国 际 民 用 航 空 组 织

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19/10/09

工 作 文 件

第十届统计专业会议

2009 年 11 月 23 日至 27 日，蒙特利尔

议程项目 14：国际民航组织的战略目标及相关衡量标准

对不同的关键绩效指标的审查

（由秘书处提交）

概要

大会第 35 届会议期间做出了提高国际民航组织的效率和有效性的决定。为了监测本组织工作方法的改进情况而制订出若干项战略目标。这些目标阐述了国际民航组织的中期优先项目，并为国际民用航空提供了一个全球框架。国际民航组织对于监测战略目标持续具有针对性给予高度重视，以保持它们继续发挥作用。作为不断提高国际民航组织的效率和有效性工作的组成部分，制定了高层次指标（HLIs），藉以协助理事会确定实现本组织战略目标的总体进展情况，以及更好地评估与战略目标有关的民用航空环境。其中一些高层次指标与航空运输业根据关键效绩指标（KPI）命名使用的其他指标有相同之处。本文件对国际民航组织制定以及航空运输业利益攸关者使用的不同关键绩效指标做了审议，评估是否需要为监测民用航空发展，尤其是在环境保护和效率等领域（包括发展）制订共同的指标。

专业会议的行动在第 5 段。

1．引言

1.1　国际民用航空组织（ICAO）的宗旨与目标在《芝加哥公约》[1]中做了规定，本组织由此得以建立。从广义上讲，这些宗旨与目标是发展国际空中航行的原则和技术，并促进国际航空运输的规划和发展。国际民航组织内部不同领域的专家是确保各国实施或得到援助，使其能够履行《芝加哥公约》附件中制订的标准和建议措施（SARPs）。

[1] 根据《芝加哥公约》第四十四条所载明，国际民用航空组织旨在发展国际空中航行的原则和技术，并促进国际空中航空运输的规划和发展，以满足世界人民对安全、正常、有效和经济的航空运输的需要。国际民用航空组织有 190 个成员国，它们通过批准或发出加入《芝加哥公约》的通知而成为国际民航组织的成员。

1.2 为了使其行动方向与迅速发展的全球化和地区化趋势保持一致，国际民航组织已开始实施一项创新的业务计划，使本组织成为一个注重成果和以效绩驱动的组织。业务计划将本组织的六项战略目标本转化为行动计划，并在各项计划的活动与绩效评估之间建立一种联系。

2. 国际民航组织目前的战略目标

2.1 为了实现这一愿景，本组织制定了 2005 年—2010 年期间的下述战略目标：

A. 安全 — 加强全球民用航空的安全。

B. 保安 — 加强全球民用航空的保安。

C. 环境保护 — 将全球民用航空对环境的不利影响减至最小。

D. 效率 — 提高航空运行的效率。

E. 连续性 — 保持航空运行的连续性。

F. 法治 — 加强规范国际民用航空的法律。

2.2 一致认为，这些战略目标需要跟上不断变化的情况，并不断对战略目标进行必要的完善与改进。

2.3 在这方面，认为高层次指标（HLIs）能够帮助理事会确定实现本组织战略目标的总体进展情况，并认为一些高层次指标可以作为帮助评估民用航空环境的可能衡量标准。这些按年度表述的高层次指标载于附录 A。

2.4 战略目标与《芝加哥公约》（第六十七条）和 A36-15 号决议附录 B，C 和 G 阐述的国际民航组织的另一个重要职能，即提供统计资料、预测和经济分析相互联系。因此，理事会通过实施目标管理概念所做的决定，证实了国际民航组织收集和发布统计资料的必要性，它需要对本组织的活动开展效绩衡量。

3. 高层次指标

3.1 设定任何目标时，其是否可以衡量是主要考量之一，为国际民航组织的大多数战略目标斟酌出几个很好的指标。关于两项战略目标——连续性和法治，未能确定有意义的指标。

3.2 正如附录 B 所示，一些指标被确认是有价值的，但没有被订立，因为在确定指标时缺乏数据。但有建议提出应收集相应的数据，使这些指标可以得到使用。

3.3 为每项战略目标绩效设立指标时，有一个标准数据可用来计算揭示的数据。第一个背景指标 [2] 对国际民航组织非常具有意义，它对航空及其过去十年的发展提供了总体看法，因而与许多高层次指标，尤其是衡量安全、环境和效率的高层次指标有关联。

[2] 国际民航组织各缔约国定期航空公司运输量增长情况按可用和执行吨公里以及离港人数表示。

3.4 在同一层次，国际组织，特别国际机场理事会使用的指标，关系到旅客人数和航空器起降架次以及按吨计算的货运，按月与前一年比较进行监测。国际航空运输协会是按年度规定一些历史性指标（5年趋势），并按地区有所下降。

3.5 在安全监测方面，国际民航组织公布事故发生率并查明在两项高层次指标中适时地反映出来的用以衡量安全趋势的潜在问题领域，即定期航班的死亡事故率和全球安全报告文化。

3.6 其他组织，比如国际航空运输协会公布年度安全趋势，但使用的指标与附录 C 所述完全不同，它们完全按照西方制造的航空器为基础，并只涉及机身损失，而不涉及死亡事故。

3.7 与安全相关的第三项指标虽有建议但却没有订立，它关系到安全监督制度八项关键要素的实施程度。使用对国家航空活动问卷（SAAQ）[3] 的答复建立一个数据库转换，把定性领域转化成定性数据。国际民航组织启动的统计分析，与欧洲航空事故征候报告系统协调中心（ECCAIRS）的事故数据库和普遍安全监督审计计划（USOAP）数据库交叉相连，使国际民航组织对所有地区实现同等水平的绩效管理，如附录 D 所示。国际民航组织的直接收益之一是能获取到地区的安全指标。

