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Air transport globalization, liberalization and sustainability: post-2001 policy dynamics in the United States and Europe

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Abstract

Against a context of international crisis in the air transport industry, this paper examines the implications of the ways in which strategies developed by key air transport stakeholders, as well as the contemporary dynamics of the globalized, liberalized market place, impact directly on sustainability issues. More specifically, the paper has two objectives. First, it discusses the policy ramifications of the interrelationships between the concepts of globalization, liberalization, and sustainability within the air transport industry. Second, the paper explores the import of these interrelationships as they interconnect with stakeholder strategies in the differing geopolitical contexts of the US and EU. Particular attention is given to airline network and frequency strategies. The paper concludes that while the financial sustainability of the airline industry is the overwhelming concern today, if this is essentially the short-term crisis that the airline industry claims it to be, the longer-term predictions of air transport growth will again bring environmental sustainability issues to the fore.

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1. Introduction

Recent academic analyses of internal air transport markets in the United States (US) and European Union (EU) have been dominated, first by a shared focus on the effects of liberalization and competition and, latterly, by the impacts of globalization. More widely, however, the contemporary debate on transport and social change as a whole is concerned increasingly with issues of sustainability, and the mounting recognition that present and projected trends in mobility cannot be pursued indefinitely. Black (1996, p. 151) defines sustainable transport as “satisfying current transport and mobility needs without compromising the ability of future generations to meet these needs”, a statement that includes environmental objectives but also invokes economic and social goals. The consensus of the most recent study into the prospect of sustainable aviation (Upham et al., 2003) is that, at best, the environmental sustainability of the air transport industry is in doubt, although, conversely, aviation is delivering social and economic goods. Nevertheless, these latter benefits are often exaggerated because they do not take into account the comparative returns that could be achieved through alternative investments of the same resources. These broader sustainability issues have had relatively little impact on industry analyses of air transport, either in European or North American contexts. Moreover, the thrust of policy-making for aviation, particularly by the agencies directly charged with its business environment, has been concerned largely with the regulation of imperfections in the liberalized, competitive and increasingly globalized market-place.
The linkages between air transport and the much broader socio-political context of sustainability seem even more remote, given the financial straits of the international airline sector in the wake of the global economic downturn that has been underway since 2001, compounded by the sharp traffic decreases caused by a succession of events external to the industry (Nolan et al., 2004). The 9/11 attacks on New York and Washington in 2001 were followed in 2002–2003 by the invasion of Afghanistan, the Iraq war, the Severe Acute Respiratory Syndrome (SARS) epidemic in Asia, and the continuing disruption of international air traffic created by enhanced security measures. The cumulative result has been sharp traffic declines and massive financial losses among the world’s leading network carriers. The International Civil Aviation Organization (ICAO) estimates that total scheduled air passenger traffic fell by almost 3% in 2001, while growth in 2002 was marginal because of concerns about the then-impending Iraq war. The combination of war and SARS led to further traffic decline in the first part of 2003 which is expected to be a year of zero growth until a full recovery in traffic gets under way in 2004 and 2005. ICAO (2003) is forecasting a global 4.4% growth in traffic for 2004, rising to 6.3% in 2005.

Against this context of crisis and industry dynamics, the general aim of this paper is to examine the implications of the ways in which strategies developed by key air transport stakeholders, as well as the contemporary dynamics of the globalized, liberalized market place, impact directly on sustainability issues. More specifically, the paper has two objectives. First, it discusses the policy ramifications of the interrelationships between the concepts of globalization, liberalization, and sustainability within the air transport industry. Second, we explore the import of these interrelationships as they interconnect with stakeholder strategies in the differing geopolitical contexts of the US and EU. We argue that, ultimately, policy-makers will be forced to address these issues because, setting aside the short-term impacts of the post-9/11 crisis, projected growth rates for air transport in excess of 5% per annum (equivalent to a doubling of air traffic by around 2018) are incompatible with the realization that infinite mobility is not attainable.

2. Globalization, liberalization and sustainability

Despite much research, it is not at all clear how globalization, liberalization, and sustainability are interrelated in the context of transport industries. One theoretical perspective maintains that globalization and liberalization strategies have rationalized the airline sector into a more efficient operation that enhances long-term sustainability. An alternative interpretation argues that globalization and liberalization have resulted in excessive air traffic growth and wasteful competition, thereby exacerbating negative social and environmental externalities incompatible with long-term sustainability. Air transport’s relationship to the globalization/liberalization/sustainability nexus can be visualized as an equilateral triangle in which each apex is occupied by one of the sets of processes (Fig. 1). It is our basic assumption that the dominant axis links the former two processes, while both are linked only weakly to sustainability, which remains the least significant element, both to the air transport industry and within the policy agendas of its regulators. It should be observed, however, that there are significant variations within the industry, airport operators, for example, being far more cognizant—for sound business reasons—of environmental issues than are airlines (Graham and Guyer, 1999; Graham, 2001).

Air transport is a business naturally dominated by short-termism and opportunist response and, crucially, by a fragmentation of responsibility among its policy-makers. This situation has only been accentuated by the security response to 9/11, especially in the US. In this post-2001 context of crisis, in which a number of airlines including Swissair and Sabena have already collapsed, while the survival of others—including once-mighty United Airlines—is open to question, it is scarcely surprising that the broader policy ramifications of the interrelationships between aviation and sustainability have been elided from the strategic responses of the industry. Nevertheless, it cannot be ignored that air transport remains the fastest-growing cause of the emissions that lead to global warming. Noise and emission limits are set by international agreements but these are being mediated through national concerns that do not necessarily allocate a high priority to sustainability objectives. Furthermore, it is demonstrably the case that the mitigation effects instilled by international agreements on noise and atmospheric pollution are being more than off-set by the long-term growth in aviation, 9/11, the Iraq war and SARS notwithstanding (Upham et al., 2003).

