sub-section 4.1), alignment with science-backed targets (Sub-section 4.2) and compatibility with aviation growth (Sub-section 4.3).

4.1. "Doing our bit"

Across airlines, we saw diverse reference to doing, showing, understanding and, to a lesser extent, practicing 'Our Bit'. For some, it was framed through an awareness of aviation's accountability for generating emissions. For others, it manifests through proclamations of leadership. Awareness of contributing to the problem and root cause of the climate crisis (burning fossil fuels) often omitted wider questions of radiative forcing, rising emissions and/or global inequalities [1,59]. With the exception of China Eastern Airlines which noted aviation contributing 'a large percentage to global carbon emissions', the construction of the scale and scope of 'aviation's bit' of the climate crisis illuminated passive language documenting the sector's contribution to 'just' 2 or 3 % of global emissions: "Although it's responsible for less than 2% of global carbon dioxide emissions from human activity, it must be committed to growing sustainably and reducing growth of its emissions" (Emirates).

Recognition of the contribution aviation makes to emissions was then followed by stressing the size of the challenge ahead. For instance, Delta stated that "The global aviation industry is a hard-to-abate sector, meaning it is innately difficult to decarbonize". Such a framing can be – and was – used to characterise the enormity of the challenge for the sector, and the need for extra-sectoral support. There is a long history of the aviation sector seeking and receiving (financial) support from national and regional governments under the guise of regional/national development (e.g., [60]). During the pandemic, for example, airlines and other sector actors received government bailouts in response to reduced passenger numbers (e.g., [61]). Nevertheless, for some airlines, policy mechanisms were seen to be hindering sectoral growth: "Aviation plays a huge role in kick-starting Europe's societal and economic recovery following Covid-19 restrictions. EU policies should promote EU connectivity and support competitiveness within the sector rather than hinder it" (Ryanair).

Airlines developed a variety of positions as they seek to 'do their bit' and "assuming its responsibility and taking action" (Air France), including recognising themselves as 'environmental stewards' (Emirates), 'climate advocates' (Delta Airlines) and 'purposeful pioneers' (KLM). For KLM, this is because "We know being an airline comes with a big responsibility" and "we feel it is our duty to make aviation sustainable". Through these roles, they propose that they are outward-looking 'leaders', working to galvanise support to develop markets and financing for new technologies and fuels (see Section 4.5, below), developing partnerships with other actor groups and recognising that the sector must work together. Many airlines described their individual leadership, yet our analysis also showed a framing of the sector collectively positioned as leaders in global efforts to reduce emissions: "Air transportation is the first industry to have taken global actions and set extensive targets to minimize the CO₂ emissions" (Turkish).

The language of 'advocacy' was used by some airlines but this materialised through lobbying for support from government and about 'partnerships' across the sector. Advocacy emerges around responsibilities for the behaviour of others within the system of aviation. For instance, climate change was depicted by some airlines through combative language, calling upon others – largely customers – (through the Corporate Sustainable Aviation Fuel Programme) to "join the climate fight" (Cathay Pacific). Another formulation of advocacy emerged