3.8 关于执行与环境有关的战略目标 C，国际民航组织正在积极参与制定燃油效率指标，这有助于本组织制订环境问题的指导政策。

3.9 鉴于计算排放量与燃油消耗相互关联，保留的高层次指标是全球燃油消耗，即每可用吨公里（ATK）的燃油消耗或每收入吨公里（RTK）的燃油消耗。

3.10 国际航空组气候变化（GIACC）或航空环境保护委员会（CAEP）虽然已批准了燃油效率指标的两个选项：1）消耗的燃油（升）/收入吨公里；和 b）消耗的燃油质量/有效业载 x 距离，但尚未确定衡量航空排放量趋势的最后标准。

3.11 燃油消耗方面缺乏准确的历史数据，所以航空环保委员会一直在使用模型，而国际民航组织已制定了一项与正式的航空公司指南（OAG）的数据相挂钩的内部燃油消耗公式。燃油消耗是根据正式的航空公司指南（定期航班）提供的各航空公司资料，结合每种型号的航空器具体的燃油消耗公式估计得出。从这些燃油消耗数字当中，通过考虑运行航空器的型号，有可能估计任何一家航空公司在所飞的每个定期航班航段上的全球燃油消耗/排放。GIACC/2 IP2[4] 号文件对详细的方法做了说明。

3.12 在支持机场和空中航行服务规划的同时，国际民航组织需要监测机场和空中航行服务的运营效率，例如通过对其在航空公司运营成本百分比加权数的跟踪。这项高层次指标能够使国际民航组织使其指导材料保持最新状态，并继续发挥其在经济领域的领导作用。

3.13 科技进步和节约燃油创造的机会使通信、导航、监视/空中交通管理（CNS/ATM）系统得到优化，因此环境和效率使用一个共同的高层次指标。

3.14 有助于实现这一战略目标的另一个指标，是表示根据自由化安排执行的航空运输的比例。这项指标在推广航空运输自由化方面对国际民航组织非常有帮助意义，下一步是有机会评估自由化进程的

[3] 国家航空活动问卷可从第十届统计专业会议网站查阅。
[4] 这份文件可从第十届统计专业会议网站查阅。

地区差异。

3.15 通过将民用航空运输协定（ASAs）的信息与运输量数据相对照，可以制定出不同类型的地区指标，如附录 E 所示。第一张图按自由化国家对航线的数量/百分比介绍了自由化的发展情况，第二张图对自由化民用航空运输协定的网络与航空公司实际运营的网络做了比较。

4. 统计专家组第十四会议的第 15 号建议

4.1 专家组指出，有必要对共同的指标予以确定，藉以供各个航空运输利益攸关方监测民用航空活动的发展情况。为了使效绩衡量能够有效，提供的指标必须基于可靠的信息，同时收集数据的格式需要保持简练和有针对性。为了加强其对各国的支持，国际民航组织愿意实施一个过程来制定新的全球及地区的高层次指标，这主要是通过提高数据覆盖面，并铭记指导本组织与其他组织和外部各方互动必要联系的战略目标预期将随着每项业务计划向前发展。未来的考虑是需要建立可供国际民航组织和不同的航空运输业利益攸关方使用的共同指标。

5. 专业会议的行动

5.1 请专业会议：

a) 注意到国际民航组织为监测实现其战略目标进展情况目前所使用的各项高层次指标；和

b) 对国际民航组织使用的高层次指标和航空运输业其他利益攸关方使用的关键绩效指标可能趋同汇集提出意见。

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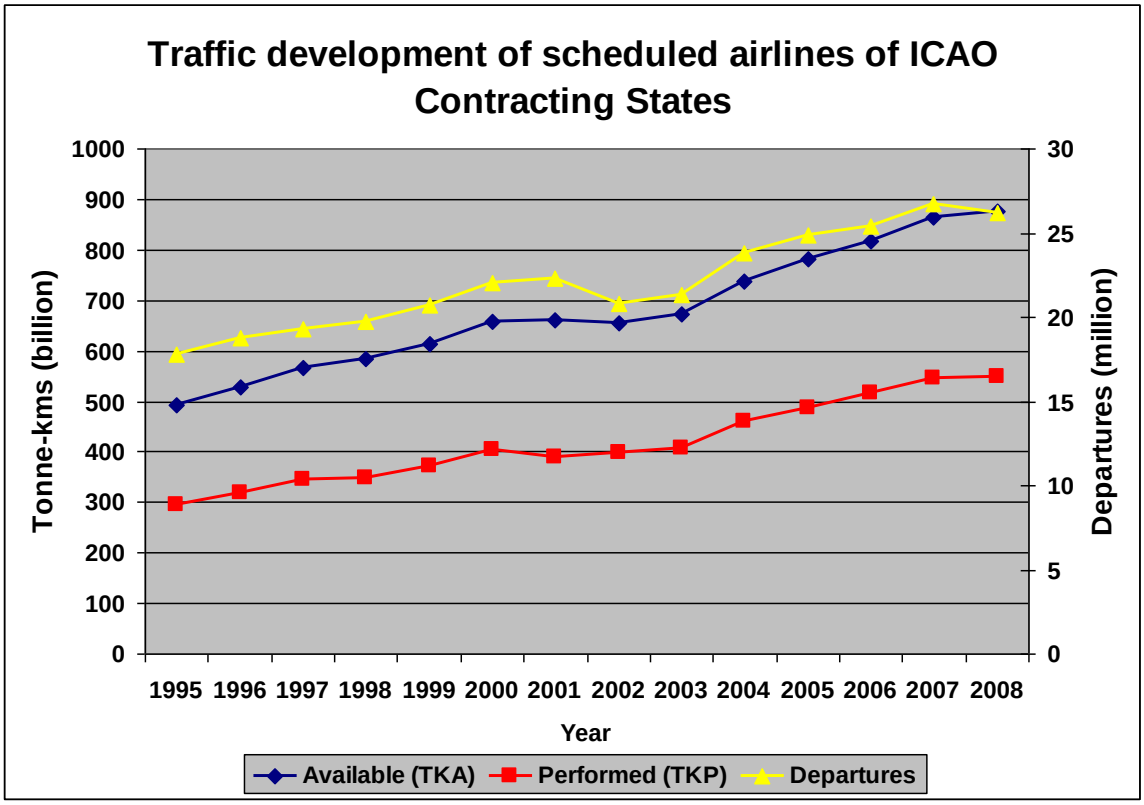
APPENDIX A

HIGH-LEVEL INDICATORS

Aviation Context – Background Indicator

- Development in aviation capacity traffic and in the number of departures of the scheduled airlines of ICAO contracting States.