![Fig. 1. The globalization/liberalization/sustainability nexus.](image-url)
2.1. Globalization

Irrespective of the post-9/11 crisis, the air transportation industry world-wide has experienced dramatic changes over the last 25 years. Perhaps the most sweeping have occurred in the institutional environment, where long-established regulatory regimes have been modified, and in some cases abolished, as a result of policies of liberalization or deregulation, resulting in mergers, acquisitions and/or strategic alliances among the largest carriers (Graham, 1995, 1998; Goetz, 2002). Together with technological improvements and economic dynamics across all industries, these forces have furthered the process of globalization, which is fundamentally altering the volumes, patterns, directions, ownership, and control of air transport passenger flows around the world. It can be argued that the combination of airline strategic alliances and network restructuring is the most potent manifestation of globalization processes in the airline industry. In addition, it is estimated that about 40% of global freight trade by value is moved by air (Upahm et al., 2003).

Although a concept not readily amenable to precise definition, globalization is taken here to refer to the increasing geographical scale of economic, political, social, and cultural interactions (Janelle and Beuthe, 1997). Although it can be difficult to determine the direction of cause–effect relationships, globalization would simply not be possible without air transportation. Likewise, the airline industry would be much less significant without concomitant global expansion. Although some of its activities are regulated globally by ICAO, the air transport industry demonstrates the broader ambiguities that characterize globalization processes, one important reason why it has several layers of policy-makers. In geographical terms, globalization involves reterritorialization rather than deterritorialization as the distinctiveness of national financial spaces is permanently eroded but not necessarily removed. Individual states remain intent on their insistence upon sovereignty and control over vital national assets and concerns. Again, the EU, often characterized as perhaps the world’s first truly post-modern international political entity, distinct from the national and federal state forms of the modern era, still remains a bounded and sovereign space. Moreover, the reterritorialization, of which globalization is part, has been accompanied by a renegotiation of place and space in which historical processes of localized economic development continue to influence the location of economic activity. Despite the revolution in air transport and other communications technologies, place remains fundamental, all economic activity being grounded in specific locations, “both physically, in the form of sunk costs, and less tangibly, in the form of localized social relationships” (Dicken, 1998, p. 11). Moreover, only the more substantial players in air transport are involved directly in the global marketplace, and even they remain fixed within national circumstances; smaller firms continue to be largely domestic in orientation.

Another dimension to globalization, which is of crucial significance to air transport but has yet to be researched convincingly, concerns the emergence of the sub-national scale as a nexus of social and economic organization. In Europe, for example, the region is defined as an intermediate spatial level between state and locality, one characterized by a certain sense of common identity and institutions. As a sphere of development and social location, this scale of social, economic and political organization is escalating in importance as the nation-state is undermined by this dimension to the reterritorialization accompanying globalization (the so-called ‘glocalization’). The ramifications of these processes for air transport have yet to be worked through but one obvious connection is to be found in the ‘fragmentation’ model favoured by Boeing, which promotes point-to-point or one-stop connecting services over a single hub as alternatives to multi-sector journeys. This network strategy requires airlines to “maintain or reduce airplane size to provide frequent, non-stop service” (Boeing, 2003, p.11). Such a diffusion of services, which is also compatible with the point-to-point strategy advocated by much of the rapidly-growing low-cost carrier (LCC) market segment, could undermine national hubs and create alternative airline network geographies.

These several dimensions to reterritorialization and the resultant interplay of global, regional (defined at a variety of scales), national and local have profound implications for the air transport industry. No one airline, for example, could ever mount a global operation without recourse to partners. Furthermore, although globalization and free trade do promote an inevitable diminution in national sovereignty, this scale remains important in terms of regulation, which remains firmly locked into a territorial framework. The reorganization of the world-economy around specific localities and city-hinterlands depends on air transport and other communications industries but, equally, these are constrained in their strategic decision-making by the location of those patterns of economic activity.

2.2. Liberalization

Globalization in general is partially explicable by economic shifts, which have encouraged free trade and increased competition, achieved through world-wide processes of deregulation and the removal of trade barriers. In this present context, deregulation involves the exposure of air transport to laissez-faire, or free-market, forces, achieved through the removal of most regulatory controls over pricing, while permitting carriers to enter and leave markets at will. There is generally a time-lag
between the implementation of domestic and international deregulation, the former being much easier to implement, either at the scale of the individual country or a trading bloc such as the EU, where the Single Aviation Market was completed in 1997. By then, deregulation was creating a world air transport market in which fully or partially privatized major airlines sought, if not to eradicate, at least to control competition and capacities through consolidation into regional and ultimately global alliances. Their strategies were increasingly driven by the pursuit of high-yield traffic and lower costs rather than chasing market share (Graham, 1999).

