



INTERNATIONAL CIVIL AVIATION ORGANIZATION

MIDDLE EAST OFFICE

ICAO SPECIAL IMPLEMENTATION PROJECT (SIP)

**WORKSHOP ON THE DEVELOPMENT OF BUSINESS CASE FOR THE
IMPLEMENTATION OF CNS/ATM SYSTEMS**

(CAIRO, 6 – 9 SEPTEMBER 2004)

**ENVIRONMENTAL BENEFITS OF COMMUNICATION, NAVIGATION,
SURVEILLANCE/AIR TRAFFIC MANAGEMENT (CNS/ATM) SYSTEMS**

SUMMARY

Although there is growing attention being given to aviation's impact on the environment, there is little understanding outside of the aviation community as to what aviation is doing to address these concerns. One of the success stories is the implementation of communication, navigation, surveillance /air traffic management (CNS/ATM) technologies. The International Civil Aviation Organization's (ICAO) Committee on Aviation Environmental Protection (CAEP) is assessing those environmental benefits and the resulting study will aid member States in implementation decisions, and provide an example of aviation's commitment to the environment.

Action by the workshop is in paragraph 7

1. BACKGROUND

1.1 There is growing attention being given to aviation's impact on the environment – both its contribution to global climate change (i.e. global warming), and to its impact on local air quality. ICAO's environmental committee (CAEP) is actively addressing these issues in a three-tiered approach to reduce aviation emissions from aircraft and other aviation-related activities, and to mitigate their impacts. These three tiers are technology, operational measures, and market-based (economic) options.

1.2 Historically, ICAO activities have been directed at improvements in methods for measuring gaseous emissions and at considering increases in stringency of the standards. At the same time, the industry has worked to maximize efficiency through better technology and improved operating methods.

1.3 As a result, significant reductions in aviation emissions have been realized. Since the early 1960's, relative fuel use per passenger seat has declined 70% with corresponding reductions in aircraft

engine emissions. The aviation industry has reduced this impact even more by initiating more efficient operational measures. More recently, CAEP has begun to consider operational measures that have the potential to reduce aviation emissions, including CNS/ATM implementation.

2. DISCUSSION

2.1 The United Nations Framework Convention on Climate Change (UNFCCC) charged the international civil aviation community to "pursue the limitation or reduction of emissions of greenhouse gases...from aviation" and to report back to the Framework Convention.

2.2 Further, the Intergovernmental Panel on Climate Change (IPCC) Special Report on Aviation and Global Atmosphere (1999), concluded: "As the aviation industry grows more and more rapidly, the impact of air traffic operations on the global atmosphere becomes increasingly important. Efforts to control or reduce the environmental impact of air traffic have identified a range of options that might reduce the impact of aviation emissions. In particular, it is expected that improvements in air traffic management (ATM) and other enhanced operational procedures for air traffic systems could help reduce aviation fuel burn, and thereby reduce the levels of aviation emissions."

2.3 ICAO is addressing these report conclusions. In one key area, CAEP has embarked on a study of the environmental benefits that might be realized from implementation of new ATM systems. This analysis focuses on the impacts due to changes in the air traffic environment brought about by the implementation of these systems.

2.4 To support this work, CAEP is using the joint resources of EUROCONTROL and the United States Federal Aviation Administration (FAA). Under the aegis of CAEP, a modeling capability was developed to quantify the impact of CNS/ATM systems on global emissions. This capability was the first step toward a common methodology that could be used globally to evaluate the impact CNS/ATM systems might have on reducing fuel consumption and related emissions.

2.5 The initial U.S. study done in 1998 had shown potential annual savings of over 10 billion pounds of fuel (6%), over 200 million pounds of both NO_x (10%) and CO (12%), and 60 million pounds of HC (18%) compared to what would have resulted without the CNS/ATM improvements. CAEP's goal was to validate and refine this approach, and to expand the study outside of the United States.