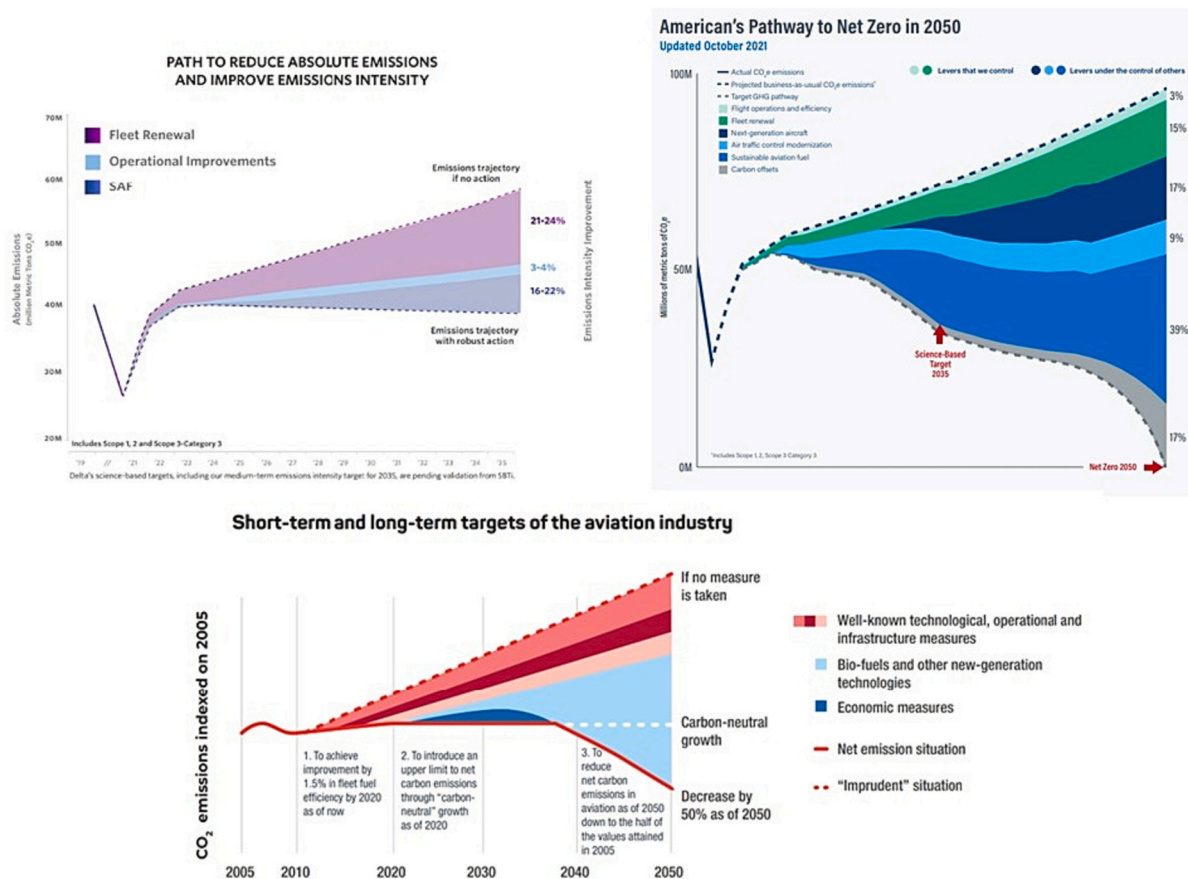


Fig. 1. Airline's graphical representations of emissions reductions. Top left: Delta Airlines, top right: American Airlines, bottom: Turkish Airlines.

through the Ryan Air Group Aviation with Purpose 2021 Sustainability Report which discusses the different approaches taken by national governments in response to climate breakdown. They argue that: “taxes deliver no environmental benefits... taxes make it more difficult for airlines to achieve climate gains, as extra costs incurred by the business hinder further investment in climate-friendly solutions” (Fig. 1).

4.2. Follow(ing) the science

Science was used by many of the airlines to legitimate their (proposed) actions on emissions reductions and sustainability efforts more broadly. Science-based targets ([SBT]; [62]) were used to depict synergies between aviation and climate policy. This was first done in terms of the proportioning of accountability, with many airlines using specific organisations and sources as ways to add authority to their claims, including the Intergovernmental Panel on Climate Change (IPCC). Next, the targets set by the individual airlines as well as sector-wide agreements were described as compatible with the Paris Agreement. KLM, for example, assert how they “have committed to the targets defined in the Paris Climate Agreement”. The language of ‘science-based targets’ has become a strong discursive tool for airlines. In particular, the ‘Science-based Targets Initiative’¹ has risen in prominence within and beyond the aviation sector as a way to add credibility to emission reduction efforts through independent assessment and validation. Delta Airlines explain how they had “announced our intention to set new and ambitious medium- and long-term climate goals aligned with the applicable framework of the Science Based Targets initiative (SBTi)”.

Net zero (or ‘jet zero’, see [3]) appears to be the dominant ‘science-

based’ future for sustainable aviation. Targets set by individual airlines or coalitions of airlines (e.g., SkyTeam, Star Alliance) are often framed around achieving net zero by a particular date. Such targets are communicated by (groups of) airlines and then (often loosely) inform articulated actions to meet the target, often presented in a stylised graphical format. Fig. 1 shows the graphs depicted in sustainability reporting for Delta (top-L), American (top-R) and Turkish (B); each offers what the airlines describe as a ‘science-based’ pathway to meet their respective targets. The graphs reveal that airlines have differential goals in regard to emissions, with only American presenting a pathway to net zero by mid-century. Activities to reach these goals include fleet renewal, sustainable aviation fuel (see Section 4.5), operational improvements, and carbon offsetting. Yet, missing detail raises a number of questions, for instance, American suggests that they will rely on Sustainable Aviation Fuels to meet their targets, though it is unclear from where these currently unavailable fuels will be sourced, and there is no reference to the carbon dependence of these fuels [63]. While the graphs refer to CO₂-e emissions, non-CO₂, representing two thirds of aviation’s warming [1,59], is not explicitly included.