Events since the late 1990s, both external to the air transport industry and within it, have combined to underscore the fragility of this model and demonstrate, once again, the dynamic instability of the air transport industry. International Air Transport Association (IATA) statistics show a global 4.4% drop in international scheduled passenger traffic in 2001. There were commensurate falls in domestic traffic. The effects were worst, however, for North American carriers with international passenger kilometres down by 6.3% compared to 4.6% in Europe and 2.0% in Asia Pacific (IATA, 2002). The succession of crises has also impacted unevenly within the airline industry. In general, the major international carriers have been most severely affected, suffering in particular from a decline in high-yield international business traffic, which some analysts think may be a permanent trend. Arguably, businesses have inadvertently uncovered the potential of transferring from a transportation-based to an electronic economy and also another means of cutting costs. Information technology, however, works both ways. While it does offer the possibility of travel substitution, it also facilitates easier and cheaper access to air transport through online reservations. Thus in both North America and Europe, LCCs such as Southwest, JetBlue, AirTran, Ryanair and easyJet have flourished. One prime reason is that they are exploiting the derived demand for air transport by selling mobility at low cost and therefore promoting behavioural changes in leisure and business traffic. The LCCs also operate a mix of point-to-point and some rudimentary hub-based networks while, conversely, the highly co-ordinated hub-and-spoke model favoured by the large network carriers may have been compromised—perhaps permanently—by the decline in high-yield business traffic necessary to sustain it. Certainly, the large carriers have responded to competition from LCCs by lowering their own fares for point-to-point services, reducing the standard of cabin service, by pushing electronic booking on the Internet, and developing airlines-within-airlines (e.g., Song by Delta, Ted by United) to serve as marketing platforms to compete more directly against the LCCs in certain markets.

Both such a general summary and the aggregate statistics of the global air transport crisis post-9/11, disguise a more complex picture because, spatially, the effects of this catalogue of disaster have been unevenly distributed. North American carriers, and also European airlines with a high exposure to the transatlantic market, were hardest hit by the post-9/11 fall in demand, whereas it was Asian and Australasian companies that experienced the worst effects of the SARS crisis. In turn, this means that the EU and US responses to the relationships between globalization/liberalization/sustainability share certain similarities but are developing somewhat different trajectories.

Deregulation of the US airline industry has consistently been deemed a success by government and industry, while labour and consumer groups have been more sceptical. From 1978 to 2000, there was, in general, a greater quantity of service, more people flying, and lower average fares, although widespread differences occurred across places based largely on the level of single carrier domination, size of market demand, and presence or absence of LCCs such as Southwest Airlines (Goetz and Sutton, 1997; Goetz, 2002; Vowles, 2000). There was very marked concentration, the eight largest airlines accounting for 95% of the domestic passenger market, while most hub airports came to be dominated by single carriers controlling more than 70% of the traffic. Today, the principal concern is the worst financial crisis in the history of the US airline industry which lost $7.7 billion in 2001 (in spite of the $5 billion stabilization payment from the US government in September 2001), $9.5 billion in 2002, and estimates ranging from $6.7 billion to $13 billion for 2003 (US Air Transport Association, 2003). Arguably, state handouts have helped perpetuate the problem by allowing weak airlines to stay in business and therefore retain unwanted capacity in the market. Nevertheless, the situation is so dire that the US Air Transport Association (2003, p. 5) has admitted “the prospect of a forced nationalization of the industry is not unrealistic.”

One of the most graphic illustrations of the extent of the crisis in the US is provided by major declines in origin–destination passenger traffic at all major airports bar Miami and a few others between 2000 and 2002 (Table 1; Fig. 2). In addition, there are the concerns as to the future efficacy of the hub-and-spoke strategy and the extent to which the LCC model has permanently altered market conditions so that there is no possibility of the major network carriers being able to reconstitute the market conditions in which high-yield traffic once sustained their revenues. While the scale of large hub operations is an effective barrier to market entry, hubs are also undermined by the high labour costs of traditional carriers. As the LCCs grow their networks in Europe and North America, more passengers are using them to make connecting journeys (up to one-third in the case of Southwest). Only a few LCCs (e.g., Frontier, AirTran), however, have yet found it expedient to set up
at least a rudimentary hub as travellers seem prepared to suffer inconvenience of poorly timed connections if the price differential is sufficiently attractive.

Although the liberalization of the EU industry was much more gradual, many of the same—apparently inexorable—processes of spatial concentration could be observed. From 1 April 1997, all EU airlines had open access to virtually all routes within the Community. The cumulative result was to allow the major European carriers to restructure their formerly national networks into trans-European hub-feed systems, the most important of which are London Heathrow, Amsterdam Schiphol, Frankfurt Main and Paris Charles de Gaulle. Largely because of problems of scarce airport capacity, the principal EU airports are less dominated than their US counterparts, although this situation is being altered by the growing importance of alliances. Again, however, while less damaged by 9/11 and its aftermath than US carriers, the major European airlines are shedding staff and capacity while still incurring heavy losses. They are experiencing increasing difficulties in sustaining their networks, especially in terms of the balance between costs and yields and have yet to formulate an effective strategy against the explosive growth of LCC sector, which is proving to be the most important outcome of liberalization in Europe (Lawton, 2002).