2.6 The study looked at both in-flight and ground operations. It consisted of expanding the study of global emissions and fuel usage and evaluating the impacts of various CNS/ATM enhancements with special emphasis on European air traffic within EUROCONTROL. To support the ongoing work within CAEP, EUROCONTROL supplied inputs necessary to evaluate the European airspace as well as to assist with the evaluation of the model.

2.7 In contrast with some previous studies in this domain, potential benefits from CNS/ATM were based on published implementation strategies. In the case of the United States, their National Airspace Architecture was used (reflecting updates since the original 1998 study), and for Europe (ECAC), the EUROCONTROL ATM 2000+ strategy document was used.

3. RESULTS OF THE INITIAL STUDY

3.1 Within the timeframe under consideration (1999-2015) at the time of the study, global air traffic was expected to increase by around 61% (these are pre 9/11 forecasts from ICAO). In the same time period, fuel consumption and CO₂ emissions were projected to increase by just 37%.

3.2 Fuel burn and CO₂ emissions are growing less quickly than traffic because of the introduction of more efficient engine technology coming into the fleet due to aircraft retirement and fleet expansion. This reflects the already strong commitment of the aviation industry for fuel conservation and the consequent emission reductions.

3.3 The preliminary results of this study show that by 2015, there would be a 5% reduction in total fuel burn and CO₂ emissions in the regions studied even with forecast growth factored in.

3.4 The table below shows a summary of the annual fuel and CO₂ savings for 2015 from CNS/ATM improvements for both the United States (CONUS) and Europe (ECAC). The results are displayed by flight segment.

Percent Annual Fuel & CO₂ Savings by 2015 due to CNS/ATM

FLIGHT SEGMENT	CONUS	ECAC
Above 3000'	5 %	4 %
Below 3000'	5 %	7 %
Surface	11 %	3.0%
Whole flight	5 %	5 %

Preliminary results show savings of a similar order of magnitude for NO_x, HC and CO, but this extrapolation would be subject to further analysis, verification and validation.

4. ADDITIONAL REGIONAL STUDIES

4.1 The intent of ICAO/CAEP is to expand this initial study into a global study by completing analysis of the CNS/ATM implementation plans from all regions of the world. As in the initial study, it is hoped that the regional studies can be based on published implementation strategies. To assess the benefits of CNS/ATM, it will be necessary to gather operational data to establish a baseline, then to apply planned CNS/ATM improvements to that baseline along with traffic and infrastructure (airport growth, etc.) forecasts.

4.2 Since the initial study, new modelling capabilities have been developed. The CAEP working group is looking into the use of these new capabilities as it prepares to expand the study globally. No matter how the working group decides to proceed, or what models it will use, data is needed from ICAO member States to complete the study.

4.3 There are two main benefits that can be derived from this study. First, ICAO regions will have, for the first time, an understanding of the environmental benefits available through the implementation of CNS/ATM, and the changes in those benefits based on different implementation decisions. Second, there will be a clear message to the global community on one of the major environmental initiatives being taken to address aviation emissions.

6. CONCLUSION

6.1 Initial studies show that the implementation of CNS/ATM systems will provide an environmental benefit in the form of decreased fuel usage and the related reductions in gaseous emissions. In a period when the aviation industry is being asked to do more to reduce the emissions related to aviation activities, it is important to fully utilize efficiency improvements available from CNS/ATM implementation – and to measure the inherent environmental benefits.

6.2 As this study progresses, it will be important for the cooperation of member States in either providing or helping to obtain operational data needed by the models. It is important for the aviation community – operators, manufacturers and air traffic service providers – to show the global community what it is doing to address its environmental responsibilities.

7. ACTION BY THE WORKSHOP

7.1 The workshop is invited to:

- a) note the need to make the assessment of environmental benefits of CNS/ATM systems;
and
- b) support the continued work of CAEP to assess and promote the environmental benefits of CNS/ATM.

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