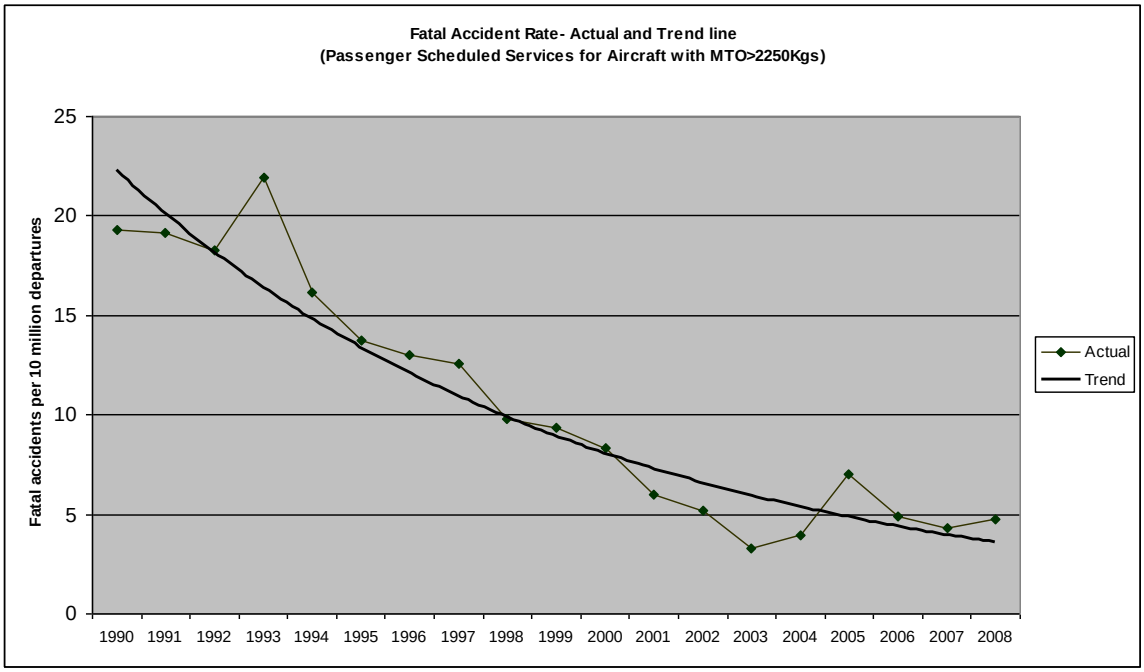


Explanation

— This component provides a view of the overall aviation context and thus relates to many high level indicators. The chart above shows the development in capacity (tonne kilometres available – TKA), traffic (tonne kilometres performed – TKP) and in the number of departures of the scheduled airlines of ICAO contracting states over the period 1995 – 2008. In terms of annual average change, TKA increased at 4.5 percent. TKP at 4.9 percent and the number of departures at 3 percent per annum. These data provides the broad context relating to the efficiency of ICAO's initiatives in the development of Civil aviation over the last twelve years.

High level indicator for A - Safety[5]

- A1 Level of Safety, Trend line indicator for fatal accident rates per million departures.



Explanation

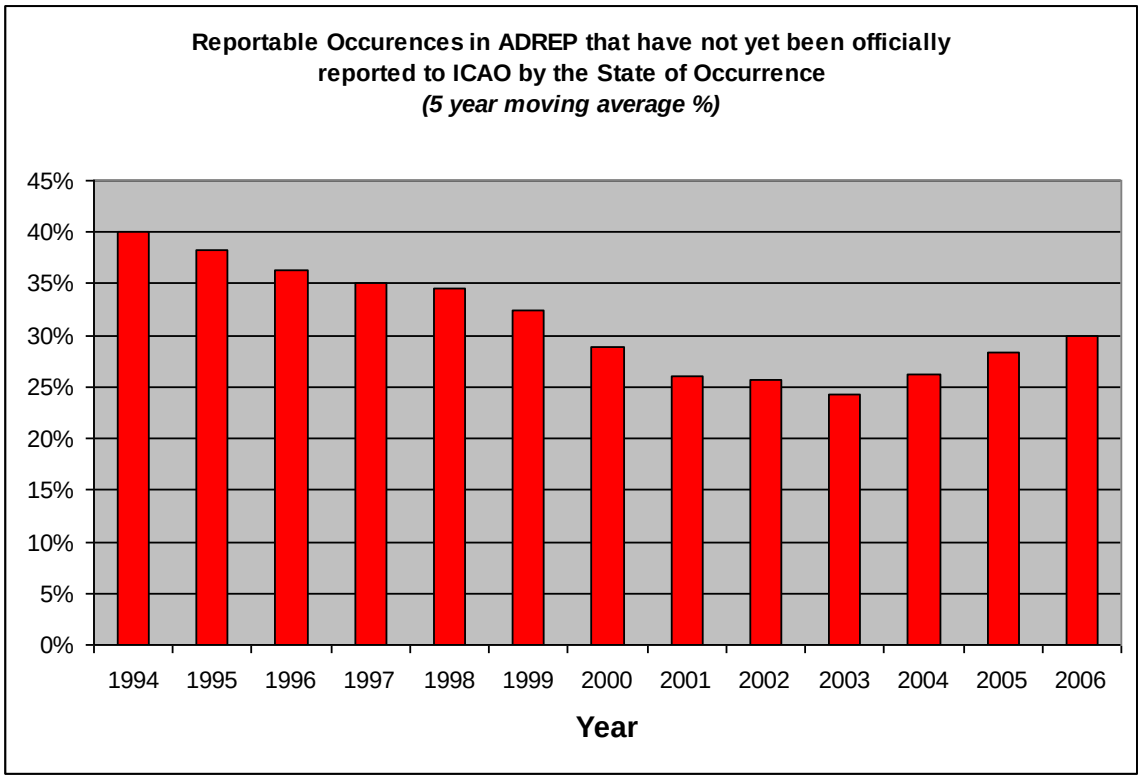
— ICAO has collected data for many years on fatal accident rate per departure for all air transport operations with aircraft maximum take off mass (MTOW) over 2 250 Kg. Data on fatal accidents are considered reliable with a more complete data set being reported to ICAO and or available from other sources.