The difficulties experienced by the major US and EU carriers since 2001 also have important ramifications for the regulatory environment controlling international air transport. At the international scale, air service provision between countries has been controlled historically by bilateral agreements, negotiated between pairs of governments. The basic principle of all bilaterals is reciprocity or equivalency, the agreements covering fares, capacity, frequency, number of carriers and routes flown. Since the imposition of domestic airline deregulation, the US government has pursued a global policy—congruent with US national interests—to liberalize international bilaterals. Most recently, it has sought so-called ‘open-skies’ bilaterals, allowing unrestricted market entry and code-sharing alliances (in which one service is operated under the flight codes of two airlines). This version of ‘open skies’ has been accompanied by the offer of anti-trust immunization for various airline alliances and mergers. Critics point, however, to the hypocrisy of the US position, citing regulatory constraints on the ownership of US airlines, internal cabotage which sees the US domestic market closed to foreign competition, and the Fly America Act which requires that employees of the US government must travel abroad on US flag-carriers. The logical outcome of full ‘open skies’ is the replacement of bilateral with multilateral agreements, in which groups of like-minded countries permit any airline virtually unlimited access to any market within their boundaries. While this has occurred to some extent within the EU, Member States did remain

| City          | Passenger change (m) | Percentage change (decline) |
|---------------|----------------------|----------------------------|
| Miami         | 0.47                 | 5.66                       |
| Houston       | (0.91)               | (12.5)                     |
| Minneapolis   | (1.13)               | (20.2)                     |
| Boston        | (1.47)               | (19.2)                     |
| New York      | (1.66)               | (8.9)                      |
| Washington/BWI| (1.73)               | (12.3)                     |
| Atlanta       | (1.93)               | (16.8)                     |
| Dallas        | (2.11)               | (19.2)                     |
| Chicago       | (2.32)               | (13.4)                     |
| Los Angeles   | (3.31)               | (16.6)                     |
| San Francisco | (7.88)               | (45.9)                     |

Fig. 2. Change in origin–destination passengers, 2000–2002 (Source: US Department of Transportation and authors’ calculations).
responsible for individual negotiation of bilateral rights, European Commission authority being restricted to intra-EU services. In 2003, however, the Commission was accorded power to negotiate international air service agreements on behalf of all EU Member States.

Global airline alliances are both products of and further catalysts for the continuation of these processes, and also provide a means of circumventing at least some of the remaining restrictions on international services. Until the merger of Air France and KLM announced in 2003 and approved by the European Commission in 2004, there were three principal groupings, Star, oneworld (sic) and SkyTeam, plus the unnamed KLM/Northwest alliance, which was actually among the oldest and most intense examples of international airline collaboration (Fig. 3, Table 2). These three alliances plus KLM/Northwest accounted for 63% of all IATA airlines’ scheduled international passenger kilometres in 2001, Star being the most important (25%), followed by oneworld (19%), SkyTeam (12%) and KLM/Northwest (7%) (IATA, 2002).

2.3. Sustainability

As Upham (2001) argues, sustainability means different things to different people at the level of both principle and detail. In general (although there are many local exceptions), the environmental objectives of sustainability are currently accorded more importance in policy-making within the EU than in the US, if only because aircraft noise is always going to be a major issue in the densely populated and most affluent regions of north-west Europe. These initiatives, however, are probably more often driven by concerns over congestion than the environment per se. The thrust of air transport policy in the US and EU has been shaped by the shared concern to introduce, implement and protect the competitive marketplace. Nevertheless, as is a characteristic of all transport modes, such policies do not encourage individual restraint in the use of environmental resources on the part of any one airline, because such actions would not be “compatible with rational self-interest, not least while any other [company] reserves the right to use the resource [whichever] as much as they choose” (Maddison, 1996, p. 10).

Greene and Wegener (1997) argue that sustainability as applied to transport has three basic conditions, that:
1. the rates of use of renewable resources do not exceed their rates of generation;
2. the rates of use of non-renewable resources do not exceed the rate at which sustainable renewable substitutes are developed; and
3. the rates of pollution emission do not exceed the assimilative capacity of the environment.

In the case of air transport, the principal environmental sustainability externalities are

- Noise from aircraft engines, airframes and ground traffic;

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**Table 2**

Airline global alliances (March 2004)

| Alliance | Member airlines | Notes |
|----------|----------------|-------|
| Star     | Air Canada, Air New Zealand, All Nippon Airlines, Austrian Airlines Group, bmi British Midland, LOT Polish Airlines, Lufthansa, SAS Scandinavian Airlines, Singapore Airlines, Spanair, Thai, United Airlines, Varig | Both Air Canada and United sought Chapter 11 bankruptcy protection in 2002. Mexicana left Star in 2004 |
| Oneworld | Aer Lingus, American Airlines, British Airways (BA), Cathay Pacific, Finnair, Iberia, LAN-Chile, Qantas, Swiss International | Crucially, oneworld lacks US anti-trust immunity for the relationship between its two most powerful members, BA and American Airlines, a factor that significantly disempowers the entire alliance |
| SkyTeam  | Aeromexico, Air France, Alitalia, Czech Airlines, Delta Air Lines, Korean Air Lines | The repercussions of the Air France/KLM merger for the KLM/Northwest alliance is as yet unclear |
Atmospheric pollution, especially from the effects of contrails in the upper atmosphere, nitric oxide/nitrogen dioxide (collectively NO\(_x\)), and carbon dioxide (CO\(_2\)), the principal cause of global warming;

- Terrestrial pollution at airports, both airside and landside including water pollution from surface run-off, waste and congestion;
- Rate of aviation fuel use exceeding the rate at which substitutes are being developed, thus driving up costs for fuel.