Another way that the sector aligns itself with ‘science’ is through partnerships with academic institutions. Ryanair discusses working with the Sustainable Aviation Research Centre at Trinity College Dublin, while Southwest Airlines partners with Yale University’s Center for Natural Carbon Capture. Both partnerships are centred on development ‘emerging technologies’ such as sustainable aviation fuels (Trinity) and direct air capture technologies (Yale) and seek to use the research-legitimacy of the academic partners under the pretence of responsibility, action, legitimacy and innovation for particular versions of sustainable aviation futures.

¹ sciencebasedtargets.org.

4.3. Carbon neutral growth

Our analysis shows some recognition of BAU being incompatible with carbon emission reductions. Turkish Airlines noted that *“if no action is taken, this rate [contribution to global emissions - authors] might increase further due to the increase of the global air traffic”*. Yet ‘carbon neutral growth’ emerged as a powerful discourse throughout the reports, with the types of SBTs described above (including net zero) and in Fig. 1 considered, by some airlines, to be operationally compatible with future aviation growth. This was explicitly reported by both Turkish and Air France, showing that their statements above are complicit in their argument for a win-win response to climate breakdown through business growth: *“Through 2030, we plan to maintain carbon neutrality to 2019 levels, while continuing to grow our operations”* (Southwest Airlines).

Many other airlines describe complex and contradictory scenarios of increased flights, and decreased emissions, decoupling the relationship between flights and kgCO₂-e per passenger kilometre as currently defined. The idea of *“growing sustainably”* (Emirates) and the compatibility of sustainable aviation and growth in passenger numbers and flights emerged throughout the analysis. For some airlines this was explicit, with Turkish describing *“expanding our flight network and expanding our fleet”* (see Section 4.4) and *“carbon neutral growth”*. Ryanair also mirror this stating how they *“are committed to growing our annual traffic from 149m to 225m customers p.a. over the next 5 years”*. This growth, they claim, would be done in a way to lower the cost of air travel as well as environmental impacts with intentions to cut CO₂ emissions per passenger/km (over decade to 2030). This quantification of emission intensities overlooks total emissions, opens space for airlines to posit *“growth with environmental protection”* (Air France) and prioritise technocentric sustainabilities.

The contradictions of growth trajectories and sustainability are exemplified in this exert from Cathay Pacific Chairman's statement in the 2021 Annual Report:

“We are excited by the possibilities provided by the launch of our new premium travel lifestyle brand and we will continue to launch new offers and enhancements that will give our customers more reasons to travel, to shop and to interact with us. Our commitments to sustainable aviation will continue as we strive to reach our net-zero target by 2050, and we will further build on our digital leadership capabilities. We continue to position ourselves to capitalise on the opportunities presented by the Greater Bay Area, and the growth potential afforded by the opening of the third runway at Hong Kong International Airport.”

(Chairman's statement p. 6)

This short paragraph from Cathay Pacific's Chairman covers four topics in quick succession, (1) new premium branding, (2) growth in travel, (3) ambitions to be net zero by 2050, (4) airport expansion opportunities. That sustainable aviation should be presented between growth, expansion and luxury is telling of the perceived capacity for the airline to achieve a ‘win-win’, and uncovers the fallacies of sustainable aviation. Carbon neutral growth is a contention within environmental discourse, policymaking and activism, bound up with ideas of ‘green growth’ [64].

4.4. Aviation for all

Aviation for All was repeated by airlines to support the need for not only a continuation (BAU) but an *expansion* of global aviation. The adoption of a justice-oriented version of sustainable aviation by the sector suggests not only that aviation should be supported by national and regional governments, but also that it is a necessity for a flourishing society and economy (e.g., [65]). Specifically, two modes, distributive justice and inter-generational justice, are used to develop a conceptualisation of social sustainability that suggests the need for the sector to continue to grow in order to fulfil the right to mobility for more geographical locations as well as for future generations. Across both

distributive and intergenerational justice are proclamations, like that made in the title for American Airline's sustainability webpage: *“A world worth traveling is a world worth protecting”*. The right to mobility, and particularly aeromobility then becomes bound into the rationale for environmental protection and emission reductions. This is also reflected in ideas of *“flying for a better world”* (Xiamen Airlines) and Alaska Airline's *“We'll keep pushing forward, with care, innovation, pragmatism, accountability, transparency, and partnership to ensure that aviation is a positive force in our world”*. Both of these represent rhetorical strategies to claim social benefits that need to be weighed against environmental impacts, while omitting the consequences of climate change including the loss of livelihoods.