— The above trend has been generated for passenger scheduled services with operations by aircraft having MTOW over 2 250 Kg and involved in passenger fatalities, the primary cause for which was "accidents" and not acts of unlawful interference.

— The trend line has been generated using a low dampener to discern real trends. The trend is overall a declining one. For the immediate future the trend indicates accident rates per departure levelling off at the rates noticed for the year 2008.

[5] 2008 Safety data extracted from ECCAIRS and is provisional.

- A.2 Global safety reporting culture (Percentage of ICAO States notifying ICAO of accident/serious incident).



Explanation

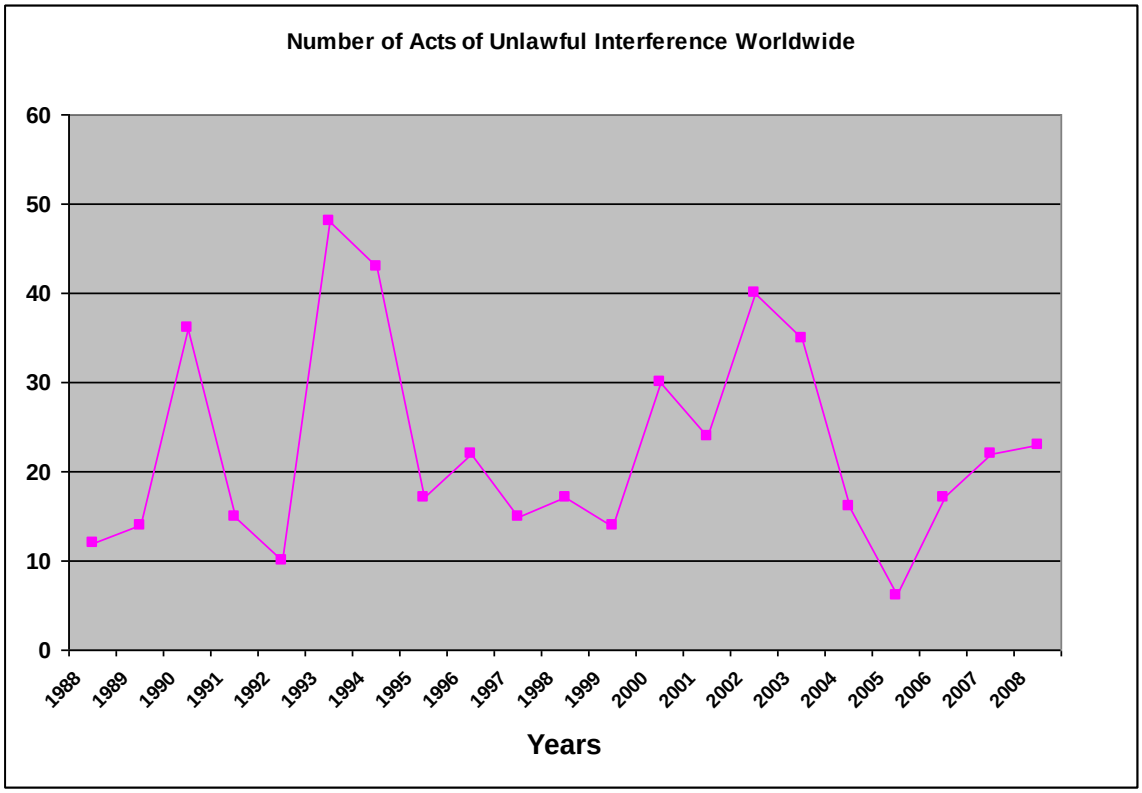
— A reportable occurrence is one that qualifies as an accident or serious incident as per Annex 13 and involves a commercial or general aviation operated aircraft with a MTOW over 5 700 Kg.

— ADREP records on reportable occurrences that have not been officially notified to ICAO by the State of occurrence have been derived through reliable industry sources such as Airclaims, Lloyds or the Flight Safety Foundation's Aviation Safety Network.

— For the time period 1 January 1990 to 31 December 2006, ADREP has records on reportable occurrences in 162 Contracting States, of these, 68 have more unofficial records in ADREP than officially notified ones.