Upham et al. (2003, p. 16) argue that “aviation is moving in an unsustainable direction due to absolute increases in environmental consumption and emissions”. The industry itself, in so far as it pays cognisance to any environmental constraints, seems to be pinning its hopes on the development of low-carbon surface transport, which might allow air transport to benefit from the emissions trading proposed in the 1997 Kyoto Protocol on atmospheric emissions. For example, the proposals aimed at ameliorating the environmental externalities of air transport contained in the UK White Paper, The Future of Air Transport, published in December 2003 (Department for Transport (DfT), 2003), depend almost entirely on emissions trading, even though aviation falls outside the Kyoto Protocol. Public opposition to aviation, which is both situationally and culturally determined, tends to focus primarily on noise rather than emissions. Whereas modern aircraft are quieter than their predecessors, it is the volume of traffic—both airside and landside—that compounds public exposure to noise, particularly for residents in the hinterlands of major airports. In general terms, internationally negotiated and implemented noise controls have largely realised the potential returns from aircraft engine noise reduction, and future gains are most likely to come from advances in airframe technology. ICAO is introducing globally binding ‘Chapter 4’ noise regulations by 2006. These will be defined as the current Chapter 3 rules minus 10 decibels. This is not as large a reduction as it sounds because the 10 decibel reduction is cumulative, being measured at three points, none of which can exceed Chapter 3 limits. In actuality, these regulations will make little difference in the UK or Europe where reasonably young aircraft fleets mostly already comply with the proposed Chapter 4 rules. Noise—or at least its perception—continues, however, to dominate the relationship between an individual airport and its local community, leading to a plethora of often-stringent local operating regulations constraining aircraft operations. One important example is the London Heathrow QC2 measurement of take-off noise at maximum weight. Large aircraft, which are Chapter 4 compliant at all weights, may not actually meet such local limits without reduced payloads.

It is becoming more widely recognised, however, that the most serious sustainability impacts of air transport stem from atmospheric pollution at both global and local scales. It is estimated, for example, that aircraft emissions have increased NO\(_x\) “at cruise altitudes in northern mid-latitudes by approximately 20%” (IPCC, 1999, p. 31). Because of aviation’s growth and the lack of alternatives to fossil fuels, the sector’s current 3% contribution to global warming may increase to between 10% and 20% of the total by 2005 (IPCC, 1999). In addition, ground level emissions at airports, both from aircraft and surface vehicles, are increasing, a trend exacerbated by the development of airports as major economic activity centres and intermodal transportation hubs. In general terms, however, although again technology has been successful in reducing atmospheric and ground emissions per individual aircraft and vehicle, the technological returns are diminishing and being offset by aviation’s long-term growth. In the longer-term (perhaps 2050+), global air transport is not sustainable on any basis because there is, as yet, no feasible renewable fuel to replace oil, hydrogen-based fuels being the only apparent possibility. Fuel costs will inevitably rise as traditional sources become increasingly depleted and other more costly substitutes are developed.

As observed above, the definition of sustainability conflates a concern with environmental carrying capacity with strategies for long-term economic development, social needs and equity. Such targets, especially when applied to more peripheral or disadvantaged regions, demand accessibility to core regions as measured by time and cost, while the access of isolated areas to wider networks is a basic social equity objective. Firms also require accessibility to factors of production and markets. However, the infrastructure created to enhance accessibility also encourages mobility, which is essentially a behavioural attribute, and moreover one easily manipulated by price. Arguably it is the provision and ready availability of cheap mobility, best exemplified here by the growth of LCCs, which provides the basic challenge to the environmental dimension of sustainability. This issue is rendered more complex, however, by the democratic, socially inclusive nature of low-cost air transport, which allows more people to fly more often. As John Spellar, the then UK Minister for Transport, remarked in 2002, “people who call for demand to be managed are saying that workers should be priced off planes” (Spellar, 2002).

Thus even at this most cursory level of analysis, it is apparent that a complex mesh of tensions and contradictions, which have difficult ramifications for policymakers, is produced by the relationships between air transport and sustainability. Indeed, such tensions exist simply within the concept of sustainability itself as it embraces the often-conflicting goals of environmental protection, long-term economic development, and social inclusion. To summarise, even before the crisis of 2001 and its aftermath, policies and strategies that might have
curbed or diminished the environmental externalities of air transport were likely to have been swamped by those promoting its development. While air transport is almost entirely a derived demand, one result of liberalization and privatization is that its provision is now dominated by the interests of private or quasi-private sector airline and airport companies. Although the latter may be constrained in that they have to interact much more directly through the planning processes than do airlines with other public concerns and demands, the marketing strategies of both airlines and airports may impact directly and negatively on the attainment of sustainability objectives. These tactics strive to achieve precisely the opposite effect to the demand management of mobility implied in the concept of sustainability. They are aimed instead at enhancing air transport demand and increasing volumes of traffic. Airlines and airports as businesses have no rational alternative but to cater to existing markets in ways that generate most profit, while fostering future growth.

In that conundrum lies the principal dilemma compromising the entire idea of reconciling aviation growth and sustainability, whether in the US, EU or globally. The evidence from the 2003 UK White Paper suggests, for example, that the reductions in airline costs and fares created by the low-cost model are “sufficient to offset the fall in demand expected from the impact of any economic instruments” such as a fuel tax which would help fulfill the “commitment for aviation to pay for its environmental impacts” (DfT, 2003, p. 150). Although this is essentially an argument for non-intervention by government, implicit in these remarks is the recognition that aviation should be linked in some way with the notion of demand management. As is the case throughout the EU, the UK government is not going to activate such a policy except in the negative sense of not providing sufficient airport capacity to accommodate growth. In sum, therefore, the axes linking globalization and liberalization in their triangular relationships to sustainability, which were already weak, have arguably been further diminished by the effects of 9/11 and its aftermath. This again demonstrates that policies which mitigate the environmental impacts of transport “are frequently dwarfed by countervailing market developments” (Greene and Wegener, 1997, p. 180).