Distributive justice is evoked by airlines as a rationale for expanding routes into new countries and regions in tandem with their variegated actions to reduce aviation-related GHG emissions. Such a framing claims mobility as a human right, one which is being denied to some of the world's population, not through the sector's exclusivity, but rather through a lack of access. For Emirates, extending routes into new regions, *“We will also continue to strengthen our global footprint, so that we can serve and connect even more cities across the world”*. The use of footprint in this way offers complicated comparisons with the idea of a carbon footprint, and may represent a strategy to appropriate and redefine this well-established concept. The importance of aviation as a social good is a critical dimension to this line of argument. Distributive justice is mobilised as a specific and targeted dimension of sectoral growth, suggesting the growth is widening the capacity to participate in aeromobilities to more of the world's population. This can be evidenced through the language used by Xiamen Airlines, who talk explicitly about route extensions into what they refer to as ‘less economically developed regions’.

The second use of a justice framing for aviation growth adds a temporal dimension: *“Flying Safely into the Future”* (China Southern). Discourses of inter-generational justice are frequently adopted in relation to climate action and for airlines, this sometimes involved very specific connections to the place/s they serve or are primarily based. For instance, Alaska Airlines state: *“We care about the incredible communities we serve and live in and we want to keep them healthy and beautiful for generations to come”*. For others, this was about a more global(ised) ambition: *“We're committed to adopting sustainable practices that safeguard the future of our planet”* (Cathay Pacific). Caring for the environment was captured in this framing, as well as the possibility of a green-growth future whereby airlines leave a *“livable world to future generations”* while also *“expanding our flight network and expanding our fleet”* (Turkish Airlines). This is drawing on traditional multi-generational environmental protectionist discourses while again positioning it as win-win. Such a framing also aligns with KLM, who reflect that *“sustainability is a future licence to operate”*, which may be positioning today's actions as ensuring the long-term future of the aviation sector. For Cathay Pacific, however, their brand purpose takes this further, where the aim is not only to protect the environment for future generations but also to allow them to travel, and presumably, fly:

“to move people forward in life through our ability to connect them to meaningful people, places and experiences. Embedded in this philosophy is being able to achieve this purpose sustainably and ensuring future generations the right to enjoy full, well-travelled lives as well.”

(Cathay Pacific)

The mobilisation of ‘full, well-travelled lives’ is once again drawing on foundations of hyper/aero-mobilities as a collective right, and in this case, as one which must be protected for future generations.

4.5. Techno-organisational sustainabilities

Having examined the ways that sustainable aviation is understood, explained, engaged with, and justified by airlines, we now turn to interrogate the discursive formations and justifications of material

examples of sustainable aviation in-practice centring on two of the most prominent: sustainable aviation fuels (SAFs) and fleet renewal. We describe these as techno-organisational sustainabilities. The variations of technocentrism below show the ways that they are intimately connected to business propositions, customer demands, and the narratives and discourses described above.

SAFs are in many ways the corner piece of sustainable aviation in-practice (e.g., [66]), and particularly central to the net zero (and jet zero) discourse. For example, SAF is purported to make up 39 % of reductions (to net zero) for American Airlines. Thus, for American, and other airlines – such as Air France – “Sustainable Aviation Fuels (SAF) are set to become the main lever for decarbonising air transport in the coming years”. Barriers to SAF were, however, frequently noted by airlines, these include low production of SAF, high cost and lack of market structure (see, [67,68]). This problem is reflected in text by Alaskan “Much of what’s needed to decarbonize aviation requires new technologies that don’t exist yet—or aren’t available with enough supply and at a sustainable cost”. Further to this, Air France reflects on the limitations of the current offerings, and the work they are doing to support its growth:

“The production of these fuels is currently very limited due to the lack of a sufficiently developed industrial sector, and their price is 4 to 8 times higher than that of fossil fuel. This is why Air France is working alongside its industrial and academic partners to ensure the rapid emergence of production facilities.”

To show their work in overcoming these barriers, airlines discussed their partnerships and purchasing agreements with companies, which they promoted as supporting this important innovation for sustainable aviation. In discussing their agreement with Neste, American Airlines state that they have made “the industry’s single largest SAF purchasing commitment by volume to date”, with these fuels meeting “the performance and safety standards of traditional jet fuel but has 75% lower greenhouse gas emission”. The diversity of SAFs and the competition between them [69] is reflected in the analysis, with airlines referencing partnerships and alignments with particular SAFs, and recognition of the different certifications, for instance: “Air France only selects fuels whose sustainability is proven and certified by independent bodies such as the RSB or ISCC+”. Yet Ryanair goes further to stress the importance of other actor groups, in what is possibly a call for governments to subsidize SAFs, and to thus shift responsibility for decarbonization to political actors:

“We call on European and national policy makers to support SAF initiatives. The additional production of SAF and greater availability of raw materials are needed to support mechanisms that can cover additional costs for products brought to market.”