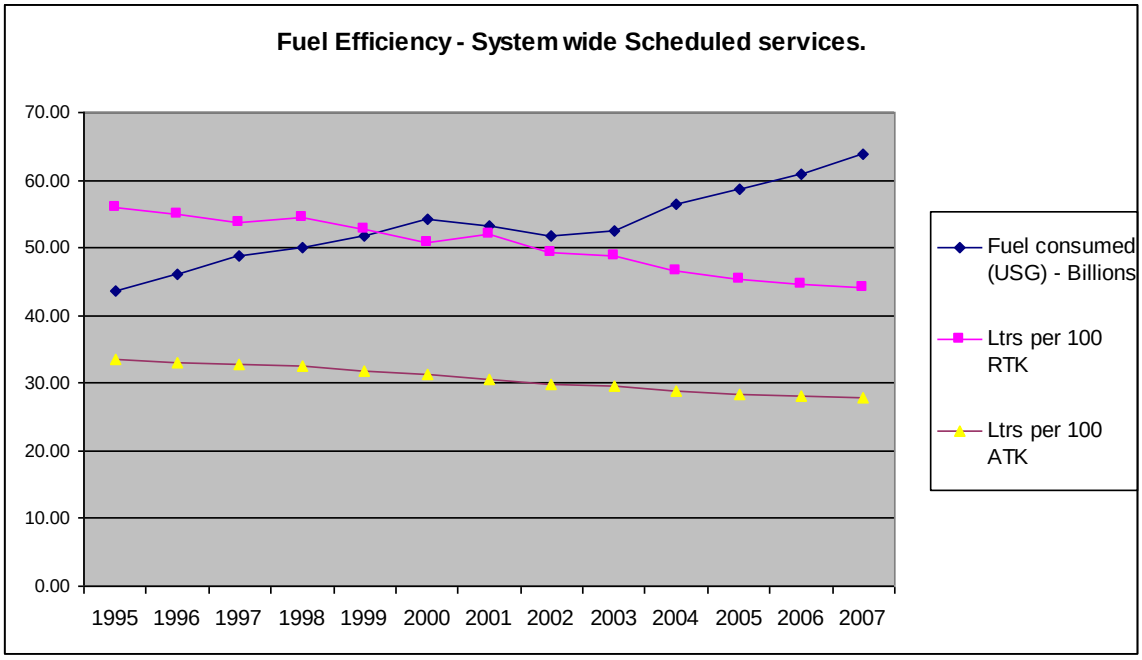
High level indicator for B – Security

— **B.1** Number of acts of unlawful interference against civil aviation worldwide.



High level indicator for C – Environment

- **C.1** Tonnes of fuel burned (and CO_2 generated) per 100 RTK/ATK

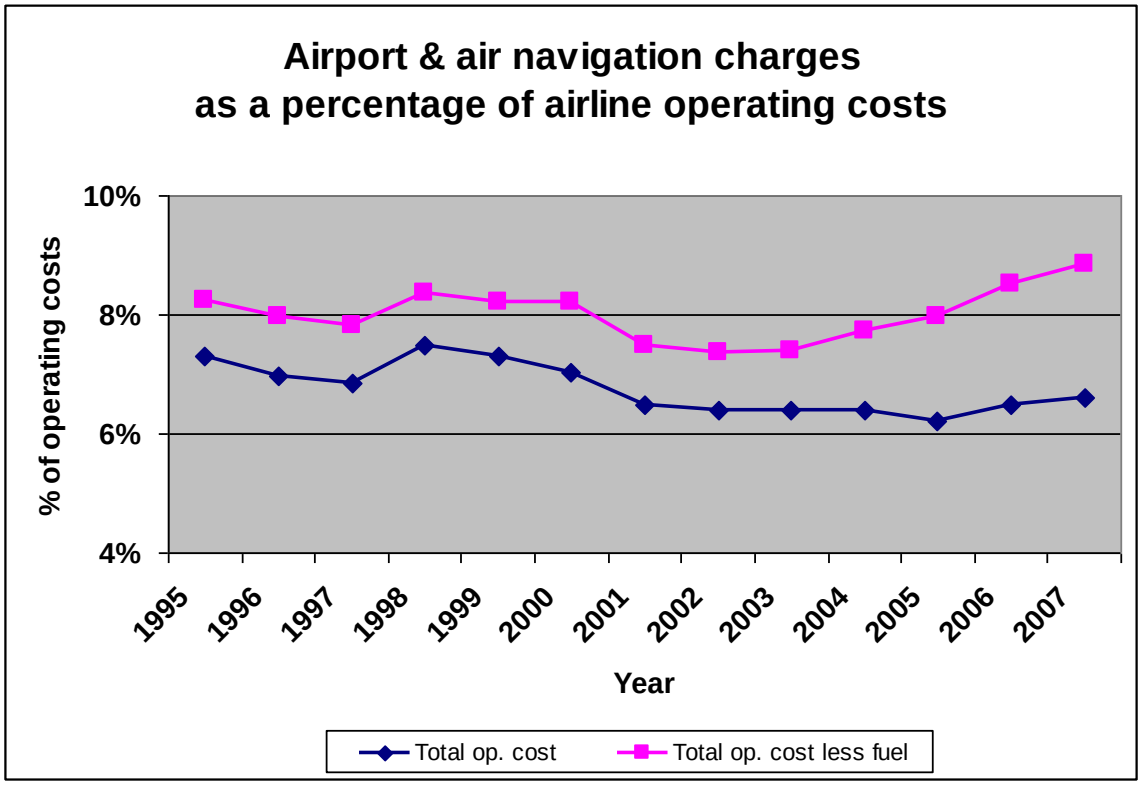


Explanation

— Aircraft engines emit a range of gaseous and particulate by-products (emissions) that contribute to various environmental impacts. Some emissions are related to components in the fuel, such as sulphur, some are related to the high-pressure, high-temperature oxidizing environment of the engine, such as oxides of nitrogen (NO_x), and some are simply by-products of the oxidation reaction that occurs in the combustion process itself, carbon dioxide (CO_2). Given this variability, there is no one measure that accurately quantifies the environmental impact of aircraft engine emissions. However, all emissions are correlated to some degree to the amount of fuel burned. Therefore, from a high-level perspective, tracking the change in fuel burn in absolute terms provides an indication of the change in the magnitude of the environmental impact of aviation emissions. Since Carbon emissions are directly correlated to hydrocarbon fuel burn (unit of fuel X 3.16 = unit of CO_2), tracking fuel burn gives precisely the same relative perspective as tracking Carbon emissions.

High level indicator for D – Efficiency and Development

- **D.1** Airport and air navigation charges as a percentage of airline operating costs.