3. The globalization/liberalization/sustainability nexus

3.1. EU and US perspectives

Marked variations in attitudes to sustainable air transportation between the EU and US reflect a suite of geographical, historical, and cultural differences relating to: airline corporate cultures and images; public accountability; airport capacity constraints; policy/institutional contexts; the multinational evolution of EU airline networks; and broader ideological distinctions as reflected in attitudes to state intervention, spatial planning and regulation. In general terms, we suggest that there are three levels at which air transport sustainability externalities might be addressed:

- to make current operation of aircraft and ground transport vehicles cleaner, more fuel efficient, and less noisy without directly addressing curbs on demand;
- to encourage shifts from air transport to more sustainable modes of transport;
- to limit or reduce the demand for air travel and reduce its traffic volume.

The US sustainable transport initiative in general has largely been confined to strategies that mitigate the environmental impacts of transportation without infringing upon the individual freedom to travel. Most of the effort has targeted motor vehicles and their impacts at the metropolitan scale. Interest in air transport and sustainability has focused on impacts from new and expanded airports, with much less concern being expressed about aviation’s overall sustainability consequences. The US Government’s 2001 refusal to ratify the Kyoto Protocol marks the quintessential example of the country’s current attitudes to global environmental concerns.

In sustainability terms, the EU looks to a transport strategy which attempts to reconcile demand management of mobility for environmental reasons with competing demands for accessibility related to: the need for competitive efficiency; the EU commitment to geographical accessibility and social equity for all its citizens; and environmentally sustainable development (Button and Nijkamp, 1997). The EU’s Fifth Environmental Action Programme, endorsed in 1993 and subtitled, “Towards Sustainability”, identified transport as one of five target sectors. The Programme argued that trends in air (and road) transport were leading towards greater environmental costs—congestion, pollution, wastage of time and value, damage to health, and danger to life (CEC, 1996). Nevertheless, even a cursory examination of more recent EU policy makes it difficult to avoid the conclusion that environmental sustainability is of subsidiary importance in the European Commission’s regulation of air transport (CEC, 1997, 1998).

As of March 2004, the EU lists 14 priority legislative areas for air transport. Bearing out the general point that air transport regulators are more concerned with imperfections in the liberalized market-place, only two of these are related to environmental concerns: integrating the environment into air transport, and management of noise at Community airports (CEC, 2002). The White Paper, EU Transport Policy for 2010 (CEC, 2001), acknowledges that air transport in the EU, which is set to double between 1990 and 2010, currently produces
13% of all CO₂ emissions attributable to transport. Although taxes are being considered on kerosene, as are the possibility of value-added tax (VAT) on airline tickets and the integration of environmental costs into charging systems, the principal policy initiative is the creation of the Single European Sky to promote a more efficient use of airport and airspace capacity and thereby reduce the delays that push up fuel consumption. Again, however, a policy that reduces congestion (and thereby potentially encourages more travel) becomes conflated with environmental sustainability, which, ultimately, must have the goal of reducing the growth in demand for air transport. The EU is also committed to reducing noise nuisance from aircraft, individual airport operators being permitted to introduce operating restrictions including the gradual withdrawal of the noisiest aircraft (CEC, 2002; Thomas, 2003).

The weaknesses of the regulatory regimes applied to air transport in both the EU and US to realise the environmental dimensions to sustainability, underlines the importance of aviation industry stakeholder strategies in the liberalized, globalized market-place. The explicit conclusion which can be drawn from our earlier discussion of levels of response to transport sustainability conflicts is that these are likely to involve curbs on mobility. Nevertheless, we argue that the strategies of airlines in the competitive marketplace, often aided by the activities of regulatory authorities, strive to achieve precisely the opposite effect. These, unsurprisingly, are aimed at enhancing demand for air transport and increasing volumes of traffic. Curiously, however, it should not axiomatically be assumed that these aims are inconsistent with sustainability principles, because they might conceivably lead to more efficient use of aircraft and airports. Consequently, these strategies can be assessed in terms of the balance between their negative and positive contribution to sustainability. We focus here on two key airline strategies: network dynamics, in particular the role of hub-and-spoke networks and the paradoxical escalation in the importance of point-to-point routes; and the function of frequency as a principal airline competitive tool.

### 3.2. Network strategies

In both the EU and US, hub-and-spoke systems represent an essentially supplier-driven strategy, maximizing the on-line (same carrier or alliance) connections available to a particular airline at the hub airport. Strictly speaking, a hub is an integrated air transport interchange through which normally a single carrier operates synchronized banks—or waves—of flights. In these, the hub-arrival times of aircraft, originating from cities at the ends of numerous spokes, are co-ordinated into a short time period. After the minimum interval necessary to redistribute passengers and baggage, an equally large number of aircraft departs to the spoke cities. This pattern is repeated several times during the day (Dennis, 1994; Graham, 1995).

Hub dominance has been seen as a large incumbent’s most effective defensive tactic in a liberalized market because, especially when combined with airport congestion and linked to an alliance strategy, it offers the real possibility of pre-empting—or at least controlling—competition at a particular airport. The strategy also avoids the costs incurred by split hub operations of the sort which British Airways (BA) tried at London Heathrow and Gatwick and which elsewhere has led, for example, to the closure of Montreal Mirabel to passenger services and a total concentration of traffic at the original and capacity-constrained Montreal Dorval. Efficient hub operation is dependent upon available runway and terminal capacity to handle the peaks, combined with extensive feeder connections, often employing smaller aircraft operated by regional airlines. Thus BA lobbied hard for a third runway at London Heathrow, one of the key recommendations included in The Future of Air Transport (DfT, 2003; Graham, 2003). While widely interpreted as the UK government coming down on the “side of aviation and the national interest rather than caving into the increasingly vociferous environmental lobby” (Flight International, 2003, p. 3), ultimately a third Heathrow runway will be constructed only if it can be shown to comply with mandatory European regulations for NO₂ which involves the reduction of emissions from aircraft and airport-related road traffic (DfT, 2003).