The strong dependence on the adoption, scaling up and marketisation of SAFs to achieve net zero ambitions is coupled with an additional logic: SAFs are being packaged by some airlines as ‘solving’ environmental harm from business travel and allowing corporations to continue hypermobility while also performing their own corporate responsibility (e.g., through Scope 3 emissions). Examples of this can be found with Cathay Pacific who encourage businesses to “learn how you can help to create a greener future while meeting the needs of your business”. Alaska Airlines are even more direct with the ways they seek to work with corporate customers: “If you’re looking to reduce your corporate emissions and reach your company’s climate goals, consider investing in sustainable aviation fuel (SAF) in partnership with Alaska Airlines”. Thus, Air France describes a ‘dual objective’ for SAFs, “to contribute to the decarbonisation of our operations, and to meet the growing demand from our customers, as purchasing SAF enables them to reduce the carbon footprint of their trips”.

Fleet renewal and fleet ‘newness’ is another economic-organisational strategy employed as part of a sustainability discourse. Competition for the ‘youngest fleet’ appeared, with American Airlines claiming: “We’ve created the youngest fleet among U.S. network carriers”, while Xiamen Airlines state: “We have also retired 21 old aircraft early to keep the fleet age under 7.67 years, becoming one of the youngest fleets in the world”.

Quantifying and qualifying fleet size and newness appeared across airline reports. An example of this is American Airlines, who state that “since 2013 we’ve added 595 new aircraft and retired 667”, and go on to explain that each new generation of aircraft offers a 10–15 % improvement in fuel efficiency. The assumption of new planes having greater efficiency than old planes is one widely shared for other transport modes (e.g., private cars, HGVs), which often depends upon optimal use and tends to overlook the specifics of real-world operations, and embedded carbon. This could be even more important for aviation, where any one airplane can have a wide variety of configurations between different classes of carriage, with vast implications for emissions. It is unclear whether the retiring of old aircraft has achieved any reduction in emissions in absolute terms, but aircraft lifecycle does mean the production of new aircrafts locks in aeromobile futures for 30 years.

The competition to have the newest fleet of airplanes is likely to differ for smaller airlines which were not part of our sample, and it is likely that many of the planes ‘retired’ would in fact be sold to other airlines. The configurations of planes, and the connections between newness and the type of offering sold to customers is clearly articulated by Ryanair, who state that:

“At the heart of Ryanair’s environmental strategy is our \$22bn investment in new technology ‘Gamechanger’ aircraft which will deliver more seats per flight with more leg room for improved comfort, yet they will burn 16% less fuel and reduce noise emissions by up to 40%.”

These two examples, SAFs and fleet renewal, indicate the types of techno-logics which are at play in sustainable aviation futures. Financial investments are used to show the commitments airlines have made/are making to ‘sustainable aviation’ futures and the ongoing importance of the sector for global(ised) mobilities.

Through this section we have shown how the 14 airlines frame the issue of climate change and the aviation sector’s emissions, their business practices, and actions to reduce emissions. We have sought to engage with the logics underpinning the narratives, discourses and practices, showing that airline proposals for carbon neutrality, as far as these exist, are unaligned with SBTs. Airlines also employ various discourses to side-line key issues, i.e., the overall development of emissions in absolute terms, while rhetorically shifting responsibility to government or customers. We now turn to re-animate our engagement with masculinities, to consider what this lens can do to help us make sense of the work the airlines are doing, or not doing, under the guise of sustainable aviation.

5. Discussion: unmasking aeromasculinities

In this section, we argue that theorisations of masculinities offer an analytic to understand the wider dynamics at play which are governing the types of actions that are presented by the aviation sector in their reporting as described in Section 4. More than this, we argue that masculinities are important because of the powerful impact masculine ideas have had on social, economic and ecological worlds, “but also because of the urgent need to change existing power relations” ([13], p. 240) if more comprehensive solutions to the climate crisis are to be realised and to move beyond the ‘questionable and misleading claims’ about net zero aviation futures [70] made visible by our analysis.

We use the language of ‘unmasking’ to denote that aeromasculinities have long been informing the direction of travel and the logics of, as well as the actions associated with, sustainable aviation. We therefore here explain how we understand aeromasculinities to be informing the pathways described above as found in our review of airline sustainability communication. We find from our analysis presented above that aeromasculinities become visible in at least four ways: (1) contingent and situated accountability [Sub-section 5.1], (2) science-legitimation [Sub-section 5.2], (3) techno-scientific solutionism [Sub-section 5.3], (4) hypermobile aviation futures [Sub-section 5.4].