Explanation

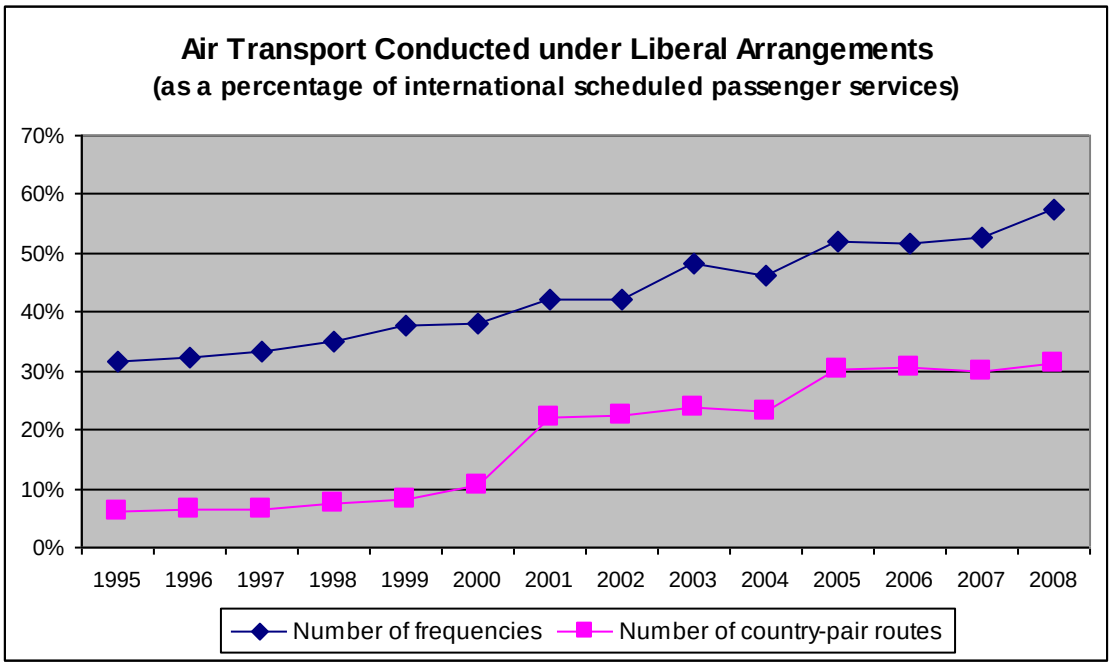
— This indicator illustrates the increased efficiency and improved cost-effectiveness in the provision and operation of airports and air navigation services, which is in its turn one of the results of the ongoing commercialization and privatization process of airports and air navigation services entities. It also reflects upon ICAO's leadership role in the economic field and the related policy and guidance material being kept updated and promoted by the Organization. However, it should be noted that the improvements in efficiency and cost-effectiveness of the service providers are relative to the improvements by air carriers and the changes shown in the percentage of these costs in the total operating costs of air carriers (after excluding fuel costs) suggests that the change in efficiency and cost-effectiveness of airports and air navigation services entities is in line with the changes introduced by the air carriers themselves.

- D.2 Tonnes of fuel burned per 100,000 ATK

— Explanation and data: see HLI for the Environment. Tracking the change in fuel burn on a rate basis (tones of fuel/100,000 RTK/ATK's) provides a picture of the relative change in fuel-efficiency of the commercial aviation sector. By following these two

measures in a time series, it is possible to form a high-level perspective of how environmental effects of international aviation are changing over time. Since Carbon emissions are directly correlated to fuel burn (unit of fuel X 3.16 = unit of CO_2), tracking fuel burn gives precisely the same relative perspective as tracking Carbon emissions.

- D.3 Percentage of air transport conducted under liberal arrangements



Explanation

— Air services agreements between States govern the operation of international air transport services. The number of liberalized agreements reflects changes in the economic regulatory environment. The data measures used in this table track the development of liberalization and can be used to assess the impact and extent of liberalization on the efficient operation of international air transport services.

— Since the mid-1990s, there has been a significant increase in the number of States which have accepted liberalized bilateral or multilateral arrangements. In terms of the impact or extent, in 2008, about 31 per cent of the country-pairs with non-stop scheduled passenger services and about 57 per cent of the frequencies offered were between States which have embraced liberalization (compared with about 7 and 35 per cent, respectively, a decade ago). To create a more favourable economic regulatory environment for the sustainable development of international air transport, there is a need for ICAO to promote and facilitate air transport liberalization, and assist States where needed, while at the same time ensuring that safety and security are not compromised.

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APPENDIX B

INDICATORS WHICH DO NOT HAVE DATA CURRENTLY AVAILABLE OR MAY REQUIRE SPECIAL DATA COLLECTION

High-level indicators for A – Safety

- A3. Level of implementation of the eight critical elements of a safety oversight system

  — *Explanation*: This indicator could be in place as soon as ICAO has enough data to provide reliable information (likely in 2009).

High-level indicator for C – Environment

- C2. Number of residents in the vicinity of major airports exposed to noise at or above DNL 65 dB

  — *Explanation*: People usually react to noises which disturb their daily activities. This "annoyance" depends on combined factors such as the intensity, frequency and duration of the noise and on the time of day where the noise is produced. Two factors influence the number of people affected by significant noise level around airports: the noise levels accrued from the operation of aircraft and the land–use planning and control which preclude encroachment at the vicinity of airports. In general, most land uses in the vicinity of airports are considered to be compatible with a day-night average sound level (DNL) that does not exceed 65 dB. To evaluate the impact of aircraft noise and its evolution over time, the number of people affected by significant aircraft noise is estimated as the number of people in the vicinity of major airports exposed to noise at or above DNL 65 dB.

- C3. Distribution of aircraft in the in-service fleet by NO_x characteristics[*]

  — *Explanation*: Different from CO_2, the production of NO_x is loosely correlated with fuel burn. NO_x is a reactive gas emitted from jet engines. The rate of NO_x formation is primarily a function of the combustion temperature, pressure ratio and dwell time of the air within the combustor. Engines are certified to specific standards which, inter alia, quantify the amount of NO_x produced within the LTO cycle. This indicator proposes to track the in-service fleet on the basis of the proportion of the fleet that is equipped with engines distinguished on the basis of the relative rate of production of NO_x.

High-level indicator for D – Efficiency and Development

- D4. The number (percentage) of major international traffic flows wherein performance-based navigation operations are conducted

[*] Further work is required to define the NO_x performance characteristics and to obtain access to the privately held proprietary database.

