Chapter 1
Aviation Industry and Environment Crisis:
A Perspective of Impacts on the Human, Urban and Natural Environments

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ABSTRACT

This chapter was prepared based upon an invitation made by the Conference organizers, to be presented by the author as opening keynote speaker to highlight "Aviation Industry and Environment Crisis" and focus on the impacts on the human, urban and natural environments. The importance and various dimensions of the issue have been reported by the IPCC following a request from the ICAO and the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer in 1999.

INTRODUCTION AND BACKGROUND

This paper was drafted based on the Special Report that was prepared by the Intergovernmental Panel on Climate Change (IPCC) following a request from the International Civil Aviation Organization (ICAO) and the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer (IPCC, 1999). In this context, the state of understanding of the relevant science of the atmosphere, aviation technology, and socio-economic issues associated with mitigation options is assessed and reported for both subsonic and supersonic fleets. The potential effects that aviation has had in the past and may have in the future on both stratospheric ozone depletion and global climate change are covered; environmental impacts of aviation at the local scale, however, are not addressed.

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Furthermore, based on the aforementioned report, the paper takes into consideration all the gases and particles emitted by aircraft into the upper atmosphere and the role that they play in modifying the chemical properties of the atmosphere and initiating the formation of condensation trails (contrails) and cirrus clouds. Subsequently, the paper considers (a) how the radiative properties of the atmosphere can be modified as a result, possibly leading to climate change, and (b) how the ozone layer could be modified, leading to changes in ultraviolet radiation reaching the Earth's surface. The paper also considers how potential changes in aircraft technology, air transport operations, and the institutional, regulatory, and economic framework might affect emissions in the future. The paper does not deal with the effects of engine emissions on local air quality near the surface (IPCC, 1999).

In view that airports constitute considerable part of the communities within which they operate, as such, reducing their impact on the environment is a major focus for many around the world. While much of the current attention is on climate change and reduction of greenhouse gas emissions, it is just one of a number of areas that airports and the rest of the aviation industry are active in the environment (ACI, 2009).

Although the environmental stresses to which man is subjected on the ground are less than those commonly encountered in aviation or under water, they may still exceed an individual's powers of adaptation (Sloan, 1975). Accordingly, several meetings and summits related to the "Aviation & Environment" were held over the past few years around the world, in order to discuss this important issue.

AVIATION: DEVELOPMENT AND IMPROVEMENT

The oldest testimonies about man's efforts to learn how to fly dates from the time of ancient civilizations, accordingly, aviation development leads to engine burning, and when aircraft engines burn fuel, they produce emissions that are similar to other emissions resulting from fossil fuel combustion. However, aircraft emissions are unusual in that a significant proportion is emitted at altitude. These emissions give rise to important environmental concerns regarding their global impact and their effect on local air quality.

Development

The results show that due to the high growth rates of international transport expected under the chosen scenario, by 2050 the share of unabated emissions from international aviation and shipping in total greenhouse gas emissions may increase significantly from 0.8% to 2.1% for international aviation (excluding non-CO_2 impacts on global warming) and from 1.0% to 1.5% for international shipping. Although these shares may still seem rather modest, compared to total global allowable emissions in 2050 in a 450 ppm stabilization scenario, unabated emissions from international aviation may have a 6% share (for CO_2 only) and unabated international shipping emissions have a 5% share. Thus, total unregulated bunker emissions account for about 11% of the total global allowable emissions of a 450 ppm scenario (European Commission, 16 May 2007).

Furthermore, the incorporation of the non-CO_2 impacts of aviation on climate change into the UNFCCC accounting scheme for GHG emissions could be considered, since aviation is a special case in this respect where the non-CO_2 impacts make a significant contribution. The inclusion of the global warming impact of non-CO_2 emissions, of which a significant fraction originates from NOx emissions (through ozone formation), would increase the share of international aviation emissions in 2050 from 6% to 17% (European Commission, 16 May 2007).