In Fig. 2, below, we present data we collected on the gender of airline

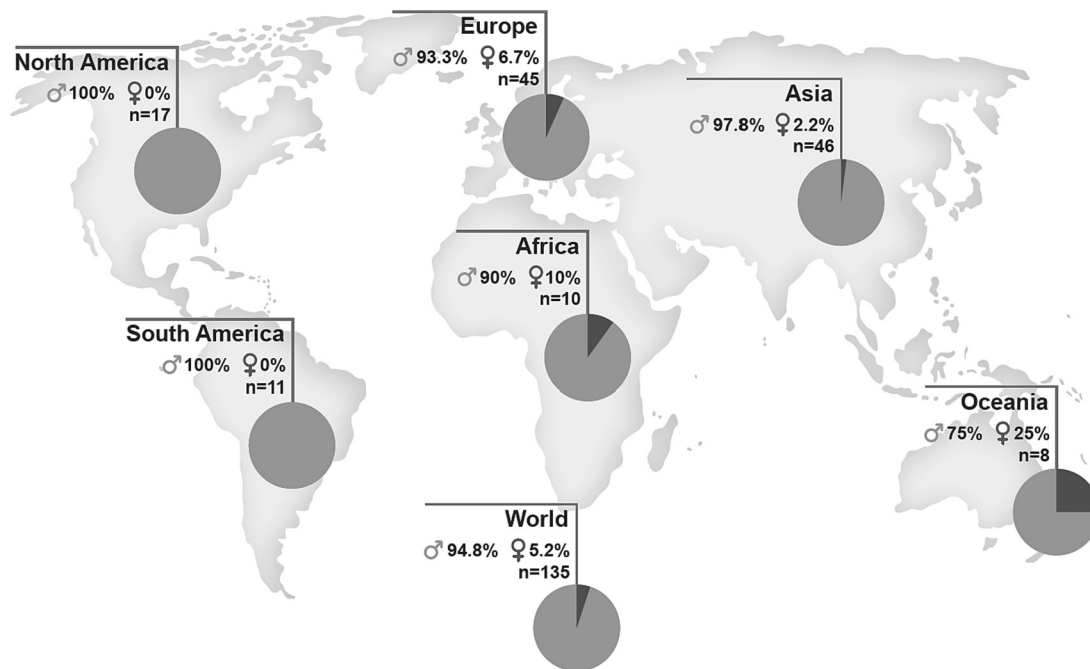


Fig. 2. A diagram representing the gender of airline CEOs. Source: Authors own data. Note: The data were collected by the research team in 2021, through a review of airline corporate reporting. Gender was ascertained through images and gendered pronouns used for CEOs at that point in time.

CEOs in 2021, presented across regions. It shows a significant male-dominance at the CEO level of airline management. While re/creating a gendered binary, it does offer a powerful illustration of the ongoing gender asymmetries in the sector, particularly in light of the gendered nature of organisational sustainability activities [71]. Moreover, for Garlick ([27], p. 181)

“The workplace is often a key site in which men stake a claim to masculinity. Aside from financial compensation and the ability to provide for one’s family, work potentially offers status, the capacity to exercise power, and the ability to establish control over a domain of activity.”

There are multiple masculinities at play in aeromascuities [72] from the elite, high-income and powerful masculinities performed at the CEO level, to the highly skilled masculinities of pilots and engineers, and risk-taking, and brawny masculinities of baggage handlers. The dominance of men across these occupations leads to particular cultures and hierarchies of power, and this is significant to avoid “preserving ‘man’ as an ostensibly ungendered subject” ([73], p. 11). It is also important to recognise the masculinities in the wider system of aeromobilities: investors, customers, innovators and tech developers, infrastructure owners.

Aeromascuities become visible through the powerful symbols and more-than-instrumental practices which govern (sustainable) aviation. These are shared across actor groups, but for the purpose of this paper, we focus on the ways aeromascuities manifest through and within airline communications, recognising the internal personalities, values, norm and symbolic meanings, and external dynamics pressures from shareholders and markets. These are characterised through two acts:

- **Problem framing:** the degree to which (the idea, and material realities of) climate change is seen to be a threat to the sector;
- **Solution development:** discourses of delay, being seen to ‘do something’, operational practices (e.g., fleet renewal) packaged as sustainability solutions.

We engage the literature reviewed in Section 2 to align aeromobilities with ideas from corporate masculinities [20,26], petromasculinity [32] and masculinised environmentalism [12]. We also

reflect on the ways that neoliberalism intersects with these forms of masculinities to open up some possibilities while foreclosing others. In doing so, we learn from Hearn [74] who stresses the gendered nature of the transnational capitalist class who “operate within a world of financial economics that is largely one of men” ([27], p. 172).