— *Explanation*: The above will be measured on the basis of implementation of required navigation performance (RNP) and area navigation (RNAV) route structures and reduced vertical separation minimum (RVSM), and appropriate infrastructure and supporting regulatory environment

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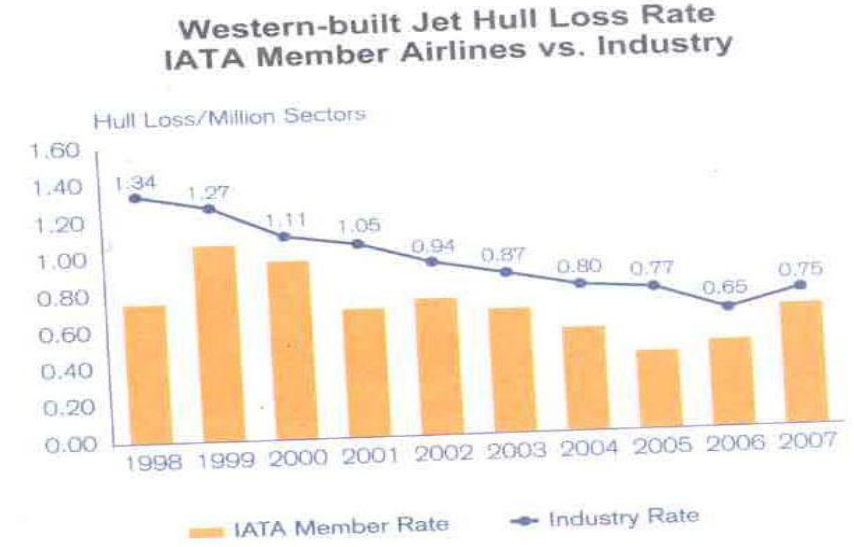
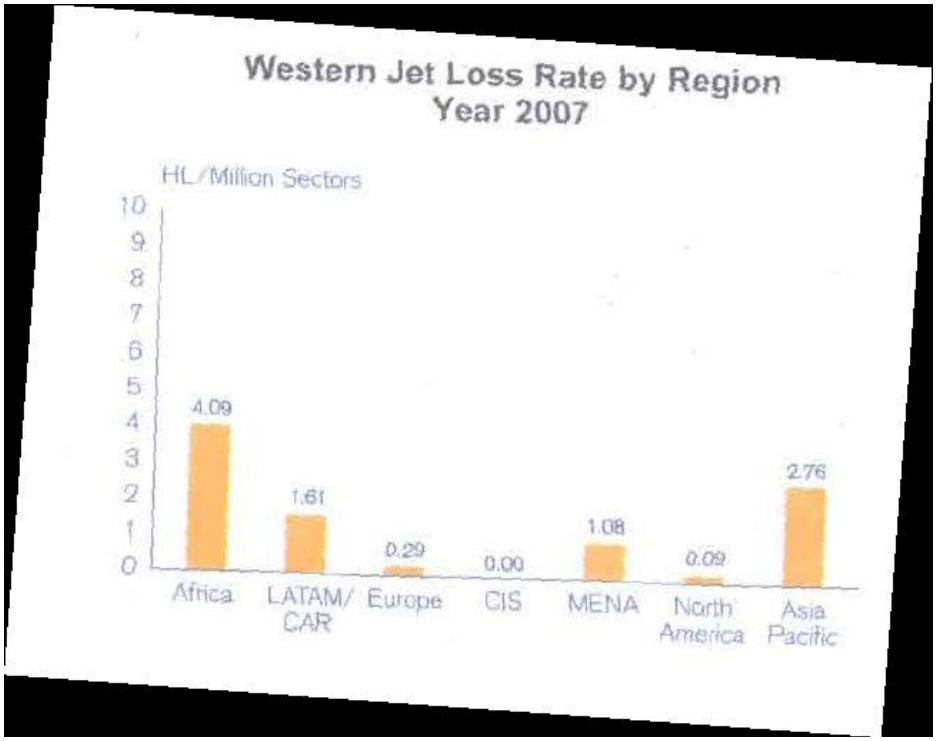
APPENDIX C

IATA SAFETY INDICATORS





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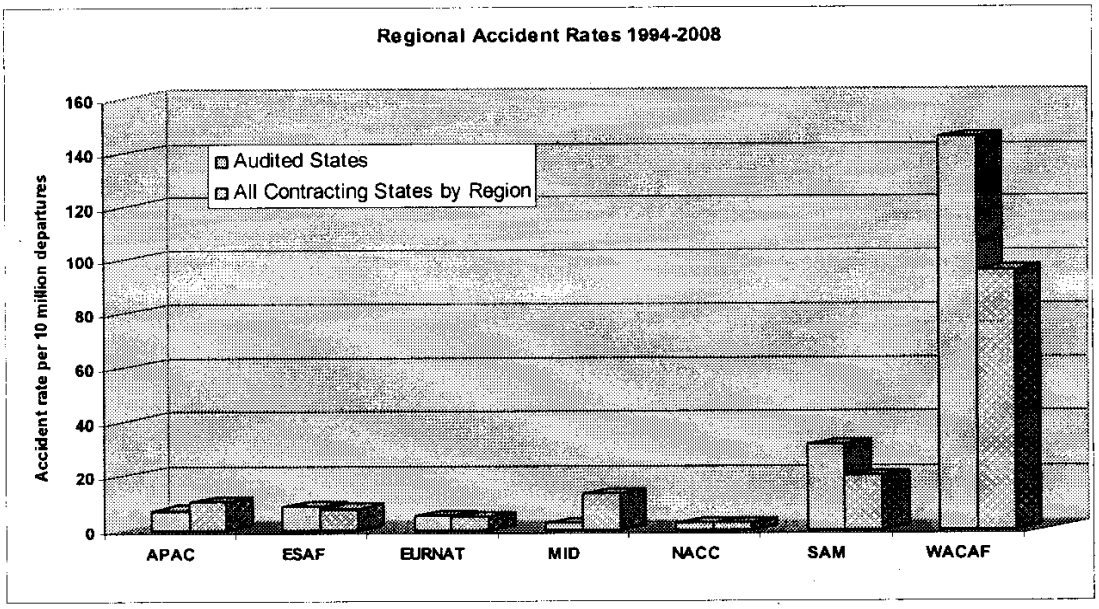
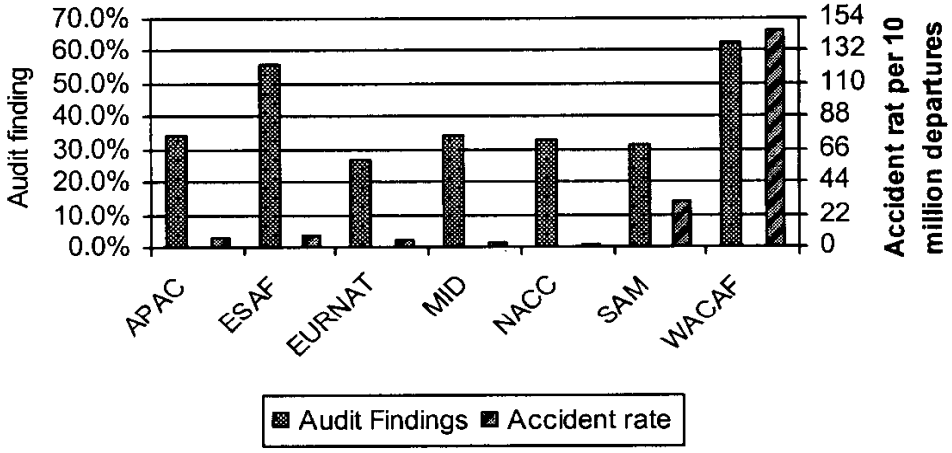
APPENDIX D