Because of environmental constraints and even given, for example, the construction of the additional runways at Heathrow and Stansted, approved in the UK White Paper, the US hub-and-spoke model, with its dominant carrier and dedicated terminals and gates, cannot be replicated fully in the EU, largely because of existing restrictions on airport capacity which, de facto, constitute a form of demand management. As the director general of Airports Council International (ACI) Europe remarked: “the main barrier to airports [in Europe] investing in airport capacity increases is environmental, not financial” (Flight International, 2004, p. 13). One of the aims of the European dimension to airline global alliances is therefore to bring together national carriers with complementary hubs, a factor that seems to be one of the most important issues driving the Air France-KLM merger. Even in the US, where airport capacity is often less of an issue, American Airlines has modified its Dallas/Fort Worth operation to a ‘rolling hub’, which essentially means that the carrier offers such a volume of flights that passengers can be offered reasonable onward connections without having the traffic peaks and airport capacity problems incurred by the traditional hub model and its waves of flights.
The process of hub concentration is being accompanied by an apparently contradictory trend towards dispersal. The liberalization of bilaterals has produced a ‘fragmentation’ of intercontinental routes, first seen in the North Atlantic but now increasingly apparent in other markets, which is leading to more flights by smaller aircraft serving a much larger number of gateways. The Boeing 767 and 777 and the Airbus A330 have emerged as the definitive transatlantic aircraft. Lufthansa has even introduced Airbus A319 and Boeing 737-700 aircraft fitted with fewer than 50 business-class seats on certain thin but high-yield transatlantic routes. Meanwhile, in 2004, Singapore Airlines introduced very long-range 200 seat Airbus A340-500s on Singapore–Los Angeles/New York (18h non-stop flights). These initiatives reflect the ways in which globalization encourages long-distance interaction, thereby elongating supply lines and demanding the use of smaller vehicles. Transport demand in general for both passengers is becoming more customized and dispersed, the continuing demand for face-to-face contact requiring more low-density routings.

Within the EU, this long-haul fragmentation is being replicated at the regional scale by the rapid expansion of hub-bypass city-pairs, increasingly serviced by regional jets although this process is less apparent in the US, where regional jets are more likely to be employed as hub feeders. Although such dispersal may have beneficial effects for reducing congestion at individual airports, the increased air traffic movements generated by the additional services compound the negative effects of air transport on global air quality.

More important, however, in this regard has been the growth of the point-to-point LCCs. Southwest Airlines has long eschewed hubs in favour of point-to-point service and secondary airports, a model pioneered in Europe by Ryanair. The LCC strategy is effectively a form of yield management in which low operating costs becomes the grail. Their expansion demonstrates that price can create markets, albeit largely located within the regions already most densely served by existing carriers. Although LCCs use aircraft very efficiently, it can be argued that their overall impact is to contradict principles of sustainability in that they contribute to air transport congestion while encouraging growth in mobility by pricing mechanisms and adding to aggregate air transport emissions and noise. Moreover, the LCCs are negotiating highly advantageous terms in relation to airport charges and handling while small airports cannot generate sufficient income from landside activities to compensate for this form of financial support. Therefore, LCCs are effectively being subsidized by regional authorities, airport companies and other agencies.

Airbus and Boeing, the two companies that dominate global aircraft manufacturing, have diametrically opposed perspectives on the hub-and-spoke concept. Airbus, which estimates that the current woes of the airline industry will lead to a loss of one year’s traffic through 2020, compared to pre-9/11 predictions, argues that “in response to increasingly severe cost pressures, established airlines [as distinct from LCCs] will be driven even further to improve the efficiency of their route networks and to use low-unit-cost aircraft”. This will involve the replacement of point-to-point systems by “lower-cost, lower-fare ‘hub’ systems” (Airbus, 2002, pp. 13 and 17), a process facilitated by the global alliances more effectively utilizing their individual partners’ hubs. Thus Airbus sees large aircraft (like its A380) catering for the bulk of long-haul passengers concentrated in the world’s major centres of population and being moved across hubs. Meanwhile, high-yield traffic will demand direct, frequent non-stop point-to-point flights. On this point, Boeing concurs but its fragmentation model sees large aircraft being flown only “on dense routes by a limited number of airlines”. Instead, “most growth in the world’s airlines will manifest as increased frequencies, more non-stops, and new city pairs served by small- and intermediate-size airplanes” (Boeing, 2003, p. 14). Hence 2003 saw the market launch of the 250-seat medium-long range Boeing 7E7 ‘Dreamliner’.