5.1. Contingent and situated accountability

The aviation sector has received criticism for its delayed articulation of responsibility for polluting practices associated with the sector. Our analysis shows explicit, albeit highly contingent, partial and situated accountability for some climate impacts; heavily skewed towards carbon and all but omitting non-carbon emissions. While this does not explicitly repeat the types of denialism that has long been connected to some dominant forms of masculinities, it is consistent with ecological modernisation [75], i.e., the blending of growth and environmentalism which can be read through forms of ecomodern masculinities [13,76]. This also is connected to classed environmentalism in which it is important to perform masculinities that reflect concern about the environment [77] and paternalistic environmentalism whereby elites (such as airline boards of directors) solve the problems for the (aero-)mobile masses [78]. This form of accountability becomes important for positioning which solutions are prioritised (Section 5.3).

By relationally constructing accountability, the airlines seek to reduce, if not negate, the scale, scope and speed of action required. By characterising aviation’s emissions as ‘just’ 2–3 %, as well as citing the IPCC as an authoritative source, the sector performs a position which recognises ecological crises but is also driven by human ingenuity as a resolution. Aeromascuities are therefore constructed through situated accountabilities which are mobilised for the benefit of internal and external stakeholders.

5.2. Science-legitimation

Science, and particularly discourse of being ‘science-led’ in policy and practice, is a strategy used by airlines to gain legitimacy for goals and (in)actions by positioning these in relation to ‘best practice’. Yet, as Andersen et al. ([64] p. 2) argue, “There is no such thing as a ‘scientific

target' applied in policy or business—operational targets are socio-political choices". This 'scientized' problem framing shares parallels with MacGregor's [12] masculinised environmentalism of climate change, where the problem and consequently also the solutions become bound up in stereotypically masculine ideals and actions. Yet science-led does not preclude scepticism, with Hultman ([13], p. 244) reporting a "general belief in positivistic industrial modern science" by climate sceptics, but also an argument that climate science incorporates both science and politics therefore feeding political goals.

Milam and Nye [79] document a long history of masculinities dominating scientific practice, methods, discovery, and cultures, and this work reminds us that the very processes of doing science, as well as the types of knowledges – and solutions – they generate are deeply gendered. A variety of forms of masculinities have been linked to science and scientific discovery, including ideas around quantification and objective knowable truths (critiqued through feminist scholarship) and mobile voyages of discovery [13]. This has important resonance for aeromasculinities and helps to illuminate the types of targets and solutions that are being prioritised by the sector (sub-Section 5.3). The adoption by some airlines of net zero goals, a legitimised – yet flexibly framed [80] – target, offers airlines a pathway towards a fully knowable 'sustainable' future but also one in which the airlines claim air travel can continue, or even expand. Through this dominant framing of masculinised science, science is singularised and used to justify a variety of actions, many of which are dependent on as yet under-/un-developed technologies, unlikely to be compatible with a climate safe future. For Pecis [81], the innovation process is a highly gendered practice, often discursively prioritising men and masculinities, where risk taking and hype generation can be prioritised, particularly if it aligns with organisational priorities (e.g., tactics of delay). Aeromasculinities make possible the selective adoption of science as a rationale for particular responses and problem framings.

5.3. Techno-scientific solutionism

Scholarship has long recognised the important nexus of gender, technoscience and environmentalism (e.g., [82]). Ecological modernisation's blending of economic growth and sustainability is visible in a number of the actions put forward by the airlines: fleet renewal, market stimulation for SAFs, and compatibility of passenger growth with emission reductions. Hultman [13] refers to this as ecomodern masculinities, a form of masculinities which "demonstrate a keen recognition of environmental problems, not least climate change, while at the same time supporting policies and technologies that conserve the structures of climate-destroying systems" and performs "a symmetrical amalgamation of care for the environment and commitment to economic growth" (p. 246). This reflects the contingent and situated accountability described above, but also the forms of responses found through the analysis. While explicitly 'following the science' towards a net zero, sustainable aviation future, we can argue that this prioritises and mainstreams the "the kinds of solutions that are the traditional domain of men and hegemonic masculinity" ([12], p. 128): those which do not challenge existing power structures, operate within the confines of market logics and enable sectoral growth. This is not only dependent on existing technologies and incremental advancements but also the emergence of new hardware (e.g., technologies, materials, digital infrastructures) and software (organisational practices, digital systems). Even for currently existing innovations, such as SAFs, the airlines recognised the lack of supply and market structure as barriers to upscaling in the immediate future. This confidence in market logics, neoliberal growth and future innovativeness is reflective of hegemonic aeromasculinities, which neglects the subsidies allowing contemporary aviation to retain low pricing inducing demand, and precludes demand management (e.g., [83]).