REGIONAL INDICATORS FOR SAFETY



Regional Analysis
Lack of Effective Implementation and Accident Rates



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APPENDIX E

Figure 1. Liberalized Country-Pair Routes with Non-Stop Scheduled Passenger Frequencies

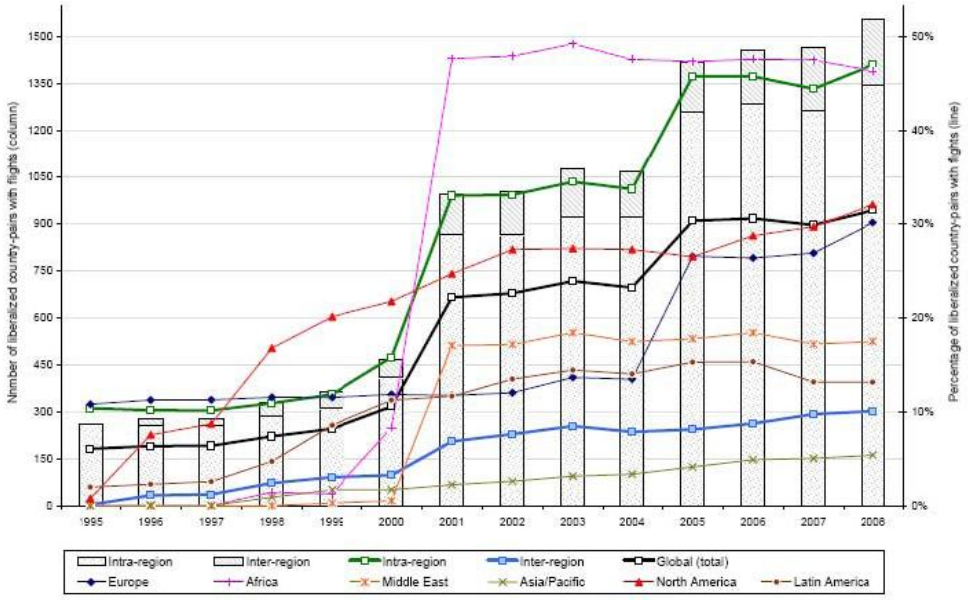
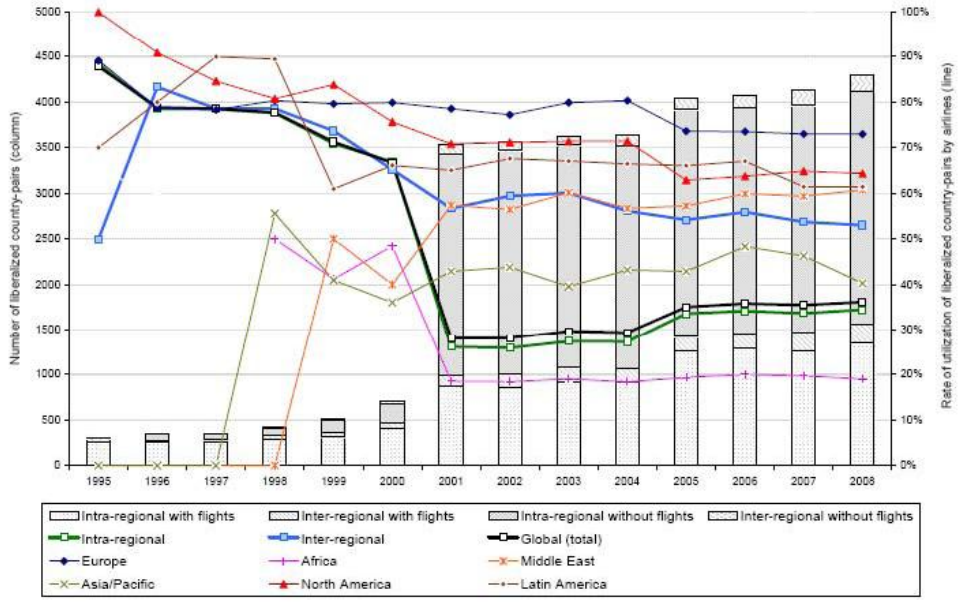


Figure 3. Regulatory Network of Liberalization vs. Actual Network Operated by Airlines



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