Both Airbus and Boeing function to sell aircraft so their market forecasts do not emphasize sustainability issues. Indeed, they do not even mention them. Hub-and-spoke operations have both positive and negative impacts on sustainability issues. It can be argued that hubs lead to more efficient use of aircraft and have operating efficiencies that increase the range of potential destinations, particularly for small cities which cannot sustain direct point-to-point services. The negative effects include the concentration of traffic at a few airports, inevitably those already most constrained by capacity shortages and largely located relatively close to each other, because of the patterns of dominant traffic flows and the location of the urban regions that generate the maximum demand for air transport. The waves also demand a large number of flights by small regional aircraft which may not represent the most effective use of scarce airport capacity. The fragmentation model, however, is clearly inimical to sustainability considerations, requiring the more frequent operation of smaller vehicles which increases the environmental costs per passenger trip. Indeed Boeing’s now-abandoned proposal for a ‘Sonic Cruiser’ catering for high-yield passengers prepared to pay premium prices for speed was widely condemned in Europe, not least because of its sustainability externalities. It remains curious that the company in its propagation of fragmentation seems—at least publicly—oblivious to the obvious criticism that this model is the antithesis of environmental sustainability. That it is arguably more congruent with the economic and social connotations to sustainability only points again to the latent contradictions within that concept.
3.3. Frequency as an airline strategic tool

Some of the trends identified above thus contradict arguments that the projected growth of demand for air transport can, at least in part, be accommodated by the use of larger aircraft, even though part of Airbus’s business strategy is predicated on this case. Larger aircraft have better seat/mile costs and do offer a means of enhancing capacity at given airports without increasing departures. They also offer better fuel consumption per passenger than smaller aircraft. However, the downward pressure on aircraft size created by both hub-and-spoke and fragmentation point-to-point strategies is compounded by the importance of frequency. “Airport congestion has had only a modest influence on airline fleet requirements” (Boeing, 1998, p. 28). It is readily apparent that the hypothetical use of larger aircraft conflicts with the evidence that “airlines will continue to pursue strategies that accommodate growth primarily through additional frequencies” (Boeing, 1997, p. 3). The airline concern with frequency as the primary means of accommodating growth stems from its role as a—if not the—primary form of non-price competition. For example, competitive market entry demands a matching of frequency with that of the incumbent carrier(s). The mix of aircraft in both US and EU airline fleet is being driven by the need to capitalize on frequency in the competitive market-place, market share being maximized by frequency share, which essentially demands smaller aircraft. Boeing (1998) estimates that 70% of aircraft deliveries over the decade from 1996 to 2006 will be single-aisle models (mostly fewer than 200 seats), which will account for 71% of the world fleet by 2006, dropping only marginally to 69.1% in 2016.

In terms of the relationships between the frequency strategy and sustainability, it could be argued that these trends encourage the use of smaller, quieter aircraft. It is the case, however, that there is no direct correlation between aircraft size and noise. While some large aircraft (such as the Boeing 777 and Airbus A330) perform well in terms of noise, others do not, the Boeing 747-400, for example, being barely Stage 3 compliant under certain conditions of weight and weather. Again, some smaller 50-seat regional jets such as the Bombardier CRJ and Embraer EMB145 are relatively noisy. In the UK, “larger aircraft and sound improvements in engine technology have meant that the areas and numbers of people affected by noise around many airports have not been increasing as quickly as air transport movements and aircraft passenger numbers” (Department for Environment, Food and Rural Affairs, 2004). Conversely, noise issues aside, although consumers benefit from more frequent services, there is substantial evidence to suggest that the negative sustainability effects of the widespread use of relatively small aircraft (defined as the sub-optimal use of scarce capacity resources) are compounded by unimpressive load factor statistics. This reduces ‘slot productivity’ so that, for example, many major EU airports rarely exceed 100 passengers/commercial aircraft movement.

4. Conclusions

As indicated by this discussion of two examples of current air transport strategies in the liberalized market place serves, the development of a policy agenda for air transport-sustainability relationships is going to be a complex process, even without the context of post-9/11 industry crisis. The key issue for research is to determine if these tactics exacerbate the sustainability externalities of air transport by increasing air traffic at a rate greater than that required by demand. Clearly, the tactics driven by globalization and liberalization have, at best, unpredictable consequences in terms of sustainability, particularly given the fragmented regulatory response. Airlines as businesses have no rational alternative but to cater to existing demand in ways that are most profitable, while fostering future demand. As posited in the introduction to the paper, it can be argued that globalization and liberalization strategies have rationalized the airline industry into a more efficient operation that enhances long-term sustainability. But the analysis here suggests that the alternative interpretation, which argues that globalization and liberalization have resulted in excessive air traffic growth and wasteful competition, is more plausible. The succession of crises between 2001–2003 notwithstanding, growth in air transport is exacerbating its negative social and environmental externalities and is incompatible with long-term sustainability objectives, particularly as air transport does not internalise its external costs.

It seems more probable that the current crisis, no matter how deep—according to IATA, 2001 was the worst year ever for air transport—is a short-term decline in a long-term cycle of growth. There may be permanent repercussions in, for example, operating strategies or the balance of power within the airline industry, or the potential of ICT and intermodal substitution for air travel. High-yield traffic may never come back. But the explosive growth in LCCs in both the US and the EU will more than compensate for any loss in network traffic. Prior to 9/11, it could be stated that environmental sustainability issues constituted the greatest challenge facing the air transport industry and that their importance could only escalate. Now, the financial sustainability of the airline industry is the overwhelming concern but, if this is essentially the short-term crisis that the airline industry claims it to be, the longer-term predictions of growth will again bring environmental sustainability to the fore. If regulators still focus unduly on the globalization-liberalization axis of the globalization/
liberalization/sustainability triangle, and—as the UK White Paper may well indicate—there is no doubt that the current crisis has accentuated this gaze, the long-term growth in air transport must eventually bring issues of sustainability back into play.

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