5.4. Hypermobile aviation futures

The positioning of aviation as a right for all continues a tradition of privileging the affordances of some forms of mobilities over others. The uniting of justice frameworks with air travel route expansion, again reproduces a win-win pathway for aviation's future. Discourses of the 'right to mobility' connect to a particular masculinity which has been repeatedly framed in scholarship and remains important in policy discourse, that of (hyper)mobility being a necessity for a successful life. There is a deep gendering of mobility practices, with "masculinity [] coded as mobile and active while femininity is coded as relatively stationary and passive" ([84], p. 2).

In addition to this, the distinct asymmetries in flight volumes maps onto wealth and privilege, with Europe and North America accounting for the majority of air travel. This mobilisation of aeromascularity then, reproduces and extends the practices, representations, norms and values of mobility as the good life, and the aviation sector as providing this service for public good. Yet, airlines work to re-incentivise existing customers to fly more and to attract new customers through their marketing communication [43]. Moreover, airlines are offering SAF as a way to offset corporate emissions for their business customers; providing solutions to (hypermobile) corporate travellers to sustain this gendered, classed and racialised form of mobile life (Gustafson, 2006). Such high-aeromobility futures are incompatible with a climate safe future, even with the techno-scientific solutions forwarded by the airlines and the sector.

6. Conclusions

We have argued that theorising aeromobilities in the climate crisis through the lens of aeromasculinities might offer new ways for understanding the types of problem framing and solution development that are put forward by airlines. While sustainable aviation has been referred to as 'contested' [58], we go further to argue that the fallacy of sustainable aviation as promoted by airlines advocates compatible coexistence of the aviation sector in a climate-constrained world, thereby foreclosing a wider range of potential actions. By doing *something* (e.g., SAF), the airlines operate in ways that limit radical potential and public/political accountability. The unequal processes described in this paper produce – and sustain – global systems of aeromobilities which then go on to perpetuate gendered, classed and racialised mobilities and affordances. The future of aviation is therefore mired by mainstream narratives and discursive strategies of 'sustainable aviation' which are visible through, complicit with, and reproducing aeromasculinities.

We propose that aeromasculinities makes visible: (a) The ways that particular forms of masculinities are performed throughout the system of aeromobilities, across a variety of socio-material contexts; (b) The historically embedded norms of aviation as a classed and gendered form of mobilities; and, (c) The contemporary norms, values and identities that sustain aviation despite its fossil fuel dependence and contributions to global GHG emissions. Importantly, we have shown that 95% of airline CEOs are male, yet resisting aeromasculinities is not about 'adding women' to aviation boards (as reported in corporate social responsibility documents) or 'thinking about women' in constructing aeromobile futures, but about the simultaneous challenging of heteronormative, white masculinities and responses to ecological collapse and the climate crisis [85].

We recognise aeromasculinities as the dominant power relation in aviation, it operates across, through and between all sectoral actor groups: airlines, industry organisations, airports, fuel companies and users/travellers. Theorisation of 'ecological masculinities' [13,86] are put forward as a pro-ecological masculinity, which might offer some thoughts for an alternative to the dominant formulation of aeromasculinities described above. Such a masculinity would enact "collaborative rather than abusive relationships with the non-human world" which is "more caring, humble, and sharing" oriented ([13], p.

247; also see [85]). A sustainable aviation which “undermines, subverts, and offers alternatives to existing systems” ([87], p. 519) is not yet apparent, but next steps would be to offer an imaginative exercise perhaps critically engaging with slow travel, low-fly and/or degrowth movements (see, for instance, [63,88]). The routes/roots lie not only in carbon dependence – arguably somewhat reduced through the ‘sustainable’ fuels discussed above – but in the historico-socio-economic embeddedness of aeromobilities, which in turn has long stems in classed forms of masculinity derived from military and civilian aviation.

To progress this research, further theorising of aeromasculinities is required, as well as empirical interrogation that moves beyond problematisation and towards propositionality (see [89]), and extends beyond airlines to engage with a broader range of aeromobility system actors, and the relations between these. Moreover, in discussing ecofeminist scholarship, Hultman ([13], p. 240) argues that “elite men tend to be portrayed as ‘the bad guys’ (i.e., the people with too much power), but without much sustained analysis of why they come to think and act as they do”. We suggest that aviation – and the lens of aeromasculinities – may offer an empirical route through which to progress this work.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.erss.2023.103319>.

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